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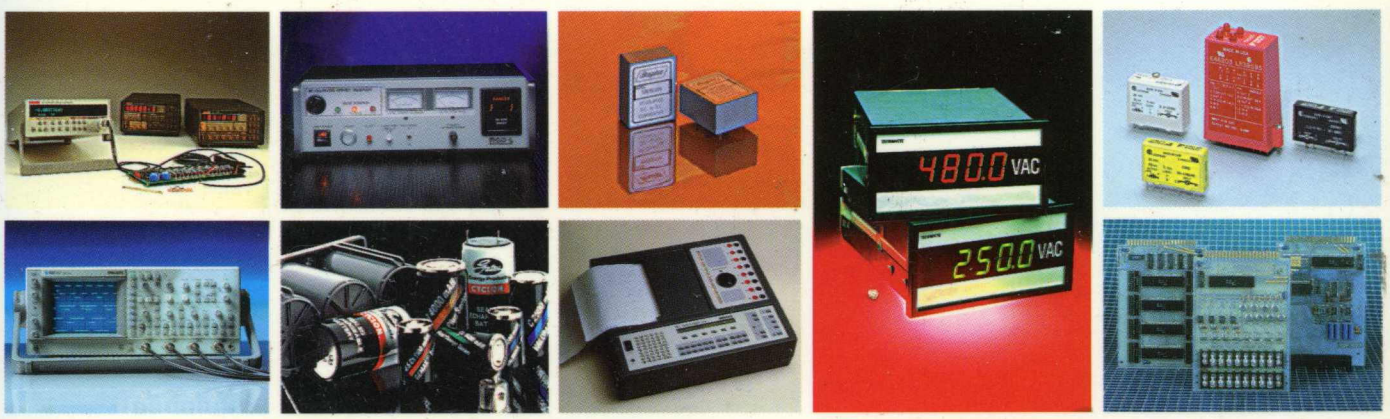
electronic engineers master catalog

VOLUME D



power sources, instrumentation, computer products, and equipment

34th EDITION

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1200 Antennas & Accessories
1300 Audio Equipment & Accessories
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2000 Computer Peripheral Equipment
2025 Computers (Mini/Micro/Boards)
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Hearst Business Communications, Inc.

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how to use eem

The 34th edition of EEM is arranged in four volumes each composed of related Product Sections. For user convenience, each volume contains its own Product Index and Directory (green pages) and its own Manufacturers and Sales Offices Directory (yellow pages). Every Product Heading and every manufacturer of electronic products is listed in each volume. Where, however, the Product Section is assigned to a volume other than that in use, a cross reference is made to the appropriate volume for further information.

To locate a specific product. Start by choosing the volume whose title describes the class of electronic product you are seeking. If you are not sure which volume is appropriate, pick up the first one at hand and look up the product heading in the green pages. There you will find either a list of that product's manufacturers or you will be referred to the proper volume. All products are identified by their generic terms. Please read the instructions on the first page of each section. Manufacturers with catalog data pages in this edition of EEM appear in boldface type and page numbers are shown. Manufacturers appearing in lightface type have submitted verifying evidence that they supply the products shown. When you have located a product of interest, turn to the page(s) shown for further information. You will find these pages in each volume in the appropriate sections.

product selection guides

There are 35 Product Selection Guides included in this edition of EEM. They are located on the first pages of the Product Section to which they apply. Use these guides for basic selection parameters and then go to the EEM pages shown in the guide for more detailed information.

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*A Product Selection Guide precedes these Product Sections

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advertisers' index

To find a specific manufacturer's data pages, an alphabetical index of EEM participants appears in EEM starting on page A•4 of Volume A and on pages B•4, C•4 and D•4 of the other volumes.

trademark and logofinder directories

A comprehensive Trademark Directory is included with Volume C. The EEM Logofinder shows the symbols and graphics used by manufacturers as identifiers on their products. Use these pages to locate manufacturers of specific trademarks and logos.

manufacturers' index

In the EEM yellow pages you will find pertinent details on all manufacturers listed in EEM including local sales offices and/or distributors. Please refer to the detailed instructions on the first page of the EEM yellow pages for additional information.

to order a product found in eem

When you have located the product that suits your needs, call the manufacturer or the local sales rep or distributor as shown in the EEM yellow pages. Give the EEM data page number and specs from that page. You and the supplier will be talking on the same wave length which should simplify your ordering and buying.

to file manufacturers' catalogs and data

The EEM File System is revised and updated to reflect changes in EEM itself. Each new EEM File System contains a complete Product Index. This index tells you where to file which catalog. It also contains a cross reference identifying what should be filed in each section. In order to use the EEM File System all you need is a supply of standard letter size, third-cut manila file folders. You then use the pressure sensitive labels which are supplied with the system to go into as much detail as you want or need.

Each label fits the third-cut file folder exactly. There are over 300 of these labels in each system: one for the index, one each for the EEM Product Sections, 24 for the alphabetical file of multiproduct catalogs, plus more than 200 additional labels for system expansion. The EEM File System also includes Cross Reference Cards so you can quickly and easily find multiproduct catalogs. The EEM File System is complete and can save you countless hours of time and thousands of dollars. Send your check for $25.00 to: EEM File System, 645 Stewart Ave., Garden City, NY 11530 and we'll absorb postage and handling. Send a purchase order and add $5.00 for postage and handling. NY, CA and MA residents, please add sales tax.

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Following each product heading is a four-digit number directing you to the Product Section where these products are usually cataloged. If that Product Section is not in the EEM volume you are using, a "See Vol. A, B, C, or D" will direct you to the proper volume for your product classification. No numbers appear with cross-reference headings.

Under each product heading whose Product Section appears in the volume you are using, the names of the manufacturers who supply the product are shown in alphabetical order with EEM catalogers shown first in boldface type with appropriate page numbers. Other manufacturers are shown in light face type. The symbol (§) indicates that these products are available from local distributors. The symbol (†) indicates that the product is available to MIL specifications.

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Accelerometers-5500 — See Vol. B

Acoustic Systems (MIL)-2440 — See Vol. B

AC Power Protection Equipment — See Line Conditioners (Vol. D)

Actuators, Satellite Antennas-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100

Actuators, Servo, Linear-4900

† BEI Motion Systems Company, Kimco Magnetics Div., San Marcos, CA 92069, 619-744-5671 ..... B•1879
Dektrol Controls, Milwaukee, WI 53215, 414-671-6000 ..... B•1617-1618
† Eastern Air Devices, Inc., Dover, NH 03820, 603-742-3330 ..... B•1254
† Electro-Mechanisms, Inc., Duarte, CA 91010, 818-359-2535 ..... B•1624-1625
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... B•1260
Hurst Manufacturing Div., Princeton, IN 47670, 812-385-2564 ..... D•1275
† Line Electric Products, Hartford, CT 06141, 203-659-3573;1-800-331-1137 ..... B•1537
† Lucas Ledex Inc., Vandalia, OH 45377-0427, 513-898-3621 ..... B•1631
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•2243
§ NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056, 708-824-1133 ..... A•1699,1704
TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
† Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1031
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410 203-271-6000
Airpax-International Division, A North American Philips Co., Cheshire, CT 06410 203-271-6000
† Astromec, Inc., Carson City, NV 89706 702-883-9226
Augat Alcoswitch, Augat Inc., N. Andover, MA 01845 508-685-4371
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
# Ball Screws & Actuators Co., San Jose, CA 95136-1305 408-629-1132
§ Bellofram Corporation, Newell, WV 26050 ..... 304-387-1200;800-727-5646
Burleigh Instruments, Fishers, NY 14453 716-924-9355
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Dynalloy, Inc., Irvine, CA 92715 714-476-1206
† EEMCO, Datron, Inc., Los Angeles, CA 90039 818-247-7060
† Globe Motors, Dayton, OH 45404 513-228-3171
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§ Hoke Incorporated, Cresskill, NJ 07626 201-568-9100
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-6728 ..... 415-883-3535;800-747-0064
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Liberty Controls, Shorewood, IL 60435 815-725-2241
† Lisk, G. W., Co., Clifton Springs, NY 14432 315-462-2611
† McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
§ Mektronix Technology, Inc., Goleta, CA 93117 805-964-9669
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
Microvision Corp., Campbell, CA 95008 408-374-3158
† Modular Devices, Shirley, NY 11967 516-345-3100
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
MTS Systems, Minneapolis, MN 55424 612-937-4000
§ Norgren, Littleton, CO 80120-1663 303-794-2611
Northern Magnetics Inc., Van Nuys, CA 91406 818-997-8675
Oriel Corp., Stratford, CT 06497-0872 203-377-8282
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
Regdon Solenoid, Inc., Westmont, IL 60559 708-789-0600
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
§# ServoByte Inc., Millbury, MA 01527 508-865-0225
† Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
SR Engineering, BW/IP International, Inc., Garden Grove, CA 92643 714-554-4200
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

Actuators, Servo, Rotary-4900

† BEI Motion Systems Company, Kimco Magnetics Div., San Marcos, CA 92069, 619-744-5671 ..... B•1879
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... B•1260
Hurst Manufacturing Div., Princeton, IN 47670, 812-385-2564 ..... B•1275
† Line Electric Products, Hartford, CT 06141, 203-659-3573;1-800-331-1137 ..... B•1537
† Lucas Ledex Inc., Vandalia, OH 45377-0427, 513-898-3621 ..... B•1629,1631
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•2243
† Motor Technology, Inc., Dayton, OH 45429, 513-294-1041 ..... B•1304
NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056, 708-824-1133 ..... A•1699,1704
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
† Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1031
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
† Astromec, Inc., Carson City, NV 89706 702-883-9226
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Bellofram Corporation, Newell, WV 26050 ..... 304-387-1200;800-727-5646
Carco Electronics, Menlo Pk., CA 94025-1106 415-321-8174
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133

† EEMCO, Datron, Inc., Los Angeles, CA 90039 818-247-7060
Escap Products, Hauppauge, NY 11788 516-234-3900
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Globe Motors, Dayton, OH 45404 513-228-3171
† Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
Infranor, Naugatuck, CT 06770 ..... 203-729-8258:800-BE-SERVO
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
† Lisk, G. W., Co., Clifton Springs, NY 14432 315-462-2611
† McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
§ Mektronix Technology, Inc., Goleta, CA 93117 805-964-9669
† Modular Devices, Shirley, NY 11967 516-345-3100
Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
MTS Systems, Minneapolis, MN 55424 612-937-4000
§ Norgren, Littleton, CO 80120-1663 303-794-2611
Parker Hannifin Corp., Rotary Actuator Division, Wadsworth, OH 44281-0450 216-336-3511
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
Portescap U.S., Inc., Hauppauge, NY 11788 516-234-3900
† Precision Mechanisms, Westbury, NY 11590 ..... 516-ED3-5955
§# ServoByte Inc., Millbury, MA 01527 508-865-0225
† Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

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EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
§ Pomona Electronics, Pomona, CA 91766, 714-623-3463 ..... C•1493,1495-1499
§ Contact East, N. Andover, MA 01845 508-682-2000
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100

Adapters, Modular Telephone-2100 — *See Vol. C*

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Adhesives, UV Curing-1600 — *See Vol. C*

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Bell, Floyd, Inc., Columbus, OH 43212, 614-294-4000 ..... D•1028-1029
International Components Corp., Melville, NY 11747, 516-293-1500 ..... D•1039
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
§ Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154, 617-894-8700 ..... D•1099
§ Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100, 800-336-5917;703-953-4751 ..... B•1218-1221
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ MG Electronics, Hauppauge, NY 11788, 516-582-3400 ..... D•1044
§ Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 .. D•1045-1047
§ Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1050,1052
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1058
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... D•1062-1065
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•1066
Action Instruments, San Diego, CA 92123 619-279-5726
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
AES Corp., Peabody, MA 01960 508-535-7310
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
American Assembly Inc., Florida, NY 10921 914-651-3433
§ Aqualarm, Marine Safety Systems, Inc., Chula Vista, CA 91911 619-575-4011
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Atkins Technical Inc., Gainesville, FL 32608 904-378-5555
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
† Barnes Engineering Div., EDO Corporation, Shelton, CT 06484 203-926-1777
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Benjamin International, Inc., Plainview, NY 11803 516-753-0700
† Brooks Instrument Div., Emerson Elec. Co., Hatfield, PA 19440 215-362-3500
Cambridge Aerofio, Inc., Shirley, MA 01464 508-45-2346
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Cole Hersee Co., Boston, MA 02127-2467 617-268-2100
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
§ Corby Industries, Inc., Allentown, PA 18103 215-433-1412
§ Dancer Communications, Inc., Media, PA 19064-2334 215-543-8066
Dantel, Fresno, CA 93727 209-292-1111
Dataprobe, Englewood, NJ 07631 201-569-6464
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§Φ Dynamic Power Systems, Div. Onset International Corp., Nesconset, NY 11767-2611 516-361-6771
§ Edwards Co., Signaling Prods. Div., Farmington, CT 06034 203-678-0410
Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
§† Gems Sensors Division, Div. of IMO Industries Inc., Plainville, CT 06062-1198 203-677-1311
§† George Risk Industries, Inc., Kimball, NE 69145 308-235-4645
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
§ Keptel/Armiger, Tinton Falls, NJ 07724 ..... 800-526-3697;201-389-8800
KMC Systems, Inc., Midland Pk., NJ 07432 201-447-0007
† Kolin Inds., Pound Ridge, NY 10576 914-764-5775
† Kurz Instruments Inc., Monterey, CA 93940 800-424-7356
Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Mallory/North American Capacitor Co., Indianapolis, IN 46241 317-856-3731
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Metrix Instrument Co., Houston, TX 77043 713-461-2131
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
NAVAN Corporation, Media, PA 19063 215-543-8066
NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 708-824-1133
Omega Engineering, Stamford, CT 06907 800-826-6342
† Oven Industries, Mechanicsburg, PA 17055 717-766-0721
§ Poly-Planar Inc., Warminster, PA 18974 215-675-7805
PPM, Inc., Cleveland, OH 44139 216-349-2300
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Rodann Electronics Mfg. Co., Brea, CA 92621 ..... 714-529-1301;800-366-7010
Rush Enterprises Inc:A Heico Company, Hudson, NH 03051 603-886-9460
§† Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
§ Sierra Monitor Corp., Milpitas, CA 95035 408-262-6611
Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§† Sonicall, Inc., Signal Hill, CA 90806 213-490-2143
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Tapeswitch Corp. of America, Farmingdale, NY 11735 516-694-6312
Tegal Scientific, Inc., Concord, CA 94524 415-827-1054
§ Tektone Sound & Signal, Lake Park, FL 33403 407-844-2383
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Vibra-Metrics, Inc., Hamden, CT 06514 ..... 203-288-6158;1-800-8-SENS-IT
Wheelock, Inc., Long Branch, NJ 07740 201-222-6880
Xylog Corp., Hackensack, NJ 07601 201-489-4040

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Alarms, Static Level-4100

§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... B•1889
Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154, 617-894-8700 ..... D•1099
§ Contact East, N. Andover, MA 01845 508-682-2000

Schlumberger Industries, Tranducers Div., Houston, TX 77082 713-558-2587
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL

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† Gerator Corp., Manassas, VA 22110-9070, 800-553-9933 ..... D•2195-2198
† American Electronics, Fullerton, CA 92631 714-871-3020
Bosch, Robert, Corp., Broadview, IL 60153 708-865-5200
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
† Eastern Air Devices, Inc., Dover, NH 03820 603-742-3330
Electro-Pacific, Goleta, CA 93117 805-964-0751
† IMC Magnetics Corp., Eastern Div., Westbury, NY 11590 516-334-7070
† Pacific Scientific, Electro Kinetics Division, Santa Barbara, CA 93101 805-963-2055
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Simmonds Precision Engine Systems, BF Goodrich Aerospace, Norwich, NY 13815 607-335-5000
§ Square D Co., Palatine, IL 60067 708-397-2600

Altimeters-2900

† Computer Instruments Corp., Westbury, NY 11590 516-476-6400
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400

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† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-4857 ..... D•1287
Magnum Opus Custom Electrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-2300 ..... D•1294
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Plitron, Downsview, Ont., CAN M3J 2N5, 416-667-9014 ..... A•2368-2369
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017
A E G Corporation, Somerville, NJ 08876-1288 908-231-5491
† AEROCOM, Miami, FL 33133 305-448-8503
§† Aiphone, Bellevue, WA 98005 206-455-2510
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analog Systems, Tucson, AZ 85731-7389 602-290-1813
§ Argos Prods, Genoa, IL 60135 815-784-5118
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Cal-Scope, Excelltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
C-COR Elctrns, State College, PA 16801 ..... 814-238-2461;800-233-2267
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Dantel, Fresno, CA 93727 209-292-1111
Dexter Research Ctr., Inc., Dexter, MI 48130 313-426-3921
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§† Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
Electro Force Corp., Anaheim, CA 92805 714-774-3666
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Energy Systems, Vancouver, WA 98682 206-896-8310
§ Furman Sound, Inc., Greenbrae, CA 94904 415-927-1225
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Instruments, Inc., San Diego, CA 92111 619-571-1111
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
Julie Research Labs., New York, NY 10001 212-633-6625
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
LogiMetrics, Plainview, NY 11803 516-349-1700
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
† MDF Products Inc., Danbury, CT 06811 203-743-3579
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Norton Associates, Inc., Copiague, NY 11726 516-842-4666
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Peca, Inc., Bensalem, PA 19020 215-245-1550
§ Perma Power Elctrns., Chicago, IL 60648 312-763-0763
† Perry Amplifier, Brookline, MA 02146 617-734-0844
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
Precision Filters, Ithaca, NY 14850 607-277-3550
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8600;800-527-4642
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
§ University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Antenna-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
Compliance Design Inc., Boxboro, MA 01719 508-264-4608
Dowty Avionics, Arcadia, CA 91006 818-445-5355
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-738-4388
§ Kay Townes, Div. of Alco Industries, Inc., Ronic, GA 30161 404-291-3871
§ Lance Industries, Sylmar, CA 91342-3632 818-367-1811
LF Engineering Company Inc., East Haven, CT 06512 203-467-3580
MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Silco Antennas Div.of Simplicity Tool Corp, Portland, OR 97220 503-253-2000
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Amplifiers, Compressor-1100

§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Spectra Sonics, Ogden, UT 84405 801-392-7531

Amplifiers, Current, AC-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005-1007,1598
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2205,2207
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-4857 ..... D•1287
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017-1019
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Behlman Electronics, Inc., Ventura, CA 93003 805-642-0660
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-6620;800-358-2244
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
CTS Corporation, Microelectronics business unit, W. Lafayette, IN 47906 317-463-2535
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
Energy Systems, Vancouver, WA 98682 206-896-8310
† Frequency Control Products, Inc., American Time Products Div., Deer Pk, NY 11729 516-243-5730
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
Julie Research Labs., New York, NY 10001 212-633-6625
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
† Modular Devices, Shirley, NY 11967 516-345-3100
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Norton Associates, Inc., Copiague, NY 11726 516-842-4666
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
§ Pacific Scientific Co., Rockford, IL 61109 815-226-3100
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 612-942-3600
Rotek Instrument Corp., Waltham, MA 02254 617-899-4611
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
§ Westamp, Santa Monica, CA 90404 213-393-0401

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† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 .... D•1005-1007
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2172
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3811 ..... D•1008
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010

† **Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650** ... **B•1892-1893**
§† **Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495** ..... **B•1277**
Infranor, Naugatuck, CT 06770, 203-729-8258;800-BE-SERVO ..... **B•1279**
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... **D•2243**
† **Modular Devices, Shirley, NY 11967, 516-345-3100** ..... **B•1302**
§ **Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566** ..... **D•1014**
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... **D•1015**
† **Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300** .... **D•1017-1019**
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§† Aiphone, Bellevue, WA 98005 206-455-0510
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Analog Systems, Tucson, AZ 85731-7389 602-290-1818
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
Bertsch U.S., Vista, CA 92083 619-727-7420
Burleigh Instruments, Fishers, NY 14453 716-924-9355
† Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
† CELCO, Mahwah, NJ 07430 201-327-1123
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
† Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
† DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
† Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
† Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
§ HBM, Inc., Marlboro, MA 01752 508-624-4500
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Inertial Motors, Doylestown, PA 18901 215-345-1010
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
Julie Research Labs., New York, NY 10001 212-633-6625
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Motion Science Inc., San Jose, CA 95112 408-993-0300
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
NWL Transformers, Bordentown, NJ 08505 609-298-7300
Omega Engineering, Stamford, CT 06907 800-826-6342
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
† Perry Amplifier, Brookline, MA 02146 617-734-0844
† PPM, Inc., Cleveland, OH 44139 216-349-2300
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 612-942-3600
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
§ Westamp, Santa Monica, CA 90404 213-393-0401
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

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Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... **D•1003,1020-1021**
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
Precision Filters, Ithaca, NY 14850 607-277-3550

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† **Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600** ..... **D•1005**
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... **D•1017**
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† CELCO, Mahwah, NJ 07430 201-327-1123
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
† Infodex, Inc., Wolcott, CT 06716 203-879-4944
† M.S. Kennedy Corp., Cicero, NY 13039 315-699-9201
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
† Modular Devices, Shirley, NY 11967 516-345-3100
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Amplifiers, Differential-1100

† **Analog Modules, Inc., Longwood, FL 32750, 407-339-4355** ..... **D•1004**
† **Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600** ..... **D•1005**
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... **D•1008**
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... **D•1010**
† **Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650** ..... **B•1892-1893,1900**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1013**
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... **D•1015**
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§† Advanced Linear Devices, Inc., Sunnyvale, CA 94086-4606 408-720-8737
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Instrum, MDH Industries, Inc., Monrovia, CA 91016 818-303-4210
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Ross Engineering Corp., Campbell, CA 95008 408-377-4621
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Siliconix, Inc., Santa Clara, CA 95054 408-988-8000
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800

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† **Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600** .... **D•1005,1598**
§ **ESE, El Segundo, CA 90245, 213-322-2136** ..... **D•1135**
† **Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500** ..... **A•1368-1369**
§ **Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566** ..... **D•1014**
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... **D•1019**
† **TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411** ..... **D•1078**
† Aiphone, Bellevue, WA 98005 206-455-0510
Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
† CATEL Telecommunications, Fremont, CA 94537 415-659-8988
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
§ Covid, Inc., Tempe, AZ 85281 602-966-2221
Datachron Inc., Anaheim, CA 92805 714-385-1705
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
† Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
§ Heath Co., St. Joseph, MI 49085 616-982-3200
M/A-COM Government Products, Inc., Hunt Valley, MD 21030 301-771-0077
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 818-993-0048
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Equalization-1300

§ **Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566** ..... **D•1014**
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... **D•1015**
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100

Precision Electronics, Franklin Park, IL 60131 708-678-5350
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

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† Ross Engineering Corp., Campbell, CA 95008, 408-377-4621 ..... B•1230
Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
Aborn Electronics Inc., San Jose, CA 95131 408-436-5444
BT & D Technologies, Wilmington, DE 19803 302-479-0300
EG&G Optoelectronics, EG&G Canada Ltd., Vaudreuil, Quebec, CANADA J7V 8P7 514-424-3300
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Opto Technology, Inc., Wheeling, IL 60090 708-537-4277
Swan Associates, New Haven, CT 06534 203-387-3917
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260

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Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1830
§ A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
A E G Corporation, Telefunken Semiconductors Div., Somerville, NJ 08876-1269 201-231-8300
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Amplifonix, Inc., Philadelphia, PA 19154 215-464-4000
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
CTS Corporation, Elkhart, IN 46514 219-293-7511
† CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
MACOM, Inc., Burlington, MA 01803 617-272-3000
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
† Microphase, Norwalk, CT 06856 203-866-8000
MicroSignals Inc., LIC., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§† Motorola Semiconductor Prods' Sector, Tempe, AZ 85284 602-244-6900
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
§† Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
† Perry Amplifier, Brookline, MA 02146 617-734-0844
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
§ Rodelco Electronics Corp., Ronkonkoma, NY 11779 516-981-0900
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Amplifiers, Instrumentation-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1002-1003,1020-1021
Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 .... D•1006-1007
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1160
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
† Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650 ..... B•1892-1893,1900
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1272
MFE Instruments, Stocker & Yale, Inc., Beverly, MA 01915-0490, 508-921-9104;800-472-4633 ..... D•1421
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015,1193
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017
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† Amptek, Inc., Bedford, MA 01730 617-275-2242
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§† Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
Data, Inc., Ft. Collins, CO 80525 303-493-1222
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
Elcon Instruments, Inc., Annapolis, MD 21401 301-280-6686
Encore Electronics, Inc., Saratoga Springs, NY 12866 518-584-5354
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
HBM, Inc., Marlboro, MA 01752 508-624-4500
§ Helm Instrument Co., Inc., Maumee, OH 43537 419-893-4356
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hughes Aircraft Co., Electron Dynamics Div., Torrance, CA 90509-2999 213-517-6000
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
† Hycomp, Inc., Marlborough, MA 01752 508-485-6300
Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
Instrum, MDH Industries, Inc., Monrovia, CA 91016 818-303-4210
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
† Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MDF Products Inc., Danbury, CT 06811 203-743-3579
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
† Modular Devices, Shirley, NY 11967 516-345-3100
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ Neff Instr., Monrovia, CA 91016 818-357-2281
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
† Paine Corporation, Seattle, WA 98144 ..... 206-329-8600;800-426-0366
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
† PPM, Inc., Cleveland, OH 44139 216-349-2300
Precise Sensors, Inc., Monrovia, CA 91016 818-358-4578
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Ross Engineering Corp., Campbell, CA 95008 408-377-4621
RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
Sensor Corp., Scottdale, PA 15683 412-887-4080
Sensotec, Inc., Columbus, OH 43212 614-486-7723
Seven Mountains Sci. Inc., Boalsburg, PA 16827 814-466-6559
† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§† Solitron Devices, Inc., Semiconductor Group, Riviera Beach, FL 33404-9978 ..... 407-848-4311;800-888-8763
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Amplifiers, Integrating-Also See Amplifiers, Operational; Integrators, Electronic-1100

† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Modular Devices, Shirley, NY 11967 516-345-3100
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Amplifiers, Isolation-1100

Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1160
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1272
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Amplifonix, Inc., Philadelphia, PA 19154 215-464-4000
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
Dymec Inc., Winchester, MA 01890 617-729-7870
Encore Electronics, Inc., Saratoga Springs, NY 12866 518-584-5354
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
Intronics, Inc., Canton, MA 02021 617-828-4992
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† Modular Devices, Shirley, NY 11967 516-345-3100
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX

Amplifiers, Klystron-3450 – *See Vol. A*

Amplifiers, Limiting-1100

§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1018
§ Action Instruments, San Diego, CA 92123 619-279-5726
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
† Litton Solid State, Litton Systems, Inc., Milpitas, CA 95035 408-433-0933
† Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
MACOM, Inc., Burlington, MA 01803 617-272-3000
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
§ Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
Trontech, Inc., Eatontown, NJ 07724 908-542-1133
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Line-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1018
§ Action Instruments, San Diego, CA 92123 619-279-5726
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
† Perry Amplifier, Brookline, MA 02146 617-734-0844
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ ROH, Portland Instrument, Glendale, CA 91201 818-500-0137
§ Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Lock-in-1100

† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Evans Electronics, Berkeley, CA 94705 415-653-3083
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040

Amplifiers, Logarithmic-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
Dymec Inc., Winchester, MA 01890, 617-729-7870 ..... D•1241
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
CTS Corporation, Elkhart, IN 46514 219-293-7511
† CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
† Microphase, Norwalk, CT 06856 203-866-8000
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† Modular Devices, Shirley, NY 11967 516-345-3100
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Perry Amplifier, Brookline, MA 02146 617-734-0844
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Amplifiers, Low Noise-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
Avens Corp., Brooklyn, NY 11208, 718-827-5991;800-452-1966 ..... A•1660
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
† Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650 ..... B•1892-1893,1900
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015
Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1018
† Amptek, Inc., Bedford, MA 01730 617-275-2242
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
† Harris Microwave Semiconductor, Harris Semiconductor, Milpitas, CA 95035 408-433-2222
HDS Inc., Reston, VA 22091 703-620-6200
† Litton Solid State, Litton Systems, Inc., Milpitas, CA 95035 408-433-0933
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Locus, Inc., State College, PA 16804 814-466-6275
† Locus, Kaman, State College, PA 16804 814-466-6275
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
MACOM, Inc., Burlington, MA 01803 617-272-3000
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
† MDF Products Inc., Danbury, CT 06811 203-743-3579
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Pacific Scientific Co., Rockford, IL 61109 815-226-3100
† Perry Amplifier, Brookline, MA 02146 617-734-0844
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Magnetic-1100

† American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100 ..... B•1876-1877
Talema Electronic, Inc., Saint James, MO 65559, 314-265-5500 ..... A•2422
Atlas Engineering Corp., Dorchester, MA 02121 617-445-7100
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
Berkshire Transformer Corp., Kent, CT 06757 203-927-3541
† Bicron Electronics, Canaan, CT 06018 203-824-5125
Cross Electronics, Warrendale, PA 15086 412-776-1591
Electrocom Industries, S. Bend, IN 46615 219-232-2743

Electro-Pacific, Goleta, CA 93117 805-964-0751
† EWC, Inc., Englishtown, NJ 07726 908-446-3110
† Fernwood Transformer Co., Transistor Devices Inc., Belvidere, NJ 07823 908-475-3207
Genisco Technology Corp., La Mirada, CA 90638 714-523-7001
† Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
† Magnecomp, Inc., Pickens, SC 29671 803-878-4700
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
† Torotel Prods. Inc., Grandview, MO 64030-3199 816-761-6314
† Torwico Elctrns. Inc., Lakewood, NJ 08701 908-364-1800
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
§† Zambre Co., Inc., Mountain View, CA 94043 415-968-9176

Amplifiers, Master Antenna — See Amplifiers, Distribution (Vol. D)

Amplifiers, Microphone — See Amplifiers, AF (Vol. D)

Amplifiers, Microwave-3450 — *See Vol. A*

Amplifiers, Mixing-1300

Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
§† Aiphone, Bellevue, WA 98005 206-455-0510
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§ ROH, Portland Instrument, Glendale, CA 91201 818-500-0137
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Multichannel-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005-1006
Avens Corp., Brooklyn, NY 11208, 718-827-5991;800-452-1966 ..... A•1660
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017-1019
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1831
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
HBM, Inc., Marlboro, MA 01752 508-624-4500
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Litton Solid State, Litton Systems, Inc., Milpitas, CA 95035 408-433-0933
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
† Modular Devices, Shirley, NY 11967 516-345-3100
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Sensotec, Inc., Columbus, OH 43212 614-486-7723
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Narrow Band-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
Avens Corp., Brooklyn, NY 11208, 718-827-5991;800-452-1966 ..... A•1660
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Dowty Avionics, Arcadia, CA 91006 818-445-5955
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
Ehrhorn Technological Opers., Inc., Colorado Springs, COLORADO 80919 719-260-1191
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 408-732-0880
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
† Litton Solid State, Litton Systems, Inc., Milpitas, CA 95035 408-433-0933
† Locus, Inc., State College, PA 16804 814-466-6275
† Locus, Kaman, State College, PA 16804 814-466-6275
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MDF Products Inc., Danbury, CT 06811 203-743-3579
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Precision Filters, Ithaca, NY 14850 607-277-3550
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Null-1100

† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
CTS Corporation, Elkhart, IN 46514 219-293-7511
CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Amplifiers, Operational-1100

† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005-1007,1598
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1160
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... B•1302
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
Wilcoxon Research, Rockville, MD 20850, 301-330-8811 ..... B•1959
† Addacon Greensboro, Greensboro, NC 27407 919-852-6200
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§† Advanced Linear Devices, Inc., Sunnyvale, CA 94086-4606 408-720-8737
A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
† Analog Systems, Tucson, AZ 85731-7389 602-290-1818
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
Burleigh Instruments, Fishers, NY 14453 716-924-9355
§† Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
CTS Corporation, Elkhart, IN 46514 219-293-7511
† CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
† DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
† Dymec Inc., Winchester, MA 01890 617-729-7870
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
Ei North America, New York, NY 10021 212-517-5622
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
§† Exar Corp., San Jose, CA 95161-9007 408-732-7970
§ Fujitsu Microelectronics Inc., Integrated Circuits Division, San Jose, CA 95134 408-922-9000
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
† Holt Inc., Irvine, CA 92718 714-859-8800
† M.S. Kennedy Corp., Cicero, NY 13039 315-699-9201
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
§† Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
§† Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
Rohm Corporation, Rohm Electronics Division, Antioch, TN 37013 615-641-2020
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Silicon General, Garden Grove, CA 92641 714-898-8121

§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241

Amplifiers, Operational, Surface Mount-4800 — *See Vol. A*

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Amplifiers, Peak Limiting-1100

§ Action Instruments, San Diego, CA 92123 619-279-5726
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
Sensotec, Inc., Columbus, OH 43212 614-486-7723
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211

Amplifiers, Peak Sense & Hold-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
§ Action Instruments, San Diego, CA 92123 619-279-5726
HBM, Inc., Marlboro, MA 01752 508-624-4500
Sensotec, Inc., Columbus, OH 43212 614-486-7723

Amplifiers, Phase-Lock Loop-1100

† Alpha Industries, Inc., Woburn, MA 01801 617-935-5150
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Exar Corp., San Jose, CA 95161-9007 408-732-7970
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
† LogiMetrics, Plainview, NY 11803 516-349-1700
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

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Amplifiers, Power-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1002,1020-1021
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005-1007,1598
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2172
† California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244 ..... D•2179-2181
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
Eagle-Picher, Seneca, MO 64865, 417-776-2256 ..... D•1445
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204,2207
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1273
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•2211
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... B•1302
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1019
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§ A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† AEROCOM, Miami, FL 33133 305-448-6503
§† Aiphone, Bellevue, WA 98005 206-455-0510
Alpha-M Corp., Dallas, TX 75229 214-406-0424
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
† Analog Systems, Tucson, AZ 85731-7389 602-290-1818
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Bertsch U.S., Vista, CA 92083 619-727-7420
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† Bruel & Kjaer Instrs. Inc., Mariboro, MA 01752-3093 508-481-7000
§† Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Chloride El Paso, Chloride Power Elctrns., El Paso, TX 79935 915-592-9985
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
CTS Corporation, Elkhart, IN 46514 219-293-7511
† CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
Ehrhorn Technological Opers., Inc., Colorado Springs, COLORADO 80919 719-260-1191
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
§ Electro Force Corp., Anaheim, CA 92806 714-774-3666
§ Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Energy Systems, Vancouver, WA 98682 206-896-8310
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
† Harris Microwave Semiconductor, Harris Semiconductor, Milpitas, CA 95035 408-433-2222
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hughes Aircraft Co., Electron Dynamics Div., Torrance, CA 90509-2999 213-517-6000
† Hughes Microelectronic Circuits Division, Newport Beach, CA 92658-8903 714-759-2952
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Instruments, Inc., San Diego, CA 92111 619-571-1111
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
M.S. Kennedy Corp., Cicero, NY 13039 315-699-9201
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
† Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
MACOM, Inc., Burlington, MA 01803 617-272-3000
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MDF Products Inc., Danbury, CT 06811 203-743-3579
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
Motion Science Inc., San Jose, CA 95112 408-993-0300
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ Pacific Scientific Co., Rockford, IL 61109 815-226-3100
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§† Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
§ University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK

Amplifiers, Programmable Gain-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005
† California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244 ..... D•2179-2181
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
Frequency Devices, Inc., Haverhill, MA 01832, 508-374-0761 ..... D•1011
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015,1193
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
† Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
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Pacific Instruments Inc., Concord, CA 94520 415-827-9010
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770

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Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

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Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1003,1020-1021
† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 .... D•1005,1598
Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
§ Action Instruments, San Diego, CA 92123 619-279-5726
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
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† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
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Berkeley Nucleonics Corp., Richmond, CA 94804 ..... 510-234 1100
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C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
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Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
CTS Corporation, Elkhart, IN 46514 219-293-7511
CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
Energy Systems, Vancouver, WA 98682 206-896-8310
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Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
† LogiMetrics, Plainview, NY 11803 516-349-1700
† Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
MACOM, Inc., Burlington, MA 01803 617-272-3000
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
M/A-COM PHI, Inc., M/A COM, Inc., Torrance, CA 90501 213-320-6160
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
Performance Controls, Inc., Horsham, PA 19044 215-675-6500
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Picosecond Pulse Labs, Inc., Boulder, CO 80306 303-443-1249
Power Functions Engineering, Garland, TX 75042 214-278-0996
Products for Research, Danvers, MA 01923 508-774-3250
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
Sensor Corp., Scottdale, PA 15683 412-887-4080
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Amplifiers, Pulse Limiting-1100

† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

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Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1002-1003,1020-1021
† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
Infranor, Naugatuck, CT 06770, 203-729-8258;800-BE-SERVO ..... B•1279
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
† Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1830
† AEROCOM, Miami, FL 33133 305-448-6503
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
† Amplifonix, Inc., Philadelphia, PA 19154 215-464-4000
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4 613-226-5772
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Ehrhorn Technological Opers., Inc., Colorado Springs, COLORADO 80919 719-260-1191
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
† Harris Microwave Semiconductor, Harris Semiconductor, Milpitas, CA 95035 408-433-2222
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hughes Aircraft Co., Electron Dynamics Div., Torrance, CA 90509-2999 213-517-6000
† Hughes Microelectronic Circuits Division, Newport Beach, CA 92658-8903 714-759-2952
§ Kay-Townes, Div. of Alco Industries, Inc., Rome, GA 30161 404-291-9871
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Locus, Inc., State College, PA 16804 814-466-6275
† Locus, Kaman, State College, PA 16804 814-466-6275
† LogiMetrics, Plainview, NY 11803 516-349-1700
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
† Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
MACOM, Inc., Burlington, MA 01803 617-272-3000
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
M/A-COM PHI, Inc., M/A COM, Inc., Torrance, CA 90501 213-320-6160
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MDF Products Inc., Danbury, CT 06811 203-743-3579
† Microphase, Norwalk, CT 06856 203-866-8000
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
§ Mirage/KLM, Morgan Hill, CA 95037 408-779-7363
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
§† Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
† Perry Amplifier, Brookline, MA 02146 617-734-0844
P.G. Electronics Ltd., Weston, Ont., CANADA M9M2Z8 416-741-7682
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
§ Rodelco Electronics Corp., Ronkonkoma, NY 11779 516-981-0900
§† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
Taiyo Yuden (USA) Inc., Arlington Heights, IL 60005-4493 708-364-6104
† Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
§ TransKinetic Sys., Canton, MA 02021 617-828-3000
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
† Wenzel Associates, Inc., Austin, TX 78728 512-244-7741
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Amplifiers, Sample & Hold-1100

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1148
Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159
† Dymec Inc., Winchester, MA 01890, 617-729-7870 ..... D•1241
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700

Analogic Corp., Peabody, MA 01960 508-977-3000
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
CTS Corporation, Elkhart, IN 46514 219-293-7511
† CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
DSP Technology, Fremont, CA 94538-7338 415-657-7555
HBM, Inc., Marlboro, MA 01752 508-624-4500
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800

Amplifiers, Servo-4900

Advanced Technology Company, Vista, CA 92083, 619-727-7430 ... B•1235-1236
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8630 .... D•1005,1506
† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
† Eltrol Corporation, Canoga Park, CA 91304, 818-709-0131 ..... B•1255
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495 ..... D•1276
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ..... B•1297
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2526 ..... D•2243
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... B•1302
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
PITTMAN, Penn Engrg. & Mfg. Corp., Harleysville, PA 19438, 215-256-6601 ..... B•1309
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Automotion, Inc., Ann Arbor, MI 48108 313-662-7771
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
Bertsch U.S., Vista, CA 92083 619-727-7420
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
§ Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
§# Encoder Products, Sandpoint, ID 83864 208-263-8541
§ Exar Corp., San Jose, CA 95161-9007 408-732-7970
† Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
† Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
Motion Science Inc., San Jose, CA 95112 408-993-0300
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
† Perry Amplifier, Brookline, MA 02146 617-734-0844
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 612-942-3600
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
§ Technology 80, Inc., Minneapolis, MN 55427 612-542-9545
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19435 215-539-4400
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
§† Westamp, Santa Monica, CA 90404 213-393-0401

Amplifiers, Single Sideband-1900

Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† AEROCOM, Miami, FL 33133 305-448-6503
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Ehrhorn Technological Opers. Inc, Colorado Springs, COLORADO 80919 719-260-1191
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
§ Mirage/KLM, Morgan Hill, CA 95037 408-779-7363
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Amplifiers, Strain Gauge — See Amplifiers, Transducer (Vol. D)

Amplifiers, Sweep-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Amplifiers, Synchro-4900

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1151
† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152,1155, 1157
† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
§ D.C Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Asirosystems, Lake Success, NY 11042 516-328-1600
Bertsch U.S., Vista, CA 92083 619-727-7420
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Modular Devices, Shirley, NY 11967 516-345-3100
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400

Amplifiers, Telemetering-1900

Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Dowty Avionics, Arcadia, CA 91006 818-445-5955
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† Microphase, Norwalk, CT 06856 203-866-8000
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

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Amplifiers, Track & Hold-1100

† Datel, Inc., Mansfield, MA 02048-1104, 508-339-3000 ..... D•1159
Acculin, Inc., Natick, MA 01760 508-650-1012
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Addacon Greensboro, Greensboro, NC 27407 919-852-6200
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
DSP Technology, Fremont, CA 94538-7338 415-657-7555
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
§† Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700

Amplifiers, Transducer-Also See Signal Conditioners-1100

† American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100 ..... B•1876-1877
† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005
Bell, Floyd, Inc., Columbus, OH 43212, 614-294-4000 ..... D•1029
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
† Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650 ..... B•1892-1893,1900
Frequency Devices, Inc., Haverhill, MA 01832, 508-374-0761 ..... D•1011
Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 ..... B•1939,1942
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013,1101,1422
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
† PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015,1193
Transducers & Systems, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... B•1947
§ Vibra-Metrics, Inc., Hamden, CT 06514, 203-288-6158;1-800-8-SENS-IT .. B•1957
† Wilcoxon Research, Rockville, MD 20850, 301-330-8811 ..... B•1959

§ Action Instruments, San Diego, CA 92123 619-279-5726
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
A. L. Design, Inc., Buffalo, NY 14217 716-875-6240
§ American Advantech Corp. San Jose, CA 95122 408-293-6786
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
Astrosystems, Lake Success, NY 11042 516-328-1600
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
BLH Electronics, Inc., Canton, MA 02021-9111 617-821-2000
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
† CEC Instruments, Imo Industries Inc., San Dimas, CA 91773 714-394-4410
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Dexter Research Ctr., Inc., Dexter, MI 48130 313-426-3921
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
Elcon Instruments, Inc., Annapolis, MD 21401 301-280-6686
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ GSE, Core Inds., Farmington Hills, MI 48024 313-476-7875
† Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
HBM, Inc., Marlboro, MA 01752 508-624-4500
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
Instrum, MDH Industries, Inc., Monrovia, CA 91016 818-303-4210
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
§ Kistler Instruments Corp., Amherst, NY 14221-2171 716-691-5100
† Kulite Semiconductor Prods., Inc., Leonia, NJ 07605 201-461-0900
Larson Instrument, Orangeburg, NY 10962 914-359-3800
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Measurements Group, Inc., Raleigh, NC 27611 919-365-3800
Metrix Instrument Co., Houston, TX 77043 713-461-2131
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
† Modular Devices, Shirley, NY 11967 516-345-3100
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
§ Neff Instr., Monrovia, CA 91016 818-357-2281
NMB Technologies, Chatsworth, CA 91311 818-341-3355
Norton Associates, Inc., Copiague, NY 11726 516-842-4666
Optoelectronics/Textron, Petaluma, CA 94975-0039 707-763-5900
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
† Paine Corporation, Seattle, WA 98144 ..... 206-329-8600;800-426-0366
Panametrics, Waltham, MA 02154-3497 617-899-2740
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Precise Sensors, Inc., Monrovia, CA 91016 818-358-4578
Sensor Corp., Scottdale, PA 15683 412-887-4080
Sensotec, Inc., Columbus, OH 43212 614-486-7723
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
Stoelting Co., Wood Dale, IL 60191 708-860-9700
Techron Div., Crown Intl., Inc., Elkhart, IN 46517 219-294-8300
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Taber, Teledyne Inc., N. Ton., NY 14120 ..... 716-694-4000;800-333-5300
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400
Transmagnetics, Farmingdale, NY 11735 516-293-3100
§† Trans Metrics, Inc., Solon, OH 44139 216-248-2229
Trans-Tek, Ellington, CT 06029 203-872-8351
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057

Amplifiers, Travelling Wave Tube-1100

Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
Aydin Corp., Horsham, PA 19044 215-657-7510
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† EEV Inc., Elmsford, NY 10523 914-592-6050
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Hughes Aircraft Co., Electron Dynamics Div., Torrance, CA 90509-2999 213-517-6000
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
† Litton Electron Devices, San Carlos, CA 94070 415-591-8411
† LogiMetrics, Plainview, NY 11803 516-349-1700
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Amplifiers, Ultrasonic-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800 ..... D•1009
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1015
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
† Control Electronics, Neurotech Corp., Farmingdale, NY 11735 516-694-0125
Energy Systems, Vancouver, WA 98682 206-896-8310
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
† Instruments, Inc., San Diego, CA 92111 619-571-1111
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
† Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
† MDF Products Inc., Danbury, CT 06811 203-743-3579
Panametrics, Waltham, MA 02154-3497 617-899-2740
† Perry Amplifier, Brookline, MA 02146 617-734-0844
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
Trontech, Inc., Eatontown, NJ 07724 908-542-1133

Amplifiers, Video-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
† Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1830
A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
Allen Avionics, Inc., Mineola, NY 11501 516-248-8080
† Analog Systems, Tucson, AZ 85731-7389 602-290-1818
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
§ ATV Research, Inc., Dakota City, NE 68731 402-987-3771
† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
† CELCO, Mahwah, NJ 07430 201-327-1123
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
Covid, Inc., Tempe, AZ 85281 602-966-2221
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§† Elantec, Inc., Milpitas, CA 95035 ..... 408-945-1323;800-821-7429
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
† M.S. Kennedy Corp., Cicero, NY 13039 315-699-9201
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Matthey Electronics, Television Equipment Associates, South Salem, NY 10590 914-763-8893
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
† MDF Products Inc., Danbury, CT 06811 203-743-3579
† Microphase, Norwalk, CT 06856 203-866-8000
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
§† Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
† Perry Amplifier, Brookline, MA 02146 617-734-0844
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Silicon General, Garden Grove, CA 92641 714-898-8121
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
† Third Domain, Inc., Tucson, AZ 85731-7568 602-290-1820
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Video Automation Systems, Pound Ridge, NY 10576 914-764-4613

Amplifiers, Voltage Reference-1100

Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005-1007,1598

§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700** ..... **D•2207**
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... **A•1753**
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
† Electronic Development Corp., EDC, Boston, MA 02127-4198 617-268-9696
Julie Research Labs., New York, NY 10001 212-633-6625
Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
§† Solitron Devices, Inc., Semiconductor Group, Riviera Beach, FL 33404-9978 ..... 407-848-4311;800-888-8763
§† Thaler Corp., Tucson, AZ 85737 602-742-5572
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
§ Trek, Incorporated, Medina, NY 14103-0231 716-798-3140

Amplifiers, Wideband-1100

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... **D•1002-1003,1020-1021**
† **Analog Modules, Inc., Longwood, FL 32750, 407-339-4355** ..... **D•1004**
† **Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600** ..... **D•1005-1006**
Avens Corp., Brooklyn, NY 11208, 718-827-5991;800-452-1966 ..... **A•1660**
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... **D•1008**
† **CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135, 201-471-6800** ..... **D•1009**
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... **D•1010**
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ..... **D•1012**
Krohn-Hite Corp., Avon, MA 02322, 508-580-1660 ..... **D•1279**
† **Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710, 813-347-2181** ..... **A•1751**
† **MDF Products Inc., Danbury, CT 06811, 203-743-3579** ..... **D•1293**
† **Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300** ..... **D•1294**
† **Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500** ..... **A•1753**
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... **D•1015,1193**
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... **D•1017-1019**
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
† Amplifonix, Inc., Philadelphia, PA 19154 215-464-4000
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Analog Systems, Tucson, AZ 85731-7389 602-290-1818
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§ ATV Research, Inc., Dakota City, NE 68731 402-987-3771
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§† Comlinear Corp., Fort Collins, CO 80525 303-226-0500
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
Dantel, Fresno, CA 93727 209-292-1111
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
† Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Dowty Avionics, Arcadia, CA 91006 818-445-5955
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
Evans Electronics, Berkeley, CA 94705 415-653-3083
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 408-732-0880
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Hughes Aircraft Co., Electron Dynamics Div., Torrance, CA 90509-2999 213-517-6000
† Instruments, Inc., San Diego, CA 92111 619-571-1111
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
† M.S. Kennedy Corp., Cicero, NY 13039 315-699-9201
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Locus, Inc., State College, PA 16804 814-466-6275
† Locus, Kaman, State College, PA 16804 814-466-6275
† Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† Microwave Solutions, Inc., National City, CA 91950 619-474-6906
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ Neff Instr., Monrovia, CA 91016 818-357-2281
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
Peca, Inc., Bensalem, PA 19020 215-245-1550
† Perry Amplifier, Brookline, MA 02146 617-734-0844
Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
R.F. Power Labs., Inc., Kalmus Engrg. Labs., Inc., Woodinville, WA 98072 206-481-8833
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Ross Engineering Corp., Campbell, CA 95008 408-377-4621
§† Silicon General, Garden Grove, CA 92641 714-898-8121
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
† Trontech, Inc., Eatontown, NJ 07724 908-542-1133
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
Western Multiplex Corp., Belmont, CA 94002 415-592-8832
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Analyzers, AF-2900

Krohn-Hite Corp., Avon, MA 02322, 508-580-1660 ..... **D•1279**
Amber Electric Design, St. Laurent, PQ., CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
Electro-Dynamics Dev. Co., Issaquah, WA 98027-4038 206-392-2493
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
Energy Systems, Vancouver, WA 98682 206-896-8310
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Kay Elemetrics Corp., Pine Brook, NJ 07058-2025 201-227-2000
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Voice Identification, Somerville, NJ 08876 908-526-3408

Analyzers, Air Pollution-2550

Process & Analytical Instruments Div., Ametek, Inc., Pittsburgh, PA 15238 412-828-9040
Environmental Telesis & Controls, Austin, TX 78718 512-835-0330
Enviroplan, Roseland, NJ 07068 201-994-2300
G.C. Industries, Inc., Chatsworth, CA 91311 818-882-7852
High Technology Sensors, Inc., Longwood, FL 32779 407-884-7722
Houston Atlas, a Baker Hughes Company, Houston, TX 77041 713-462-6116
§ Leybold Inficon Inc., E. Syracuse, NY 13057 315-434-1100
§# Milton Roy Co., Environmental, Orange, CA 92665-4134 714-974-5560
Sensidyne, Inc., Clearwater, FL 34620 ..... 813-530-3602;1-800-451-9444
Servomex Company, Norwood, MA 02062 617-769-7710
§ Sierra Monitor Corp., Milpitas, CA 95035 408-262-6611

Analyzers, Antenna Pattern-2900

† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
†Φ Nearfield Systems, Inc., Carson, CA 90745 213-518-4277

Analyzers, Dielectric Constant-2900

Forte Technology, Inc., Norwood, MA 02062 617-769-9150
Hipotronics Inc., Brewster, NY 10509 914-279-8091
§ Moisture Register Products Div., Aqua Measure Instrument Co., LaVerne, CA 91750-0369 714-392-5833
Rosemount Analytical Inc., Cedar Grove, NJ 07009 800-367-7242

Analyzers, Differential — See Analyzers, Phase & Voltage (Vol. D)

Analyzers, Digital Signal-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... **D•1214-1215**
MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... **D•1295,1412-1413**
Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Ariel Corporation, Highland Pk., NJ 08904 908-249-2900
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Interface Technology, Dynatech Corp., Glendora, CA 91740 818-914-2741
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Phoenix Microsystems, Huntsville, AL 35806 205-922-1200

Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Systems Research Laboratories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Analyzers, Distortion — See Analyzers, AF (Vol. D)

Analyzers, Disturbance (Power, Volt, Humidity, Temperature)-2900

Voltech, Inc., Ashland, MA 01721, 508-881-7329 ..... D•1336
§ Contact East, N. Andover, MA 01845 508-682-2000
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Superior Electric, Bristol, CT 06010 203-582-9561

Analyzers, Fast Fourier Transform (FFT)-2900

Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
Bomem Inc., Quebec, CANADA G2E-5S5 ..... 418-877-2944;1-800-888-FTIR
Enviroplan, Roseland, NJ 07068 201-994-2300
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Systems Research Laboratories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464

Analyzers, Frequency — See Analyzers, Spectrum (Vol. D)

Analyzers, Frequency Stability — See Meters, Frequency Deviation (Vol. D)

Analyzers, Harmonic-2900

Krohn-Hite Corp., Avon, MA 02322, 508-580-1660 ..... D•1279
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1333
Voltech, Inc., Ashland, MA 01721, 508-881-7329 ..... D•1336
Amber Electric Design, St. Laurent, PQ., CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Analyzers, Impedance-2900

Anritsu, Oakland, NJ 07436 ..... 201-337-1111;800-255-7234
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Electro-Dynamics Dev. Co., Issaquah, WA 98027-4038 206-392-2493
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
Schlumberger Instruments, Schlumberger Technlgs., Billerica, MA 01821 ..... 508-671-9700;1-800-225-5765
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Venable Industries, Inc., Torrance, CA 90505 213-539-2522
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Analyzers, Interference-2900

Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Omicron electronic, Hohenems, AUSTRIA A-6845 ..... + /5576/4010-0
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Analyzers, Intermodulation-2900

Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... D•1292
Amber Electric Design, St. Laurent, PQ., CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
Ariel Corporation, Highland Pk., NJ 08904 908-249-2900
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Omicron electronic, Hohenems, AUSTRIA A-6845 ..... + /5576/4010-0
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800

Analyzers, Logic-2900

Emulation Technology, Inc., Santa Clara, CA 95051, 408-982-0660 ..... C•1358
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
§ MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... D•1295,1412-1413
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
Arium Corporation, Anaheim, CA 92806-6052 714-978-9531
§ Biomation, Cupertino, CA 95014-0718 408-988-6800
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
§ E & L Instruments, Interplex Electronics, Inc., New Haven, CT 06512 800-368-0880
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
§ Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
§ NCI, Huntsville, AL 35806 205-837-6667
Outlook Technology, Inc., Campbell, CA 95008 408-374-2990
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Φ Vetra Systems Corp., Plainview, NY 11803 516-454-6469
VMETRO, Inc., VMETRO as, Houston, TX 77042 713-266-6430
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Analyzers, Magnetic-2900

§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
Bell, F. W., Inc., Orlando, FL 32807 407-678-6900
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202
Q-Card, Inc., Owings Mills, MD 21117-1634 410-581-0112
Sensor Corp., Scottdale, PA 15683 412-887-4080
Third Wave Instruments, Inc., Burlington, MA 01803 617-273-0779

Analyzers, Microwave-3450 — *See Vol. A*

Analyzers, Modulation-2900

§ Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... D•1292
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Systems Research Laboratories, Arvin/Calspan, Dayton, OH 45440 513-426-6000

Analyzers, Network-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1214-1215
† Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1219
Voltech, Inc., Ashland, MA 01721, 508-881-7329 ..... D•1336
Ariel Corporation, Highland Pk., NJ 08904 908-249-2900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Compliance Design Inc., Boxboro, MA 01719 508-264-4668
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wavetek Microwave, Inc., (Formerly Pacific Measurement, Inc.), Sunnyvale, CA 94089 408-734-5780
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Analyzers, Noise-2900

Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218
Elgenco, Inc., Hurricane, UT 84737, 801-635-4954 ..... D•1244
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
Bearing Inspection, Santa Fe Springs, CA 90670 213-944-6251
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
California Microwave, Sunnyvale, CA 94086 408-732-4000
Chesterfield Products, Inc., Elmwood Park, NJ 07407 201-797-9655
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Marconi Instruments, Allendale, NJ 07401 201-934-9050
§ Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
† Raytheon Co., Microwave & Power Tube Div., Waltham, MA 02254 617-899-8400
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Analyzers, Particle Size-2900

Brinkmann Instruments, Inc., Westbury, NY 11590-9974 516-334-7500
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Tegal Scientific, Inc., Concord, CA 94524 415-827-1054
§ Carl Zeiss, Inc., Thornwood, NY 10594 914-747-1800

Analyzers, Phase & Voltage-2900

Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242
† North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332
Voltech, Inc., Ashland, MA 01721, 508-881-7329 ..... D•1336
Astrosystems, Lake Success, NY 11042 516-328-1600
† Basic Measuring Instruments, Foster City, CA 94404 415-570-5355
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
Venable Industries, Inc., Torrance, CA 90505 213-539-2522
§ Western Electro-Mechanical Co., Inc., Oakland, CA 94607 415-452-1936
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Analyzers, Power-2900

Valhalla Scientific, San Diego, CA 92121 619-457-5576

Analyzers, Protocol-2900

Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
§ Telenex Corporation, A Unit of General Signal Corp., Mt. Laurel, NJ 08054 609-234-7900
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Φ Vetra Systems Corp., Plainview, NY 11803 516-454-6469

Analyzers, Pulse-2900

† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 ..... A•1749, D•1251
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
† Ferretec Inc., Fremont, CA 94539-7474 415-226-1216
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Analyzers, Servo-4900

Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1005-1006,1598
† North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
Astrosystems, Lake Success, NY 11042 516-328-1600
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Venable Industries, Inc., Torrance, CA 90505 213-539-2522

Analyzers, Signature-2900

§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000

Analyzers, Sonic & Subsonic-2900

A. P. Circuit, Brooklyn, NY 11237 718-456-2717
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
Precision Filters, Ithaca, NY 14850 607-277-3550
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Voice Identification, Somerville, NJ 08876 908-526-3408

Analyzers, Spectrum-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1214-1215
† Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218-1219
B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1223
Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368-1369
§ Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... D•1292
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
Analogic Corp., Peabody, MA 01960 508-977-3000
† Andersen Laboratories, Bloomfield, CT 06002 203-286-9090
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
Ariel Corporation, Highland Pk., NJ 08904 908-249-2900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Burleigh Instruments, Fishers, NY 14453 716-924-9355
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Eventide, Inc., Little Ferry, NJ 07643 ..... 201-641-1200;800-446-7878
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
IFR Sys. Inc., Wichita, KS 67215 316-522-4981
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Omicron electronic, Hohenems, AUSTRIA A-6845 ..... +/5576/4010-0
PERX,Inc., Corte Madera, CA 94925 415-927-0155
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
Precision Filters, Ithaca, NY 14850 607-277-3550
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
† Sawtek Inc., Orlando, FL 32860-9501 407-886-8860
Schlumberger Instruments, Schlumberger Technlgs., Billerica, MA 01821 ..... 508-671-9700;1-800-225-5765
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
§ SC Technology, Inc., Livermore, CA 94550 415-373-9230
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Techron Div., Crown Intl., Inc., Elkhart, IN 46517 219-294-8300
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464

§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Voice Identification, Somerville, NJ 08876 908-526-3408

Analyzers, Surface Area-2900

Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
§ Carl Zeiss, Inc., Thornwood, NY 10594 914-747-1800

Analyzers, Time Interval-2900

§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Stoelting Co., Wood Dale, IL 60191 708-860-9700

Analyzers, Total Combustibles-2900

† Astro International Corp., League City, TX 77573 713-332-2484
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Bambeck Systems Inc., Santa Ana, CA 92705 ..... 714-250-3100;800 334-3101
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Sierra Monitor Corp., Milpitas, CA 95035 408-262-6611

Analyzers, Transfer Function-2900

† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Diversified Optical Products, Inc., Salem, NH 03079 603-898-1880
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Ovenaire-Audio-Carpenter, Oak Crystal Inc., Charlottesville, VA 22901 804-977-8050
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Venable Industries, Inc., Torrance, CA 90505 213-539-2522

Analyzers, Transient-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Analogic Corp., Peabody, MA 01960 508-977-3000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199

Analyzers, Ultrasonic-2900

§† Ansonics, Inc., Halfway, OR 97834 503-742-7475
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
Metrix Instrument Co., Houston, TX 77043 713-461-2131
Panametrics, Waltham, MA 02154-3497 617-899-2740
Precision Filters, Ithaca, NY 14850 607-277-3550
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255

Analyzers, Vibration-2900

† Alpha-M Corp., Dallas, TX 75229 214-406-0424
American Hofmann Corp., Lynchburg, VA 24506 804-522-0300
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Atec, Inc., Houston, TX 77055 713-468-7971
Bearing Inspection, Santa Fe Springs, CA 90670 213-944-6251
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Helm Instrument Co., Inc., Maumee, OH 43537 419-893-4356
† Kelmet, Inc., San Dimas, CA 91773 714-599-0954
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
Metrix Instrument Co., Houston, TX 77043 713-461-2131
PMC/BETA Ltd. Partnership, Natick, MA 01760 617-237-6920
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§† Rockland Scientific Corporation, Princeton, NJ 08543 609-896-2255
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
Space Electronics, Inc., Berlin, CT 06037 203-829-0001
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vibro-Meter Corp., Billerica, MA 01822-5058 508-663-7322

Analyzers, Video — See Analyzers, Spectrum (Vol. D)

Analyzers, Waveform-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Analogic Corp., Peabody, MA 01960 508-977-3000
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
PERX,Inc., Corte Madera, CA 94925 415-927-0155
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Analyzers, Wow & Flutter-2900

§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 ..... 508 481-7000
† Data Check Corporation, San Diego, CA 92126 ..... 619 578-0101
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6000 1-800-645-5104
Marconi Instruments, Allendale, NJ 07401 201-934-9050
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
RE Instruments Corp., Westlake, OH 44145 216-871-7617

Analyzers, Zirconia O2-2900

Process & Analytical Instruments Div., Ametek, Inc., Pittsburgh, PA 15238 412-828-9040
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Bambeck Systems Inc., Santa Ana, CA 92705 ..... 714-250-3100;800 334-3101
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Enviroplan, Roseland, NJ 07068 201-994-2300
§ Fuji Electric Corp. of America, Los Angeles, CA 90071 213-622-4490
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§# Milton Roy Co., Environmental, Orange, CA 92665-4134 714-974-5560
Servomex Company, Norwood, MA 02062 617-769-7710

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Anemometers-2900

Climatronics, Bohemia, NY 11716 516-567-7300
Controlex, Inc., New Boston, NH 03070 603-487-5512
† Kurz Instruments Inc., Monterey, CA 93940 800-424-7356
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199

Annunciators-2200

§ Babcock Display Products, Inc., A Subsidiary of Babcock, Inc., Anaheim, CA 92805, 714-491-5100 ..... B•1041
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1091,1723
Minelco Inc. - A Talley Ind., Thomaston, CT 06787-0459, 203-283-8261 .. B•1178
Staver Co., Inc., Bay Shore, NY 11706, 516-666-8000 ..... B•1128-1129
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1380
AdVoTech, Inc., Butler, PA 16001 412-283-4497
AES Corp., Peabody, MA 01960 508-535-7310
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
§ Aqualarm, Marine Safety Systems, Inc., Chula Vista, CA 91911 619-575-4011
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
Automation Displays Inc., Eau Claire, WI 54703 715-834-9595
Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
† Capitol Switch Inc., Bethel, CT 06801 203-744-3300
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154 617-894-8700
KMC Systems, Inc., Midland Pk., NJ 07432 201-447-0007
Mauell Corp., Dillsburg, PA 17019-0339 717-432-8686

§ Metra Instruments, Inc., San Jose, CA 95131 408-432-1110
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Rodann Electronics Mfg. Co., Brea, CA 92621 ..... 714-529-1301;800-366-7010
§† Shelly Associates, Inc., Tustin, CA 92680 714-669-9850
† Stacoswitch, Costa Mesa, CA 92626 714-549-3041
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854 908-572-9512
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Tektone Sound & Signal, Lake Park, FL 33403 407-844-2383
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Antenna Connectors-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
§ AVA Electronics Corporation, Drexel Hill, PA 19026 215-284-2500
§† Electronic Essentials, Woodside, NY 11377 718-898-8300
§† M/A-COM Omni Spectra, Inc., Waltham, MA 02254-9101 617-890-4750
† Pasternack Enterprises, Irvine, CA 92713 714-261-1920
SMK Electronics Corporation, U.S.A., Placentia, CA 92670 714-996-0960
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831

Antenna Dummy Loads — See Dummy Loads (Vol. D)

Antenna Feed Systems-3450 — *See Vol. A*

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Antenna Rotators-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
Adams Rite Products, Inc., Glendale, CA 91204 818-241-5121
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ Lin Engineering, Sylmar, CA 91342-3832 818-367-1811
† Moog Microwave Corp., Cucamonga, CA 91730 714-987-4715
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
† Sage Laboratories, Inc., Natick, MA 01760 508-653-0844
ST Research Corporation, Newington, VA 22122 703-550-7000
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831

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Antenna Switching Matrices-1200

CYTEC Corp., Penfield, NY 14526, 716-381-4740;800-346-3117 ..... D•1240
† Dow-Key Microwave Corporation, Ventura, CA 93003, 805-650-0260 .... B•1682
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† Daico Industries, Inc., Compton, CA 90220 213-631-1143
† Dielectric Communications, General Signal, Raymond, ME 04071 ..... 207-655-4555; 800-341-9678
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
MarLee Switch Co., Upland, CA 91786 714-982-8988
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
† Ross Engineering Corp., Campbell, CA 95008 408-377-4621
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831

Antenna Towers-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
Andrew Corp., Orland Pk., IL 60462 800-255-1479
Compliance Design Inc., Boxboro, MA 01719 508-264-4668
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† Microflect Co., Inc., Salem, OR 97309-0985 503-363-9267
Milliflect, Newark, CA 94560 415-791-5188
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Stainless, Inc., N. Wales, PA 19454 215-699-4871

Antennas, Airborne-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
§† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
† Alpha Products, Inc., Westlake Village, CA 91362 818-889-9304
Andrew Corp., Orland Pk., IL 60462 800-255-1479
† Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Eastern Microwave, Burlington, MA 01803 617-273-4700
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
† Electronic Space Systems Corp., Concord, MA 01742 508-369-7200
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† MDM, Inc., Chatsworth, CA 91311 818-700-8400
§ Milliflect, Newark, CA 94560 415-791-5188
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
† Premier Microwave, Port Chester, NY 10573 914-939-8900
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
§ Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
ST Research Corporation, Newington, VA 22122 703-550-7000
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
† Titchener, E. H., & Co., Binghamton, NY 13902 607-772-1161
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

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Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
§† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
General Instrument, Govt. Systems, Hicksville, NY 11802-0709 516-933-3000
§ Glatzer Industries Corp., New Rochelle, NY 10801 914-576-2700
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
LF Engineering Company Inc., East Haven, CT 06512 203-467-3590
§ Milliflect, Newark, CA 94560 415-791-5188
Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
† Premier Microwave, Port Chester, NY 10573 914-939-8900
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
§ Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
ST Research Corporation, Newington, VA 22122 703-550-7000
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
† Titchener, E. H., & Co., Binghamton, NY 13902 607-772-1161
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

Antennas, Ground Plane-1200

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
† Eastern Microwave, Burlington, MA 01803 617-273-4700
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
§ Kreckman, Herb, Co., Cresco, PA 18326 717-595-2212
Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
§† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

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† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
Andrew Corp., Orland Pk., IL 60462 800-255-1479
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
§† Centurion International, Inc., Lincoln, NE 68504 402-467-4491
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Eastern Microwave, Burlington, MA 01803 617-273-4700
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000

§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
SMK Electronics Corporation, U.S.A., Placentia, CA 92670 714-996-0960
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

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Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1003,1020-1021

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

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§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Eastern Microwave, Burlington, MA 01803 617-273-4700
Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
§ Kay-Townes, Div. of Alco Industries, Inc., Rome, GA 30161 404-291-9871
§ Lance Industries, Sylmar, CA 91342-3832 818-367-1811
§ Mirage/KLM, Morgan Hill, CA 95037 408-779-7363
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§ Sitco Antennas Div.of Simplicity Tool Corp., Portland, OR 97220 503-253-2000
ST Research Corporation, Newington, VA 22122 703-550-7000
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

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Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ Palomar Engineers, Escondido, CA 92033 619-747-3343
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
§ Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

Antennas, Microwave-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

§† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Alpha Industries, Inc., Woburn, MA 01801 617-935-5150
Andrew Corp., Orland Pk., IL 60462 800-255-1479
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
† Electronic Space Systems Corp., Concord, MA 01742 508-369-7200
† Gabriel Electronics, Scarborough, ME 04074 207-883-5161
† Gamma-f Corp., Electromagnetic Sciences, Inc., Torrance, CA 90505 213-539-6704
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
HDS Inc., Reston, VA 22091 703-620-6200
Lance Industries, Sylmar, CA 91342-3832 818-367-1811
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
† LogiMetrics, Plainview, NY 11803 516-349-1700
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
MACOM, Inc., Burlington, MA 01803 617-272-3000
† MDM, Inc., Chatsworth, CA 91311 818-700-8400
† Microwave Applications Group, Santa Maria, CA 93455 805-928-5711
§† Milliflect, Newark, CA 94560 415-791-5188
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
† Premier Microwave, Port Chester, NY 10573 914-939-8900
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
† Stainless, Inc., N. Wales, PA 19454 215-699-4871
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Antennas, Multiband, UHF/VHF-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

§† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
§† Centurion International, Inc., Lincoln, NE 68504 402-467-4491
Compliance Design Inc., Boxboro, MA 01719 508-264-4668
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
§ Lance Industries, Sylmar, CA 91342-3832 818-367-1811
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
§† Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Sitco Antennas Div.of Simplicity Tool Corp., Portland, OR 97220 503-253-2000
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

Antennas, Phased Array-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Allied-Signal Aerospace Co., Bendix Communications Div., Towson, MD 21204 410-583-4000
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Aydin Corp., Horsham, PA 19044 215-657-7510
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Eastern Microwave, Burlington, MA 01803 617-273-4700
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
† Gamma-f Corp., Electromagnetic Sciences, Inc., Torrance, CA 90505 213-539-6704
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
† MDM, Inc., Chatsworth, CA 91311 818-700-8400
† Microwave Applications Group, Santa Maria, CA 93455 805-928-5711
§ Mirage/KLM, Morgan Hill, CA 95037 408-779-7363
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
† Premier Microwave, Port Chester, NY 10573 914-939-8900
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
§† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§ Sitco Antennas Div.of Simplicity Tool Corp., Portland, OR 97220 503-253-2000
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

Antennas, Rhombic-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

† Sabre Communications Corp., Sioux City, IA 51102 712-258-6690
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165

Antennas, Satellite-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
Andrew Corp., Orland Pk., IL 60462 800-255-1479
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† Gamma-f Corp., Electromagnetic Sciences, Inc., Torrance, CA 90505 213-539-6704
Lance Industries, Sylmar, CA 91342-3832 818-367-1811
† MDM, Inc., Chatsworth, CA 91311 818-700-8400
§ Prodelin Corporation, Conover, NC 28613 704-464-4141
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
§ Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

Antennas, Spiral-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

† Adams-Russell, Inc., Div. of M/A COM, INC., Amesbury, MA 01913 508-388-5210
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Eastern Microwave, Burlington, MA 01803 617-273-4700
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
† Premier Microwave, Port Chester, NY 10573 914-939-8900
§† Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
ST Research Corporation, Newington, VA 22122 703-550-7000
† Tecom Industries, Inc., Chatsworth, CA 91311 818-341-4010
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
† Til-Tek Limited, Kemptville, Ontario, CANADA K0G 1J0 613-258-5928
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007

Antennas, Telescopic-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

AEL Defense Corp., Lansdale, PA 19446 215-822-2929
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
International Microelectronics, Arlington, TX 76003 817-561-2244
Mouser Electronics, Mansfield, TX 76063 800-346-6873
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500

Antennas, Whip & Accessories (Incl. Marine & Mobile Types-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023

AEL Defense Corp., Lansdale, PA 19446 215-822-2929
Alexander Manufacturing Company, Mason City, IA 50401 ..... 800-247-1821; 515-423-8955
§ Antenna Research Associates, Beltsville, MD 20705 301-937-8888
† Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
§† Centurion International, Inc., Lincoln, NE 68504 402-467-4491
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Magnetic Component Engineering Co., Culver City, CA 90230 213-398-4761
§† Sensor Systems, Inc., Chatsworth, CA 91311 818-341-5366
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831

Antennas (MIL)-2440 — *See Vol. B*

Antenna Systems (MIL)-2440 — *See Vol. B*

Antistatic Devices, Blowers, Guns, etc.-4100

§† NRD Inc., Subsidiary of Mark IV Inds., Inc., Grand Island, NY 14072, 716-773-7634 ..... D•2238

§† ACL Inc., Elk Grove, IL 60007 ..... 708-981-9212;1-800-782-8420
† Chapman Corp., Portland, ME 04104 207-773-4726
§ Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
† Contact East, N. Andover, MA 01845 508-682-2000
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Ideal Industries, Sycamore, IL 60178 815-895-5181
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§ Semtronics Corp., Peachtree City, GA 30269 404-487-6681
§ Simco Co., Hatfield, PA 19440 215-822-2171
§† Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
§† Wescorp Antistatic Products, Mountain View, CA 94041 415-969-7717
§ Wilson, H. F., Engineering Co., Glen Ellyn, IL 60137 708-469-7473

Antistatic Packaging Materials — See Packaging Materials, Antistatic (Vol. C)

Antitheft Devices — See Alarms & Alarm Systems (Vol. D)

Armatures — See Motor & Generator Armatures, Rotors, Stators (Vol. B)

Arms & Manipulators, Robotic-4900

Mercotac Inc., Carlsbad, CA 92009, 619-431-7723 ..... B•1295

† Adams Rite Products, Inc., Glendale, CA 91204 818-241-5121
† Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
† ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
Dover Electronics Manufacturing, Binghamton NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
§ Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
MOLEX, Inc., Lisle, IL 60532 708-969-4550
§ Parker Hannifin Corp., Rotary Actuator Division, Wadsworth, OH 44281-0450 216-336-3511
§† Seiko Instruments U.S.A., Inc., Robotics/Automation Div., Torrance, CA 90505 213-517-7850

Array Processors-2025

Electro-Films, Inc., Warwick, RI 02886, 401-738-9150 ..... C•1680-1681

§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Datacube, Inc., Peabody, MA 01960 508-535-6644
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
Mercury Computer Systems, Lowell, MA 01854 508-458-3100
MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
Numerix Corp., Newton, MA 02164 617-964-2500
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Submarine Signal Division, Raytheon Company, Portsmouth, RI 02871 401-847-8000
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831

Array Sockets — See Sockets, Array (Vol. C)

Arresters, Electrical Surge — See Suppressors, Transient Voltage (Vol. B)

Arresters, Electrical Surge/Lightning (MIL)-2440 — *See Vol. B*

Artificial Loads — See Dummy Loads (Vol. D)

Assemblers/Disassemblers, Network-1900

Byte Craft Limited, Waterloo, Ont., CAN N2J 4E4 519-888-6911
HILEVEL Technology, Irvine, CA 92718 714-727-2100
KelTech Inc., Roanoke, VA 24019 703-362-8466
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
§ Stag Microsystems Inc., Santa Clara, CA 95054 ..... 408-988-1118;1-800-227-8836
†# Tratec of California, Inc., Chula Vista, CA 91911 619-476-1155

Assembly & Fabrication Services (Incl. R & D) — See Services, Assembly & Fabrication (Vol. D)

Attenuators, Audio-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
Elcom Systems, Inc., Boca Raton, FL/33487, 407-994-1774 ..... A•1747
† Kay Elemetrics Corp., Pine Brook, NJ 07058-2025, 201-227-2000 ..... A•1750
§ Mallory Controls, Emerson Electric Canada, Woodstock, Ont., CANADA N4S 7W8, 519-539-4891 ..... A•2064-2065
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
† Tech Laboratories Inc., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1789

Allen Avionics, Inc., Mineola, NY 11501 516-248-8080
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Clarostat Mfg. Co., Inc., Hawker Siddeley, PLC., Dover, NH 03820-1507 603-742-1120,800-872-0042
Dantel, Fresno, CA 93727 209-292-1111
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
† Duncan Electronics, Inc., Costa Mesa, CA 92626 714-545-8261
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
† Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
Projects Unlimited, Dayton, OH 45414 513-890-1918
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Shallco, Inc., Smithfield, NC 27577 ..... 919-934-3135; 1-800-876-3135
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
§ Switchcraft, Inc., A Raytheon Company, Chicago, IL 60630 312-792-2700
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Vernitron Corp., Passive Comps. Group, St. Petersburg, FL 33743 813-347-2181
Vishay Resistive Systems, Malvern, PA 19355 215-644-1300
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Attenuators, Audio (T, L, LL Pads)-4750 — *See Vol. A*

Attenuators, Coaxial-3450 — *See Vol. A*

Attenuators, Decade-3450 — *See Vol. A*

Attenuators, Fiber Optic-2475 — *See Vol. B*

Attenuators, Fixed-3450 — *See Vol. A*

Attenuators, IF-1900

† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 ..... A•1749
† Kay Elemetrics Corp., Pine Brook, NJ 07058-2025, 201-227-2000 ..... A•1750
† Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
† Tech Laboratories Inc., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1789

† Alan Industries Inc., Columbus, IN 47202 812-372-8869
† Amplifonix, Inc., Philadelphia, PA 19154 215-464-4000
§ AVA Electronics Corporation, Drexel Hill, PA 19026 215-284-2500
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Daico Industries, Inc., Compton, CA 90220 213-631-1143
† Elcom Systems, Inc., Boca Raton, FL 33487 407-994-1774
§ Electronic Resources Inc., Sunnyvale, CA 94089 408-745-1420
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hyletronics:Litton Industries, Littleton, MA 01460 617-486-8911
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
† Pasternack Enterprises, Irvine, CA 92713 714-261-1920
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
Shallco, Inc., Smithfield, NC 27577 ..... 919-934-3135; 1-800-876-3135
§ Solitron/Microwave, Solitron Devices, Inc., Riviera Bch., FL 33404-9978 ..... 407-848-4311;800-888-8763
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Telonic/Berkeley, Berkeley Inds. Inc., Laguna Beach, CA 92652 714-494-9401
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Vermont Precision Resistor, Codeco Corp. of Vermont, Stowe, VT 05672-1207 802-253-8567

Attenuators, Impedance Matching-3450 — *See Vol. A*

Attenuators, Logarithmic-3450 — *See Vol. A*

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Attenuators, RF-1900

ABL Electronics Supply, Inc., Yorktown Hgts., NY 10598, 914-962-2253 ..... C•1155
† Elcom Systems, Inc., Boca Raton, FL 33487, 407-994-1774 ..... A•1747
† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 .... A•1749
† Kay Elemetrics Corp., Pine Brook, NJ 07058-2025, 201-227-2000 ..... A•1750
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
† Tech Laboratories Inc., Palisades Pk., NJ 07650, 201-944-2221 ..... B•1789
† Alan Industries Inc., Columbus, IN 47202 812-372-8669
§† AMITRON, American Micro-Tronix, Inc., North Andover, MA 01845 508-686-1882
§ AVA Electronics Corporation, Drexel Hill, PA 19026 215-284-2500
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
§ Chomerics, Inc.:W.R. Grace & Co., Woburn, MA 01888 617-935-4850
§ Coax Connection, Yorktown Hgts., NY 10598 ..... 914-962-2303;800-431-2103
Compac, Holbrook, NY 11741 516-585-3400
§ Concord Electronics Corporation, New York, NY 10012 1-212-777-6571
Control Concepts Corp., Liebert Corp., Binghamton, NY 13902-1380 607-724-2484
† Daico Industries, Inc., Compton, CA 90220 213-631-1143
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
† EMC Technology Inc, Cherry Hill, NJ 08034 609-429-7800
Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
§† KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
§ Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
MACOM, Inc., Burlington, MA 01803 617-272-3000
§† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
Marconi Instruments, Allendale, NJ 07401 201-934-9050
MarLee Switch Co., Upland, CA 91786 714-982-8988
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
† Metropole Products Inc., Stafford, VA 22554 703-659-2132
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
Noble U.S.A., Inc., Rolling Meadows, IL 60008 708-364-6038
† Pasternack Enterprises, Irvine, CA 92713 714-261-1920
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
§ Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000
† RE Instruments Corp., Westlake, OH 44145 216-871-7617
† RLC Electronics, Inc., Mt. Kisco, NY 10549 914-241-1334
Rosenberger-Micro Coax, (Formerly Micro-Coax Components, Inc.), Collegeville, PA 19426 215-489-3700
† Sage Laboratories, Inc., Natick, MA 01760 508-653-0844
§ Solitron/Microwave, Solitron Devices, Inc., Riviera Bch., FL 33404-9978 ..... 407-848-4311;800-888-8763
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Telonic/Berkeley, Berkeley Inds. Inc., Laguna Beach, CA 92652 714-494-9401
§ Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Vermont Precision Resistor, Codeco Corp. of Vermont, Stowe, VT 05672-1207 802-253-8567
Vernitron Corp., Passive Comps. Group, St. Petersburg, FL 33743 813-347-2181
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Attenuators, Step-3450 — *See Vol. A*

Attenuators, Switch Operated-3450 — *See Vol. A*

Attenuators, Switchable-3450 — *See Vol. A*

Attenuators, Turret-3450 — *See Vol. A*

Attenuators, Variable-3450 — *See Vol. A*

Attenuators, Voltage Controlled-3450 — *See Vol. A*

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Attenuators (MIL), Inductive-2440 — *See Vol. B*

Audible Alarms & Transducers-Also see Piezoelectric Ceramics; Transducers, Audio-1300

§ Accutech Benchmark Services, Brick, NJ 08723, 1-908-206-0026 ... D•1024-1026
Bell, Floyd, Inc., Columbus, OH 43212, 614-294-4000 ..... D•1028-1029
CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... D•1031
§ Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1032-1033,1035
International Components Corp., Melville, NY 11747, 516-293-1500 .. D•1038-1039
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1040-1041
§ Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 .. D•1045-1047
§ Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1050,1052
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1058
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
Sonicall, Inc., Signal Hill, CA 90806, 213-490-2143 ..... D•1061
§ Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... D•1062-1065
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•1066
§ Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
§ Kyocera Northwest, Electronic Components Group, Vancouver, WA 98661 206-696-2840
§† Line Electric Products, Hartford, CT 06141 ..... 203-659-3573;1-800-331-1137
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
§† Mallory/North American Capacitor Co., Indianapolis, IN 46241 317-856-3731
§ Motorola Ceramic Products, Components Division, Albuquerque, NM 87113 505-822-8801
§ NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 708-824-1133
Omega Engineering, Stamford, CT 06907 800-826-6342
Relay Service Co., Chicago, IL 60651 312-252-2700
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Autoclaves-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
Brinkmann Instruments, Inc., Westbury, NY 11590-9974 516-334-7500
Express Test Corp., Mountain View, CA 94043 415-968-8818

Automated Wafer Fabrication Systems — See Machines, Accessories, Semiconductor Machine (Vol. D)

Awls-5400 — *See Vol. C*

Backpanel Interconnect Systems-3200 — *See Vol. C*

Backplane Wiring Services — See Services, Backplane Wiring (Vol. D)

Baffles, Speaker-1300

§ Quam-Nichols Co., Chicago, IL 60637, 312-488-5800 ..... D•1055
§† Abalon Precision Mfg., Bronx, NY 10459 ..... 212-589-5682;1-800-888-ABALON
§ Argos Prods., Genoa, IL 60135 815-784-5118
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Fourjay Industries, Dayton, OH 45413-0617 513-890-6444
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Hammond Manufacturing Co., Buffalo, NY 14225 716-894-5710
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
§ Hartley Products, Wilmington, NC 28405 919-763-7422
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
† Permaluster, Inc., Burbank, CA 91504 ..... 213-849-4543;213-849-6454
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

Ballasts — See Resistors, Ballast (Vol. A)

Ballasts, Lighting, Magnetic-1850 — *See Vol. A*

Baluns — See Transformers, Matching (Vol. A)

Bargraphs — See Meters, Bargraph (Vol. D)

Barrier Blocks & Strips — See Terminal Blocks (Vol. C), Terminal Strips (Vol. C)

Barriers, Intrinsic Safety-2100 — *See Vol. C*

Bars, Shorting-3200 — *See Vol. C*

Baths, Controlled Temperature (Air & Liquid)-4100

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
Brinkmann Instruments, Inc., Westbury, NY 11590-9974 516-334-7500
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
§† Fisons Instruments, Valencia, CA 91355 805-295-0019
† Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Omega Engineering, Stamford, CT 06907 800-826-6342
Products for Research, Danvers, MA 01923 508-774-3250
† Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
Rush Enterprises Inc:A Heico Company, Hudson, NH 03051 603-886-9460

§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943

Baths, Ultrasonic – See Cleaners, Ultrasonic (Vol. D)

Batteries, Alkaline Manganese-3900

†# Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
 # Cell-Con, Inc., Exton, PA 19341, 215-363-8552 ..... D•1436
§† Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274 ..... D•1439-1441
 # Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452-1453
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-1457
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266 ..... D•1471-1475
§ Tadiran Electronic Industries, Inc., Port Washington, NY 11050, 516-621-4980 ..... D•1493
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
§ Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154 ... D•1497
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
†# Centurion International, Inc., Lincoln, NE 68504 402-467-4491
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
International Microelectronics, Arlington, TX 76003 817-561-2244
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
§# Powercard Corp., Waltham, MA 02159 617-890-6789
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§† RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
# Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
§ West Electronic Sales Team, Westminster, CA 92683 .... 714-898-0120;213-495-5569

Batteries, Carbon Zinc-3900

Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 .... D•1431
 # Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452-1453
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-1457
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266 ..... D•1471-1475
Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800 ..... D•1481-1482
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154 ... D•1497
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
Cell-Con, Inc., Exton, PA 19341 215-363-8552
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
International Microelectronics, Arlington, TX 76003 817-561-2244
§# Mouser Electronics, Mansfield, TX 76063 800-346-6873
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
§# Powercard Corp., Waltham, MA 02159 617-890-6789
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§† RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§ T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
# Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311

Batteries, Gelled Electrolyte-3900

†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 ..... D•1431-1432
 # Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670, 213-949-4266 ..... D•1499
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Alexander Manufacturing Company, Mason City, IA 50401 ..... 800-247-1821; 515-423-8955
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
§# C&D Charter Power Systems, Plymouth Meeting, PA 19462 215-828-9000
Cell-Con, Inc., Exton, PA 19341 215-363-8552
§ CSB/Taiwan Kobe Battery Co., Ltd., Ft. Worth, TX 76116 817-732-2258
§† Eagle-Picher, Joplin, MO 64801 417-623-8000
§ Eagle-Picher, Seneca, MO 64865 417-776-2256
§ East Penn Manufacturing, Lyon Station, PA 19536 215-682-6361
# Elgin Electronics, Erie, PA 16509-3570 814-864-4921
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
§# Johnson Controls Battery Group, Inc., Milwaukee, WI 53212 414-961-6500
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
§ Power-Sonic, Redwood City, CA 94063 415-364-5001
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§ T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Lead Acid-3900

 # Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 ..... D•1431-1432
§ CSB/Taiwan Kobe Battery Co., Ltd., Ft. Worth, TX 76116, 817-732-2258 ..... D•1437
§† Eagle-Picher, Joplin, MO 64801, 417-623-8000 ..... D•1449
§ Eagle-Picher, Seneca, MO 64865, 417-776-2256 ..... D•1444
 # Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452,1455
§† Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911 ..... D•1458-1461,1463-1465
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266 ..... D•1470-1475
 # Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873 ..... D•1479
§ Power-Sonic, Redwood City, CA 94063, 415-364-5001 ..... D•1483
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
§† Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670, 213-949-4266 ..... D•1499
† Accudyne Corp., Janesville, WI 53547 608-752-4053
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
§# Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
# Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
§# C&D Charter Power Systems, Plymouth Meeting, PA 19462 215-828-9000
Cell-Con, Inc., Exton, PA 19341 215-363-8552
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ East Penn Manufacturing, Lyon Station, PA 19536 215-682-6361
# Elgin Electronics, Erie, PA 16509-3570 814-864-4921
Exide Corporation, Reading, PA 19601 215-378-0500
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
§# Johnson Controls Battery Group, Inc., Milwaukee, WI 53212 414-961-6500
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
§† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
§ West Electronic Sales Team, Westminster, CA 92683 .... 714-898-0120;213-495-5569
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Lead Dioxide-3900

Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 .... D•1431
 # Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452,1455
Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911 .. D•1458-1465
† Accudyne Corp., Janesville, WI 53547 608-752-4053
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
Cell-Con, Inc., Exton, PA 19341 215-363-8552
† Eagle-Picher, Joplin, MO 64801 417-623-8000
§ Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
§# Johnson Controls Battery Group, Inc., Milwaukee, WI 53212 414-961-6500
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670 213-949-4266
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Lithium-3900

†# Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 ..... D•1431-1433
§† Battery Engineering, Inc., Hyde Park, MA 02136, 617-361-7555 ..... D•1435
# Cell-Con, Inc., Exton, PA 19341, 215-363-8552 ..... D•1436
§† Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274 ..... D•1439,1441
† Eagle-Picher, Joplin, MO 64801, 417-623-8000 ..... D•1448-1450
§† Eagle-Picher, Seneca, MO 64865, 417-776-2256 ..... D•1446-1447
†# Electrochem Industries, Wilson Greatbatch Ltd., Clarence, NY 14031, 716-759-2828 ..... D•1451
Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452-1453
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-1457
Gould Inc., Foil Div., Eastlake, OH 44095, 216-953-5065 ..... D•1466
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266 ..... D•1471-1475
# Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873 ..... D•1478-1479
§† Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800 ..... D•1481-1482
§† SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601, 912-247-2331 ..... D•1486-1488
§ Sanyo Energy Corp., San Diego, CA 92073, 619-661-6620 ..... D•1489
Tadiran Electronic Industries, Inc., Port Washington, NY 11050, 516-621-4980 ..... D•1493
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
§† Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154 ... D•1497
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
§† Catalyst Research, Mine Safety Appliances Co., Inc., Owings Mills, MD 21117 301-356-2400
† Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
Moli Energy Limited, Maple Ridge, B.C., CANADA V2X 9E7 ..... 604-465-7911/1-800-663-MOLI
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Renata U. S., Dallas, TX 75207 214-630-2563,800-527-0719
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
§ West Electronic Sales Team, Westminster, CA 92683 .... 714-898-0120;213-495-5569

Batteries, Lithium Manganese Dioxide-3900

†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 .... D•1433
§† Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274 ..... D•1439,1441-1443
Eagle-Picher, Joplin, MO 64801, 417-623-8000 ..... D•1449
Eagle-Picher, Seneca, MO 64865, 417-776-2256 ..... D•1446-1447
§# Electrochem Industries, Wilson Greatbatch Ltd., Clarence, NY 14031, 716-759-2828 ..... D•1451
Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452-1453
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-1457
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873 ..... D•1478-1479
§† Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800 ..... D•1481-1482
§ SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601, 912-247-2331 ..... D•1486-1488
§ Sanyo Energy Corp., San Diego, CA 92073, 619-661-6620 ..... D•1489
§ Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770 ..... D•1490
# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
Cell-Con, Inc., Exton, PA 19341 215-363-8552
§ Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
† Gould Inc., Foil Div., Eastlake, OH 44095 216-953-5065
# Hoppecke Battery Systems, Inc., Bulter, NJ 07405 201-492-0045
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Moli Energy Limited, Maple Ridge, B.C., CANADA V2X 9E7 ..... 604-465-7911/1-800-663-MOLI
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
§# Powercard Corp., Waltham, MA 02159 617-890-6789
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Renata U. S., Dallas, TX 75207 214-630-2563,800-527-0719
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311

Batteries, Lithium Thionyl Chloride-3900

Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 .... D•1433
§† Battery Engineering, Inc., Hyde Park, MA 02136, 617-361-7555 ..... D•1435
§† Eagle-Picher, Joplin, MO 64801, 417-623-8000 ..... D•1449
§† Eagle-Picher, Seneca, MO 64865, 417-776-2256 ..... D•1446-1447
†# Electrochem Industries, Wilson Greatbatch Ltd., Clarence, NY 14031, 716-759-2828 ..... D•1451
Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452-1453
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1457
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873 ..... D•1478-1479
§† Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800 ..... D•1481-1482
§ SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601, 912-247-2331 ..... D•1486-1487
§ Tadiran Electronic Industries, Inc., Port Washington, NY 11050, 516-621-4980 ..... D•1493
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
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Cell-Con, Inc., Exton, PA 19341 215-363-8552
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
†# Tauber Elctrns. Inc., San Diego, CA 92117 619-274-7242
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311

Batteries, Mercury-3900

†# Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
†# Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 .... D•1431
Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274 ..... D•1439-1440,1443
Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-1457
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266 ..... D•1471-1475
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
Cell-Con, Inc., Exton, PA 19341 215-363-8552
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Renata U. S., Dallas, TX 75207 214-630-2563,800-527-0719
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
§† Varta Batteries, Inc., Elmsford, NY 10523 ..... 914-592-2500;800-431-2154

Batteries, Mercury Oxide-3900

§† Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274 ..... D•1439,144
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452-145
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-145
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•146
Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154 ... D•149
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-444
†# Alexander Manufacturing Company, Mason City, IA 50401 ..... 800-247-1821 515-423-895
†# Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-129
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll fre in CA
Cell-Con, Inc., Exton, PA 19341 215-363-855
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-338
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-136
Plainview Batteries, Inc., Plainview, NY 11803 516-249-287
Pro Battery, Inc., Atlanta, GA 30340 800-451-717
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-469

Batteries, Nickel Cadmium-3900

†# **Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955** ..... D•1430
†# **Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295** ..... D•1431-1433
Cell-Con, Inc., Exton, PA 19341, 215-363-8552 ..... D•1436
† **Eagle-Picher, Joplin, MO 64801, 417-623-8000** ..... D•1449
# **Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639** ..... D•1452,1454
§† **Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000** ..... D•1456-1457
§† **Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911** ..... D•1458-1460,1462-1465
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ **Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266** ..... D•1471-1475
# **Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873** ..... D•1476-1477
§ **Power-Sonic, Redwood City, CA 94063, 415-364-5001** ..... D•1483
§† **SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601, 912-247-2331** ..... D•1486-1487
§ **Sanyo Energy Corp., San Diego, CA 92073, 619-661-6620** ..... D•1489
†# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... D•1496
§† **Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154** ... D•1497
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
§# Bomar Crystal Company, Middlesex, NJ 08846 ..... 908-356-7787;800-526-3935
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
†# Centurion International, Inc., Lincoln, NE 68504 402-467-4491
Christie Electric Corp., Gardena, CA 90248 213-715-1402
† Eagle-Picher, Seneca, MO 64865 417-776-2256
East Penn Manufacturing, Lyon Station, PA 19536 215-682-6361
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
# Golden Pacific Electronics, Inc, Placentia, CA 92670 714-993-6970
# Hoppecke Battery Systems, Inc., Bulter, NJ 07405 201-492-0045
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
Hughes Aircraft Co., Electron Dynamics Div., Torrance, CA 90509-2999 213-517-6000
International Microelectronics, Arlington, TX 76003 817-561-2244
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Jaro Components, Inc., Boca Raton, FL 33431 305-771-7000
§† Marathon Power Technologies, Waco, TX 76714-8233 817-776-0650
§# Mouser Electronics, Mansfield, TX 76063 800-346-6873
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
S A B NIFE, Inc., Div. of Sonesson, Greenville, NC 27834 919-830-1600
§† Saft America Inc., Power Sources Div., Valdosta, GA 31601 912-247-2331
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
§† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
§† Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670 213-949-4266
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Rechargeable-3900

†# **Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295** .... D•1432
§ **CSB/Taiwan Kobe Battery Co., Ltd., Ft. Worth, TX 76116, 817-732-2258** ..... D•1437
Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274 .. D•1439
§† **Eagle-Picher, Seneca, MO 64865, 417-776-2256** ..... D•1444
# **Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639** ..... D•1452
§† **Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000** ..... D•1456-1457
§† **Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911** ..... D•1458-1461,1463-1465
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ **Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266** ..... D•1470-1475
# **Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873** ..... D•1476-1477
Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800 ..... D•1481-1482
§ **Power-Sonic, Redwood City, CA 94063, 415-364-5001** ..... D•1483
§ **Sanyo Energy Corp., San Diego, CA 92073, 619-661-6620** ..... D•1489
Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770 ..... D•1490
†# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... D•1496
§ **Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154** ... D•1497
§† **Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670, 213-949-4266** ..... D•1499
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
# Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
§# Bomar Crystal Company, Middlesex, NJ 08846 ..... 908-356-7787;800-526-3935
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
Cell-Con, Inc., Exton, PA 19341 215-363-8552
†# Centurion International, Inc., Lincoln, NE 68504 402-467-4491
Christie Electric Corp., Gardena, CA 90248 213-715-1402
† Eagle-Picher, Joplin, MO 64801 417-623-8000
§† East Penn Manufacturing, Lyon Station, PA 19536 215-682-6361
Energy Ltd., Bladensburg, MD 20710 301-699-1144
Exide Corporation, Reading, PA 19601 215-378-0500
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
# Golden Pacific Electronics, Inc, Placentia, CA 92670 714-993-6970
# Hoppecke Battery Systems, Inc., Bulter, NJ 07405 201-492-0045
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Jaro Components, Inc., Boca Raton, FL 33431 305-771-7000
§# Johnson Controls Battery Group, Inc., Milwaukee, WI 53212 414-961-6500
§† Marathon Power Technologies, Waco, TX 76714-8233 817-776-0650
# Moli Energy Limited, Maple Ridge, B.C., CANADA V2X 9E7 ..... 604-465-7911/1-800-663-MOLI
§# Mouser Electronics, Mansfield, TX 76063 800-346-6873
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
§# Powercard Corp., Waltham, MA 02159 617-890-6789
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§ SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601 912-247-2331
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
§† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
§ West Electronic Sales Team, Westminster, CA 92683 .... 714-898-0120;213-495-5569
†# Yardney Technical Products, Inc., Pawcatuck, CT 06379 203-599-1100
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Silver Cadmium-3900

Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295 .... D•1431
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
Cell-Con, Inc., Exton, PA 19341 215-363-8552
† Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
†# Yardney Technical Products, Inc., Pawcatuck, CT 06379 203-599-1100

Batteries, Silver Oxide-3900

Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
§† **Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274** .. D•1439
# **Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639** ..... D•1452
§† **Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000** ..... D•1456-1457
Lyntronics, Inc., Deer Park, NY 11729, 516-243-6397 ..... D•1467
§ **Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266** ..... D•1471-1475
§ **Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770** ..... D•1490
†# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... D•1496
§† **Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154** ... D•1497
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
Cell-Con, Inc., Exton, PA 19341 215-363-8552
† Eagle-Picher, Joplin, MO 64801 417-623-8000
† Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
# Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
# Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Renata U. S., Dallas, TX 75207 214-630-2563,800-527-0719
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
†# Yardney Technical Products, Inc., Pawcatuck, CT 06379 203-599-1100

Batteries, Silver Zinc-3900

† **Eagle-Picher, Joplin, MO 64801, 417-623-8000** ..... D•1449
# **Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639** ..... D•1452
§ **Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770** ..... D•1490
†# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... D•1496
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
Cell-Con, Inc., Exton, PA 19341 215-363-8552
† Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440

SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601 912-247-2331
† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
†# Yardney Technical Products, Inc., Pawcatuck, CT 06379 203-599-1100

Batteries, Solar — See Cells, Photovoltaic (Vol. B)

Batteries, Standard Cell-3900

†# **Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295** .... **D•1432**
† **Eagle-Picher, Joplin, MO 64801, 417-623-8000** ..... **D•1449**
Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911 ..... **D•1458-1461,1463-1465**
Panasonic Industrial Co., Battery Sales GP, Secaucus, NJ 07096-1511, 201-348-5266 ..... **D•1471-1472,1474-1475**
Plainview Batteries, Inc., Plainview, NY 11803, 516-249-2873 ..... **D•1477**
Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800 ..... **D•1481-1482**
§ **SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601, 912-247-2331** ..... **D•1486-1488**
§ **Sanyo Energy Corp., San Diego, CA 92073, 619-661-6620** ..... **D•1489**
Tadiran Electronic Industries, Inc., Port Washington, NY 11050, 516-621-4980 ..... **D•1493**
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Cell-Con, Inc., Exton, PA 19341 215-363-8552
§# Contact East, N. Andover, MA 01845 508-682-2000
Eagle-Picher, Seneca, MO 64865 417-776-2256
§ East Penn Manufacturing, Lyon Station, PA 19536 215-682-6361
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
†# Tauber Elctrns. Inc., San Diego, CA 92117 619-274-7242
Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311
†# Yardney Technical Products, Inc., Pawcatuck, CT 06379 203-599-1100
Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670 213-949-4266
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Thermal-3900

†# **Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295** .... **D•1432**
† **Eagle-Picher, Joplin, MO 64801, 417-623-8000** ..... **D•1449**
§† **Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800** ..... **D•1481-1482**
SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601, 912-247-2331 ..... **D•1486**
† Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
SAFT America Inc., Advanced Battery Systems Div., Cockeysville, MD 21030 301-771-3200

Batteries, Thin Format-3900

§† **Power Conversion, Inc., Hawker Siddeley Group, Ltd.-London, England, Saddle Brook, NJ 07662, 201-796-4800** ..... **D•1481-1482**
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
Golden Pacific Electronics, Inc, Placentia, CA 92670 714-993-6970
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
§# Powercard Corp., Waltham, MA 02159 617-890-6789
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
SAFT America, Inc., Portable Battery Division, Valdosta, GA 31601 912-247-2331

Batteries, Zinc Air-3900

§† **Duracell Inc.: OEM Sales & Marketing, Bethel, CT 06801, 203-791-3274** ..... **D•1439,1442**
# **Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639** ..... **D•1452**
§† **Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000** ..... **D•1456-1457**
# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... **D•1496**
§# Adcour, Inc., Sharon, MA 02067 617-784-8123
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
†# Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-1295
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
† Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§ RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Renata U. S., Dallas, TX 75207 214-630-2563,800-527-0719
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§† Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670 213-949-4266
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900

Batteries, Zinc Carbon-3900

†# **Avex Electronics, Bensalem, PA 19020, 215-638-1515;800-345-1295** .... **D•1431**
Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... **D•1452**
§† **Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000** ..... **D•1456-1457**
# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... **D•1496**
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
†# Bren-Tronics, Inc., Commack, NY 11725 516-499-5155
§ Daitron, Inc., Tigard, OR 97223 503-620-2879
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
# Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
§# Powercard Corp., Waltham, MA 02159 617-890-6789
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§† RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§† T.D.I. Batteries, Downers Grove, IL 60515 708-971-3460
§# TNR Technical Inc., Altamonte Springs, FL 32714 407-682-4311

Batteries, Zinc Chloride-3900

Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... **D•1430**
Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... **D•1452**
§† **Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000** ..... **D•1456-1457**
†# **Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242** ..... **D•1496**
Varta Batteries, Inc., Elmsford, NY 10523, 914-592-2500;800-431-2154 ... **D•1497**
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
§ Daitron, Inc., Tigard, OR 97223 503-620-2879
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
†# NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
§† RAYOVAC Corporation, Madison, WI 53711-0960 608-275-4692
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440

Batteries, Zinc Oxide-3900

Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... **D•1452**
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
† Eagle-Picher, Seneca, MO 64865 417-776-2256
# House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171

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Battery Chargers — See Chargers, Battery (Vol. D), Power Supplies, Plug-in (Vol. D)

Battery Holders — See Connectors, Battery (Vol. C), Retainers, Battery (Vol. C)

Battery Plugs — See Connectors, Battery (Vol. C)

Beads, Shielding, Ferrite — See Shielding, Beads, Ferrite (Vol. C)

Beam Splitters-3700 — ***See Vol. B***

Bearings-2500 — ***See Vol. C***

Beepers — See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices (Vol. D)

Bells, Buzzers, Gongs, Sirens & Aural Warning Devices-2200

Accutech Benchmark Services, Brick, NJ 08723, 1-908-206-0026 ... **D•1024-1026**
§ **Bell, Floyd, Inc., Columbus, OH 43212, 614-294-4000** ..... **D•1028-1029**
CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... **D•1031**
§ **Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970** ..... **D•1032,1035**
§ **International Components Corp., Melville, NY 11747, 516-293-1500** .. **D•1037-1039**
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... **D•1040-1041**
§† **Line Electric Products, Hartford, CT 06141, 203-659-3573;1-800-331-1137** ..... **B•1537**
§ **MG Electronics, Hauppauge, NY 11788, 516-582-3400** ..... **D•1044**
§ **Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300** ..... **D•1046**
§ **Projects Unlimited, Dayton, OH 45414, 513-890-1918** ..... **D•1050-1052**
† **Shogyo International Corp., Great Neck, NY 11021, 516-466-0911** ..... **D•1058**
§† **Sonicall, Inc., Signal Hill, CA 90806, 213-490-2143** ..... **D•1061**
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... **D•1062-1065**
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... **D•1066**

§ Adcour, Inc., Sharon, MA 02067 ... 617-784-8123
§ Alarm Controls Corporation, Deer Park, NY 11729 ... 516-586-4220
§ Aqualarm, Marine Safety Systems, Inc., Chula Vista, CA 91911 ... 619-575-4011
§ Atlas/Soundolier, Fenton, MO 63026 ... 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 ... 203-377-4475
§ EAO Switch Corp., Milford, CT 06460 ... 203-877-4577
Endicott Coil Co., Inc., Binghamton, NY 13905 ... 607-797-1263
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ... 201-288-4477; 800-447-5639
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 ... 408-432-8331
§ GC-Thorsen, Rockford, IL 61105-1209 ... 815-968-9661
Harrel, Inc., E. Norwalk, CT 06855 ... 203-866-2573
§ Heath Co., St. Joseph, MI 49085 ... 616-982-3200
§† Mallory/North American Capacitor Co., Indianapolis, IN 46241 ... 317-856-3731
§ NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 ... 708-824-1133
§ Ohmite Manufacturing Co., Skokie, IL 60076 ... 708-675-2600
† RDI Elctrns., Inc., New Rochelle, NY 10801 ... 914-632-7274
Relay Service Co., Chicago, IL 60651 ... 312-252-2700
§ Relay Specialties, Oakland, NJ 07436 ... 201-337-1000
Rodann Electronics Mfg. Co., Brea, CA 92621 ... 714-529-1301;800-366-7010
Shokai Far East Ltd., Peekskill, NY 10566 ... 914-736-3500
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ... 516-957-8700; 800-645-5516
†# Tauber Elctrns. Inc., San Diego, CA 92117 ... 619-274-7242
Trinetics Inc., Mishawaka, IN 46545-4899 ... 219-259-8535
§ Wheelock, Inc., Long Branch, NJ 07740 ... 201-222-6880

Belts, Dial Drive – See Cords & Cable, Dial Drive (Vol. C)

Belts, Drive-2500 – *See Vol. C*

Benches, Consoles, Tables (Work Stations, Lab & Shop)-Also See Enclosures, Equipment and Panel Mounting-1400 – *See Vol. C*

Bends & Twists, Microwave-3450 – *See Vol. A*

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Bimetals, Thermostatic-5300 – *See Vol. B*

Bins, Part Storage-1400 – *See Vol. C*

Bins, Static Conductive-1400 – *See Vol. C*

Blackbody Radiation Sources-2900

† Electro Optical Industries Inc., Santa Barbara, CA 93111 ... 805-964-6701 (ext. 280)
E-Squared Technology Corp., Ventura, CA 93003 ... 805-644-9544
High Technology Sensors, Inc., Longwood, FL 32779 ... 407-884-7722
† Infrared Industries, Inc., Orlando, FL 32826 ... 407-282-7700
§† Mikron Instr., Wyckoff, NJ 07481 ... 201-891-7330
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
Swan Associates, New Haven, CT 06534 ... 203-387-3917

Blowers, Centrifugal-2600 – *See Vol. C*

Blowers, Scroll (Squirrel Cage)-2600 – *See Vol. C*

Blowers, Tangential-2600 – *See Vol. C*

Board Computers & Subassemblies, Multibus Compatible-2025

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ... D•1145
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
† Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ... C•1684
§ Scanbe, Unit of Zero Corporation, El Monte, CA 91731, 619-452-9333 ... C•1098-1099
Traceweli Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ... C•1120
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ... D•1197
§† Advanced Interconnections Corp., West Warwick, RI 02893 ... 401-823-5200
ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 ... 603-882-1447
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 ... 516-694-6700
AFE Displays Inc., Charlottesville, VA 22901 ... 804-974-7801
§ Analog Devices, Inc., Norwood, MA 02062-9106 ... 617-329-4700
Analogic Corp., Peabody, MA 01960 ... 508-977-3000
Andrew/KMW Systems, Austin, TX 78730 ... 800-531-5167;512-338-3082
Augat, Inc., Interconnection Products Group, Attleboro, MA 02703 ... 508-222-2202
Bit 3 Computer Corporation, Minneapolis, MN 55431-1393 ... 612-881-6955
§ Burr-Brown Corp., Tucson, AZ 85734 ... 602-746-1111
§ Central Data Corp., Champaign, IL 61821 ... 217-359-8010
§ Ciprico Inc., Plymouth, MN 55441 ... 612-559-2034
Comark Corp., Medfield, MA 02052 ... 508-359-8161
§ Computrol:An AEG Co., Ridgefield, CT 06877 ... 203-431-2000
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 ... 617-273-5800
Data Translation, Inc., Marlboro, MA 01752 ... 508-481-3700
§ Datel, Inc., Mansfield, MA 02048-1194 ... 508-339-3000
§ Diversified Technlg., Ridgeland, MS 39157 ... 601-856-4121
ELMA Electronic Inc., Fremont, CA 94538 ... 415-656-3400
E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 ... 714-669-9473
GEN/COMP Inc., Canton, MA 02021 ... 617-828-2008
Hybricon Corporation, Ayer, MA 01432 ... 508-772-5422
† ILC Data Device Corp., Bohemia, NY 11716-2482 ... 516-567-5600
Interlogic Industries, Melville, NY 11747-4294 ... 516-420-8111
§ International Instrumentation, Inc., Westlake Vlg., CA 91361 ... 805-495-7673
Knurr USA Inc., Knurr A.G., Simi Valley, CA 93063 ... 805-526-7733
† K-Systems of Texas, Inc., El Paso, TX 79936 ... 915-598-9769
Mathematical Systems Design, Inc., Los Angeles, CA 90064 ... 310-479-7180
§ Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 ... 514-685-2630
Megadata Corp., Bohemia, NY 11716 ... 516-589-6800
Microbar Systems, Inc., Sunnyvale, CA 94086 ... 408-720-9300
Micro Industries, Westerville, OH 43081 ... 614-895-0404
Micro/sys, Glendale, CA 91201-3010 ... 818-244-4600
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 ... 508-588-6110
Omnibyte Corp., W. Chicago, IL 60185 ... 708-231-6880
§ Pacific Microcomputers, Signal Technology, San Diego, CA 92121 ... 619-453-8649
§ Phoenix Contact Inc., Harrisburg, PA 17111 ... 717-944-1300
Precicontact, Inc., Langhorne, PA 19047 ... 215-757-1202
§† Radstone Technology, Montvale, NJ 07645 ... 201-391-2700;800-368-2738
SBE, Concord, CA 94520 ... 501-680-7722;800-347-COMM
Schroff Incorporated, Warwick, RI 02886 ... 401-732-3770
§† SCOPE Incorporated, Reston, VA 22090 ... 703-471-5600
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 ... 214-466-6000
§ Toko America, Inc., Mt. Prospect,, IL 60056 ... 708-297-0070
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co.,, Specialties Division, Anaheim, CA 92807 ... 714-632-9842; 800-326-9888
§ Xylogics, Inc., Burlington, MA 01803 ... 800-225-3317
Zendex Corp., Dublin, CA 94568 ... 415-828-3000
Ziatech, San Luis Obispo, CA 93401 ... 805-541-0488

Board Computers & Subassemblies, EXORBUS Compatible-2025

§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 ... 707-584-7558
§ Creative Micro Systems, Los Alamitos, CA 90720 ... 213-493-2484
§ Daedal, Harrison City, PA 15636 ... 412-744-4451
Interlogic Industries, Melville, NY 11747-4294 ... 516-420-8111
Micro Industries, Westerville, OH 43081 ... 614-895-0404
TL Inds. Inc., Northwood, OH 43619 ... 419-666-8144

Board Computers & Subassemblies, PC Bus Compatible-2025

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ... D•1145-1147
§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ... B•1889
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ... D•1179
Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ... D•1184
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ... D•1124
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1384
Traceweli Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ... C•1120
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ... D•1197
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 ... 716-235-5000
§ Action Instruments, San Diego, CA 92123 ... 619-279-5726
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 ... 603-882-1447
AFE Displays Inc., Charlottesville, VA 22901 ... 804-974-7801
Alligator Technologies, Fountain Valley, CA 92708 ... 714-850-9984
§ Alpha Omega Computer Systems, Corvallis, OR 97333 ... 503-754-1911
Ampro Computers,Inc., Sunnyvale, CA 94086 ... 408-522-2100
Analogic Corp., Peabody, MA 01960 ... 508-977-3000
Antona Corp., Los Angeles, CA 90024-5603 ... 213-473-8995
Augat, Inc., Interconnection Products Group, Attleboro, MA 02703 ... 508-222-2202
Bit 3 Computer Corporation, Minneapolis, MN 55431-1393 ... 612-881-6955
§ Burr-Brown Corp., Tucson, AZ 85734 ... 602-746-1111
C & C Technology Inc., West Chicago, IL 60185 ... 708-231-0015
CGRS Microtech, Langhorne, PA 19047 ... 215-757-0284
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 ... 707-584-7558
Computer Dynamics Sales, Greer, SC 29650 ... 803-877-8700
Computer Systems Technical Support, Anaheim, CA 92807 ... 714-632-1300
§ Computrol:An AEG Co., Ridgefield, CT 06877 ... 203-431-2000
§ Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ... 800-361-4914;514-333-1301
§ Daedal, Harrison City, PA 15636 ... 412-744-4451
Data Translation, Inc., Marlboro, MA 01752 ... 508-481-3700
DDI Inc., Beverly, MA 01915-1703 ... 508-927-7976
Design Components, Inc., Franklin, MA 02038 ... 508-528-7300;800-341-4811
§ Diversified Technlg., Ridgeland, MS 39157 ... 601-856-4121
§# Encoder Products, Sandpoint, ID 83864 ... 208-263-8541
ICS Electronics Corp., Milpitas, CA 95035-5545 ... 408-263-5500
Industrial Computer Source, San Diego, CA 92111 ... 619-279-0084
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 ... 914-373-9003
Interlogic Industries, Melville, NY 11747-4294 ... 516-420-8111
KineticSystems, Lockport, IL 60441 ... 815-838-0005
† K-Systems of Texas, Inc., El Paso, TX 79936 ... 915-598-9769
Logical Design Group, Inc., Raleigh, NC 27607 ... 919-851-1101
§ Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 ... 514-685-2630
Mercury Computer Systems, Lowell, MA 01854 ... 508-458-3100
Micro Electronic Technologies, Hopkinoon, MA 01748 ... 508-435-9057
Micro Industries, Westerville, OH 43081 ... 614-895-0404
Micro/sys, Glendale, CA 91201-3010 ... 818-244-4600
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 ... 613-592-2122
§ Monolithic Sys. Corp., Englewood, CO 80112 ... 303-790-7400
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 ... 508-588-6110
† Northern Precision Labs., Fairfield, NJ 07006 ... 201-227-4800
Octagon Systems, Westminster, CO 80030 ... 303-430-1500
Optivision, Inc., Davis, CA 95616 ... 916-756-4429;800-562-8934
Parsytec Inc., West Chicago, IL 60185 ... 708-293-9500
§ Phoenix Contact Inc., Harrisburg, PA 17111 ... 717-944-1300

Qualogy Inc., San Jose, CA 95134 408-434-5200
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Systronix Inc., Salt Lake City, UT 84152-6398 801-487-7412
§† Thaler Corp., Tucson, AZ 85737 602-742-5572
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co.,, Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
Vesta Technology, Inc., Wheat Ridge, CO 80033 303-422-8088
Vetra Systems Corp., Plainview, NY 11803 516-454-6469
Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945
§ WinSystems, Inc., Arlington, TX 76011 817-274-7553
Zaki Corporation, Marlboro, MA 01752 508-480-0201
Zendex Corp., Dublin, CA 94568 415-828-3000

Board Computers & Subassemblies, Q Bus/Unibus Compatible-2025

§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
Bit 3 Computer Corporation, Minneapolis, MN 55431-1393 612-881-6955
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
GEN/COMP Inc., Canton, MA 02021 617-828-2008
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
Hybricon Corporation, Ayer, MA 01432 508-772-5422
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
Logical Design Group, Inc., Raleigh, NC 27607 919-851-1101
§ Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
Mercury Computer Systems, Lowell, MA 01854 508-458-3100
Micro Industries, Westerville, OH 43081 614-895-0404
Parsytec Inc., West Chicago, IL 60185 708-293-9500
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Board Computers & Subassemblies, S100 Bus Compatible-2025

§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
§ Scanbe, Unit of Zero Corporation, El Monte, CA 91731, 619-452-9333 ... C•1099
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1197
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co.,, Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888

Board Computers & Subassemblies, STD Bus Compatible-2025

§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
§ Scanbe, Unit of Zero Corporation, El Monte, CA 91731, 619-452-9333 ... C•1099
Tracewell Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ..... C•1120,1124
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1197
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
Antona Corp., Los Angeles, CA 90024-5603 213-473-8995
§† Baradine Products Ltd., North Vancouver, B.C., CANADA V7L 4L3 604-988-9853
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
Computer Dynamics Sales, Greer, SC 29650 803-877-8700
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
§ Daedal, Harrison City, PA 15636 412-744-4451
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 402-563-6506
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
§ Datricon, Scientific Technologies, Inc., Hayward, CA 94544 415-471-9717
Davidge Corporation, Buellton, CA 93427 805-688-9598
DDI Inc., Beverly, MA 01915-1703 508-927-7976
Electrologic, Inc., Signal Hill, CA 90806 213-595-0551
Electronic Design Engineering, Norco, CA 91760 714-735-1761
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
Hybricon Corporation, Ayer, MA 01432 508-772-5422
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
Matrix Corp., Raleigh, NC 27610 919-231-8000
Micro/sys, Glendale, CA 91201-3010 818-244-4600
Octagon Systems, Westminster, CO 80030 303-430-1500
§ Pro-Log Corp., Monterey, CA 93940 408-372-4593
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
Solarcom Technology, Inc., Hayward, CA 94544 415-489-3141
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk, NY 11040 ..... 516-328-0200;328-3300
TL Inds. Inc., Northwood, OH 43619 419-666-8144
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co.,, Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
Versalogic Corp., Eugene, OR 97402 800-824-3163
§ WinSystems, Inc., Arlington, TX 76011 817-274-7553
XYZ Electronics, McCordsville, IN 46055 317-335-2128
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Board Computers & Subassemblies, VXI Bus Compatible-2025

Graham Electronic Manufacturing Inc., Escondido, CA 92025, 619-747-9177;800-628-4095 ..... C•1057
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
KineticSystems, Lockport, IL 60441 815-838-0005
Knurr USA Inc., Knurr A.G., Simi Valley, CA 93063 805-526-7733
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 508-588-6110
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
Precision Filters, Ithaca, NY 14850 607-277-3550
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Schroff Incorporated, Warwick, RI 02886 401-732-3770
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tracewell Enclosures, Inc., Westerville, OH 43081 ..... 614-846-6175;800-848-4525
Transmagnetics, Farmingdale, NY 11735 516-293-3100

Board Computers & Subassemblies, VME Bus Compatible-2025

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145
ELMA Electronic Inc., Fremont, CA 94538, 415-656-3400 ..... C•1041
Graham Electronic Manufacturing Inc., Escondido, CA 92025, 619-747-9177;800-628-4095 ..... C•1057
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
† Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... C•1684
§ Scanbe, Unit of Zero Corporation, El Monte, CA 91731, 619-452-9333 ..... C•1098-1099
Tracewell Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ..... C•1120,1122-1124
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1197
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-522-5020 ..... D•1119
Acromag Inc., Wixom, MI 48393-7037 313-624-1541
§† Advanced Interconnections Corp., West Warwick, RI 02893 401-823-5200
ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Analogic Corp., Peabody, MA 01960 508-977-3000
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
Augat, Inc., Interconnection Products Group, Attleboro, MA 02703 508-222-2202
Bit 3 Computer Corporation, Minneapolis, MN 55431-1393 612-881-6955
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
§ Central Data Corp., Champaign, IL 61821 217-359-8010
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
§ Ciprico Inc., Plymouth, MN 55441 612-559-2034
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
§ Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301
§ Daedal, Harrison City, PA 15636 412-744-4451
Dage Precision Industries, Inc., Fremont, CA 94538 415-683-3930
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
§ Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 714-669-9473
Hybricon Corporation, Ayer, MA 01432 508-772-5422
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
Knurr USA Inc., Knurr A.G., Simi Valley, CA 93063 805-526-7733
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
Logical Design Group, Inc., Raleigh, NC 27607 919-851-1101
Matrix Corp., Raleigh, NC 27610 919-231-8000
§ Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
Mercury Computer Systems, Lowell, MA 01854 508-458-3100
Micro Industries, Westerville, OH 43081 614-895-0404

Micro/sys, Glendale, CA 91201-3010 818-244-4600
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 508-588-6110
Omnibyte Corp., W. Chicago, IL 60185 708-231-6880
§ Pacific Microcomputers, Signal Technology, San Diego, CA 92121 619-453-8649
Parsytec Inc., West Chicago, IL 60185 708-293-9500
§ Perceptics Corp., Knoxville, TN 37922 615-966-9200
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Precicontact, Inc., Langhorne, PA 19047 215-757-1202
§† Radstone Technology, Montvale, NJ 07645 ..... 201-391-2700;800-368-2738
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
Schroff Incorporated, Warwick, RI 02886 401-732-3770
§ Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
† Star-Tron Corporation, Providence, RI 02909 401-274-5090
TL Inds. Inc., Northwood, OH 43619 419-666-8144
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444
§ Xylogics, Inc., Burlington, MA 01803 800-225-3317

Boards, Adapter, IBM PC-2000

§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 .. A•1725
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1191
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1384
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
Ampro Computers,Inc., Sunnyvale, CA 94086 408-522-2100
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Antona Corp., Los Angeles, CA 90024-5603 213-473-8995
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Ballard Technology, Seattle, WA 98117 206-782-8704
Bit 3 Computer Corporation, Minneapolis, MN 55431-1393 612-881-6955
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Dage Precision Industries, Inc., Fremont, CA 94538 415-683-3930
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Dataq Instruments, Inc., Akron, OH 44311 ..... 216-434-4284 ; 800-553-9006
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ EBY Company, Philadelphia, PA 19124 215-537-4700
§# Encoder Products, Sandpoint, ID 83864 208-263-8541
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
Industrial Computer Source, San Diego, CA 92111 619-279-0084
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
Pacific Industrial Components Corp., See Altair Exchange Corp.
Parsytec Inc., West Chicago, IL 60185 708-293-9500
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
Redlake Corp., Morgan Hill, CA 95037 408-779-6464
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
Vetra Systems Corp., Plainview, NY 11803 516-454-6469

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Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145-1146
§ Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 ..... B•1488, D•1170-1172
§ Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124,1188,1296-1297
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1228
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1384
§ Action Instruments, San Diego, CA 92123 619-279-5726
Advanced Hardware Architectures, Inc., Moscow, ID 83843 208-883-8000
Ampro Computers,Inc., Sunnyvale, CA 94086 408-522-2100
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Peabody, MA 01960 508-977-3000
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
California Automation Inc., San Diego, CA 92121 619-452-1341
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
§ Capital Equipment Corporation, Burlington, MA 01803 617-273-1818
§ Central Data Corp., Champaign, IL 61821 217-359-8010
CGRS Microtech, Langhorne, PA 19047 215-757-0284
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Colorgraphic Communications Corp., Atlanta, GA 30366 404-455-3921
§ Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
§ Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Diversified Technlg., Ridgeland, MS 39157 601-856-4121
§ EBY Company, Philadelphia, PA 19124 215-537-4700
E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 714-669-9473
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Industrial Computer Source, San Diego, CA 92111 619-279-0084
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
KineticSystems, Lockport, IL 60441 815-838-0005
Logical Design Group, Inc., Raleigh, NC 27607 919-851-1101
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mercury Computer Systems, Lowell, MA 01854 508-458-3100
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
Micro Industries, Westerville, OH 43081 614-895-0404
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 508-588-6110
Pacific Industrial Components Corp., See Altair Exchange Corp.
Parsytec Inc., West Chicago, IL 60185 708-293-9500
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001 812-386-1000
Qualogy Inc., San Jose, CA 95134 408-434-5200
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TL Inds. Inc., Northwood, OH 43619 419-666-8144
§ Visionary Electronics, San Francisco, CA 94118 415-751-8811
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444
XYZ Electronics, McCordsville, IN 46055 317-335-2128

Boards, Plug-in Processor-1900

§ Action Instruments, San Diego, CA 92123 619-279-5726
Advanced Hardware Architectures, Inc., Moscow, ID 83843 208-883-8000
AFE Displays Inc., Charlottesville, VA 22901 804-974-7801
Ampro Computers,Inc., Sunnyvale, CA 94086 408-522-2100
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
§ Central Data Corp., Champaign, IL 61821 217-359-8010
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Comark Corp., Medfield, MA 02052 508-359-8161
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
§ Dallas Semiconductor, Dallas, TX 75067 214-450-0400
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Davidge Corporation, Buellton, CA 93427 805-688-9598
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
§# Encoder Products, Sandpoint, ID 83864 208-263-8541
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
General Digital Corp., Enfield, CT 06082 203-741-7171
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Industrial Computer Source, San Diego, CA 92111 619-279-0084
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
KineticSystems, Lockport, IL 60441 815-838-0005
§ Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
Logical Design Group, Inc., Raleigh, NC 27607 919-851-1101
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mercury Computer Systems, Lowell, MA 01854 508-458-3100
Micro Industries, Westerville, OH 43081 614-895-0404
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
Omega Engineering, Stamford, CT 06907 800-826-6342
Optivision, Inc., Davis, CA 95616 ..... 916-756-4429;800-562-8934
Parsytec Inc., West Chicago, IL 60185 708-293-9500
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001 812-386-1000
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
Solarcom Technology, Inc., Hayward, CA 94544 415-489-3141
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
XYZ Electronics, McCordsville, IN 46055 317-335-2128
Ziatech, San Luis Obispo, CA 93401 805-541-0488

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Bolometers, Infrared-2900

Micro-Ohm Corp., Duarte, CA 91010, 818-3575377 ..... A•1947
† Barnes Engineering Div., EDO Corporation, Shelton, CT 06484 203-926-1777
Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
Swan Associates, New Haven, CT 06534 203-387-3917
† Thermometrics, Inc., Edison, NJ 08817-4695 908-287-2870
§ Victory Engineering Corp., Springfield, NJ 07081 201-379-5900

Bolometers, Microwave-2900

† Alpha Industries, Inc., Woburn, MA 01801 617-935-5150
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
† General Microwave Corporation, Amityville, NY 11701 516-226-8900
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428

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Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000

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Bridges, Admittance-2900

Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

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Bridges, Audio-1900

Dantel, Fresno, CA 93727 209-292-1111
Electro-Dynamics Dev. Co., Issaquah, WA 98027-4038 206-392-2493
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Bridges, Capacitance-2900

Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264-1265
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1288
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Epic, Inc., New York, NY 10038 212-349-2470
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Bridges, Deviation-2900

Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
Meissner Industries, Dover, NJ 07801 201-366-1700
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729

Bridges, Dissipation Factor-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1288
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
§ Epic, Inc., New York, NY 10038 212-349-2470
Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Bridges, Impedance-2900

§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1288
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Electro-Dynamics Dev. Co., Issaquah, WA 98027-4038 206-392-2493
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Marconi Instruments, Allendale, NJ 07401 201-934-9050
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Vernitron Corp., Passive Comps. Group, St. Petersburg, FL 33743 813-347-2181
Western Multiplex Corp., Belmont, CA 94002 415-592-8832
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Bridges, Inductance-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Marconi Instruments, Allendale, NJ 07401 201-934-9050
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Bridges, Kelvin-2900

§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
Shalltronix Corp., Selma, NC 27576, 919-965-6346 ..... D•1325
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Epic, Inc., New York, NY 10038 212-349-2470
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Julie Research Labs., New York, NY 10001 212-633-6625
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Meissner Industries, Dover, NJ 07801 201-366-1700
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Bridges, LCR-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264-1265
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1288
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200

Marconi Instruments, Allendale, NJ 07401 201-934-9050
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

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BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ International Rectifier Corp., El Segundo, CA 90245 213-772-2000
§† Semtech, Newbury Park, CA 91320 805-498-2111
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196

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Bridges, Q-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

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Bridges, Resistance-2900

General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1272
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
Vishay Resistive Systems, Malvern, PA 19355, 215-644-1300 ..... A•2001
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
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Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Dantel, Fresno, CA 93727 209-292-1111
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Meissner Industries, Dover, NJ 07801 201-366-1700
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
Shalltronix Corp., Selma, NC 27576 919-965-6346
† Space Electronics, Inc., Berlin, CT 06037 203-829-0001
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Western Multiplex Corp., Belmont, CA 94002 415-592-8832
Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Bridges, RF-2900

§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Eagle Wichita, Wichita, KS 67277 316-942-5100
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Palomar Engineers, Escondido, CA 92033 619-747-3343
Teleplex, Inc., Alford Division, Woburn, MA 01801 617-935-8610
Telonic/Berkeley, Berkeley Inds. Inc., Laguna Beach, CA 92652 714-494-9401
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Werlatone, Inc., Brewster, NY 10509 914-279-6187
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

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Bridges, Strain Gauge-2900

§ Action Instruments, San Diego, CA 92123 619-279-5726
A. L. Design, Inc., Buffalo, NY 14217 716-875-6240
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
BLH Electronics, Inc., Canton, MA 02021-9111 617-821-2000
DJ Instruments, Inc., N. Billerca, MA 01862 508-667-5301
HBM, Inc., Marlboro, MA 01752 508-624-4500
† Kulite Semiconductor Prods., Inc., Leonia, NJ 07605 201-461-0900
Omega Engineering, Stamford, CT 06907 800-826-6342
† PPM, Inc., Cleveland, OH 44139 216-349-2300

Bridges, Synchro & Resolver-2900

† North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
Astrosystems, Lake Success, NY 11042 516-328-1600
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
† Transmagnetics, Farmingdale, NY 11735 516-293-3100

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Prem Magnetics, Inc., McHenry, IL 60050, 815-385-2700 ..... A•2376,2378
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
§ Conklin Instrument Corp., Pleasant Valley, NY 12569 914-635-2136
Dantel, Fresno, CA 93727 209-292-1111
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ DEK, Inc., St. Charles, IL 60174 708-377-2575
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Bridges, Temperature-2900

Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087, 708-662-9200 ..... B•1662
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1854
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
† Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Minco Products, Minneapolis, MN 55432 612-571-3121
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Bridges, Wheatstone-2900

Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Shalltronix Corp., Selma, NC 27576, 919-965-6346 ..... D•1325
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
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Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
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§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
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Meissner Industries, Dover, NJ 07801 201-366-1700
† Space Electronics, Inc., Berlin, CT 06037 203-829-0001
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† **GSI Corp., Timonium, MD 21093, 410-252-1768** ..... **C•1756**
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... **D•1022-1023**
§ **Pomona Electronics, Pomona, CA 91766, 714-623-3463** ..... **C•1496**
Andrew Corp., Orland Pk., IL 60462 800-255-1479
§ AVA Electronics Corporation, Drexel Hill, PA 19026 215-284-2500
CableStar, Incorporated, Glasgow, KY 42141 800-338-8223
§ Electronic Resources Inc., Sunnyvale, CA 94089 408-745-1420
§ EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
§ International Components Corp., Melville, NY 11747 516-293-1500
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
† Pasternack Enterprises, Irvine, CA 92713 714-261-1920
Power Dynamics Inc., West Orange, NJ 07052 201-736-5722
Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0 519-696-2616
Transtechnology Electronics, Transtechnology Corporation, Peoria, IL 61615-1584 309-693-3300
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984

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Cable Fault Locators-2900

Cirris Systems Corp., Salt Lake City, UT 84119, 801-973-4600;800-441-9910 ..... **D•1235**
§ AT&T Network Systems,Network Cable Sys. Div., Morristown, NJ 07962 ..... 1-800-344-0223, Ext. 1027
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cablescan, Inc., Subsidiary of Eubanks Engrg. Co., Orange, CA 92665 714-998-1961
Cabletest Products Co., Malden, MA 02148 617-665-2932
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Contact East, N. Andover, MA 01845 508-682-2000
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
Hipotronics Inc., Brewster, NY 10509 914-279-8091
§ International Electro Magnetics, Inc., Palatine, IL 60067 708-358-4622
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
§ Laser Precision Corp., Utica, NY 13502 315-797-4449
3M Dynatel Systems Division, Austin, TX 78769-2963 ..... 512-984-3412;800-426-8688
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
Phenix Technologies, Accident, MD 21520 301-746-8118
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Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

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Wilcoxon Research, Rockville, MD 20850, 301-330-8811 ..... **B•1959**
Alpha-M Corp., Dallas, TX 75229 214-406-0424
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ Kistler Instruments Corp., Amherst, NY 14221-2171 716-691-5100
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929

Calibrators, Attenuation-2900

Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... **D•1243**
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
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M/A-COM Government Products, Inc., Hunt Valley, MD 21030 301-771-0077
† Maury Microwave Corp., Cucamonga, CA 91730 714-987-4715
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Calibrators, Automated-2900

Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... **D•1010**
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... **D•1270,1273**
† **Valhalla Scientific, San Diego, CA 92121, 619-457-5576** ..... **D•1332-1333**
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Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
Xitron Technologies, San Diego, CA 92121 619-458-9852
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Calibrators, Crystal-2900

PPM, Inc., Cleveland, OH 44139 216-349-2300
Rutherford Research, Rutherford, NJ 07070 201-933-2091

Calibrators, Current-2900

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... **D•1145**
† **Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696** ..... **D•1242-1243**
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... **D•1252-1253**
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... **D•1258,1265**
§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700** ..... **D•2207**
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... **D•1270,1273**
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... **D•1275**
† **Valhalla Scientific, San Diego, CA 92121, 619-457-5576** ..... **D•1332-1333**
Analogic Corp., Peabody, MA 01960 508-977-3000
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
† California Instruments Corp., San Diego, CA 92111-1216 ..... 619-279-8620;800-356-2244
Clarke-Hess Communications Research Corp., New York, NY 10011 212-255-2940

§ Contact East, N. Andover, MA 01845 ... 508-682-2000
§ Crystal Engineering Corp., Los Osos, CA 93402 ... 805-528-2155;800-444-1850
§ CYBRID INCORPORATED, Woodcliff Lake, NJ 07675 ... 201-307-0426
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB ... 603-404824
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 ... 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 ... 407-423-8215
Holt Instrument, C.P.D. Engineering, Inc., Oconto, WI 54153 ... 414-834-2222
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ... 201-757-2220/2277
§ Martel Electronics, Salem, NH 03079 ... 603-893-0886
North Hills Electronics, Glen Cove, NY 11542 ... 516-671-5700
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
Omicron electronic, Hohenems, AUSTRIA A-6845 ... +/5576/4010-0
Rotek Instrument Corp., Waltham, MA 02254 ... 617-899-4611
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Tucker Electronics, Dallas, TX 75355-1419 ... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 ... 800-874-7123
Xitron Technologies, San Diego, CA 92121 ... 619-458-9852
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 ... 415-966-8484

Calibrators, Fluxmeter-2900

§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638

Calibrators, Frequency-2900

§† Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000 ... A•1307
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ... D•1164
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ... A•1368
Julie Research Labs., New York, NY 10001, 212-633-6625 ... D•1273
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 ... 319-395-1000
Compliance Design Inc., Boxboro, MA 01719 ... 508-264-4668
Dixson, Inc., Grand Junction, CO 81503 ... 303-244-1241
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 ... 206-347-6100
† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ... 708-932-9380;800-468-6009
FTS/AUSTRON, Austin, TX 78761-4766 ... 512-251-2341
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 ... 707-528-1230
Loral Microwave Narda, Hauppauge, NY 11788 ... 516-231-1700
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 ... 818-993-0048
† PPM, Inc., Cleveland, OH 44139 ... 216-349-2300
Rutherford Research, Rutherford, NJ 07070 ... 201-933-2091
Spectracom Corporation, East Rochester, NY 14445-1484 ... 716-381-4827
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 ... 800-874-7123

Calibrators, LVDT-2900

† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ... D•1152-1153
† Computer Conversions Corp., E. Northport, NY 11731 ... 516-261-3300
Lucas Schaevitz, Pennsauken, NJ 08110-1489 ... 609-662-8000
† North Atlantic Industries, Hauppauge, NY 11788 ... 516-582-6500
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
† Transmagnetics, Farmingdale, NY 11735 ... 516-293-3100

Calibrators, Magnetic Field-2900

Magnos, Hudson, MA 01749, 508-562-1173 ... D•1291
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ... D•1337
LDJ Incorporated, Troy, MI 48099-0219 ... 313-528-2202
Magnetic Instrumentation, Indianapolis, IN 46226 ... 317-545-2102
§ Tensor, Austin, TX 78761 ... 512-251-4131

Calibrators, Meter-2900

Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ... D•1332-1333
G.C. Industries, Inc., Chatsworth, CA 91311 ... 818-882-7852
§ TEGAM, Inc., Madison, OH 44057 ... 800-666-1010
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 ... 619-279-2200
Xitron Technologies, San Diego, CA 92121 ... 619-458-9852

Calibrators, Oscilloscope-2900

Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ... D•1332-1333
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
§ E.I.L. Instruments, Inc., Sparks, MD 21152 ... 301-771-4800
Julie Research Labs., New York, NY 10001 ... 212-633-6625
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
Tektronix, Inc., Beaverton, OR 97077 ... 800-835-9433

Calibrators, Sound Level-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 ... 508-481-7000
§ Metrosonics, Inc., Rochester, NY 14692-3075 ... 716-334-7300
§ Simpson Electric Co., Elgin, IL 60120 ... 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ... 215-673-5600;800-343-1199

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Calibrators, Synchro-2900

Astrosystems, Lake Success, NY 11042 ... 516-328-1600
† Computer Conversions Corp., E. Northport, NY 11731 ... 516-261-3300
† ILC Data Device Corp., Bohemia, NY 11716-2482 ... 516-567-5600
† Industrial Control Co., Rockledge, FL 32955 ... 407-259-7105
International Machine & Tool Corp., Warwick, RI 02888 ... 401-467-6905
Jonard Industries Corp., Tuckahoe, NY 10707 ... 914-793-0700
† North Atlantic Industries, Hauppauge, NY 11788 ... 516-582-6500
† Transmagnetics, Farmingdale, NY 11735 ... 516-293-3100

Calibrators, Time Base-2900

§† Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000 ... A•1307
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ... D•1164
Julie Research Labs., New York, NY 10001, 212-633-6625 ... D•1270
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
CAL-AV, Inc., Campbell, CA 95008 ... 408-371-0666
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 ... 516-243-5730
FTS/AUSTRON, Austin, TX 78761-4766 ... 512-251-2341
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 ... 818-993-0048
Tektronix, Inc., Beaverton, OR 97077 ... 800-835-9433

Calibrators, Transducer-2900

Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ... D•1010
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ... D•1332
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 ... 508-481-7000
§ Crystal Engineering Corp., Los Osos, CA 93402 ... 805-528-2155;800-444-1850
DJ Instruments, Inc., N. Billerca, MA 01862 ... 508-667-5301
HBM, Inc., Marlboro, MA 01752 ... 508-624-4500
International Machine & Tool Corp., Warwick, RI 02888 ... 401-467-6905
† Kurz Instruments Inc., Monterey, CA 93940 ... 800-424-7356
Martel Electronics, Salem, NH 03079 ... 603-893-0886
§ Meriam Instrument, Scott Fetzer, Cleveland, OH 44102 ... 216-281-1100
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
Omicron electronic, Hohenems, AUSTRIA A-6845 ... +/5576/4010-0
§ PMT Division, Ametek, Inc., Feasterville, PA 19053 ... 215-355-6900
Sensor Developments Inc., Lake Orion, MI 48361 ... 313-391-3000
§ S-Products Inc., Fairfield, CT 06430 ... 203-331-9546
Xitron Technologies, San Diego, CA 92121 ... 619-458-9852

Calibrators, Voltage-2900

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ... D•1145
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ... D•1010
† Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ... D•1242-1243
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ... D•1252-1253
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ... D•1258,1265
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ... D•2207
Julie Research Labs., New York, NY 10001, 212-633-6625 ... D•1270,1273
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ... D•1332-1333
§ Analogic Corp., Peabody, MA 01960 ... 508-977-3000
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 ... 617-894-6440
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
§ Contact East, N. Andover, MA 01845 ... 508-682-2000
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
§ Crystal Engineering Corp., Los Osos, CA 93402 ... 805-528-2155;800-444-1850
Datel, Inc., Mansfield, MA 02048-1194 ... 508-339-3000
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB ... 603-404824
§ EDL, Inc., Danville, VA 24540 ... 804-799-0807;1-800-DIAL EDL
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ... 805-964-6701 (ext. 280)
§ Extech Instruments Corp., Waltham, MA 02154 ... 617-890-7440
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 ... 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 ... 407-423-8215
Holt Instrument, C.P.D. Engineering, Inc., Oconto, WI 54153 ... 414-834-2222
§ Keithley MetraByte, Taunton, MA 02780 ... 508-880-3000
Kentron, Inc., Cedarburg, WI 53012-0142 ... 414-377-3733
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ... 201-757-2220/2277
Leeds & Northrup, General Signal, North Wales, PA 19454 ... 215-699-2000
§ Linear Instruments, Spectra Physics Analytical, Reno, NV 89523 ... 702-746-2200
§ Martel Electronics, Salem, NH 03079 ... 603-893-0886
North Hills Electronics, Glen Cove, NY 11542 ... 516-671-5700
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
Omicron electronic, Hohenems, AUSTRIA A-6845 ... +/5576/4010-0
§ Power Designs, Inc., Westbury, NY 11590 ... 516-333-6200
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 ... 818-365-0101
Ross Engineering Corp., Campbell, CA 95008 ... 408-377-4621
Rotek Instrument Corp., Waltham, MA 02254 ... 617-899-4611
§ Sunshine Instruments, Philadelphia, PA 19115 ... 215-673-5600;800-343-1199
Tempo Instrument, Inc., Commack, NY 11725 ... 516-864-3700
Tucker Electronics, Dallas, TX 75355-1419 ... 214-348-8800;800-527-4642
Tustin Electronics Co., Anaheim, CA 92807 ... 714-777-5800
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 ... 800-874-7123
Xitron Technologies, San Diego, CA 92121 ... 619-458-9852
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 ... 415-966-8484

Calibrators, VSWR-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
Direct Conversion Technique, Inc., Des Plaines, IL 60016 ... 708-827-2282
Lectronic Research Labs., Inc., Camden, NJ 08104 ... 609-541-4200
Loral Microwave Narda, Hauppauge, NY 11788 ... 516-231-1700

Calorimeters, Microwave-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
† Bird Electronic Corp., Cleveland, OH 44139-2794 ... 216-248-1200
† Electro Impulse, Neptune, NJ 07754-0278 ... 908-776-5800
† Raytheon Co., Microwave & Power Tube Div., Waltham, MA 02254 ... 617-899-8400
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 ... 312-670-0150

§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

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Cameras, Data Recording-2325

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† CELCO, Mahwah, NJ 07430 201-327-1123
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Heitz, Karl, Inc., Woodside, NY 11377 718-565-0004
Mini-Circuits Lab., Brooklyn, NY 11235-0003 718-934-4500

Cameras, Digital Image Acquisition-2325

§ Advanced Video Products, Littleton, MA 01460 508-486-0024
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456
§ CCD Imaging, Fairchild Weston Systems, Inc., Milpitas, CA 95035 408-433-2500
† CELCO, Mahwah, NJ 07430 201-327-1123
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
§ Daitron, Inc., Tigard, OR 97223 503-620-2879
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
EG&G Reticon, Div. of EG&G, Sunnyvale, CA 94086-4197 408-738-4266
Eikonix, Bedford, MA 01730 617-276-7161
Gordon Instruments, Inc., Orchard Park, NY 14127 ..... 716-662-5353;1-800-333-2672
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
† Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Cameras, Image Converter-1900

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
§ IR Scientific, Carlisle, MA 01741 508-667-7110
Princeton Electronic Products, North Brunswick, NJ 08902 908-297-4448
Spiricon, Inc., Logan, UT 84321 801-753-3729

Cameras, Infrared-2325

§† Aiphone, Bellevue, WA 98005 206-455-0510
† Barnes Engineering Div EDO Corporation, Shelton, CT 06484 203-926-1777
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
† EEV Inc., Elmsford, NY 10523 914-592-6050
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
§ IR Scientific, Carlisle, MA 01741 508-667-7110
Loral Fairchild, Imaging Sensors, Milpitas, CA 95035 408-433-2500
Spiricon, Inc., Logan, UT 84321 801-753-3729
Swan Associates, New Haven, CT 06534 203-387-3917
§† Teltron, Inc., Birdsboro, PA 19508 215-582-2711
† Xedar Corp., Boulder, CO 80301 303-443-6441

Cameras, Machine Vision-4100

† Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456
CIDTEC (CID Technologies Inc.), Liverpool, NY 13088 315-451-9410
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Eastman Kodak Company, Motion Analysis Systems Division, San Diego, CA 92121-1095 619-535-2908
† EEV Inc., Elmsford, NY 10523 914-592-6050
EG&G Reticon, Div. of EG&G, Sunnyvale, CA 94086-4197 408-738-4266
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
† Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
§ Loral Fairchild, Imaging Sensors, Milpitas, CA 95035 408-433-2500
Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
PULNiX America, Inc., Sunnyvale, CA 94086 408-733-1560
Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
§ Sony Component Products Co, Semiconductor Division, Cypress, CA 90630 714-229-4197
§ Xenon Corp., Woburn, MA 01801 617-938-3594
§ Zevatech, Inc., Morrisville, NC 27560 919-460-0111

Cameras, Oscilloscope-2975

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Contact East, N. Andover, MA 01845 508-682-2000
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ..... 617-275-0850; 800-937-4688
Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
Heitz, Karl, Inc., Woodside, NY 11377 718-565-0004
Mini-Circuits Lab., Brooklyn, NY 11235-0003 718-934-4500
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 818-365-0101
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Cameras, Television-1900

§ Advanced Video Products, Littleton, MA 01460 508-486-0024
Aiphone, Bellevue, WA 98005 206-455-0510
§ Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
† Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456
§ CCD Imaging, Fairchild Weston Systems, Inc., Milpitas, CA 95035 408-433-2500
CIDTEC (CID Technologies Inc.), Liverpool, NY 13088 315-451-9410
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
§ Colorado Video, Inc., Boulder, CO 80306 303-530-9580
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
Gordon Instruments, Inc., Orchard Park, NY 14127 ..... 716-662-5353;1-800-333-2672
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 516-921-7200
Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
§ Loral Fairchild, Imaging Sensors, Milpitas, CA 95035 408-433-2500
Outland Technology Inc., Gretna, LA 70056 504-394-4354
PULNiX America, Inc., Sunnyvale, CA 94086 408-733-1560
†# Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
Video Automation Systems, Pound Ridge, NY 10576 914-764-4613

Cameras, Television, Fiber Optic-1900

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§ CCD Imaging, Fairchild Weston Systems, Inc., Milpitas, CA 95035 408-433-2500
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
§ Loral Fairchild, Imaging Sensors, Milpitas, CA 95035 408-433-2500
Stenning Instruments, Inc., Pacific Palisades, CA 90272 213-459-2930

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HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500

Card Equip., Punch-2000

HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060

Card Equip., Reader-2000

American Magnetics Corporation, Group 4, Carson, CA 90745, 213-775-8651 ..... **D•1079**
Signal Research Inc., Titusville, NJ 08560, 609-737-1917 ..... **D•1109**
§ **Xico, Inc., Chatsworth, CA 91311, 818-709-4403** ..... **D•1118**
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ Mag-Tek, Carson, CA 90746 213-631-8602
Q-Card, Inc., Owings Mills, MD 21117-1634 410-581-0112
THORN Automated Systems, Inc, THORN EMI, Westlake, OHIO 44145 216-871-9900
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
XCP, Inc., Dryden, NY 13053 607-844-9143

Card Equip., Reader/Punch-2000

Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Opto Technology, Inc., Wheeling, IL 60090 708-537-4277

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Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... **D•1008**
§ **Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000** ..... **B•1488, D•1170,1172**
† **GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950** ..... **D•1072-1074**
§ **Keithley MetraByte, Taunton, MA 02780, 508-880-3000** ..... **D•1184**
§ **National Instruments Corp., Austin, TX 78730-5039, 512-794-0100** ..... **D•1124,1188,1296-1297**
Teka Interconnection Systems, Providence, RI 02907, 401-785-4110 ..... **C•1544-1545**
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
AFE Displays Inc., Charlottesville, VA 22901 804-974-7801
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
§ Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
§ Diversified Technlg., Ridgeland, MS 39157 601-856-4121
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
§ Laser Diode, Inc., Morgan Crucible, New Brunswick, NJ 08901 201-249-7000
Matrix Corp., Raleigh, NC 27610 919-231-8000
Megadata Corp., Bohemia, NY 11716 516-589-6800
§ Renco Encoders Inc., Goleta, CA 93117-3094 805-968-1525
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
XYZ Electronics, McCordsville, IN 46055 317-335-2128

Cards, Linear Function-2000

Elgenco, Inc., Hurricane, UT 84737, 801-635-4954 ..... **D•1244**
§ Action Instruments, San Diego, CA 92123 619-279-5726
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† CELCO, Mahwah, NJ 07430 201-327-1123
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 203-528-9821
Electronic Solutions, A Unit of Zero Corp., San Diego, CA 92121 619-452-9333
† Force, Inc., Christiansburg, VA 24073 703-382-0462
§ Gunther, W., GmbH, D 8500 Nurnberg 82, GERMANY ..... (0)911/65521 or 65520
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691

Cards, Logic-2000

§ **Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000** .. **B•1488**
§ **Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179** ..... **D•1179**
§ Anaheim Automation, Anaheim, CA 92801 714-992-6990
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Douglas Electronics, Inc., San Leandro, CA 94577 510-483-8770
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 203-528-9821
Greenspring Computers, Inc., Menlo Park, CA 94025 415-327-1200
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§ Intra-computer, Jamacia, NY 11418 718-297-5500
† Logic Technology, Inc., Mtn. View, CA 94043 415-967-1007
§ Macrolink, Anaheim, CA 92807 714-777-8800
Matrix Corp., Raleigh, NC 27610 919-231-8000
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
Micro/sys, Glendale, CA 91201-3010 818-244-4600
† Moisture Register Products Div., Aqua Measure Instrument Co., LaVerne, CA 91750-0369 714-392-5833
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
† Product Technology, Inc., Irvine, CA 92714 714-474-8998
§ Pro-Log Corp., Monterey, CA 93940 408-372-4593
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825

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Carriers — See Holders & Carriers, Chip (Vol. C)

Carrier Tape, Component-4100

Caristrap International, Inc., Chomedey, Lavac, QUEBEC, CANADA H7SIN8 514-667-4700
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
† Electro Insulation Corp./Remtek Corp., Arlington Hgts., IL 60004 708-632-1020
Mutual Industries, Inc., Philadelphia, PA 19120 215-927-6000
Shin-Etsu Polymer America, Inc., Union City, CA 94587 415-475-9000

Carts & Dollies, Instrument & Equipment-1400 — *See Vol. C*

Cases, Equipment, Instrument, Meter (Portable) — See Enclosures, Portable, Metallic & Nonmetallic (Vol. C)

Cases, Equipment, Instrument, Meter (Stationary) — See Enclosures, Equipment & Panel Mounting (Vol. C)

Cases, Shielded — See Enclosures, Shielded (Vol. C)

Cases, Transit — See Enclosures, Shipping (Vol. C)

Casters-1400 — *See Vol. C*

Castings, Die, Sand, Permanent Mold-4100

† Cercast Group Howmet Corporation, Montreal-North, QUE H1H 2Z2 514-322-2371
§† FISHERCAST, Fisher Gauge Limited, Peterborough, Ontario, CANADA K9J 6Y9 705-748-9522
Insulaton Components Associates, Inc., Downey, CA 90241 213-861-7268
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000

Cathode-Ray Readout Tubes — See Tubes, Readout (Vol. A)

CATV Systems & Equipment-1900

§† **Microwave Filter Inc., East Syracuse, NY 13057-0486, 315-437-3953;800-448-1666** ..... **A•1691-1694**
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
ASC Systems, St. Clair Shores, MI 48080 313-882-1133

Aston Electronics, Inc., Aston Electronic Designs, Ltd., Olathe, KS 66062 913-782-4007
§ AT&T Network Systems,Network Cable Sys. Div., Morristown, NJ 07962 ..... 1-800-344-0223, Ext. 1027
§ ATV Research, Inc., Dakota City, NE 68731 402-987-3771
§ C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
D & P MFG. Inc., Chalfont, PA 18914 215-997-1200
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
Dotronix, New Brighton, MN 55112 612-633-1742
§ EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
§ Johnson Controls Battery Group, Inc., Milwaukee, WI 53212 414-961-6500
§ Kay-Townes, Div. of Alco Industries, Inc., Rome, GA 30161 404-291-9871
§ Manhattan Electric Cable Corporation, Rye, NY 10580 914-967-8000
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§ Multi Products International, West Paterson, NJ 07424 201-890-1344
Peca, Inc., Bensalem, PA 19020 215-245-1550
Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
† RLC Electronics, Inc., Mt. Kisco, NY 10549 914-241-1334
§ Sitco Antennas Div.of Simplicity Tool Corp., Portland, OR 97220 503-253-2000
† Stainless, Inc., N. Wales, PA 19454 215-699-4871
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Video Automation Systems, Pound Ridge, NY 10576 914-764-4613
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

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Cells, Photoconductive-3700 — ***See Vol. B***

Cells, Photoemissive-3700 — ***See Vol. B***

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Cells, Solar — See Cells, Photovoltaic (Vol. B)

Cements — See Adhesives, (All Types) (Vol. C)

Chambers, Altitude-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
† Bemco, Simi Valley, CA 93065 805-583-4970
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
§ Hull Corp., Hatboro, PA 19040 215-672-7800
† Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
† Thermodynamic Engineering Inc., Camarillo, CA 93012 805-484-0472
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580

Chambers, Anechoic-2550

† Ark Elctrns. Corp., Southampton, PA 18966 215-322-6510
† Lectro Magnetics, Inc., Los Angeles, CA 90016 ..... 213-870-9383;USA 800-969-9383
Soundcoat Co., Inc., Deer Park, NY 11729-5701 516-242-2200
§ TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056 708-803-6100

Chambers, Environmental-2550

Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ..... D•1202-1203
† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
Alpha-M Corp., Dallas, TX 75229 214-406-0424
Alusett U.S.A., Inc., Pleasantville, NY 10570 914-737-0120
† Ark Elctrns. Corp., Southampton, PA 18966 215-322-6510
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
§† Associated Environmental Systems, Eastern Technologies, Amesbury, MA 01913-4848 508-388-7241
Baker Co., Inc., Sanford, ME 04073 1-800-992-2537
† Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Express Test Corp., Mountain View, CA 94043 415-968-8818
Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† Gruenberg Oven Co., Inc., Williamsport, PA 17701 717-326-1755
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
International Instrumentation, Inc., Westlake Vlg, CA 91361 805-495-7673
JC Systems, Inc., San Diego, CA 92121 619-453-9980
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
† Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
Rush Enterprises Inc:A Heico Company, Hudson, NH 03051 603-886-9460
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
† Thermodynamic Engineering Inc., Camarillo, CA 93012 805-484-0472
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
† VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555

Chambers, Explosion-2550

Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
† Tenney Engineering, Union, NJ 07083 908-686-7870

Chambers, Fluid Conditioner-2550

† Bemco, Simi Valley, CA 93065 805-583-4970
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
† Tenney Engineering, Union, NJ 07083 908-686-7870
Thermodynamic Engineering Inc., Camarillo, CA 93012 805-484-0472
VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555

Chambers, Humidity-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
§† Associated Environmental Systems, Eastern Technologies, Amesbury, MA 01913-4848 508-388-7241
† Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Express Test Corp., Mountain View, CA 94043 415-968-8818
Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
† Gruenberg Oven Co., Inc., Williamsport, PA 17701 717-326-1755
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
† Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
† Thermodynamic Engineering Inc., Camarillo, CA 93012 805-484-0472
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
† Thunder Scientific Corp., Albuquerque, NM 87123 ..... 505-265-8701;800-872-7728

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Chambers, Pressure-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
Bemco, Simi Valley, CA 93065 805-583-4970
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200

Chambers, Radiation-2550

Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
† Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
Nordion International, Kanata, Ontario, CANADA K2K 1X8 613-592-2790
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
Tokin America, Inc., San Jose, CA 95134 408-432-8020

Chambers, RFI/EMI-2550

† Amuneal Manufacturing Corp., Philadelphia, PA 19124, 215-535-3000 ... C•1687
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
† Ark Elctrns. Corp., Southampton, PA 18966 215-322-6510
† Lectro Magnetics, Inc., Los Angeles, CA 90016 ..... 213-870-9383;USA 800-969-9383
† Lindgren RF Enclosures, Inc., Glendale Hgts., IL 60139 708-307-7200
Tokin America, Inc., San Jose, CA 95134 408-432-8020

Chambers, Shock-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
§† Associated Environmental Systems, Eastern Technologies, Amesbury, MA 01913-4848 508-388-7241
† Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
† Despatch Industries, Minneapolis, MN 55418 612-781-5363
† Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311 305-587-5577
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580

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Chambers, Temperature-2550

Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ..... D•1202-1203
† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
Alpha-M Corp., Dallas, TX 75229 214-406-0424
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
§† Associated Environmental Systems, Eastern Technologies, Amesbury, MA 01913-4848 508-388-7241
† Bemco, Simi Valley, CA 93065 805-583-4970

† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA), 800-227-8409
† Gruenberg Oven Co., Inc., Williamsport, PA 17701 717-326-1755
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
§ Hull Corp., Hatboro, PA 19040 215-672-7800
JC Systems, Inc., San Diego, CA 92121 619-453-9980
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
Omega Engineering, Stamford, CT 06907 800-826-6342
Products for Research, Danvers, MA 01923 508-774-3250
† Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
Rush Enterprises Inc:A Heico Company, Hudson, NH 03051 603-886-9460
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
† VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555

Chambers, Vacuum-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
§† Abalon Precision Mfg., Bronx, NY 10459 ..... 212-589-5682;1-800-888-ABALON
† Aremco Products, Inc., Ossining, NY 10562 914-762-0685
† Astro Dynamics, Inc., Woburn, MA 01801 617-935-4944
† Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
CHA Industries, Fremont, CA 94538 415-683-8554
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
§ Hull Corp., Hatboro, PA 19040 215-672-7800
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
Temescal/Airco Coating Technology, The BOC Group, Inc., Fairfield, CA 94533 707-425-1010
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300

Chambers, Vibration-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
† Bemco, Simi Valley, CA 93065 805-583-4970
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
† Despatch Industries, Minneapolis, MN 55418 612-781-5363
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580

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Character Recognition Equip., Magnetic Ink-2000

American Magnetics Corporation, Group 4, Carson, CA 90745, 213-775-8651 ..... D•1079

Character Recognition Equip., Optical-2000

Cognex Corp., Needham, MA 02194 617-449-6030
† Cognitronics, Stamford, CT 06906 203-327-5307
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009

Chargers, Battery-4000

† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156-2157,2159
§ Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
§ Ault, Incorporated, Minneapolis, MN 55428, 612-493-1900 ..... D•1618
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1699
Dynage/Power & Magnetics, Division Of Oakleaf, Inc , Canistota, SD 57012, 605-296-3462/3487 ..... A•2203
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1715
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
 # Engineered Assemblies & Components Corp., Teterboro, NJ 07608, 201-288-4477;800-447-5639 ..... D•1452,1454-1455
§† Eveready Battery Co. Inc., St. Louis, MO 63164, 314-982-2000 ..... D•1456-1457
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755
Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911 .. D•1458-1465
† Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•1795,2202
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... A•2241, D•1822-1823,1825
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1885
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1898
† Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337 ..... D•1960
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1975
§ Sanyo Energy Corp., San Diego, CA 92073, 619-661-6620 ..... D•1489
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•1494-1495
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2230
§ Acme Electric Corporation, Cuba, NY 14727 716-968-2400
§† ACME-URDC, Inc., West Jordan, UT 84084 801-561-9385
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
AES Corp., Peabody, MA 01960 508-535-7310
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
Albar, Inc., Lynnwood, WA 98036 ..... 206-771-4006;800-822-5227
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
American Assembly Inc., Florida, NY 10921 914-651-3433
† American Monarch, Minneapolis, MN 55421 612-788-9161
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
† Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-1295
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
Battery Specialities, Costa Mesa, CA 92626 ... 714-755-0888;1-800-352-3706 (Toll free in CA)
§ Beaver Labs, Kingston, MA 02364 617-585-5666
§ Cal-Tek Engineering, Kingston, MA 02364 617-585-5666
§ C&D Charter Power Systems, Plymouth Meeting, PA 19462 215-828-9000
Cell-Con, Inc., Exton, PA 19341 215-363-8552
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
Circom Inc., Bensenville, IL 60106 708-595-4460
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ Contact East, N. Andover, MA 01845 508-682-2000
Converter Concepts, Inc., Pardeeville, WI 53954 608-429-2144
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
§ CUI Stack Inc., Beaverton, OR 97005 503-643-4899
Domino, Inc., Fort Wayne, IN 46899 219-456-5512
§ East Penn Manufacturing, Lyon Station, PA 19536 215-682-6361
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
§ Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Engineering Design & Sls., Danville, VA 24541 804-792-6405
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ GN National Electric Inc., Walnut, CA 91789 ..... 714-598-1919;714-598-1337; 800-321-1266
† Good-All Electric, Inc., Fort Collins, CO 80524 ..... 303-484-3080;800-826-7891
† Hand Held Products, Inc., Charlotte, NC 28226 704-541-1380
§ HDR Power Systems, Inc., Hilliard, OH 43026 614-771-5500
Hoppecke Battery Systems, Inc., Bulter, NJ 07405 201-492-0045
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
§ Johnson Controls Battery Group, Inc., Milwaukee, WI 53212 414-961-6500
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
§ La Marche Mfg., Des Plaines, IL 60018 708-299-1188
Lark Electronics, Inc., New York, NY 10040 212-569-0430
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
Maccor, Inc., Tulsa, OK 74107 918-446-1874
§ Magnetek Triad, Huntington, IN 46750 219-356-7100
† Modular Devices, Shirley, NY 11967 516-345-3100
† NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Nesco Battery Systems, National Electro-Sales Corp., Van Nuys, CA 91406-7840 ..... 818-781-0505;1-800-423-2664
NIDEC Corporation, Torrington, CT 06790 203-482-4422
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Plainview Batteries, Inc., Plainview, NY 11803 516-249-2873
Power Conversion Products, Crystal Lake, IL 60014 815-459-9100
§ Power Designs, Inc., Westbury, NY 11590 516-333-6200
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
§ Power-Sonic, Redwood City, CA 94063 415-364-5001
Pro Battery, Inc., Atlanta, GA 30340 800-451-7171
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
§ Quantum Batteries, Inc., Carlsbad, CA 92008 619-438-2202
† Ratelco, Power Systems, Seattle, WA 98109-5589 206-624-7770
§ Reliance Comm/Tec, Reliance Electric, Cleveland, OH 44117 800-245-4501
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
RMS Techn., Newport News, VA 23606 804-873-0100
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
Rutherford Research, Rutherford, NJ 07070 201-933-2091
§ Schauer Manufacturing, Cincinnati, OH 45242 513-791-3030
† Silicon Sensors, Dodgeville, WI 53533 608-935-2707
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
Unitrode Corp., Watertown, MA 02172 617-926-0404

† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
† Western Reserve Electronics, Twinsburg, OH 44087 216-425-4951
§† Xenotronix Inc., Valencia, CA 91355 805-257-4793
† Yardney Technical Products, Inc., Pawcatuck, CT 06379 203-599-1100

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† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Displaytech, Inc., Boulder, CO 80301 303-449-8933
† Duplicon, Inc., S. Boston, MA 02127 617-269-5859
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
† Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

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Cleaners, Ultrasonic-4100

§† Alpha Metals, Jersey City, NJ 07304 201-434-6778
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
§ Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
† Comatel USA, Inc., Danbury, CT 06810 203-797-9445
† Contact East, N. Andover, MA 01845 508-682-2000
Fidelity Chemical Products Corp., Newark, NJ 07114 201-242-4110
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Heat System, Inc., Farmingdale, NY 11735 516-694-9555
§ Hollis Automation, Esterline Corporation, Nashua, NH 03063 603-889-1121
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
§† L & R Mfg. Co., Kearny, NJ 07032 201-991-5330
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
† Miller-Stephenson Chem. Co., Inc., Danbury, CT 06810-0950 203-743-4447
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§ NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 708-824-1133
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§† Sonicor Instrument Corp., Copiague, NY 11726 516-842-3344
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
Transene, Rowley, MA 01969 508-948-2501
† U. E. Systems, Inc., Elmsford, NY 10523 ..... 914-592-1220;800-223-1325

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Clean Room Design & Construction-4100

† Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
MODULAIR, Reno, NV 89502 702-829-2033

Clean Room Equipment & Supplies-2550

§† Aluminum Filter, Carpinteria, CA 93013 805-684-7651
† Baker Co., Inc., Sanford, ME 04073 1-800-992-2537
Baxter-Industrial Division, Valencia, CA 91355 805-253-7466
Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
§ Cambridge Filter Corp., Syracuse, NY 13221-4906 315-457-1000
§† Chemtronics Inc., Hauppauge, NY 11788 ..... 516-582-3322;800-645-5244
§ Clauss Cutlery Co., Alco Industries, Fremont, OH 43420 ..... 419-332-7344;800-225-2877
† Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
§ Contact East, N. Andover, MA 01845 508-682-2000
† Controlled Environmental Equipment Corp., Westbrook, ME 04092 207-854-9126
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
† Gordon Brush Mfg. Co., Inc., Los Angeles, CA 90021-1786 213-627-6889
Inter Metro Industries Corp., Wilkes-Barre, PA 18705 717-825-2741
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
† Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ L & R Mfg. Co., Kearny, NJ 07032 201-991-5330
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
# NAVAN Corporation, Media, PA 19063 215-543-8066
§† Polygenex International Inc., Cary, NC 27513 919-380-8100
Precision Tech. Sewing, Palo Alto, CA 94303 415-856-2128
§† Seiko Instruments U.S.A., Inc., Robotics/Automation Div., Torrance, CA 90505 213-517-7850
Sensidyne, Inc., Clearwater, FL 34620 ..... 813-530-3602;1-800-451-9444
§† Simco Co., Hatfield, PA 19440 215-822-2171
§ Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
Tegal Scientific, Inc., Concord, CA 94524 415-827-1054
† Tenney Engineering, Union, NJ 07083 908-686-7870
VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555

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§ **Emulation Technology, Inc., Santa Clara, CA 95051, 408-982-0660** ..... **C•1358**
§† **E-Z Hook, Tektest Inc., Arcadia, CA 91006, 818-446-6175** ..... **C•1364**
§ **Richard Hirschmann of America Inc., Riverdale, NJ 07457, 201-835-5002** ..... **C•1398**
3M-Electronic Products Division, Austin, TX 78769-2963, 1-800-225-5373 Sls. & Prod. Info. ..... **C•1464**
§ **Pomona Electronics, Pomona, CA 91766, 714-623-3463** .. **C•1493,1495,1497,1499**
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Beta Automation, Inc., Newbury Park, CA 91320 805-499-5785
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990

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§† **Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000** ..... **A•1307**
§ **Chrono-log Corp., Havertown, PA 19083, 215-853-1130** ..... **D•1084**
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§ **ESE, El Segundo, CA 90245, 213-322-2136** ..... **D•1135**
† **Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500** ..... **A•1368**
† **FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341** ..... **A•1371**
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† **TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411** ..... **D•1078,1194-1195**
§† Catalyst Research, Mine Safety Appliances Co., Inc., Owings Mills, MD 21117 301-356-2400
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
CTS Corporation, Elkhart, IN 46514 219-293-7511
CTS Corp., Frequency Controls business unit, (Formerly Knights Div.), Sandwich, IL 60548 815-786-8411
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
Digital Equip., Marlborough, MA 01752
§† Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
Electric Time Company, Inc., Medfield, MA 02052 508-359-4396
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
§ Fox Electronics, Ft. Myers, FL 33905 813-693-0099
† Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
† Greenray Inds., Inc., Mechanicsburg, PA 17055 717-766-0223
† Holt Inc., Irvine, CA 92718 714-859-8800
§† Hybrids International Ltd., Thick Film Division, Olathe, KS 66062 913-764-6400
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
† Isotemp Research, Inc., Charlottesville, VA 22903 804-295-3101
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154 ... 617-894-8700
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
§ Lite-On Inc., Milpitas, CA 95035 408-946-4873
NEL Frequency Controls, Inc., Burlington, WI 53105 414-763-3591
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
† Piezo Technology Inc., Orlando, FL 32804 407-298-2000
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
RF Monolithics, Inc., Dallas, TX 75244 214-233-2903
SARONIX, Palo Alto, CA 94303 415-856-6900
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Spectrum Corp., Houston, TX 77075 ..... 713-944-6200;1-800-392-5050(Sls)
Spectrum Technology, Inc., DATUM, Incorporated, Santa Barbara, CA 93111 805-964-7791
Telegenix, Inc., Div. of Inductotherm Industries, Cherry Hill, NJ 08034 ... 609-424-5220
§ VGI, Inc., Vikay Industrial Pte. Ltd., Roseville, CA 95661 916-783-7878

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Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... **D•1382**
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§ VGI, Inc., Vikay Industrial Pte. Ltd., Roseville, CA 95661 916-783-7878

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Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100

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Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... **D•1048-1049**

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Collimators-2900

† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
§ Optics for Research, Inc., Caldwell, NJ 07006 201-228-4480
† Optima Precision, Inc., West Linn, OR 97068 ..... 800-544-4118;503-638-2525

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† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
California Microwave, Sunnyvale, CA 94086 408-732-4000
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Avionics, Arcadia, CA 91006 818-445-5955
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
† Glatzer Industries Corp., New Rochelle, NY 10801 914-576-2700
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
§ Marsh Products, Inc., Spectrum Companies, Intl., Batavia, IL 60510 708-879-8008
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ TransKinetic Sys., Canton, MA 02021 617-828-3000

Communications Systems, Laser-1900

§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
BT & D Technologies, Wilmington, DE 19803 302-479-0300
§† Coderoll Technology Corp., Yonkers, NY 10701 914-965-6300
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Laser Diode, Inc., Morgan Crucible, New Brunswick, NJ 08901 201-249-7000
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
† Ortel Corp., Alhambra, CA 91803 818-281-3636
RE Instruments Corp., Westlake, OH 44145 216-871-7617

Communications Module, Power Line LANs-1900

Adaptive Networks, Cambridge, MA 02142 617-497-5150
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459

Communication Systems, Megalinks-1900

BT & D Technologies, Wilmington, DE 19803 302-479-0300
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100

Communication Systems, Megaplex-1900

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262

Communications Systems, Microwave-3450 — *See Vol. A*

Communications Systems, Multiplex-1900

† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1070-1072
§ Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100, 800-336-5917;703-953-4751 ..... B•1218-1221
§† Aiphone, Bellevue, WA 98005 206-455-0510
† Allied-Signal Aerospace Co., Bendix Communications Div., Towson, MD 21204 410-583-4000
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
Control Module, Enfield, CT 06082 203-745-2433
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
§ Dataprobe, Englewood, NJ 07631 201-569-6464
† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
§ EDA Instruments, Inc., Toronto, ON, CANADA M4H1H1 416-425-7800
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§# Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Intra-computer, Jamacia, NY 11418 718-297-5500
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300
† Librascope Corp., Glendale, CA 91201 818-244-6541
Loral Data Systems, Sarasota, FL 34230 813-371-0811
Loral TerraCom, Sub. of Loral Corp., San Diego, CA 92123 619-278-4100
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
† Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
† Optelecom, Inc., Gaithersburg, MD 20877 301-840-2121
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
† Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Communications Systems, Telemetering-1900

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1003,1020-1021
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1067,1120,1165-1167
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1070-1071
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1397,1400
AES Corp., Peabody, MA 01960 508-535-7310
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
† Climatronics, Bohemia, NY 11716 516-567-7300
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
† Corvus Microwave Inc., Syracuse, NY 13211-2100 315-437-4400
§ Dataprobe, Englewood, NJ 07631 201-569-6464
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Loral Data Systems, Sarasota, FL 34230 813-371-0811
† Metraplex Corp., Frederick, MD 21701 301-662-8000
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Pacific Communications, Santa Ana, CA 92705 714-546-0147
§† Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
§ TransKinetic Sys., Canton, MA 02021 617-828-3000

Communications Systems, Telephone-1900

Anco Electronics, Inc., Rancho Cucamonga, CA 91730, 1-800-545-ANCO ..... D•1080
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1070-1072
3M-Electronic Products Division, Austin, TX 78769-2963, 1-800-225-5373 Sls. & Prod. Info. ..... C•1464
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ..... D•1048-1049
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
§† Aiphone, Bellevue, WA 98005 206-455-0510
§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475

§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§† BYTEK Corp., Instrument Systems Div., Boca Raton, FL 33487-1323 407-994-3520
California Microwave, Sunnyvale, CA 94086 408-732-4000
Cambridge Electronics Laboratories, Somerville, MA 02144 617-629-2805
§† Cinch Connector Division, Labinal Components & Systems Inc., Elk Grove Village, IL 60007 312-981-6000
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
Conklin Instrument Corp., Pleasant Valley, NY 12569 914-635-2136
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Dantel, Fresno, CA 93727 209-292-1111
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§† Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Electronic Tele-Communications, Inc., Atlanta, GA 30340-2178 404-455-4890
† Electro Physics Co., Inc., Waukegan, IL 60085 708-249-5801
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
NAVAN Corporation, Media, PA 19063 215-543-8066
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
§ Pan International (USA), Inc., Rancho Cucamonga, CA 91730 714-945-1365
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Rhetorex, Inc., Campbell, CA 95008 408-370-0881
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Solid State Systems, Kennesaw, GA 30144 404-423-2200
§ Tektone Sound & Signal, Lake Park, FL 33403 407-844-2383
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
§ Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893
Viking Electronics, Hudson, WI 54016 715-386-8861
Voice Processing Corp., Cambridge, MA 02142 617-494-0100

Communicators, Digital-1900

General Security Inc., Plainview, NY 11803 516-753-0700
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082

Commutators-3500 — *See Vol. B*

Comparators, Analog — See Comparators, Voltage (Vol. D)

Comparators, Attenuation-3450 — *See Vol. A*

Comparators, Capacitance — See Bridges, Capacitance (Vol. D)

Comparators, Digital-2900

DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368-1369
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264-1265
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 .. B•1723
Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1370
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
Anadex Inc., Camarillo, CA 93012 805-987-9660
† Atec, Inc., Houston, TX 77055 713-468-7971
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ ESE, El Segundo, CA 90245 213-322-2136
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Holt Inc., Irvine, CA 92718 714-859-8800
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Interswitch, Wm. J. Purdy Co., Burlingame, CA 94010 415-347-8217
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
PPM, Inc., Cleveland, OH 44139 216-349-2300
Sensor Corp., Scottdale, PA 15683 412-887-4080
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Comparators, Dimension Calibrators-4100

Astrosystems, Lake Success, NY 11042 516-328-1600
† Communication Coil Inc., Chicago, IL 60634 312-637-1333
Trans-Tek, Ellington, CT 06029 203-872-8351

Comparators, Frequency-2900

Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
Autronics Corp., Arcadia, CA 91006 818-445-5470
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 818-993-0048
Sensor Corp., Scottdale, PA 15683 412-887-4080
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
† Tremetrics Inc., Baker Hughes Incorporated, Austin, TX 78725-2100 512-929-2051

Comparators, Impedance — See Bridges, Impedance (Vol. D)

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Comparators, Optical-2900

† Communication Coil Inc., Chicago, IL 60634 312-637-1333
H & L Instruments, Burlingame, CA 94010 415-342-7850
Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
Oriel Corp., Stratford, CT 06497-0872 203-377-8282
Rolyn Optics Co., Covina, CA 91722-2199 ..... 818-915-5707/5717
§ Vision Engineering, Inc., New Milford, CT 06776 203-355-3776

Comparators, Phase-2900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1164
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710, 813-347-2181 ..... A•1751
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
Astrosystems, Lake Success, NY 11042 516-328-1600
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 818-993-0048
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Sensor Corp., Scottdale, PA 15683 412-887-4080
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
TRM, Inc., Manchester, NH 03103 603-627-6000

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Comparators, Voltage-2900

General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375
§† Advanced Linear Devices, Inc., Sunnyvale, CA 94086-4606 408-720-8737
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Analog Systems, Tucson, AZ 85731-7389 602-290-1818
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
† Brannag, Inc., North Tonawanda, NY 14120 716-693-5994
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
CP Technology, Inc., Cupertino, CA 95014 408-996-8069
† CTS Corporation, Microelectronics business unit., W. Lafayette, IN 47906 317-463-2565
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
† Holt Inc., Irvine, CA 92718 714-859-8800
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Signal Processing Technologies, Colorado Springs, CO 80906 719-540-3900
§† Silicon General, Garden Grove, CA 92641 714-898-8121
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Component Handling Equipment, Surface Mount-4100

Electro-Films, Inc., Warwick, RI 02886, 401-738-9150 ..... C•1680-1681
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
† Autosplice, Inc., San Diego, CA 92121 619-535-0077
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811

Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
Exatron Automatic Test Equip., San Jose, CA 95111 .... 408-629-7600;800-EXA-TRON
Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000
§† Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
§ TRIGON/ADCOTECH, Dynatech, Milpitas, CA 95035 408-946-4300

Compounds, Encapsulating, Molding, Potting-Also See Plastic Raw Materials-1600 — *See Vol. C*

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Compression Systems, Image-2000

Optivision, Inc., Davis, CA 95616 ..... 916-756-4429;800-562-8934
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314

Computer-Aided Design Services — See Computers, CAD, CAM, & CAD/CAM (Vol. D), Services, Computer-Aided Design (Vol. D)

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Computer Logic Circuits — See Cards, Logic (Vol. D), Circuits, Hybrid (Vol. A), Integrated Circuits (Vol. A), Modules, Logic (Vol. A)

Computer Systems, Ruggedized-2000

§ Action Instruments, San Diego, CA 92123 619-279-5726
AFE Displays Inc., Charlottesville, VA 22901 804-974-7801
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Corp., Horsham, PA 19044 215-657-7510
Chromatics, Tucker, GA 30084 404-493-7000
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
§ Dataware Electronics Inc., Mukilteo, WA 98275 206-742-8577
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
† DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
General Digital Corp., Enfield, CT 06082 203-741-7171
Greenspring Computers, Inc., Menlo Park, CA 94025 415-327-1200
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Matrix Corp., Raleigh, NC 27610 919-231-8000
Micro/sys, Glendale, CA 91201-3010 818-244-4600
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
† NAVAN Corporation, Media, PA 19063 215-543-8066
† Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
Qualogy Inc., San Jose, CA 95134 408-434-5200
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
WinSystems, Inc., Arlington, TX 76011 817-274-7553
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Computer Tape Recorders — See Recorders, Computer Data (Vol. D)

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Computers, Analog-2025

Action Instruments, San Diego, CA 92123 619-279-5726
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
Keithley MetraByte, Taunton, MA 02780 508-880-3000
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Computers, CAD, CAM, & CAD/CAM-2025

Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 .... D•1122
Aldec, Inc., Newbury Park, CA 91320 805-499-6867
Alden Computer Systems, Salem, MA 01970 508-744-1314
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
Aydin Corp., Horsham, PA 19044 215-657-7510
Calay Systems, Inc., Irvine, CA 92714 714-863-1700
§ Compact Software, Inc., Paterson, NJ 07504 201-881-1200
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
§ Instant Board Circuits Grp., Novato, CA 94949 415-883-1717
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
Micro Industries, Westerville, OH 43081 614-895-0404
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§ Pixelworks, Inc., Hudson, NH 03051 603-880-1322
§ Quad Design Technology, Inc., Camarillo, CA 93010 805-988-8250
Spectragraphics Corp., San Diego, CA 92121 619-450-0611
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Versacad Computervision Personal CAD/CAM, Huntington Bch., CA 92648 714-960-7720
§† Viewlogic Systems, Inc., Marlboro, MA 01752 508-480-0881
Visionics Corporation, Santa Clara, CA 95054 408-492-1440

Computers, Digital, Micro-2025

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1422
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 .... D•1122
Action Instruments, San Diego, CA 92123 619-279-5726
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Allen Systems, Columbus, OH 43221 614-488-7122
Ampro Computers,Inc., Sunnyvale, CA 94086 408-522-2100
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
California Automation Inc., San Diego, CA 92121 619-452-1341
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
Digital Equip., Marlborough, MA 01752
§ Diversified Technlg., Ridgeland, MS 39157 601-856-4121
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§† Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Fuji Electric Corp. of America, Los Angeles, CA 90071 213-622-4490
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
§ Gimix, Inc., Northbrook, IL 60062-2406 708-559-0999
Greenspring Computers, Inc., Menlo Park, CA 94025 415-327-1200
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-890-8400
Industrial Computer Source, San Diego, CA 92111 619-279-0034
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
§ Intra-computer, Jamacia, NY 11418 718-297-5500
KineticSystems, Lockport, IL 60441 815-838-0005
§ LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Matrix Corp., Raleigh, NC 27610 919-231-8000
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
Micro/sys, Glendale, CA 91201-3010 818-244-4600
Mitronics, Rolling Hills, CA 90274 213-377-2022
Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Octagon Systems, Westminster, CO 80030 303-430-1500
Omnibyte Corp., W. Chicago, IL 60185 708-231-6880
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
§† Rockwell Int'l:Semiconductor Products Division, Newport Beach, CA 92660 714-833-4600
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
§ Terra Technlg. Corp., Redmond, WA 98052 206-883-7300
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† Trilobyte Computer Corporation, San Leandro, CA 94577 415-895-1100
† Warren-Knight Instrument Co., Warren Industries, Inc., Philadelphia, PA 19116 215-464-9300
WinSystems, Inc., Arlington, TX 76011 817-274-7553
Zaki Corporation, Marlboro, MA 01752 508-480-0201
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Computers, Digital, Mini-2025

Densitron Corporation, Densitron International, Torrance, CA 90505, 213-530-3530 ..... B•1055
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Digital Equip., Marlborough, MA 01752
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
§ International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Computers, Hybrid, Analog/Digital-2025

† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Chromatics, Tucker, GA 30084 404-493-7000
† GEC-Marconi Electronic Systems Corp., Wayne, NJ 07474-0975 201-633-6000
Matrix Corp., Raleigh, NC 27610 919-231-8000
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
§† Triconex Corp., Irvine, CA 92718 ..... 714-768-3709; 800-325-2128 (outside Ca)
† White Technology, Inc., Bowmar Instrument Corp., Phoenix, AZ 85040 .. 602-437-1520

Computers, Mainframe-2025

Honeywell Information Systems, Waltham, MA 02154 617-895-6000
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100

Computers, Micro-2025

Magnum Opus Custom Electrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 .... D•1122
Action Instruments, San Diego, CA 92123 619-279-5726
Advanced Electronic Packaging, Huntington Beach, CA 92646 714-969-1150
ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Allen Systems, Columbus, OH 43221 614-488-7122
Ampro Computers,Inc., Sunnyvale, CA 94086 408-522-2100
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Comark Corp., Medfield, MA 02052 508-359-8161
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Dynamics Sales, Greer, SC 29650 803-877-8700
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Decision Corporation, Buellton, CA 93427 805-688-9598
[illegible] Computer Company, Mountain View, CA 94039-7400 415-964-7400
[illegible] Inc., Teaneck, NJ 07666 201-837-0051
[illegible] Fremont, CA 94538 415-656-3400
[illegible] Angeles, CA 90071 213-622-4490
[illegible] 203-741-7171
§ GENROCO, [illegible] 414-644-8700
§ Gimix, Inc. [illegible] 708-559-0909
§† GMR Co. [illegible] 213-399-1490
[illegible] Menlo Park, CA 94025 415-327-1200
[illegible] SUPPLY, DFW Airport, TX 75261 800-433-4837
[illegible] Corp., Hingham, MA 02043 617-740-4190
[illegible] Co., Cupertino, CA 95014 800-752-0900
[illegible] Information Systems, Waltham, MA 02154 617-895-6000
Industrial Computer Source, San Diego, CA 92111 619-279-0084
§ International Instrumentation, Inc., Westlake Vlg, CA 91361 805-495-7673
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
Matrix Corp., Raleigh, NC 27610 919-231-8000
Megadata Corp., Bohemia, NY 11716 516-589-6800
Mesa Technology Corp., Columbia, MD 21045 800-888-0567
Microbar Systems, Inc., Sunnyvale, CA 94086 408-720-9300
Micro/sys, Glendale, CA 91201-3010 818-244-4600
§† Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Octagon Systems, Westminster, CO 80030 303-430-1500
Omnibyte Corp., W. Chicago, IL 60185 708-231-6880
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
Pacific Microcomputers, Signal Technology, San Diego, CA 92121 619-453-8649
Parsytec Inc., West Chicago, IL 60185 708-293-9500
§ Pixelworks, Inc., Hudson, NH 03051 603-880-1322
[illegible] Corporation, Salt Lake City, UT 84115 801-466-8770
[illegible] Computer Products, Inc., Los Gatos, CA 95030 408-374-8290
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
Tempustech, Inc., Naples, FL 33942 813-643-2424
§† Terminal Data Corp., Rockville, MD 20855 301-921-8282
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† White Technology, Inc., Bowmar Instrument Corp., Phoenix, AZ 85040 .. 602-437-1520
§ WinSystems, Inc., Arlington, TX 76011 817-274-7553
XYZ Electronics, McCordsville, IN 46055 317-335-2128
Zendex Corp., Dublin, CA 94568 415-828-3000
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Computers, Micro, Ruggedized, for Industrial Applications-2000

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1191,1422
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Action Instruments, San Diego, CA 92123 619-279-5726
AFE Displays Inc., Charlottesville, VA 22901 804-974-7801
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Allen Systems, Columbus, OH 43221 614-488-7122
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Computer Dynamics Sales, Greer, SC 29650 803-877-8700
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
Fuji Electric Corp. of America, Los Angeles, CA 90071 213-622-4490
General Digital Corp., Enfield, CT 06082 203-741-7171
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HMW Enterprises, Inc., Etters, PA 17319 717-938-4691
Industrial Computer Source, San Diego, CA 92111 619-279-0084
Industrial CPU Systems, Intl, Santa Ana, CA 92707 714-957-2815
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
KMS Advanced Products, Inc., Ann Arbor, MI 48106-1868 313-769-1780
Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
Matrix Corp., Raleigh, NC 27610 919-231-8000
Micro/sys, Glendale, CA 91201-3010 818-244-4600
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Pro-Log Corp., Monterey, CA 93940 408-372-4593
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
Qualogy Inc., San Jose, CA 95134 408-434-5200
Rapid Systems Inc., Seattle, WA 98103 206-547-8311
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
Tempustech, Inc., Naples, FL 33942 813-643-2424
TL Inds. Inc., Northwood, OH 43619 419-666-8144
† White Technology, Inc., Bowmar Instrument Corp., Phoenix, AZ 85040 .. 602-437-1520
WinSystems, Inc., Arlington, TX 76011 817-274-7553
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Computers, Mini, High End-2025

Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
§ International Instrumentation, Inc., Westlake Vlg, CA 91361 805-495-7673
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Parsytec inc., West Chicago, IL 60185 708-293-9500
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Computers, Mini, Low End-2025

§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Anacom, Anaheim, CA 92805-6235 714-774-8080
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
Mitronics, Rolling Hills, CA 90274 213-377-2022
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Computers, Mini, Midrange-2025

Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† Trilobyte Computer Corporation, San Leandro, CA 94577 415-895-1100

Computers, Personal-2025

Magnum Opus Custom Electrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§# National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124,1188,1296
§ Action Instruments, San Diego, CA 92123 619-279-5726
Advanced Electronic Packaging, Huntington Beach, CA 92646 714-969-1150
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051

Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
§ Gimix, Inc., Northbrook, IL 60062-2406 708-559-0909
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GMR Co., Venice, CA 90291 213-399-1490
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
Industrial Computer Source, San Diego, CA 92111 619-279-0084
§ International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
Megadata Corp., Bohemia, NY 11716 516-589-6800
Mitronics, Rolling Hills, CA 90274 213-377-2022
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Pixelworks, Inc., Hudson, NH 03051 603-880-1322
§# Rapid Systems Inc., Seattle, WA 98103 206-547-8311
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Xerox Corporation, Rochester, NY 14644 800-832-6979
Zaki Corporation, Marlboro, MA 01752 508-480-0201

Computers, Personal, Laptop-2025

§ Computer Peripherals Inc., Newbury Pk., CA 91320 ..... 805-499-5751;800-854-7600
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Industrial Computer Source, San Diego, CA 92111 619-279-0084
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Computers, Small Business-2025

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Accu Data, Inc., Springville, UT 84663-0963 801-377-9156
Advanced Electronic Packaging, Huntington Beach, CA 92646 714-969-1150
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
§ Gimix, Inc., Northbrook, IL 60062-2406 708-559-0909
§ GMR Co., Venice, CA 90291 213-399-1490
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
§ International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Megadata Corp., Bohemia, NY 11716 516-589-6800
Mitronics, Rolling Hills, CA 90274 213-377-2022
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
† Terminal Data Corp., Rockville, MD 20855 301-921-8282
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Computer Sets (MIL), Digital Data-2440 — *See Vol. B*

Computer Systems (MIL)-2440 — *See Vol. B*

Computing Equipment, Peripheral — See Converters, Digital To Paper Tape (Vol. D), Printers (Vol. D), Terminals, Data Display (Vol. D), etc.

Concentrators, Communications-1900

Advanced Systems Concepts, Inc., Altadena, CA 91001, 818-791-0983 .. D•1144
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
Control Module, Enfield, CT 06082 203-745-2433
§ Dupont Electro-Optic Products, Dupont Electronics, Research Triangle Park, NC 27709 ..... 1-800-888-LAN1;919-481-5100
§ EDA Instruments, Inc., Toronto, ON, CANADA M4H1H1 416-425-7800
Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§† Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600

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Conductive Elastomers-4525 — *See Vol. C*

Conductive Fabrics, Films & Tapes — See Fabrics, Conductive (Vol. C)

Conductive Floor Coatings & Cleaners-1600 — *See Vol. C*

Conductive Plastic Materials & Parts-4525 — *See Vol. C*

Conduit, Electrical-6000 — *See Vol. C*

Connecting Blocks, Data-2100 — *See Vol. C*

Connecting Blocks, Modular Telephones-2100 — *See Vol. C*

Connector Adapters-2100 — *See Vol. C*

Connector Assemblies, IEEE 488-GPIB-2100 — *See Vol. C*

Connector Backshells-2100 — *See Vol. C*

Connector Blocks, Mother Board-2100 — *See Vol. C*

Connector Boxes & Strips, Power Outlet-2500 — *See Vol. C*

Connectors, AC Power-2100 — *See Vol. C*

Connectors, Antenna — See Connectors, RF, Coaxial & Triaxial (Vol. C)

Connectors, Audio-2100 — *See Vol. C*

Connectors, Back Panel — See Connectors, Wirewrap (Z-3 Level) (Vol. C)

Connectors, Battery-2100 — *See Vol. C*

Connectors, Cable-2100 — *See Vol. C*

Connectors, Circular, MS/AN-2100 — *See Vol. C*

Connectors, Data-2100 — *See Vol. C*

Connectors, DIN-2100 — *See Vol. C*

Connectors, D Subminiature-2100 — *See Vol. C*

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Connectors, Elastomeric-2100 — *See Vol. C*

Connectors, Fiber Optic-2475 — *See Vol. B*

Connectors, Filtered, EMI/RFI-Also See Gaskets, Shielding, RF-2100 — *See Vol. C*

Connectors, Flat Cable (Incl. Flexible)-2100 — *See Vol. C*

Connectors, Fused-2100 — *See Vol. C*

Connectors, Heavy Duty, Power-2100 — *See Vol. C*

Connectors, Hermetically & Glass Sealed-2100 — *See Vol. C*

Connectors, Hermetically Sealed, Pressurized, or Waterproof-2100 — *See Vol. C*

Connectors, High Density, Multipin-2100 — *See Vol. C*

Connectors, High Voltage (1,000 Volts & Over)-2100 — *See Vol. C*

Connectors, IDC (Insulation Displacement Contact)-2100 — *See Vol. C*

Connectors, Integrated Circuit — See Sockets, Integrated Circuit (Vol. C)

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Connectors, Lead Frame-2100 — *See Vol. C*

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Connectors, Rack & Panel-2100 — *See Vol. C*

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Connectors, Test-2100 — *See Vol. C*

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Connectors (MIL), Flat Cable-2440 — *See Vol. B*

Connectors (MIL), Power-2440 — *See Vol. B*

Connectors (MIL), Printed Circuit-2440 — *See Vol. B*

Connectors (MIL), RF-2440 — *See Vol. B*

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Contract Manufacturing & Services-Also See Services: Board Assembly; Cable & Harness Assembly; Comp. Test & Screen; Semiconductor Wafer Fab., Assembly; Mfg. Turnkey-4100

§ **Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY** ..... **D•2234**
§ **Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020** ..... **D•2239**
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Aitek Co., Torrington, CT 06790 203-482-7626
† Altron, Inc., Anoka, MN 55303 612-427-7735
American Assembly Inc., Florida, NY 10921 914-651-3433
Argo Electronics, Inc., Baldwin Park, CA 91706 818-962-8422
Array Connector Corporation, Miami, FL 33152-1250 305-591-7530
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
Automatic Systems Developers, Poughkeepsie, NY 12603 914-473-5530
Chloride El Paso, Chloride Power Elctrns., El Paso, TX 79935 915-592-9985
Circom Inc., Bensenville, IL 60106 708-595-4460
Clover Elctrns., Inc., Newnan, GA 30264 404-251-5323
Compac, Holbrook, NY 11741 516-585-3400
†# Component Mfg. Svc., Inc., W. Bridgewater, MA 02379 508-580-0111
† Da-Tech Corp., Ivyland, PA 18974 215-322-9410
Electronic Devices, Inc., Yonkers, NY 10710 914-965-4400
The Electronics Group, Inc., Charlotte, NC 28208 704-391-9500
† Electronic Specialty Corp., Vancouver, WA 98665 206-574-5000
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
EOG, INC., OMX, INC., Hunt Valley, MD 21030 301-785-3000
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
The Five Star Co., Plantsville, CT 06479 203-628-5561
Flexible Technologies, Arlon, E. Providence, RI 02914 401-434-2340
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA K0G 1JO 613-724-1993
General Digital Corp., Enfield, CT 06082 203-741-7171
† Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
† Hutronix, Inc., Tucson, AZ 85726 602-790-5348
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Jettron Products Inc., E. Hanover, NJ 07936 201-887-0571
Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
Kepro Circuit Systems, Fenton, MO 63026-2992 314-343-1630
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 414-358-4000
Mep Controls, Bordentown, NJ 08505 609-298-7300
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
† P C Express, Inc., Hudson, FL 34667 813-863-6114
PCI, Inc., San Jose, CA 95128 408-282-0200
Pine Instrument Co., Grove City, PA 16127 412-458-6391
Power Pac, Shelton, CT 06484 203-925-0123
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
Radio Television Products Corp., Douglas, AZ 85607 602-364-4438
§† RCD Components, Inc., Manchester, NH 03109 603-669-0054
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
SMT East Corporation, Stoughton, MA 02072-1141 ..... 800-888-SMT1
Southtronics, Inc., Marietta, GA 30066-6029 404-429-1000
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Optoelectronics, Inc., Garland, TX 75042 214-487-0085
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
TL Inds. Inc., Northwood, OH 43619 419-666-8144
†# Tratec of California, Inc., Chula Vista, CA 91911 619-476-1155
Trionics, Inc., St. Charles, IL 60174 312-232-9117
Varian Tempe Elctrns. Div., Varian Assocs., Tempe, AZ 82581 602-968-6790
§ Wellex Corporation, Fremont, CA 94538 415-490-3263
Xetel Corporation, Austin, TX 78753 512-834-2266

Controllers, Card Reader/Punch, Add-in-2000

GEN/COMP Inc., Canton, MA 02021 617-828-2008

Controllers, Card Reader/Punch, Standalone-2000

Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Controllers, Energy Conservation-2200

§ **Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179** ..... **D•1179**
† **NWL Transformers, Bordentown, NJ 08505, 609-298-7300** ..... **D•1915**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1142**
§ **Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229** ..... **D•2224**
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
Bambeck Systems Inc., Santa Ana, CA 92705 ..... 714-250-3100;800 334-3101
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
California Automation Inc., San Diego, CA 92121 619-452-1341
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
Controlex, Inc., New Boston, NH 03070 603-487-5512
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
§ Letco International, New Braunfels, TX 78131-1200 512-625-6993
† Xenotronix Inc., Valencia, CA 91355 805-257-4793

Controllers, Floppy Disk Drive, Add-in-2000

§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Ciprico Inc., Plymouth, MN 55441 612-559-2034
Comark Corp., Medfield, MA 02052 508-359-8161
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ Distributed Processing Technlg. Corp., Maitland, FL 32751 407-830-5522
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Micro/sys, Glendale, CA 91201-3010 818-244-4600
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Western Digital Corp., Irvine, CA 92718 714-932-6000
XYZ Electronics, McCordsville, IN 46055 317-335-2128
Zendex Corp., Dublin, CA 94568 415-828-3000
Zlatech, San Luis Obispo, CA 93401 805-541-0488

Controllers, Floppy Disk Drive, Standalone-2000

Apollo Display Technologies, Inc., Holtsville, NY 11742, 516-654-1143 ... **B•1040**
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... **D•1121**
§ Action Instruments, San Diego, CA 92123 619-279-5726
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
Matrix Corp., Raleigh, NC 27610 919-231-8000
Maximum Strategy, Inc., San Jose, CA 95133 408-729-1526
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Western Digital Corp., Irvine, CA 92718 714-932-6000
Zendex Corp., Dublin, CA 94568 415-828-3000

Controllers, Graphic Display-2450 — *See Vol. B*

Controllers, Hard Disk Drive, Add-in-2000

§ **Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300** ..... **D•1095**
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600

Ciprico Inc., Plymouth, MN 55441 612-559-2034
§ Cirrus Logic, Inc., Fremont, CA 94538 415-623-8300
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ Distributed Processing Technlg. Corp., Maitland, FL 32751 407-830-5522
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
§ Macrolink, Anaheim, CA 92807 714-777-8800
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Micro/sys, Glendale, CA 91201-3010 818-244-4600
§ Mini Computer Technology, San Jose, CA 95131 408-435-1616
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
§ Western Digital Corp., Irvine, CA 92718 714-932-6000
§ Xylogics, Inc., Burlington, MA 01803 800-225-3317
Zendex Corp., Dublin, CA 94568 415-828-3000
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Controllers, Hard Disk Drive, Standalone-2000

Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
Avasem Corporation, San Jose, CA 95126 408-297-1201
Cipher Data Products, Inc., an Archive Co., San Diego, CA 92131 619-578-9100
§ Cirrus Logic, Inc., Fremont, CA 94538 415-623-8300
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Computer System Assocs., San Diego, CA 92121 619-566-3911
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
Davidge Corporation, Buellton, CA 93427 805-688-9598
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§ Western Digital Corp., Irvine, CA 92718 714-932-6000
Zendex Corp., Dublin, CA 94568 415-828-3000
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Controllers, IEEE 488 (GPIB) Bus-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1207
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124,1188-1189,1296-1297
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2218
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2039-2040
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ... D•1203
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
Capital Equipment Corporation, Burlington, MA 01803 617-273-1818
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Electrologic, Inc., Signal Hill, CA 90806 213-595-0551
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Express Test Corp., Mountain View, CA 94043 415-968-8818
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
Intelligent Interfaces, Inc., Stone Mountain, GA 30086 ... 404-381-9891;1-800-842-0888
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
Micro Industries, Westerville, OH 43081 614-895-0404
Omnibyte Corp., W. Chicago, IL 60185 708-231-6880
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Prema Precision Electronics, Inc., Montclair, CA 91763 714-621-7292
Quatech Inc., Akron, OH 44311 216-434-3154
† Republic Electronics Co., Hauppauge, NY 11788 516-273-9800
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Controllers, Keyboard-5150 — *See Vol. B*

Controllers, Magnetic Tape Drive, Add-in-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Cipher Data Products, Inc., an Archive Co., San Diego, CA 92131 619-578-9100
Ciprico Inc., Plymouth, MN 55441 612-559-2034
Comark Corp., Medfield, MA 02052 508-359-8161
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ ICI Inc., Placentia, CA 92670 714-579-7575
§ Macrolink, Anaheim, CA 92807 714-777-8800
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§ Mini Computer Technology, San Jose, CA 95131 408-435-1616
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Xylogics, Inc., Burlington, MA 01803 800-225-3317

Controllers, Magnetic Tape Drive, Standalone-2000

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Mesa Technology Corp., Columbia, MD 21046 800-888-0567

Controllers, Memory Device, Add-in-2000

Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1095
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•1119
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
§ ICI Inc., Placentia, CA 92670 714-579-7575
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
§ Macrolink, Anaheim, CA 92807 714-777-8800
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Western Digital Corp., Irvine, CA 92718 714-932-6000

Controllers, Memory Device, Standalone-2000

§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•1119
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
General Digital Corp., Enfield, CT 06082 203-741-7171
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§ Western Digital Corp., Irvine, CA 92718 714-932-6000

Controllers, Motion-4900

Advanced Technology Company, Vista, CA 92083, 619-727-7430 ... B•1235-1236
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635, 602-459-1150 ..... B•1280-1282
§ Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•1140-1141,2243
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 707-584-7558
§ Daedal, Harrison City, PA 15636 412-744-4451
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Electronic Design Engineering, Norco, CA 91760 714-735-1761
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
§ Global Components & Controls, Eatontown, NJ 07724 201-389-1470
§ Go Switch, Louisville, KY 40233 502-969-2386
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
§ Interloop, San Jose, CA 95131 408-922-0520
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
§ Mektronix Technology, Inc., Goleta, CA 93117 805-964-9669
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Motion Science Inc., San Jose, CA 95112 408-993-0300
Parker Hannifin Corp., Daedal Div., Harrison City, PA 15636 412-744-4451
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 516-328-3970
Transmagnetics, Farmingdale, NY 11735 516-293-3100

Controllers, Paper Tape Reader/Punch, Add-in-2000

Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Dataprobe, Englewood, NJ 07631 201-569-6464
GEN/COMP Inc., Canton, MA 02021 617-828-2008
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097

Controllers, Paper Tape Reader/Punch, Standalone-2000

Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097

Controllers, Plotter, Add-in-2000

† Telpar, Inc., Addison, TX 75001, 214-233-6631 ..... D•1117
Data Technology, Inc., Woburn, MA 01811 617-935-8820
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Controllers, Plotter, Standalone-2000

† **Telpar, Inc., Addison, TX 75001, 214-233-6631** ..... **D•1117**
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Controllers, Point-of-Sale Peripherals-2000

Data Mega Inc., Mega Data, Bensenville, IL 60106, 708-860-6501 ... **D•1088-1089**
F-P Electronics, Mississauga, Ont., CANADA L4W 2P1, 416-624-3020 ..... **B•1075,1077**
§ Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
† Telpar, Inc., Addison, TX 75001 214-233-6631
Texmate, Inc., Vista, CA 92083-8397 619-598-9899

Controllers, Power-2200

Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... **D•1131**
Douglas Randall, Pawcatuck, CT 06379, 203-599-2075 .... **B•1458,1460, D•1133**
§ **Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000** .. **D•1170**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... **D•1915**
Optima Electronic Packaging Systems, Tucker, GA 30084-5088, 404-496-4000 ..... **C•1064**
§ **Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229** ..... **D•2224**
Teledyne Relays, Teledyne, Inc., Hawthorne, CA 90250, 213-777-0077 .. **B•1605**
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
Control Concepts Corp., Liebert Corp., Binghamton, NY 13902-1380 607-724-2484
§ Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
Energy Systems, Vancouver, WA 98682 206-896-8310
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
§ Go Switch, Louisville, KY 40233 502-969-2386
§ Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† Modular Devices, Shirley, NY 11967 516-345-3100
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Payne Engineering, Scott Depot, WV 25560 304-757-7353
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
§† Teledyne Solid State, A Div. of Teledyne Relays, Hawthorne, CA 90250 213-777-0077
Transmagnetics, Farmingdale, NY 11735 516-293-3100
† Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711

Controllers, Printer, Add-in-2000

Data Mega Inc., Mega Data, Bensenville, IL 60106, 708-860-6501 ... **D•1087-1089**
Omniprint, Inc., Sunnyvale, CA 94089, 408-745-6400 ..... **D•1102,1105**
§ **Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512** ..... **D•1113**
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
§ Cirrus Logic, Inc., Fremont, CA 94538 415-623-8300
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
GEN/COMP Inc., Canton, MA 02021 617-828-2008
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
ICI Inc., Placentia, CA 92670 714-579-7575
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
§ Macrolink, Anaheim, CA 92807 714-777-8800
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Printer Products, Boston, MA 02134 617-254-1200
Telpar, Inc., Addison, TX 75001 214-233-6631
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Westrex Products, Boston, MA 02134 617-254-1200

Controllers, Printer, Standalone-2000

Data Mega Inc., Mega Data, Bensenville, IL 60106, 708-860-6501 ... **D•1087-1089**
Omniprint, Inc., Sunnyvale, CA 94089, 408-745-6400 ..... **D•1102,1105**
§ **Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512** ..... **D•1113**
† **Telpar, Inc., Addison, TX 75001, 214-233-6631** ..... **D•1117**
§ Cirrus Logic, Inc., Fremont, CA 94538 415-623-8300
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Printer Products, Boston, MA 02134 617-254-1200
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Westrex Products, Boston, MA 02134 617-254-1200

Controllers, Programmable-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... **D•1127**
Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... **D•1129**
California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244 ..... **D•2179-2180**
Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... **D•1131**
§ **Chrono-log Corp., Havertown, PA 19083, 215-853-1130** ..... **D•1084**
Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... **D•2241**
~~**Data Mega Inc., Mega Data, Bensenville, IL 60106, 708-860-6501**~~ ..... **D•1088**
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... **D•1247**
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... **D•1382**
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... **D•1348-1349**
§ **Grayhill Inc., La Grange, IL 60525, 708-354-1040** ..... **B•1491**
† **GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950** ..... **D•1070**
§ **Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179** ..... **D•1179**
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... **D•1121**
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... **D•1140-1141,2243**
† **NWL Transformers, Bordentown, NJ 08505, 609-298-7300** ..... **D•1915**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **C•1799, D•1142**
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... **D•2216,2218**
Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... **D•1315**
† **Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300** ..... **B•1312**
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ..... **D•1202-1203**
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... **D•1382**
§ **TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676** ..... **D•2245**
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Basicon, Inc., Portland, OR 97229 503-626-1012
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
Burling Instruments, Inc., Chatham, NJ 07928-0298 201-635-9481
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Cole Instrument Corp., Santa Ana, CA 92704 714-556-3100
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
† Digitec, Marion, OH 43302 614-387-3444
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
EG&G Reticon, Div. of EG&G, Sunnyvale, CA 94086-4197 408-738-4266
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
Electrologic, Inc., Signal Hill, CA 90806 213-595-0551
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§# Encoder Products, Sandpoint, ID 83864 208-263-8541
§ Enerco, Inc., Seattle, WA 98108 206-762-1422
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
§ Fuji Electric Corp. of America, Los Angeles, CA 90071 213-622-4490
§ Furnas Elec., Batavia, IL 60510 708-879-6000
§ Ge Fanuc Automation North America Inc., Charlottesville, VA 22906 ..... 804-978-5000; 800-648-2001
General Digital Corp., Enfield, CT 06082 203-741-7171
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100

Gordon Products, Brookfield, CT 06804 203-775-4501
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 ..... 401 781-5595
JC Systems, Inc., San Diego, CA 92121 619-453-9950
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
§ JMR Electronics, Bronx, NY 10461 212-597-6050
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Klockner Moeller, Franklin, MA 02038 508-520-7080
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Matrix Corp., Indianapolis, IN 46241 317-248-2036
Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
§ McGill Manufacturing Co., Inc., Valparaiso, IN 46383 219-465-2200
† Mep Controls, Gordontown, NJ 08505 609-298-7300
† Metric Systems, Ft. Walton Beach, FL 32548-9590 904-244-9600
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
NAVAN Corporation, Media, PA 19063 215-543-8066
§ Norgren, Littleton, CO 80120-1663 303-794-2611
† Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Ogden Manufacturing Co., Arlington Heights, IL 60005 708-593-3050
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
Optimum Applied Systems, Dobbs Ferry, NY 10522-1696 914-693-3001
Oriental Motor USA Corp., Super Vexta, Torrance, CA 90505-5217 213-515-2264
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Guardata, Inc., Herndon, VA 22070 703-471-0892
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Richard Lee Co., Stamford, NJ 07016 201-275-0710
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Square D Co., Palatine, IL 60067 708-397-2600
Stoelting Co., Wood Dale, IL 60191 708-860-9700
Struthers-Dunn, Inc. and Hi-G Co. Inc., Pitman, NJ 08071-0901 609-589-7500
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8398
Techniques, Inc., Englewood, NJ 07631 201-569-5900
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 516-328-3970
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Toshiba Instrumentation Div., Toshiba Intl. Corp., Tulsa, OK 74134 918-252-3548
§† Triconex Corp., Irvine, CA 92718 ..... 714-738-3709; 800-325-2123 (outside Ca)
Unico, Franksville, WI 53126-0505 414-886-5678
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ WestCon, Marion, OH 43302 614-382-5771
§ Xico, Inc., Chatsworth, CA 91311 818-709-4403
Zlatech, San Luis Obispo, CA 93401 805-541-0488
Z-World Engineering, Davis, CA 95616 916-753-3722

Controllers, Protocol, Communications-2000

† **GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950** ..... **D•1070**
§ **Xico, Inc., Chatsworth, CA 91311, 818-709-4403** ..... **D•1118**
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
§ Cirrus Logic, Inc., Fremont, CA 94538 415-623-8300
Comark Corp., Medfield, MA 02052 508-359-8161
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
Innovative Electronics, Inc., Dynatech Corporation, Miramar, FL 33025 305-432-0300
JF Microsystems, Pasco, WA 99301-9619 ..... 509-297-4294;800-532-2737
Megadata Corp., Bohemia, NY 11716 516-589-6800
Quatech Inc., Akron, OH 44311 216-434-3154
† Racal-Guardata, Inc., Herndon, VA 22070 703-471-0892
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
§ Western Digital Corp. Irvine, CA 92718 714-932-6000

Controllers, Terminal, Add-in-2000

§† **Interaction Systems Inc., Watertown, MA 02172, 617-923-6001** ..... **D•1098**
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
GEN/COMP Inc., Canton, MA 02021 617-828-2008
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
§ GMR Co., Venice, CA 90291 213-399-1490
ICI Inc., Placentia, CA 92670 714-579-7575
§ Lucas Deeco Corp., Hayward, CA 94544-7831 415-471-4700
§ Macrolink, Anaheim, CA 92807 714-777-8800
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Micro/sys, Glendale, CA 91201-3010 818-244-4600
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Western Digital Corp., Irvine, CA 92718 714-932-6000
§ Xylogics, Inc., Burlington, MA 01803 800-225-3317

Controllers, Terminal, Standalone-2000

§† **Interaction Systems Inc., Watertown, MA 02172, 617-923-6001** ..... **D•1098**
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Energy Systems, Vancouver, WA 98682 206-896-8310
General Digital Corp., Enfield, CT 06082 203-741-7171
§ GMR Co., Venice, CA 90291 213-399-1490
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
† Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Western Digital Corp., Irvine, CA 92718 714-932-6000

Controls, Access-2200

Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100, 800-336-5917;703-953-4751 ..... **D•1218-1220**
Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... **D•1118**
AES Corp., Peabody, MA 01960 508-535-7310
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ Enerco, Inc., Seattle, WA 98108 206-762-1422
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ THORN Automated Systems, Inc, THORN EMI, Westlake, OHIO 44145 216-871-9900

Controls, AC Motor Speed, Variable Frequency-2200

Advanced Technology Company, Vista, CA 92083, 619-727-7430 ..... **D•1235**
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... **D•1640**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Electro! Co., York, PA 17405 717-848-1722
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
§ Square D Co., Palatine, IL 60067 708-397-2600
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., Mansfield, OH 44907-0538 419-525-8500
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Controls, Audio System Consoles-2200

† **GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950** ..... **D•1070-1072**
§ **Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566** ..... **D•1014**
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Duncan Electronics, Inc., Costa Mesa, CA 92626 714-545-8261
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262

Controls, Capacitance Operated-2200

§ ASI Instruments, Inc., Houston, TX 77024 800-245-7056
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
§ Efector, Inc., Exton, PA 19341 ..... 215-524-2000;800-441-8246
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Gordon Products, Brookfield, CT 06804 203-775-4501
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
Princo Instruments, Inc., Southampton, PA 18966
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-6484

Controls, Carbon — See Potentiometers (Vol. A), Rheostats (Vol. A)

Controls, Computer Input, Joysticks, Mouse Devices, etc.-2000

CTI Electronics, Stratford, CT 06497, 203-386-9779 ..... **D•1085**
† **Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561** ..... **D•1138**
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ..... **D•1139**
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... **D•1140-1141,2243**

† **Orbit Instrument of Cal., Orbit Instrument Corp., Cypress, CA 90630, 714-527-0561** ..... **B•1826, D•1143**
† Adams Rite Products, Inc., Glendale, CA 91204 818-241-5121
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
Amkey, Methuen, MA 01844 508-975-5445
§ Augat Alcoswitch, Augat Inc., N. Andover, MA 01845 508-685-4371
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
§ BURGESS-SAIA, Inc., Buffalo Grove, IL 60089 708-215-9600
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
Flex-Key Corporation, Gloucester, MA 01930 508-281-2040
§† Guardian Elec. Mfg. Co., Koike Electric, Woodstock, IL 60098 815-337-0050
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716 516-563-3388
§ Interaction Systems Inc., Watertown, MA 02172 617-923-6001
§ Interactive Computer Products, Inc., Laguna Hills, CA 92653 714-770-5332
† Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
† Orbit Instrument Corp., Hauppauge, NY 11788 516-435-8300
Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000
Rundel Products, Allied Controls Incorporated, Waterbury, CT 06705 203-757-4200
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684

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Controls, Counting & Sorting-2200

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... **D•1121**
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
HH Controls Co., Inc., Arlington, MA 02174 617-646-2626
§ IVO Industries, Inc., Eatontown, NJ 07724 ..... 908-542-5151;800-932-0489
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
§ Redington Counters, Windsor, CT 06095 203-688-6205
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Sensor Corp., Scottdale, PA 15683 412-887-4080
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Square D Co., Palatine, IL 60067 708-397-2600
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Controls, DC Motor, Programmable-4900

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... **D•1127**
Automotion, Inc., Ann Arbor, MI 48108, 313-662-7771 ..... **B•1245**
§ **Bodine Electric Company, Chicago, IL 60618, 312-478-3515** ..... **B•1248**
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... **B•1260, D•1136**
§† **Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495** ..... **B•1277**
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ..... **B•1297**
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... **B•1920, D•1140-1141,2243**
† **Motor Technology, Inc., Dayton, OH 45429, 513-294-1041** ..... **B•1303**
Quality Thermistor, Boise, ID 83709, 208-377-3373 ..... **B•1858**
† **Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300** ..... **B•1312**
§ **Superior Electric, Bristol, CT 06010, 203-582-9561** ..... **B•1315**
§ **TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676** ..... **D•2245**
ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
American Assembly Inc., Florida, NY 10921 914-651-3433
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
§ Electrol Co., York, PA 17405 717-848-1722
Electronic Design Engineering, Norco, CA 91760 714-735-1761
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
§ Technology 80, Inc., Minneapolis, MN 55427 612-542-9545
Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Controls, DC Regenerative-2200

Cableform Inc., Troy, VA 22974, 804-589-8224 ..... **D•1640**
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Electrol Co., York, PA 17405 717-848-1722
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK

Controls, Density-2200

ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
† Automation Prods., Inc., Houston, TX 77008 713-869-0361
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
§ Kay-Ray/Sensall, Inc., Mt. Prospect, IL 60056 708-803-5100
§ Lektra Service Corp., Bronx, NY 10474 212-617-7786
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
Princo Instruments, Inc., Southampton, PA 18966
Schlumberger Industries, Tranducers Div., Houston, TX 77082 713-558-2587

Controls, Dimension-4100

Astrosystems, Lake Success, NY 11042 516-328-1600
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
# Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Magnetoelastic Devices, Pittsfield, MA 01202 413-445-5608
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Trans-Tek, Ellington, CT 06029 203-872-8351

Controls, Environmental Test Equipment-2550

Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... **D•1131**
Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... **D•1200**
Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... **D•1201**
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ..... **D•1202-1203**
† **Tenney Engineering, Union, NJ 07083, 908-686-7870** ..... **D•1205**
§ Acrosystems Corp., Beverly, MA 01915 508-927-8880
ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
AES Corp., Peabody, MA 01960 508-535-7310
Alpha-M Corp., Dallas, TX 75229 214-406-0424
American Assembly Inc., Florida, NY 10921 914-651-3433
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
JC Systems, Inc., San Diego, CA 92121 619-453-9980
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
Omega Engineering, Stamford, CT 06907 800-826-6342
† Oven Industries, Mechanicsburg, PA 17055 717-766-0721
Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
† Thermonics, Inc., Santa Clara, CA 95054 408-496-6838
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
† Warren-Knight Instrument Co., Warren Industries, Inc., Philadelphia, PA 19116 215-464-9300
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711

Controls, Fader-1300

§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
CTS Corporation, Elkhart, IN 46514 219-293-7511
† Duncan Electronics, Inc., Costa Mesa, CA 92626 714-545-8261
Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
Noble U.S.A., Inc., Rolling Meadows, IL 60008 708-364-6038
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500

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Controls, Fluid Conductivity-2200

Omega Engineering, Stamford, CT 06907, 800-826-6342
..... **Φ•1854-1855,1946, C•1799, D•1013,1307,1368-1369**
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
Rosemount Analytical Inc. Cedar Grove, NJ 07009 800-367-7242
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700

Controls, Fluid Flow-2200

Omega Engineering, Stamford, CT 06907, 800-826-6342
..... **Φ•1854-1855, C•1799, D•1142,1307,1368-1369**
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550
..... **D•1398**
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
Accusonic Division, Ferranti O.R.E. Inc., Falmouth, MA 02541 508-548-5800
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§ ASI Instruments, Inc., Houston, TX 77024 800-245-7056
† Astro Dynamics, Inc., Woburn, MA 01801 617-935-4944
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Bellofram Corporation, Newell, WV 26050 ..... 304-387-1200;800-727-5646
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
† Brooks Instrument Div., Emerson Elec. Co., Hatfield, PA 19440 215-362-3500
Computer Instruments Div., Hempstead, NY 11550 516-483-8200
Controlex, Inc., New Boston, NH 03070 603-487-5512
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Delta Controls Corp., Shreveport, LA 71107 318-424-8471
DEVAR Inc., Bridgeport, CT 06605 203-368-6751
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
† EEMCO, Datron, Inc., Los Angeles, CA 90039 818-247-7060
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
Fluid Components, Inc. San Marcos, CA 92069 619-744-6950
§† Gems Sensors Division, Div. of IMO Industries Inc., Plainville, CT 06062-1198
..... 203-677-1311
§ Harwil, Santa Monica, CA 90404 213-829-2310
Hersey Measurement Co., A Miller Industries Co., Spartanburg, SC 29305
..... 803-574-8960;1-800-845-2102
Intek, Inc., Westerville, OH 43081 614-895-0301
§ IVEK Corp., N. Springfield, VT 05150 802-886-2238
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
† Kurz Instruments Inc., Monterey, CA 93940 800-424-7356
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Micro Pneumatic Logic, inc., Fort Lauderdale, FL 33309-1786 305-973-6166
§ Norgren, Littleton, CO 80120-1663 303-794-2611
Parker Hannifin Corp., Cleveland, OH 44112-1290 ..... 800-272-7537;800-C-PARKER
§ Plant Specialties, Inc., Carrollton, TX 75011-0537 214-245-9673
† Pressure Controls, Inc., Belleville, NJ 07109 201-751-5002
Princo Instruments, Inc., Southampton, PA 18966
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Schlumberger Industries, Tranducers Div., Houston, TX 77082 713-558-2587
§ Snaptite/Allied, Erie, PA 16505 814-833-6131
§ Square D Co., Palatine, IL 60067 708-397-2600
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
§ ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Controls, Fluorescent Light Power-2200

§ Carlon, A Div. of Lamson & Sessions, Cleveland, OH 44122 216-831-4000
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700

Controls, Frequency-2200

Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2150-2151
Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500
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FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ..... A•1371
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857
..... **D•1267**
Pacific Power Source Corp., Huntington Bch., CA 92649,
714-898-2691;800-854-2433 ..... D•2218
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550
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§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
† Autronics Corp., Arcadia, CA 91006 818-445-5470
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 .....
201-471-6800
Controlex, Inc., New Boston, NH 03070 603-487-5512
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
CTS Corporation, Elkhart, IN 46514 219-293-7511
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Omega Engineering, Stamford, CT 06907 800-826-6342
Ovenaire-Audio-Carpenter, Oak Crystal Inc., Charlottesville, VA 22901 .. 804-977-8050
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700

Controls, Gas-2200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600
..... **D•1268-1269**
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§† Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Bellofram Corporation, Newell, WV 26050 ..... 304-387-1200;800-727-5646
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
Cambridge Aerofio, Inc., Shirley, MA 01464 508-45-2346
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
§† MKS Instruments, inc., Andover, MA 01810 508-975-2350
† Pressure Controls, Inc., Belleville, NJ 07109 201-751-5002
§ Snaptite/Allied, Erie, PA 16505 814-833-6131

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Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 .....
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ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
AES Corp., Peabody, MA 01960 508-535-7310
§ Analogic Corp., Peabody, MA 01960 508-977-3000
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408
..... 612-870-2294
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
JC Systems, Inc., San Diego, CA 92121 619-453-9980
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Moisture Register Products Div., Aqua Measure Instrument Co., LaVerne, CA
91750-0369 714-392-5833
MULTISENS Inc. Laval, Que., CANADA H7S 2E8 514-629-5646
Omega Engineering, Stamford, CT 06907 800-826-6342
Panametrics, Waltham, MA 02154-3497 617-899-2740
Rosemount Analytical Inc., Cedar Grove, NJ 07009 800-367-7242
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311 305-587-5577
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
† Thunder Scientific Corp., Albuquerque, NM 87123 ..... 505-265-8701;800-872-7728
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711

Controls, Ignitron Firing-2200

§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100

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Controls, Lamp Dimming, Flashing-2200

§ Douglas Randall, Pawcatuck, CT 06379, 203-599-2075 ..... D•1133
† Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
§ Hughey & Phillips, Inc., Simi Valley, CA 93065 805-581-5591
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179;
800-423-3179
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
International Configurations, Inc., Enfield, CT 06082 203-749-6380
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
† Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
§ Lutron Electronics Co., Coopersburg, PA 18036 215-282-3800
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
§ Payne Engineering, Scott Depot, WV 25560 304-757-7353
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Spectrum Devices, Sugar Land, TX 77478-2420 713-242-6417
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Superior Electric, Bristol, CT 06010 203-582-9561
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759

Controls, Level, Dry Material-2200

§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... Φ•1889
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... Φ•1924
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ ASI Instruments, Inc., Houston, TX 77024 800-245-7056

† Automation Prods., Inc., Houston, TX 77008 713-869-0361
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
Control Engrg., Inc., West Springfield, MA 01089 413-781-1330
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Delta Controls Corp., Shreveport, LA 71107 318-424-8471
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Gordon Products, Brookfield, CT 06804 203-775-4501
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
§ Kay-Ray/Sensall, Inc., Mt. Prospect, IL 60056 708-803-5100
Kistler-Morse, Redmond, WA 98073 206-881-8000
Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
§ Magnetrol International, Downers Grove, IL 60515-4499 708-969-4000
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
Penberthy, Inc., De Vlieg-Bullard, Prophetstown, IL 61277 815-537-2311
Princo Instruments, Inc., Southampton, PA 18966
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§ SOR, Inc., Lenexa, KS 66215 913-888-2630
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Controls, Level, Liquid-2200

Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... D•1131
§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... B•1889
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1446
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... B•1924
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1854-1855, C•1799, D•1142,1307,1368-1369
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§ ASI Instruments, Inc., Houston, TX 77024 800-245-7056
§† Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
† Automation Prods., Inc., Houston, TX 77008 713-869-0361
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Barksdale Controls Div., Imo Industries Inc., Los Angeles, CA 90058 213-589-6181
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
Computer Instruments Div., Hempstead, NY 11550 516-483-8200
Conax Buffalo Corporation, Buffalo, NY 14225 716-684-4500
Control Engrg., Inc., West Springfield, MA 01089 413-781-1330
Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Delta Controls Corp., Shreveport, LA 71107 318-424-8471
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
§† Dova Controls, Redmond, WA 98052-5165 206-881-7414
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
† EEMCO, Datron, Inc., Los Angeles, CA 90039 818-247-7060
§ Efector, Inc., Exton, PA 19341 ..... 215-524-2000;800-441-8246
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
Fluid Components, Inc., San Marcos, CA 92069 619-744-6850
§ Furnas Elec., Batavia, IL 60510 708-879-6000
§† Gems Sensors Division, Div. of IMO Industries Inc., Plainville, CT 06062-1198 203-677-1311
§ Gordon Products, Brookfield, CT 06804 203-775-4501
§† Gunther, W., GmbH, D 8500 Nurnberg 82, GERMANY ..... (0)911/65521 or 65520
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
§ Harwil, Santa Monica, CA 90404 213-829-2310
Hersey Measurement Co., A Miller Industries Co., Spartanburg, SC 29305 ..... 803-574-8960;1-800-845-2102
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§† Kay-Ray/Sensall, Inc., Mt. Prospect, IL 60056 708-803-5100
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
Kistler-Morse, Redmond, WA 98073 206-881-8000
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Mag-Con, St. Paul, MN 55113 612-633-8820
Magnetoelastic Devices, Pittsfield, MA 01202 413-445-5608
§ Magnetrol International, Downers Grove, IL 60515-4499 708-969-4000
Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
§ Meriam Instrument, Scott Fetzer, Cleveland, OH 44102 216-281-1100
Micro Pneumatic Logic, inc., Fort Lauderdale, FL 33309-1786 305-973-6166
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
Parker Hannifin Corp., Refrigerating Specialties Division, Broadview, IL 60153 708-681-6300
Penberthy, Inc., De Vlieg-Bullard, Prophetstown, IL 61277 815-537-2311
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Plant Specialties, Inc., Carrollton, TX 75011-0537 214-245-9673
§ PMT Division, Ametek, Inc., Feasterville, PA 19053 215-355-6900
§† Pres-Air-Trol Corp., Mamaroneck, NY 10543 ..... 914-698-2026;800-431-2625 (outside NY)
† Pressure Controls, Inc., Belleville, NJ 07109 201-751-5002
Princo Instruments, Inc., Southampton, PA 18966
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
Schlumberger Industries, Tranducers Div., Houston, TX 77082 713-558-2587
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Solarcom Technology, Inc., Hayward, CA 94544 415-489-3141
§ SOR, Inc., Lenexa, KS 66215 913-888-2630
§ Square D Co., Palatine, IL 60067 708-397-2600
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Temposonics Sensors Division, MTS Sys. Corp., Research Triangle Park, NC 27709 919-677-0100
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Viatran Corporation, Grand Isl. 14072 716-773-1700
§ ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Controls, Machine Tool-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•1140-1141,2243
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
§ Action Instruments, San Diego, CA 92123 619-279-5726
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
AES Corp., Peabody, MA 01960 508-535-7310
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Ambi-Tech Inds., Hillsdale, NJ 07642 201-666-0504
American Assembly Inc., Florida, NY 10921 914-651-3433
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Antex Electronics Corp., Gardena, CA 90248 213-532-3092
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
Electrologic, Inc., Signal Hill, CA 90806 213-595-0551
Electronic Design Engineering, Norco, CA 91760 714-735-1761
§ Furnas Elec., Batavia, IL 60510 708-879-6000
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
Helm Instrument Co., Inc., Maumee, OH 43537 419-893-4356
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
IXYS Corp., San Jose, CA 95131-1109 408-435-1900
§ KB Electronics, Brooklyn, NY 11207 718-257-3300
Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
§ Mektronix Technology, Inc., Goleta, CA 93117 805-964-9669
Mesur-Matic Elctrns., Salem, MA 01970-2294 508-745-7000
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
§ Namco Controls, An Acme-Cleveland Co., Mentor, OH 44060 216-946-9900
§† Nolatron, Harrisburg, PA 17111 717-564-3398
§ Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Payne Engineering, Scott Depot, WV 25560 304-757-7353
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924

§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§ Square D Co., Palatine, IL 60067 708-397-2600
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
§ Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Tapeswitch Corp. of America, Farmingdale, NY 11735 516-694-6312
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Timeco, Inc., Huntington, WV 25705 304-523-5149
Torq Corp., Bedford, OH 44146 216-232-4100
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Unico, Franksville, WI 53126-0505 414-886-5678
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Westamp, Santa Monica, CA 90404 213-393-0401
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Controls, Moisture — See Controls, Humidity (Vol. D)

Controls, Motion, Digital-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
Automotion, Inc., Ann Arbor, MI 48108, 313-662-7771 ..... B•1245
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... B•1889
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ..... D•1139
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ..... B•1297
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140-1141,2243
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
Controls Unlimited, inc., Perry, OH 44081 216-259-2500
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
§ Daedal, Harrison City, PA 15636 412-744-4451
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Digital Motor, Inc., Portland, OR 97229-5501 503-629-9692
Disc Instruments, Honeywell, Costa Mesa, CA 92626 714-433-0343
§ Dova Controls, Redmond, WA 98052-5165 206-881-7414
§ Electrol Co., York, PA 17405 717-848-1722
Electronic Design Engineering, Norco, CA 91760 714-735-1761
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
Escap Products, Hauppauge, NY 11788 516-234-3900
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
HMW Enterprises, Inc., Etters, PA 17319 717-938-4691
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ IVO Industries, Inc., Eatontown, NJ 07724 ..... 908-542-5151;800-932-0489
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
Matrix Corp., Raleigh, NC 27610 919-231-8000
Maxwell Electronics, Research Triangle Park, NC 27609 919-846-1633
§ Mektronix Technology, Inc., Goleta, CA 93117 805-964-9669
Motion Science Inc., San Jose, CA 95112 408-993-0300
Oregon Micro Systems, Inc., Beaverton, OR 97006 503-644-4999
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
PITTMAN, Penn Engrg. & Mfg. Corp., Harleysville, PA 19438 215-256-6601
Portescap U.S., Inc., Hauppauge, NY 11788 516-234-3900
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
§ Technology 80, Inc., Minneapolis, MN 55427 612-542-9545
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
Waters Manufacturing, Inc., Talley Industries, Wayland, MA 01778 508-358-2777

Controls, Motor, PWM-2200

Advanced Technology Company, Vista, CA 92083, 619-727-7430 ..... B•1235
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•1140-1141,2243
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
Electrol Co., York, PA 17405 717-848-1722
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
Motion Science Inc., San Jose, CA 95112 408-993-0300
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§ Technology 80, Inc., Minneapolis, MN 55427 612-542-9545

Controls, Motor Speed-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
Advanced Technology Company, Vista, CA 92083, 619-727-7430 ... B•1235-1236
Automotion, Inc., Ann Arbor, MI 48108, 313-662-7771 ..... B•1245
BEI Motion Systems Company, Computer Products Div., San Marcos, CA 92069, 619-471-2600 ..... B•1879
BEI Motion Systems Company, Digital Products Div., Little Rock, AR 72203, 501-851-4000 ..... B•1879
BEI Motion Systems Company, Industrial Encoder Div., Goleta, CA 93117, 805-968-0782 ..... B•1879
BEI Motion Systems Company, Itek Encoder Div., Needham Hgts., MA 02194, 617-455-1414 ..... B•1879-1881
BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311, 818-341-6161 ..... B•1879
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
§ Douglas Randall, Pawcatuck, CT 06379, 203-599-2075 .... B•1458,1460, D•1133
† Eltrol Corporation, Canoga Park, CA 91304, 818-709-0131 ..... B•1255
† ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... A•2040, B•1256,1258, D•1136
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ..... B•1297
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140-1141,2243
† Motor Technology, Inc., Dayton, OH 45429, 513-294-1041 ..... B•1303
NMB Technologies, Chatsworth, CA 91311, 818-341-3355 ..... C•1650-1652
Quality Thermistor, Boise, ID 83709, 208-377-3373 ..... B•1858
Servo-Tek Products Co., Hawthorne, NJ 07506, 201-427-3100 ..... B•1310
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§† Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
Synektron Corporation, Portland, OR 97223, 503-684-3090 ..... B•1316-1317
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Anaheim Automation, Anaheim, CA 92801 714-992-6990
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Atec, Inc., Houston, TX 77055 713-468-7971
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
BEI Motion Systems Company, Corporate Off., Carlsbad, CA 92009 619-931-1500
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
Bertsch U.S., Vista, CA 92083 619-727-7420
Cambridge Aerofio, Inc., Shirley, MA 01464 508-45-2346
§ Centent Co., Santa Ana, CA 92707 714-979-6491
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Cole Hersee Co., Boston, MA 02127-2467 617-268-2100
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
Controlex, Inc., New Boston, NH 03070 603-487-5512
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
Digital Motor, Inc., Portland, OR 97229-5501 503-629-9692
Dixson, Inc., Grand Junction, CO 81503 303-244-1241
Duncan Electronics, Inc., Costa Mesa, CA 92626 714-545-8261
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§† Electrol Co., York, PA 17405 717-848-1722
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
Elmwood Sensors, Pawtucket, RI 02861 401-727-1300
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§ Go Switch, Louisville, KY 40233 502-969-2386
§ Harowe Servo Controls, Inc.:A Fasco Co., West Chester, PA 19380 215-692-2700
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
† Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
H D Systems, Inc., Hauppauge, NY 11788 516-231-6630
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO

† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 ... 602-459-1150
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 ... 708-543-6200
IXYS Corp., San Jose, CA 95131-1109 ... 408-435-1900
JMR Electronics, Bronx, NY 10461 ... 212-597-6050
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 ... 215-837-0700
§ KB Electronics, Brooklyn, NY 11207 ... 718-257-3300
§ Linemaster Switch, Woodstock, CT 06281-0238 ... 203-974-1000
Litton Potentiometer Div., Mt. Vernon, NY 10551 ... 914-664-7733
§ Lutron Electronics Co., Coopersburg, PA 18036 ... 215-282-3800
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 ... 803-249-5191
† Maxon Precision Motors, Inc., Burlingame, CA 94010 ... 415-697-9614
Maxwell Electronics, Research Triangle Park, NC 27609 ... 919-846-1633
Mesur-Matic Elctrns., Salem, MA 01970-2294 ... 508-745-7000
Micronel U.S., Vista, CA 92083 ... 619-727-7400
† Modular Devices, Shirley, NY 11967 ... 516-345-3100
Motion Science Inc., San Jose, CA 95112 ... 408-993-0300
§† Ohmite Manufacturing Co., Skokie, IL 60076 ... 708-675-2600
§ Oriental Motor USA Corp., Super Vexta, Torrance, CA 90505-5217 ... 213-515-2264
Ormec Systems Corp., Rochester, NY 14625 ... 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 ... 815-226-3100
§ Payne Engineering, Scott Depot, WV 25560 ... 304-757-7353
† Performance Controls, Inc., Horsham, PA 19044 ... 215-675-6500
Phase Control Electronics, Glendale, NY 11385 ... 718-441-4278
PIC Design, Remington Technologies, Inc., Middlebury, CT 06762 ... 203-758-8272
§ Plant Specialties, Inc., Carrollton, TX 75011-0537 ... 214-245-9673
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 ... 516-864-1000
Power Functions Engineering, Garland, TX 75042 ... 214-278-0996
§ POWR-UPS Corp., Shirley, NY 11967 ... 516-345-5700;1-800-333-POWR
Rapidsyn Division, Oceanside, CA 92054 ... 619-439-7500
§ Relay Specialties, Oakland, NJ 07436 ... 201-337-1000
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 ... 800-245-4501
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 ... 612-942-3600
† Sierracin/Magnedyne, Carlsbad, CA 92008 ... 619-438-3321
† Sigma Electronics Inc., Houston, TX 77099 ... 713-933-4700;800-874-7121
§† Silicon General, Garden Grove, CA 92641 ... 714-898-8121
§ Square D Co., Palatine, IL 60067 ... 708-397-2600
Square D. Company, Control Products, Knightdale, NC 27545 ... 919-266-3671
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 ... 513-426-6000
Teledyne Components, Mountain View, CA 94039-7267 ... 415-968-9241
Tempo Instrument, Inc., Commack, NY 11725 ... 516-864-3700
§ Toko America, Inc., Mt. Prospect, IL 60056 ... 708-297-0070
§ Torq Corp., Bedford, OH 44146 ... 216-232-4100
Triac Electronic Systems, Inc., Glendale, NY 11385 ... 718-441-4759
Trionics, Inc., St. Charles, IL 60174 ... 312-232-9117
Unico, Franksville, WI 53126-0505 ... 414-886-5678
Unitrode Corp., Watertown, MA 02172 ... 617-926-0404
Vasak Inds., Inc., El Segundo, CA 90245 ... 1-800-67-VASAK
§ Veeder-Root, Simsbury, CT 06070-2003 ... 203-651-2700
Voltex, Amityville, NY 11701 ... 516-842-2772
§ Westamp, Santa Monica, CA 90404 ... 213-393-0401
§ Westinghouse Electric Corp., Control Division, Oldsmar, FL 34667 ... 813-855-4621
Wilmington Research & Development, Topsfield, MA 01983 ... 508-887-2501
Xylog Corp., Hackensack, NJ 07601 ... 201-489-4040

Controls, Oscillator-2200

† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ... A•1368
FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ... A•1371
† Vectron Laboratories, Inc., Norwalk, CT 06850, 203-853-4433 ... A•1487
Anders, Inc., Simsbury, CT 06070 ... 203-658-7666
CTS Corporation, Elkhart, IN 46514 ... 219-293-7511
§† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ... 708-932-9380;800-468-6009
† Piezo Technology Inc., Orlando, FL 32804 ... 407-298-2000
Teledyne Components, Mountain View, CA 94039-7267 ... 415-968-9241
Unholtz-Dickie Corp., Wallingford, CT 06492 ... 203-265-3929

Controls, Photoelectric-2200

§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 ... 414-382-2000
§ Altech Corp., Somerville, NJ 08876 ... 908-707-8484
§† Ametek, Inc., Mansfield & Green Div., Largo, FL 34643 ... 813-536-7831
Applied Controls Co., Inc., Fairfield, NJ 07004 ... 201-227-5454
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ... 215-337-5500; 800-441-8245
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ... 908-819-7070; 908-572-0500
§ Banner Engineering Corp., Minneapolis, MN 55441 ... 612-544-3164
BURGESS-SAIA, Inc., Buffalo Grove, IL 60089 ... 708-215-9600
§ Carlon, A Div. of Lamson & Sessions, Cleveland, OH 44122 ... 216-831-4000
§ Curtis Industries, Milwaukee, WI 53219-0910 ... 414-649-4200
§ Dolan-Jenner Inds., Woburn, MA 01801 ... 617-935-7444
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 ... 414-449-7487
§ Efector, Inc., Exton, PA 19341 ... 215-524-2000;800-441-8246
EG & G Vactec, St. Louis, MO 63132 ... 314-423-4900
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 ... 708-882-5757
Enerco, Inc., Seattle, WA 98108 ... 206-762-1422
§ FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ... 708-932-9380;800-468-6009
§ Furnas Elec., Batavia, IL 60510 ... 708-879-6000
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 ... 201-825-9696
HH Controls Co., Inc., Arlington, MA 02174 ... 617-646-2626
§ Hughey & Phillips, Inc., Simi Valley, CA 93065 ... 805-581-5591
§ IDEC Corporation, Sunnyvale, CA 94089-2211 ... 408-747-0550
§ Intermatic, Spring Grove, IL 60081 ... 815-675-2321
§ JMR Electronics, Bronx, NY 10461 ... 212-597-6050
Larson Instrument, Orangeburg, NY 10962 ... 914-359-3800
§ Lektra Service Corp., Bronx, NY 10474 ... 212-617-7786
§ Luft Instruments, Inc., Lincoln, MA 01773 ... 617-259-9215
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 ... 803-249-5191
§ McGill Manufacturing Co., Inc., Valparaiso, IN 46383 ... 219-465-2200
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 ... 815-235-6600
Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB ... 0264-324155
§ Namco Controls, An Acme-Cleveland Co., Mentor, OH 44060 ... 216-946-9900
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 ... 708-843-7900
§ Optek Technology Inc., Carrollton, TX 75006 ... 214-323-2200
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 ... 414-793-1161
§ Redington Counters, Windsor, CT 06095 ... 203-688-6205
§ Regent Controls, Inc., Shelton, CT 06484-0767 ... 203-924-2924
§ Relay Specialties, Oakland, NJ 07436 ... 201-337-1000
Rodann Electronics Mfg. Co., Brea, CA 92621 ... 714-529-1301;800-366-7010
Scanning Devices, Inc., Waltham, MA 02154 ... 617-891-8991
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§ Square D Co., Palatine, IL 60067 ... 708-397-2600
Square D. Company, Control Products, Knightdale, NC 27545 ... 919-266-3671
§ Sunx Sensors/Imported by Ramco Elect., West Des Moines, IA 50265 ... 515-225-6933
§ Switches Unlimited, Inc., Woodside, NY 11377 ... 718-478-5000;800-221-0487
Unico, Franksville, WI 53126-0505 ... 414-886-5678
† Xenotronix Inc., Valencia, CA 91355 ... 805-257-4793
§ Xercon, Inc., Portland, OR 97207 ... 503-292-8682

Controls, Positioning-4100

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ... D•1127
BEI Motion Systems Company, Computer Products Div., San Marcos, CA 92069, 619-471-2600 ... B•1879
BEI Motion Systems Company, Digital Products Div., Little Rock, AR 72203, 501-851-4000 ... B•1879
BEI Motion Systems Company, Industrial Encoder Div., Goleta, CA 93117, 805-968-0782 ... B•1879
BEI Motion Systems Company, itek Encoder Div., Needham Hgts., MA 02194, 617-455-1414 ... B•1879-1881
BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311, 818-341-6161 ... B•1879
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ... B•1248
§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ... B•1889
† Eltrol Corporation, Canoga Park, CA 91304, 818-709-0131 ... B•1255
† ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ... A•2040, B•1256,1258-1259, D•1136
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495 ... B•1276-1277
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ... D•1183
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ... D•1138
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ... D•1139
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ... B•1297
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ... B•1920, D•1140-1141,2243
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ... B•1924
† Orbit Instrument of Cal., Orbit Instrument Corp., Cypress, CA 90630, 714-527-0561 ... B•1826, D•1143
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ... B•1312
§† Superior Electric, Bristol, CT 06010, 203-582-9561 ... B•1315
Synektron Corporation, Portland, OR 97223, 503-684-3090 ... B•1316
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ... D•2245
§ Action Instruments, San Diego, CA 92123 ... 619-279-5726
Adams Rite Products, Inc., Glendale, CA 91204 ... 818-241-5121
§ Adatek, inc., Sandpoint, ID 83864 ... 208-263-1471;800-323-3343
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 ... 603-882-1447
§ Aerotech, Inc., Pittsburgh, PA 15238 ... 412-963-7470
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 ... 414-382-2000
Amkey, Methuen, MA 01844 ... 508-975-5445
§ Anaheim Automation, Anaheim, CA 92801 ... 714-992-6990
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 ... 513-339-2241
Analog Systems, Tucson, AZ 85731-7389 ... 602-290-1818
Applied Controls Co., Inc., Fairfield, NJ 07004 ... 201-227-5454
Astrosystems, Lake Success, NY 11042 ... 516-328-1600
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ... 215-337-5500; 800-441-8245
# Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 ... 212-228-0900
§† Bailey Controls Co., Wickliffe, OH 44092 ... 216-585-8500
§ Baldor Electric Company, Fort Smith, AR 72902 ... 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ... 908-819-7070; 908-572-0500
† BEI Motion Systems Company, Corporate Off., Carlsbad, CA 92009 ... 619-931-1500
§ Bellofram Corporation, Newell, WV 26050 ... 304-387-1200;800-727-5646
§ Berkeley Process Control, Inc., Richmond, CA 94804 ... 415-526-3333
† Branmag, Inc., North Tonawanda, NY 14120 ... 716-693-5994
§ BURGESS-SAIA, Inc., Buffalo Grove, IL 60089 ... 708-215-9600
Burleigh Instruments, Fishers, NY 14453 ... 716-924-9355
§ Centent Co., Santa Ana, CA 92707 ... 714-979-6491
† Columbia Resch. Labs., Woodlyn, PA 19094 ... 215-872-3900
Compact Power Company, Yorba Linda, CA 92686 ... 714-996-5826
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 ... 707-584-7558
† Computer Conversions Corp., E. Northport, NY 11731 ... 516-261-3300
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 ... 818-882-0424
Controls Unlimited, Inc., Perry, OH 44081 ... 216-259-2500

† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
§ Daedal, Harrison City, PA 15636 412-744-4451
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Data Technology, Inc., Woburn, MA 01811 617-935-8820
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4611
Disc Instruments, Honeywell, Costa Mesa, CA 92626 714-433-0343
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
§ Dova Controls, Redmond, WA 98052-5165 206-881-7414
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1535
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
§ Global Components & Controls, Eatontown, NJ 07724 201-389-1470
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§ Go Switch, Louisville, KY 40233 502-969-2386
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
Hecon Corp., Eatontown, NJ 07724 908-542-9200
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Intranor, Naugatuck, CT 06770 ..... 203-729-8256;800-BE-SERVO
† Inland Motor: Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
Innovatek Microsystems, Inc., Milleton, NY 12546-9720 914-373-9003
Instrumentation & Control Sys., ICS,Inc., Addison, IL 60101 708-543-6200
International Machine & Tool Corp., Warwick, RI 02886 401-467-6905
§ IVO Industries, Inc., Eatontown, NJ 07724 ..... 908-542-5151;800-632-0489
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kay-Ray/Sensall, Inc., Mt. Prospect, IL 60056 708-803-5100
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Magnetoelastic Devices, Pittsfield, MA 01202 413-445-5608
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5551
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
Mesur-Matic Electrns., Salem, MA 01970-2294 508-745-7000
† Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
§ MKC Electronics Corp., Overland Park, KS 66215 913-894-9711
Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 10SAB 0264-324155
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
† Orbit Instrument Corp., Hauppauge, NY 11788 516-435-8300
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
Phase Control Electronics, Glendale, NY 11385 718-441-4278
PIC Design, Remington Technologies, Inc., Middlebury, CT 06762 203-758-8272
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
† Precision Mechanisms, Westbury, NY 11590 ..... 516-ED3-5955
Rapidsyn Division, Oceanside, CA 92054 619-439-7500
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliance Electric Co. Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Renco Encoders Inc., Goleta, CA 93117-3094 805-968-1525
Robbins & Myers/Electro Craft, Eden Prairie, MN 55344 612-942-3600
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
Servo-Tek Products Co., Hawthorne, NJ 07506 201-427-2100
Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
† Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
§ Temposonics Sensors Division, MTS Sys. Corp., Research Triangle Park, NC 27709 919-677-0100
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Trans-Tek, Ellington, CT 06029 203-872-8351
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
Unico, Franksville, WI 53126-0505 414-886-5678
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9588
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
† Warren-Knight Instrument Co., Warren Industries, Inc., Philadelphia, PA 19116 215-464-9300
Waters Manufacturing, Inc., Talley Industries, Wayland, MA 01778 508-358-2777
§ Westamp, Santa Monica, CA 90404 213-393-0401
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Controls, Pressure-2200

Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1854-1855, C•1799, D•1142,1307,1368-1369
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Analogic Corp., Peabody, MA 01960 508-977-3000
† Atec, Inc., Houston, TX 77055 713-468-7971
§ Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Barksdale Controls Div., Imo Industries Inc., Los Angeles, CA 90058 213-589-6181
§ Bellofram Corporation, Newell, WV 26050 ..... 304-387-1200;800-727-5646
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
† Computer Instruments Corp., Westbury, NY 11590 516-476-8400
Computer Instruments Div., Hempstead, NY 11550 516-483-8200
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Dynisco, Sharon, MA 02067 617-784-8400
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ EliWell-USA Ltd., EliWell S.P.A., NYC, NY 10022 212-832-9393
§ Furnas Elec., Batavia, IL 60510 708-879-6000
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
§ International Technologies, inc., Warwick, RI 02888 401-781-5595
§ ITT Conoflow, ITT Fluid Technology Corp., St. George, SC 29477 803-563-9281
§ IVEK Corp., N. Springfield, VT 05150 802-886-2238
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§ Jumo Process Control, Inc., Coatesville, PA 19320 215-380-8002
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
§ Meriam Instrument, Scott Fetzer, Cleveland, OH 44102 216-281-1100
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Micro Pneumatic Logic, Inc., Fort Lauderdale, FL 33309-1786 305-973-6166
§† MKS Instruments, Inc., Andover, MA 01810 508-975-2350
MULTISENS Inc, Laval, Que., CANADA H7S 2E8 514-629-5646
Norgren, Littleton, CO 80120-1663 303-794-2611
Parker Hannifin Corp., Cleveland, OH 44112-1290 ..... 800-272-7537;800-C-PARKER
Parker Hannifin Corp., Fluidpower Pump Division, Ostego, MI 49078-1495 616-694-9411
Parker Hannifin Corp., Hydraulic Valve Division, Elyria, OH 44035 216-366-5100
PMT Division, Ametek, Inc., Feasterville, PA 19053 215-355-6900
† Pressure Controls, Inc., Belleville, NJ 07109 201-751-5002
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Snapitte/Allied, Erie, PA 16505 814-833-6131
§ Square D Co., Palatine, IL 60067 708-397-2600
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311 305-587-5577
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Texas Instruments, Connector System, Attleboro, MA 02703 ..... 508-699-5269; 508-699-3450
Texas Instrs., Matls. & Controls Grp., Attleboro, MA 02703 508-699-3300
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., Mansfield, OH 44907-0538 419-525-8500
§ Total Temperature Instrumentation, inc., Williston, VT 05495 802-863-0085
Trans Metrics, Inc., Solon, OH 44139 216-248-2229
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
Viatran Corporation, Grand Isl. 14072 716-773-1700

Controls, Proportional-2200

§ Douglas Randall, Pawcatuck, CT 06379, 203-599-2075 .... B•1458,1460, D•1133
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ..... D•1138
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
Antex Electronics Corp., Gardena, CA 90248 213-532-3092
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
† Automation Prods., Inc., Houston, TX 77008 713-869-0361
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751

§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
§ Dova Controls, Redmond, WA 98052-5165 206-881-7414
§ Dowty Custom Elctrns., Inc., Thermocontrol Div., Brandon, VT 05733 ... 802-247-6811
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
Elma Engineering, Palo Alto, CA 94303 415-494-7303
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
§ IVEK Corp., N. Springfield, VT 05150 802-886-2238
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
§ JMR Electronics, Bronx, NY 10461 212-597-6050
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
§† Kay-Ray/Sensall, Inc., Mt. Prospect, IL 60056 708-803-5100
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
† Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
§ Machine Components Corp., Plainview, NY 11803 516-694-7222
§ MKC Electronics Corp., Overland Park, KS 66215 913-894-9711
Omega Engineering, Stamford, CT 06907 800-826-6342
† Oven Industries, Mechanicsburg, PA 17055 717-766-0721
§ Payne Engineering, Scott Depot, WV 25560 304-757-7353
Phase Control Electronics, Glendale, NY 11385 718-441-4278
PMT Division, Ametek, Inc., Feasterville, PA 19053 215-355-6900
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
Regdon Solenoid, Inc., Westmont, IL 60559 708-789-0600
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Toshiba Instrumentation Div., Toshiba Intl. Corp., Tulsa, OK 74134 918-252-3548
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Unico, Franksville, WI 53126-0505 414-886-5678
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711

Controls, Proximity-Also See Controls, Capacitance Operated-2200

Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... D•1131
§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... B•1889
§ Hamlin Inc., Lake Mills, WI 53551, 414-648-3000 ..... B•1903
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... B•1924
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Augat Alcoswitch, Augat Inc., N. Andover, MA 01845 508-685-4371
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
BURGESS-SAIA, Inc., Buffalo Grove, IL 60089 708-215-9600
§ C.P. Clare Corp., Chicago, IL 60645 312-262-7700
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Efector, Inc., Exton, PA 19341 ..... 215-524-2000;800-441-8246
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Furnas Elec., Batavia, IL 60510 708-879-6000
§ Global Components & Controls, Eatontown, NJ 07724 201-389-1470
§ Gordon Products, Brookfield, CT 06804 203-775-4501
§ Go Switch, Louisville, KY 40233 502-969-2386
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 708-543-6200
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
MULTISENS Inc, Laval, Que., CANADA H7S 2E8 514-629-5646
§ Namco Controls, An Acme-Cleveland Co., Mentor, OH 44060 216-946-9900
Norgren, Littleton, CO 80120-1663 303-794-2611
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Redington Counters, Windsor, CT 06095 203-688-6205
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Sensor Corp., Scottdale, PA 15683 412-887-4080
§ Snaptite/Allied, Erie, PA 16505 814-833-6131
§ Square D Co., Palatine, IL 60067 708-397-2600
Square D. Company, Control Products, Knightdale, NC 27545 919-266-3671
§ Sunx Sensors/Imported by Ramco Elect., West Des Moines, IA 50265 .. 515-225-6933
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Controls, Remote-2200

§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... A•2040, D•1136
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1070-1071,1073-1074
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212-2213
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ..... D•1139
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ..... D•1048
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
§ Augat Alcoswitch, Augat Inc., N. Andover, MA 01845 508-685-4371
§ Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
California Automation Inc., San Diego, CA 92121 619-452-1341
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
CGRS Microtech, Langhorne, PA 19047 215-757-0284
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ Dancer Communications, Inc., Media, PA 19064-2334 215-543-8066
Dantel, Fresno, CA 93727 209-292-1111
§ Dataprobe, Englewood, NJ 07631 201-569-6464
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Efector, Inc., Exton, PA 19341 ..... 215-524-2000;800-441-8246
§ Electrol Co., York, PA 17405 717-848-1722
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
Electronic Design Engineering, Norco, CA 91760 714-735-1761
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
§ Furnas Elec., Batavia, IL 60510 708-879-6000
HDS Inc., Reston, VA 22091 703-620-6200
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 708-543-6200
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
† Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
† Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
NAVAN Corporation, Media, PA 19063 215-543-8066
§ Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§ Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000
§† Pres-Air-Trol Corp., Mamaroneck, NY 10543 ..... 914-698-2026;800-431-2625 (outside NY)
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Square D Co., Palatine, IL 60067 708-397-2600
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711

Controls, Run, Shutdown Command, Start-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•1140-1141,2243
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
§ Action Instruments, San Diego, CA 92123 619-279-5726
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000

Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Ambi-Tech Inds., Hillsdale, NJ 07642 201-666-0504
Anaheim Automation, Anaheim, CA 92801 714-992-6990
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Autronics Corp., Arcadia, CA 91006 818-445-5470
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
Cardinal Control Co., Kensington, CT 06037 203-828-6379
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
C-Tek Inc., Wakefield, MA 01880 617-246-1720
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Furnas Elec., Batavia, IL 60510 708-879-6000
Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
§† Nolatron, Harrisburg, PA 17111 717-564-3398
Norgren, Littleton, CO 80120-1663 303-794-2611
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 415-471-9717
§ Square D Co., Palatine, IL 60067 708-397-2600
Tapeswitch Corp. of America, Farmingdale, NY 11735 516-694-6312
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
Timeco, Inc., Huntington, WV 25705 304-523-5149
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Controls, SCR-2200

§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
† Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... D•1131
§ Douglas Randall, Pawcatuck, CT 06379, 203-599-2075 ..... D•1133
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
§ Powerex, Westinghouse, GE, Mitsubishi, Youngwood, PA 15697, 412-925-7272 ..... A•2117
Teccor Electronics, Inc., Irving, TX 75038, 214-580-1515 ..... A•2122,2124-2125
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Anders, Inc., Simsbury, CT 06070 203-658-7666
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
§ Dowty Custom Elctrns., Inc. , Thermocontrol Div., Brandon, VT 05733 802-247-6811
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electrol Co., York, PA 17405 717-848-1722
Electro-Pacific, Goleta, CA 93117 805-964-0751
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
Elma Engineering, Palo Alto, CA 94303 415-494-7303
§ Furnas Elec., Batavia, IL 60510 708-879-6000
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
† Glenro, Inc., Paterson, NJ 07501-1715 ..... 201-279-5900;800-922-0106
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§ Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
§ KB Electronics, Brooklyn, NY 11207 718-257-3300
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Payne Engineering, Scott Depot, WV 25560 304-757-7353
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§ Plant Specialties, Inc., Carrollton, TX 75011-0537 214-245-9673
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Square D Co., Palatine, IL 60067 708-397-2600
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Unico, Franksville, WI 53126-0505 414-886-5678
Voltex, Amityville, NY 11701 516-842-2772
§† Westamp, Santa Monica, CA 90404 213-393-0401
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711
Xylog Corp., Hackensack, NJ 07601 201-489-4040

Controls, Sensing/Monitoring-Voltage, Phase, Frequency-2200

Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
† American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100 ..... B•1876-1877
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1446
Douglas Randall, Pawcatuck, CT 06379, 203-599-2075 ..... B•1461
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345-1346
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... B•1912-1913, D•1289
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... A•2421, B•1315
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1395,1398
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§ Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
Control Engrg., Inc., West Springfield, MA 01089 413-781-1330
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
§ Go Switch, Louisville, KY 40233 502-969-2386
§ Hughey & Phillips, Inc., Simi Valley, CA 93065 805-581-5591
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 708-543-6200
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
KB Electronics, Brooklyn, NY 11207 718-257-3300
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
Lark Electronics, Inc., New York, NY 10040 212-569-0430
§† Leach Corporation, Buena Pk., CA 90622-5032 714-739-0770
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Omega Engineering, Stamford, CT 06907 800-826-6342
Optimum Applied Systems, Dobbs Ferry, NY 10522-1696 914-693-9001
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831 ..... 415-471-9717;800-221-7060
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 415-471-9717
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
WestCon, Marion, OH 43302 614-382-5771
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501
Xylog Corp., Hackensack, NJ 07601 201-489-4040

Controls, Servo System-4900

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
BEI Motion Systems Company, Computer Products Div., San Marcos, CA 92069, 619-471-2600 ..... B•1879
BEI Motion Systems Company, Digital Products Div., Little Rock, AR 72203, 501-851-4000 ..... B•1879
BEI Motion Systems Company, Industrial Encoder Div., Goleta, CA 93117, 805-968-0782 ..... B•1879
BEI Motion Systems Company, Itek Encoder Div., Needham Hgts., MA 02194, 617-455-1414 ..... B•1879-1881
BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311, 818-341-6161 ..... B•1879

† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
† Eltrol Corporation, Canoga Park, CA 91304, 818-709-0131 ..... B•1255
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... D•1136
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495 ..... B•1277
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
† Lucas Ledex Inc., Vandalia, OH 45377-0427, 513-898-3621 ..... B•1915
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ..... B•1297
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140-1141
† Motor Technology, Inc., Dayton, OH 45429, 513-294-1041 ..... B•1303
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... D•1914
PITTMAN, Penn Engrg. & Mfg. Corp., Harleysville, PA 19438, 215-256-6601 ..... B•1309
Servo-Tek Products Co., Hawthorne, NJ 07506, 201-427-3100 ..... B•1310
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
Synektron Corporation, Portland, OR 97223, 503-684-3090 ..... B•1316
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† BEI Motion Systems Company, Corporate Off., Carlsbad, CA 92009 619-931-1500
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
Bertsch U.S., Vista, CA 92083 619-727-7420
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
§ Daedal, Harrison City, PA 15636 412-744-4451
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
Data Technology, Inc., Woburn, MA 01811 617-935-8820
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
§ Dova Controls, Redmond, WA 98052-5165 206-881-7414
Dynapar, Gurnee, IL 60031 312-662-2666
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
Electronic Design Engineering, Norco, CA 91760 714-735-1761
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
Industrial Computer Source, San Diego, CA 92111 619-279-0084
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
§ Inertial Motors, Doylestown, PA 18901 215-345-1010
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
IXYS Corp., San Jose, CA 95131-1109 408-435-1900
§ LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
§ Mektronix Technology, Inc., Goleta, CA 93117 805-964-9669
Mesur-Matic Elctrns., Salem, MA 01970-2294 508-745-7000
Micronel U.S., Vista, CA 92083 619-727-7400
† Modular Devices, Shirley, NY 11967 516-345-3100
† Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
Motion Engineering, Inc., Santa Barbara, CA 93103 805-962-5409
Motion Science Inc., San Jose, CA 95112 408-993-0300
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Omutec, Odetics, Inc., Anaheim, CA 92802 714-758-0200
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
Parker Hannifin Corp., Compumotor Div., Rohnert Pk., CA 94928 707-584-7558
Parker Hannifin Corp., Daedal Div., Harrison City, PA 15636 412-744-4451
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Renco Encoders Inc., Goleta, CA 93117-3094 805-968-1525
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 612-942-3600
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
§ Technology 80, Inc., Minneapolis, MN 55427 612-542-9545
§ Temposonics Sensors Division, MTS Sys. Corp., Research Triangle Park, NC 27709 919-677-0100
§ Toko America, Inc., Mt. Prospect., IL 60056 708-297-0070
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Unico, Franksville, WI 53126-0505 414-886-5678
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444
Westamp, Santa Monica, CA 90404 213-393-0401
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501
† Wilson Company-Systems Division, Dallas, TX 75248 .... 214-931-8666;800-325-4436

Controls, Stepping Motor-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
Hurst Manufacturing Div., Princeton, IN 47670, 812-385-2564 ..... B•1275
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140-1141,2243
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§† Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
Airpax-International Division, A North American Philips Co., Cheshire, CT 06410 203-271-6000
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Centent Co., Santa Ana, CA 92707 714-979-6491
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
§ Daedal, Harrison City, PA 15636 412-744-4451
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Digital Motor, Inc., Portland, OR 97229-5501 503-629-9692
DSP Technology, Fremont, CA 94538-7338 415-657-7555
† Eastern Air Devices, Inc., Dover, NH 03820 603-742-3330
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
Escap Products, Hauppauge, NY 11788 516-234-3900
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
† IMC Magnetics Corp., Eastern Div., Westbury, NY 11590 516-334-7070
Industrial Computer Source, San Diego, CA 92111 619-279-0084
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
§ Interloop, San Jose, CA 95131 408-922-0520
IXYS Corp., San Jose, CA 95131-1109 408-435-1900
Japanese Products Corp., Elmsford, NY 10523 914-592-8880
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesur-Matic Elctrns., Salem, MA 01970-2294 508-745-7000
† Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
Motion Engineering, Inc., Santa Barbara, CA 93103 805-962-5409
Motion Science Inc., San Jose, CA 95112 408-993-0300
MTS Systems, Minneapolis, MN 55424 612-937-4000
§ Oriental Motor USA Corp., Super Vexta, Torrance, CA 90505-5217 213-515-2264
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
Parker Hannifin Corp., Compumotor Div., Rohnert Pk., CA 94928 707-584-7558
Parker Hannifin Corp., Daedal Div., Harrison City, PA 15636 412-744-4451
Portescap U.S., Inc., Hauppauge, NY 11788 516-234-3900
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§† Silicon General, Garden Grove, CA 92641 714-898-8121
† Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
§ Toko America, Inc., Mt. Prospect., IL 60056 708-297-0070
Unitrode Corp., Watertown, MA 02172 617-926-0404
§† Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100

Controls, Temperature-2200

Airpax-Frederick Division, A North American Philips Co., Frederick, MD 21701, 301-663-5141 ..... B•1832
† Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... D•1131

DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
† Elmwood Sensors, Pawtucket, RI 02861, 401-727-1300 ..... B•1842-1843
Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... D•1136
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345-1346
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•1382
§ International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1851
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
† Marlow Industries, Inc., Dallas, TX 75238-1645, 214-340-4900 ..... C•1630-1631
† McLean Engineering, Zero Corporation, Princeton Junction, NJ 08550, 609-799-0100 ..... C•1633
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1854-1855, C•1799, D•1142,1307,1368-1369
Ovenaire-Audio-Carpenter, Oak Crystal Inc., Charlottesville, VA 22901, 804-977-8050 ..... A•1434-1435
Sensor Scientific, Inc., Fairfield, NJ 07006, 201-227-7790;800-524-1610 ..... B•1862-1863
Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ... D•1203
TECA, ThermoElectric Cooling America Corp., Chicago, IL 60622, 312-666-1600 ..... C•1664
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,1382,2075
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., Mansfield, OH 44907-0538, 419-525-8500 ..... B•1391,1865
Therm-O-Disc, Inc., Midwest Components Product Grp., Mansfield, OH 44907-0538, 419-525-8450 ..... B•1866-1869
U.S. Sensor Corp., Orange, CA 92667, 714-639-1000 ..... B•1871
WARREN G-V, GENERAL SIGNAL CORP., WHIPPANY, NJ 07981, 201-386-1200 ..... B•1870
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1398
§ ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Acrosystems Corp., Beverly, MA 01915 508-927-8880
§ Action Instruments, San Diego, CA 92123 619-279-5726
Advanced Thermal Products, Inc., St. Marys, PA 15857 814-834-1541
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Alpha-M Corp., Dallas, TX 75229 214-406-0424
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
§ Analogic Corp., Peabody, MA 01960 508-977-3000
† Anders, Inc., Simsbury, CT 06070 203-658-7666
# ARi Industries, Inc., Addison, IL 60101 ..... 708-953-9100;800-237-6725
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Atec, Inc., Houston, TX 77055 713-468-7971
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
§ Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§† Barksdale Controls Div., Imo Industries Inc., Los Angeles, CA 90058 213-589-6181
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
§ Bayley Instrument Company, Kenwood, CA 95452 707-833-6014
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Biomation Instruments, Almonte K0A1A0 613-256-2821
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
Burling Instruments, Inc., Chatham, NJ 07928-0298 201-635-9481
Caig Labs., Escondido, CA 92029-1431 619-743-7143
Cambridge Aeroflo, Inc., Shirley, MA 01464 508-45-2346
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Chatham Controls, Chatham, NJ 07928 201-635-8892
Cole-Parmer Instrument Company, Chicago, IL 60648 ..... 708/647-7600
Control Resources Inc., Smart Fan Div., Harvard, MA 01451 508-772-4043
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
DGH Corporation, Manchester, NH 03108 603-622-0452
† Digitec, Marion, OH 43302 614-387-3444
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
§ Dowty Custom Elctrns., Inc., Thermocontrol Div., Brandon, VT 05733 ... 802-247-6811
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Dynisco, Sharon, MA 02067 617-784-8400
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
Elma Engineering, Palo Alto, CA 94303 415-494-7303
§ E-Squared Technology Corp., Ventura, CA 93003 805-644-9544
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
§ Extech Instruments Corp., Waltham, MA 02154 617-890-7440
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
† Force, Inc., Christiansburg, VA 24073 703-382-0462
§ Fuji Electric Corp. of America, Los Angeles, CA 90071 213-622-4490
§† Gordon Co.:Watlow, Richmond, IL 60071 815-678-2211
§ Gordon Products, Brookfield, CT 06804 203-775-4501
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 201-825-9696
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Hexacon Electric Co., Roselle Park, NJ 07204 908-245-6200
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
Isotemp Research, Inc., Charlottesville, VA 22903 804-295-3101
JC Systems, Inc., San Diego, CA 92121 619-453-9980
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
Lake Shore Cryotronics, Inc., Westerville, OH 43081 614-891-2243
§ Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Mag-Con, St. Paul, MN 55113 612-633-8820
§ Markat Div., Wild Oats Corp., N. Myrtle Bch., SC 29582 803-249-5191
Matrix Corp., Indianapolis, IN 46241 317-248-2036
Maxwell Electronics, Research Triangle Park, NC 27609 919-846-1633
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Micro-Ohm Corp., Duarte, CA 91010 818-3575377
§† Mikron Instr., Wyckoff, NJ 07481 201-891-7330
Minco Products, Minneapolis, MN 55432 612-571-3121
§ MKC Electronics Corp., Overland Park, KS 66215 913-894-9711
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
Ogden Manufacturing Co., Arlington Heights, IL 60005 708-593-8050
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
† Oven Industries, Mechanicsburg, PA 17055 717-766-0721
§ Paktronics Controls, Inc., Ft. Worth, TX 76181 817-284-5241
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
Parker Hannifin Corp., Fluidpower Pump Division, Ostego, MI 49078-1495 616-694-9411
Parker Hannifin Corp., Hydraulic Valve Division, Elyria, OH 44035 216-366-5100
§ Payne Engineering, Scott Depot, WV 25560 304-757-7353
Phase Control Electronics, Glendale, NY 11385 718-441-4278
PMT Division, Ametek, Inc., Feasterville, PA 19053 215-355-6900
PPM, Inc., Cleveland, OH 44139 216-349-2300
Princo Instruments, Inc., Southampton, PA 18966
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ RFL Inds., Inc., (DBA) Dowty Elctrns. Co., Brandon, VT 05733 802-247-6811
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621 714-521-8673
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Square D Co., Palatine, IL 60067 708-397-2600
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Sylvania GTE Control Devices, Standish, ME 04084 207-642-4535
† Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
Texas Instruments, Connector System, Attleboro, MA 02703 ..... 508-699-5269; 508-699-3450
Texas Instrs., Matls. & Controls Grp., Attleboro, MA 02703 508-699-3800
Thermik Corp., Thermik Sensor Technics, GmbH, New Bern, NC 28562 919-636-5720
† Thermo Electric, Saddle Brook, NJ 07662 201-843-5800
† Thermonics, Inc., Santa Clara, CA 95054 408-496-6838
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
§ Total Temperature Instrumentation, Inc., Williston, VT 05495 802-863-0085
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
† VirTis Co., Gardiner, NY 12525 ..... 914-255-5000; 800-431-8232
Voltex, Amityville, NY 11701 516-842-2772
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711
† Williamson Corporation, Concord, MA 01742 508-369-9607
§ Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Controls, Timing — See Timers (Vol. D)

Controls, Torque, Electronic-2200

† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•1140-1141,2243
§ Ambi-Tech Inds., Hillsdale, NJ 07642 201-666-0504
ASC Systems, St. Clair Shores, MI 48080 313-882-1133

§† B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Eaton Corporation, Electric Drives Division, Kenosha, WI 53141 414-656-4011
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electrol Co., York, PA 17405 717-848-1722
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
§ GSE, Core Inds., Farmington Hills, MI 48024 313-476-7875
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
§ KB Electronics, Brooklyn, NY 11207 718-257-3300
Magnetoelastic Devices, Pittsfield, MA 01202 413-445-5608
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
§ POWR-UPS Corp., Shirley, NY 11967 ..... 516-345-5700;1-800-333-POWR
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
Vibrac, Amherst, NH 03031 603-882-6777
† Waters Manufacturing, Inc., Talley Industries, Wayland, MA 01778 508-358-2777
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501
§ Wilson, H. F., Engineering Co., Glen Ellyn, IL 60137 708-469-7473

Controls, Vibrator-2200

Anders, Inc., Simsbury, CT 06070 203-658-7666
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
§ Staco Energy Products Co., Dayton, OH 45403 513-253-1191

Controls, Voltage Regulating — See Regulators & Stabilizers, Voltage (Vol. D)

Controls, Volume & Tone — See Potentiometers (Vol. A), Rheostats (Vol. A)

Control Systems, Air Traffic-2200

† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1070
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300

Control Systems, Distributed Numerical-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
§ Action Instruments, San Diego, CA 92123 619-279-5726
Analogic Corp., Peabody, MA 01960 508-977-3000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Moore Products Co., Spring House, PA 19477 215-646-7400
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
Toshiba Instrumentation Div., Toshiba Intl. Corp., Tulsa, OK 74134 918-252-3548

Control Systems, Robotics-4900

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240-2241
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Motor Technology, Inc., Dayton, OH 45429, 513-294-1041 ..... B•1304
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... B•1924
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
§ Action Instruments, San Diego, CA 92123 619-279-5726
Adams Rite Products, Inc., Glendale, CA 91204 818-241-5121
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
American Assembly Inc., Florida, NY 10921 914-651-3433
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
Dynalloy, Inc., Irvine, CA 92715 714-476-1206
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
HDS Inc., Reston, VA 22091 703-620-6200
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Devices Corporation, Novato, CA 94949-5728 .. 415-883-3535;800-747-0064
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
MOLEX, Inc., Lisle, IL 60532 708-969-4550
§ Norgren, Littleton, CO 80120-1663 303-794-2611
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§† Seiko Instruments U.S.A., Inc., Robotics/Automation Div., Torrance, CA 90505 213-517-7850
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§† Silicon General, Garden Grove, CA 92641 714-898-8121
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
† Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
Technology 80, Inc., Minneapolis, MN 55427 612-542-9545
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Unico, Franksville, WI 53126-0505 414-886-5678
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Convection Cooling Packages, Semiconductor — See Heat Sinks, Semiconductor (Vol. C)

Converters, AC to DC (Nonrotary) — See Power Supplies, AC Input, DC Output (Vol. D)

Converters, Analog to Digital-2325

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145,1148
BEI Motion Systems Company, Computer Products Div., San Marcos, CA 92069, 619-471-2600 ..... B•1879
BEI Motion Systems Company, Itek Encoder Div., Needham Hgts., MA 02194, 617-455-1414 ..... B•1879-1881
§ Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637-1639
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1158-1160
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 ..... D•1170,1173
† Hopper Electronics, Phoenix, AZ 85021,.602-870-3093 ..... D•1175
† iLC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 .... A•1731
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1192
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Action Instruments, San Diego, CA 92123 619-279-5726
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
† Addacon Greensboro, Greensboro, NC 27407 919-852-6200
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§† Advanced Linear Devices, Inc., Sunnyvale, CA 94086-4606 408-720-8737
Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Peabody, MA 01960 508-977-3000
Ariel Corporation, Highland Pk., NJ 08904 908-249-2900
§ Aromat Corp., Matsushita Electrical Works Ltd., New Providence, NJ 07974 908-464-3550
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Basicon, Inc., Portland, OR 97229 503-626-1012
Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
BEI Motion Systems Company, Corporate Off., Carlsbad, CA 92009 619-931-1500
† BEI Motion Systems Company, Digital Products Div., Little Rock, AR 72203 501-851-4000

BEI Motion Systems Company, Industrial Encoder Div., Goleta, CA 93117 805-968-0782
BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311 818-341-6161
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
CGRS Microtech, Langhorne, PA 19047 215-757-0284
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
Comark Corp., Medfield, MA 02052 508-359-8161
Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
Computron Display Systems, Xcel Corporation, Elk Grove Village, IL 60007 708-952-8800
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Covid, Inc., Tempe, AZ 85281 602-966-2221
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
§ Datricon, Scientific Technologies, Inc., Hayward, CA 94544 415-471-9717
DGH Corporation, Manchester, NH 03108 603-622-0452
Digital Equip., Marlborough, MA 01752
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
† Dymec Inc., Winchester, MA 01890 617-729-7870
† Film Microelectronics Inc., Peabody, MA 01960 508-532-9913
§ Fujitsu Microelectronics Inc., Integrated Circuits Division, San Jose, CA 95134 408-922-9000
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† GEC-Marconi Electronic Systems Corp., Wayne, NJ 07474-0975 201-633-6000
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
§ Gunther, W., GmbH, D 8500 Nurnberg 82, GERMANY ..... (0)911/65521 or 65520
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§† Integrated Device Technology, Inc., Santa Clara, CA 95054-3090 408-727-6116
KineticSystems, Lockport, IL 60441 815-838-0005
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Marconi Circuit Technology Corp., Farmingdale, NY 11735 516-293-8636
Matrix Corp., Raleigh, NC 27610 919-231-8000
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
§† Micro Power Sys. Inc., Santa Clara, CA 95056 408-727-5350
§† Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
Optelecom, Inc., Gaithersburg, MD 20877 301-840-2121
Parsytec Inc., West Chicago, IL 60185 708-293-9500
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
Prema Precision Electronics, Inc., Montclair, CA 91763 714-621-7292
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
Quatech Inc., Akron, OH 44311 216-434-3154
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
Rapid Systems Inc., Seattle, WA 98103 206-547-8311
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§† Signal Processing Technologies, Colorado Springs, CO 80906 719-540-3900
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§ Siliconix, Inc., Santa Clara, CA 95054 408-988-8000
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
§ Sony Component Products Co, Semiconductor Division, Cypress, CA 90630 714-229-4197
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
† Technology 80, Inc., Minneapolis, MN 55427 612-542-9545
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§† Thaler Corp., Tucson, AZ 85737 602-742-5572
§† TRW LSI Products INC., La Jolla, CA 92038 619-457-1000
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444
§† WestCon, Marion, OH 43302 614-382-5771

Converters, Analog to Pulse-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159-1160
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 ..... B•1941
† Ametek, Inc., Mansfield & Green Div., Largo, FL 34643 813-536-7831
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
Dymec Inc., Winchester, MA 01890 617-729-7870
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Converters, ASCII to Baudot-2325

§ Dataprobe, Englewood, NJ 07631 201-569-6464
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600

Converters, ASCII to BCD-2325

Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600

Converters, BCD to ASCII-2325

§ Dataprobe, Englewood, NJ 07631 201-569-6464

Converters, Binary to BCD-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151
† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1154, 1156
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000

Converters, Binary to Decimal-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1154, 1156
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
† Transmagnetics, Farmingdale, NY 11735 516-293-3100

Converters, CRT Display-2000

† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2161
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701,1705
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1735,1737
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... B•1067
† Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
† Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2020-2022
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049,2053
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Dotronix, New Brighton, MN 55112 612-633-1742
Dymec inc., Winchester, MA 01890 617-729-7870
EWC, Inc., Englishtown, NJ 07726 908-446-3110
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174 904-677-7070
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889 908-534-9007
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300
North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Penn-Tran Corp.,Sub. of Spectrum Elctrns. Inc., Wingate, PA 16880 814-355-1521
§† Signal Processing Technologies, Colorado Springs, CO 80906 719-540-3900
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Vidco, Inc., Beaverton, OR 97005 503-641-1804

Converters, DC to DC, for LANs-4000

† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1598
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1611-1612
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Bel Fuse, Jersey City, NJ 07302, 201-432-0463 ..... A•2179, D•1629-1630
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697

Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2191
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1745-1746
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1800,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1808
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1818
§ Kappa Technologies, Inc., Rahway, NJ 07065, 908-396-9400;1-800-223-0603 ..... D•1836
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1454,1457, D•1887-1888
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 .. A•1736-1737
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1972
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2029,2031
Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2059-2068
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
§ Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ... A•1606, D•2134
Vernitron Corp., Passive Comps. Group, St. Petersburg, FL 33743, 813-347-2181 ..... A•1279
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2140
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
§ El Microcircuits, Inc., Mankato, MN 56001 507-345-5786
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
§ GC International Inc., Richardson, TX 75085-1198 214-234-3240
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Intronics, Inc., Canton, MA 02021 617-828-4992
JBM Electronics, Inc., Bedford, NH 03110-6802 603-623-0222
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
§ Nano Pulse Industries, Brea, CA 92670 714-529-2600
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Power Trends, Inc., Batavia, IL 60510 708-406-0900
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5 416-630-8108
Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL

Converters, DC to DC, Less than 1 W Output-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1611-1612
Bel Fuse, Jersey City, NJ 07302, 201-432-0463 ..... D•1629-1630
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1638-1639
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1704-1705
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1735
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801,1805
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1454,1457, D•1887-1888
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2021-2022
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2140
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
Dexter Scientific, Palatka, FL 32177 904-328-2450
Ericsson Components, Inc., Richardson, TX 75081 214-480-8300
§ GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ International Power Sources, Inc., Ashland, MA 01721 508-881-7434
Intronics, Inc., Canton, MA 02021 617-828-4992
JBM Electronics, Inc., Bedford, NH 03110-6802 603-623-0222
Kappa Technologies, Inc., Rahway, NJ 07065 ..... 908-396-9400;1-800-223-0603
§ Laube Technology, Woodland Hills, CA 91367 818-703-1188
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
† Modular Devices, Shirley, NY 11967 516-345-3100
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
Polytron Devices, Inc., Paterson, NJ 07544 201-345-5885
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
§ Shindengen America Inc., Westlake Vl., CA 91361 800-634-3654
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5 416-630-8108
Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Converters, DC to DC, 1 to 5 W Output-4000

AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1611-1612
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1638-1639
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1641-1642
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1162
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1704-1705
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1734,1736,1738
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ... B•1066, D•1740
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1760
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1801,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1807
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810,1817-1818
Kappa Technologies, Inc., Rahway, NJ 07065, 908-396-9400;1-800-223-0603 ..... D•1836
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1454,1457, D•1887-1888
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1903,1906
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 .. A•1736-1737
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1970-1971,1973
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1985-1986
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2021-2022
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110,2113
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2140
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
§ El Microcircuits, Inc., Mankato, MN 56001 507-345-5786
Ericsson Components, Inc., Richardson, TX 75081 214-480-8300
§ GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Intronics, Inc., Canton, MA 02021 617-828-4992
JBM Electronics, Inc., Bedford, NH 03110-6802 603-623-0222
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Power Pac, Shelton, CT 06484 203-925-0123
Power Trends, Inc., Batavia, IL 60510 708-406-0900
Rohm Corporation, Rohm Electronics Division, Antioch, TN 37013 615-641-2020
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Converters, DC to DC, 5 to 10 W Output-4000

AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1611-1612

AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1638-1639
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1641-1645
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1162
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1705
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1714
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1737
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ... B•1066, D•1740
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1746
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1760
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1802,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1807
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ... D•1810,1816
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 .. C•1454, D•1888
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1905
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1985-1986
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2001
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2020-2022
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110,2113
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2140
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
§ GC International Inc., Richardson, TX 75085-1198 214-234-3240
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Intronics, Inc., Canton, MA 02021 617-828-4992
JBM Electronics, Inc., Bedford, NH 03110-6802 603-623-0222
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
† Micropac Inds., Inc., Garland, TX 75040 214-272-3571
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Power Trends, Inc., Batavia, IL 60510 708-406-0900
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
† RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Converters, DC to DC, 10 to 15 W Output-4000

AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1508-1510
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1598
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606,1608,1611-1612
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1638-1639
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1644-1645
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
† Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1705
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1714
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ... B•1066, D•1740
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1745
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801-1803,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1807
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1889
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
Microtran Co. Inc., Valley Stream, NY 11582, 516-561-6050 ..... A•2288
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1902,1904
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000-2002
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2021-2022
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110,2113
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Autec Power Systems, Chatsworth, CA 91311 818-341-6123
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
† CEC Electronics Corp., Hauppauge, NY 11788 516-582-4422
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174 904-677-7070
§ GC International Inc., Richardson, TX 75085-1198 214-234-3240
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intronics, Inc., Canton, MA 02021 617-828-4992
JBM Electronics, Inc., Bedford, NH 03110-6802 603-623-0222
† Micropac Inds., Inc., Garland, TX 75040 214-272-3571
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Polytron Devices, Inc., Paterson, NJ 07544 201-345-5885
Power Trends, Inc., Batavia, IL 60510 708-406-0900
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Converters, DC to DC, 15 to 30 W Output-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
† Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Apex Microtechnology Corp., Tucson, AZ 85741, 602-742-8600 ..... D•1598
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606,1608,1611-1612
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1620
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1644-1645
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
† Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1162
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1705
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1714
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ... B•1066, D•1740
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1744-1745
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797

§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801-1802,1804-1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1808
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ... D•1810,1816
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
LZR Electronics, inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1889
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
Microtran Co. Inc., Valley Stream, NY 11582, 516-561-6050 ..... A•2288
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1902,1904-1906
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1969
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2001
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2021-2022
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174 904-677-7070
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
§ GC International Inc., Richardson, TX 75085-1198 214-234-3240
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Intronics, Inc., Canton, MA 02021 617-828-4992
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
† Micropac Inds., Inc., Garland, TX 75040 214-272-3571
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Power Trends, Inc., Batavia, IL 60510 708-406-0900
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Converters, DC to DC, 30 to 50 W Output-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
† Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606,1608,1611-1612
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1620
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1645-1646
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1705
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 .... D•1714-1715
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1744-1745
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801-1802,1804-1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1808
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
Microtran Co. Inc., Valley Stream, NY 11582, 516-561-6050 ..... A•2288
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1906
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1996,1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000-2002
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2021-2022
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2137
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Caritronics Inc., West Caldwell, NJ 07007 201-575-8916
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intronics, Inc., Canton, MA 02021 617-828-4992
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
§† Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
Polytron Devices, Inc., Paterson, NJ 07544 201-345-5885
Power Trends, Inc., Batavia, IL 60510 708-406-0900
† RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL

Converters, DC to DC, 50 to 200 W Output-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1608,1611
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1620
Avel-Lindberg Inc., New Milford, CT 06776, 203-355-4711 ..... D•1625
Cableform Inc., Troy, VA 22974, 804-589-8224 ..... D•1640
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1646
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 .... D•1714-1715
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1723
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1751
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1177
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1803-1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1808
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Microtran Co. Inc., Valley Stream, NY 11582, 516-561-6050 ..... A•2288
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1996,1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000,2002
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 .. D•2021
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2137-2138
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2140
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intronics, Inc., Canton, MA 02021 617-828-4992
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
Mesa Power Systems, Escondido, CA 92029 619-489-8162

† Modular Devices, Shirley, NY 11967 516-345-3100
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
§† Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
† RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Switching Systems International, Placentia, CA 92670 714-996-0909
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL

Converters, DC to Dc, 100 to 300 W Output-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1591
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1608,1611
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1617
Avel-Lindberg Inc., New Milford, CT 06776, 203-355-4711 ..... D•1625
Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2166
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1723
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749,1751
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1177
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1803,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1808
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1964-1965
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1996,1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2002
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2016
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 .... D•2029,2031,2033
Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
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Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2136-2138
Acon, Inc., South Easton, MA 02375 508-230-8022
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Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
Mesa Power Systems, Escondido, CA 92029 619-489-8162
† Modular Devices, Shirley, NY 11967 516-345-3100
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
§† Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Switching Systems International, Placentia, CA 92670 714-996-0909
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
§† Vicor Corp., Andover, MA 01810 508-470-2900
Westcor Corporation, Los Gatos, CA 95032 408-395-7050

Converters, DC to Dc, Greater than 300 W Output-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1611
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1707
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1736
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1965
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1998
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2017-2019
RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2033
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2136-2138
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ C&D Charter Power Systems, Plymouth Meeting, PA 19462 215-828-9000
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102 510-657-6700
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
† HC Power Inc., Irvine, CA 92714-5716 714-261-2200
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
International Power Sources, Inc., Ashland, MA 01721 508-881-7434
† Modular Devices, Shirley, NY 11967 516-345-3100
§† Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§† Vicor Corp., Andover, MA 01810 508-470-2900
Westcor Corporation, Los Gatos, CA 95032 408-395-7050

Converters, DC to Sine/Cosine-2325

Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2151
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156-2157
Belmont Instrument Corp., Billerica, MA 01821, 508-663-0212 ..... D•2176
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2191-2192
Energy, Ltd., Bladensburg, MD 20710, 301-699-1144 ..... D•2194
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758
HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1785
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186
† Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Astrosystems, Lake Success, NY 11042 516-328-1600
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
EWC, Inc., Englishtown, NJ 07726 908-446-3110
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
§ North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Performance Controls, Inc., Horsham, PA 19044 215-675-6500
Polyphase Instrument, Ft. Washington, PA 19034 215-643-6950
Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001

Converters, DC to Synchro-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151
Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152
Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 . D•2240
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1176
Astrosystems, Lake Success, NY 11042 516-328-1600
Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Converters, Digital to Analog-2325

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145,1147-1148
§† Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637-1639
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159-1160
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 ..... D•1170,1173
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 .... A•1731
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Action Instruments, San Diego, CA 92123 619-279-5726
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
† Addacon Greensboro, Greensboro, NC 27407 919-852-6200
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
§† Advanced Linear Devices, Inc., Sunnyvale, CA 94086-4606 408-720-8737
Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Peabody, MA 01960 508-977-3000
Avasem Corporation, San Jose, CA 95126 408-297-1201
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Basicon, Inc., Portland, OR 97229 503-626-1012
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
CGRS Microtech, Langhorne, PA 19047 215-757-0284
Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Covid, Inc., Tempe, AZ 85281 602-966-2221
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
§ Datricon, Scientific Technologies, Inc., Hayward, CA 94544 415-471-9717
DGH Corporation, Manchester, NH 03108 603-622-0452
Digital Equip., Marlborough, MA 01752
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
Ei North America, New York, NY 10021 212-517-5622
§ Fujitsu Microelectronics Inc., Integrated Circuits Division, San Jose, CA 95134 408-922-9000
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† GEC-Marconi Electronic Systems Corp., Wayne, NJ 07474-0975 201-633-6000
§ Gunther, W., GmbH, D 8500 Nurnberg 82, GERMANY ..... (0)911/65521 or 65520
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Hycomp, Inc., Marlborough, MA 01752 508-485-6300
§ Inmos Corp., Colorado Springs, CO 80935 ..... 719-630-4000 (ext 4357)
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§† Integrated Device Technology, Inc., Santa Clara, CA 95054-3090 408-727-6116
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
KineticSystems, Lockport, IL 60441 815-838-0005
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Marconi Circuit Technology Corp., Farmingdale, NY 11735 516-293-8636
Matrix Corp., Raleigh, NC 27610 919-231-8000
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
§† Micro Power Sys. Inc., Santa Clara, CA 95056 408-727-5350
§† Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ Optrex/Satori, Torrance, CA 90503 213-214-1791
Parsytec Inc., West Chicago, IL 60185 708-293-9500
† Perkin-Elmer Corp., Elctrn. Prods. Dept., Norwalk, CT 06859-0132 203-762-4786
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
Quatech Inc., Akron, OH 44311 216-434-3154
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§† Signal Processing Technologies, Colorado Springs, CO 80906 719-540-3900
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
§ Sony Component Products Co, Semiconductor Division, Cypress, CA 90630 714-229-4197
Sorensen Company, Chicago, IL 60630 ..... 312-775-0843;1-800-525-2024
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† TRW LSI Products INC., La Jolla, CA 92038 619-457-1000
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Converters, Digital to Paper Tape-2000

Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301
§ Dataprobe, Englewood, NJ 07631 201-569-6464

Converters, Digital to Resolver-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151
† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1153, 1156
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1176
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196,1199
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Astrosystems, Lake Success, NY 11042 516-328-1600
Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Converters, Digital to Synchro-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1153, 1156
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196,1199
† Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1031
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Astrosystems, Lake Success, NY 11042 516-328-1600
Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
KineticSystems, Lockport, IL 60441 815-838-0005
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Converters, Frequency to Frequency-1900

† Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2151
Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156-2157,2159
† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2160,2162
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2174-2175
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1160
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2192
† Georator Corp., Manassas, VA 22110-0070, 800-523-9938 ..... D•2195-2198
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204,2206-2207
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208-2209
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
† Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
§ ATV Research, Inc., Dakota City, NE 68731 402-987-3771
Avasem Corporation, San Jose, CA 95126 408-297-1201
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
§ Clary Corp., Precision Instrs. Div., San Gabriel, CA 91776 818-287-6111
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
† Comtech Microwave Corp., Comtech Corp., Hauppauge, NY 11788 516-435-4646
§ Falcon Electric, San Gabriel, CA 91776 818-287-6116

† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
† International Power Machines, Garland, TX 75042 800-527-1208
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Locus, Inc., State College, PA 16804 814-466-6275
† Locus, Kaman, State College, PA 16804 814-466-6275
M/A-COM Government Products, Inc., Hunt Valley, MD 21030 301-771-0077
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Magnum Microwave Corp., Fremont, CA 94538 415-657-9898
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
§† Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
Precision Filters, Ithaca, NY 14850 607-277-3550
Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
RGB Spectrum, Berkeley, CA 94710 415-848-0180
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Unitron Inc., Dallas, TX 75238 214-340-8600
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Converters, Frequency to Voltage-2325

† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2160,2162
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159
† Dymec Inc., Winchester, MA 01890, 617-729-7870 ..... D•1241
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
§ Action Instruments, San Diego, CA 92123 619-279-5726
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
Anadex Inc., Camarillo, CA 93012 805-987-9660
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
Brooks Instrument Div., Emerson Elec. Co., Hatfield, PA 19440 215-362-3500
§ Clary Corp., Precision Instrs. Div., San Gabriel, CA 91776 818-287-6111
§ Custom Micro Systems, Inc., Livonia, MI 48151 313-559-5397
Dixson, Inc., Grand Junction, CO 81503 303-244-1241
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§ Falcon Electric, San Gabriel, CA 91776 818-287-6116
§ Fujitsu Microelectronics Inc., Integrated Circuits Division, San Jose, CA 95134 408-922-9000
GENERAL POWER CORPORATION, Anaheim, CA 92815 714-956-9321
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
† Unitron Inc., Dallas, TX 75238 214-340-8600
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Converters, Frequency, Logarithmic-4050

AEL Defense Corp., Lansdale, PA 19446 215-822-2929

Converters, Frequency Shift Keying-1900

† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
Dantel, Fresno, CA 93727 209-292-1111
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† Electrocom Industries, S. Bend, IN 46615 219-232-2743
Frequency Control Products, Inc., American Time Products Div., Deer Pk, NY 11729 516-243-5730

Converters, Frequency to DC-Also See Power Supplies, AC Input, DC Output-4000

† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1596-1597
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637-1639
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1702
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
† PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Action Instruments, San Diego, CA 92123 619-279-5726
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
† American Electronics, Fullerton, CA 92631 714-871-3020
American Monarch, Minneapolis, MN 55421 612-788-9161
Anadex Inc., Camarillo, CA 93012 805-987-9660
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Brooks Instrument Div., Emerson Elec. Co., Hatfield, PA 19440 215-362-3500
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
Dymec Inc., Winchester, MA 01890 617-729-7870
† EG & G Flow Technology, Inc., Phoenix, AZ 85072 602-437-1315
† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
EWC, Inc., Englishtown, NJ 07726 908-446-3110
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† Modular Devices, Shirley, NY 11967 516-345-3100
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Polytron Devices, Inc., Paterson, NJ 07544 201-345-5885
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL

Converters, Graphic to Digital-2000

Audre, Inc., San Diego, CA 92127 619-451-2260
Princeton Electronic Products, North Brunswick, NJ 08902 908-297-4448
§ Summagraphics Corp., Seymour, CT 06483 203-881-5400

Converters, Multiplying, Analog to Digital & Digital to Analog-2325

† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1177
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
† Dymec Inc., Winchester, MA 01890 617-729-7870
§† Micro Power Sys. Inc., Santa Clara, CA 95056 408-727-5350
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
Teledyne Components, Mountain View, CA 94039-7267 415-968-9241

Converters, Paper Tape to Magnetic Tape-2000

§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241

Converters, Phase-4050

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
Antex Electronics Corp., Gardena, CA 90248 213-532-3092
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
† Magnum Microwave Corp., Fremont, CA 94538 415-657-9898
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Phase Control Electronics, Glendale, NY 11385 718-441-4278
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Converters, Polar to Rectangular Coordinates-2325

Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
§ Vidco, Inc., Beaverton, OR 97005 503-641-1804

Converters, Power Frequency, Electronic-4050

† Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2151
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156,2159
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2160-2162

§ **Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168, 2173-2175**
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
§ **Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2192**
Enegren Electronics, Inc., Olathe, KS 66062, 913-782-4720 ..... A•2210
Energy, Ltd., Bladensburg, MD 20710, 301-699-1144 ..... D•2194
§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204,2206-2207**
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208-2209
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
† **Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215**
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... D•2222
Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
D & B Power, Inc., Bayshore, NY 11706 516-586-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† EG & G Rotron, Custom Div., Woodstock, NY 12498 914-679-5201
Electro-Pacific, Goleta, CA 93117 805-964-0751
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
EWC, Inc., Englishtown, NJ 07726 908-446-3110
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† Modular Devices, Shirley, NY 11967 516-345-3100
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
§ North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§† Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
† Unitron Inc., Dallas, TX 75238 214-340-8600
Voltex, Amityville, NY 11701 516-842-2772

Converters, Power Frequency, Rotary-4050

† **Gerator Corp., Manassas, VA 22110-0070, 800-523-9938 .... D•2195,2197-2198**
† American Electronics, Fullerton, CA 92631 714-871-3020
§† Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
§ Carter Motor, Warren, IL 61087-0647 815-745-2100
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
EPE Technologies, Inc., Subsidiary of Merlin Gerin, Costa Mesa, CA 92626 714-557-1636
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040

Converters, Pressure to DC, Pressure to Frequency — See Transducers, Pressure (Vol. B)

Converters, Rectangular to Polar-2325

† **Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151**
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196**

Converters, Resolver to Digital-2325

† **Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151**
† **Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1155**
† **ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1176**
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182**
† **Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 ..... D•1186-1187**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196,1199**
† **Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1031**
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Astrosystems, Lake Success, NY 11042 516-328-1600
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Princeton Electronic Products, North Brunswick, NJ 08902 908-297-4448
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Converters, Rotary — See Motor Generator Sets (Vol. D)

Converters, RS-232/RS-485-2325

Electronic Controls Design, Milwaukie, OR 97222, 503-659-6100 ..... D•1169
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† Dova Controls, Redmond, WA 98052-5165 206-881-7414
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
§† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700

Converters, Serial to Parallel/Parallel to Serial-2325

Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1059-1064
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§ **National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124**
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
CableStar, Incorporated, Glasgow, KY 42141 800-338-8223
§ Greenwich Instruments USA, Charlotte, NC 28205 704-376-1021
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
Intelligent Interfaces, Inc., Stone Mountain, GA 30086 ... 404-381-9891;1-800-842-0888
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
PERX,Inc., Corte Madera, CA 94925 415-927-0155
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Verdure Industries Inc., Omaha, NE 68124 402-691-8300

Converters, Synchro to Digital-2325

† **Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151**
† **Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1155**
† **ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177**
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182**
† **Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1186**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196,1199**
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Astrosystems, Lake Success, NY 11042 516-328-1600
Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
KineticSystems, Lockport, IL 60441 815-838-0005
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
† Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
§ Ragen Data Systems. Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Converters, Synchro to Linear DC-2325

† **Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151**
† **Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1153, 1157**
† **Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240**
† **ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1176**
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196**
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Climatronics, Bohemia, NY 11716 516-567-7300
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100

Converters, Synchro to Sine/Cosine-2325

† **Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1151**
† **Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1153, 1157**
† **ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1176**
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196**
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595

† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
† Vernitech:Vernitron Corp., Deer Pk, NY 11729 516-586-5100

Converters, Telemetry-1900

Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Converters, Thermal-5300 — *See Vol. B*

Converters, UHF to VHF-1900

Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1369
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
A E G Corporation, Telefunken Semiconductors Div., Somerville, NJ 08876-1269 201-231-8300
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
† Ferretec Inc., Fremont, CA 94539-7474 415-226-1216
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† Magnum Microwave Corp., Fremont, CA 94538 415-657-9898
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291

Converters, VLF to HF-1900

Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
LF Engineering Company Inc., East Haven, CT 06512 203-467-3590
† Magnum Microwave Corp., Fremont, CA 94538 415-657-9898
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Palomar Engineers, Escondido, CA 92033 619-747-3343
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291

Converters, Voltage to Frequency-2325

§† Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637-1639
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2192
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
Anadex Inc., Camarillo, CA 93012 805-987-9660
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Autronics Corp., Arcadia, CA 91006 818-445-5470
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
† Dymec Inc., Winchester, MA 01890 617-729-7870
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
Endicott Research Group, Endicott, NY 13760 607-754-9187
§ Exar Corp., San Jose, CA 95161-9007 408-732-7970
Frequency Control Products, Inc., American Time Products Div., Deer Pk, NY 11729 516-243-5730
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
KineticSystems, Lockport, IL 60441 815-838-0005
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† Raytheon Semiconductor, Mountain View, CA 94043 415-966-7639
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Unitron Inc., Dallas, TX 75238 214-340-8600
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

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Converters (MIL), Frequency-2440 — *See Vol. B*

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Cords, Retractile-6000 — *See Vol. C*

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Cores, Magnetic, Powdered Iron, Slug-1850 — *See Vol. A*

Cores, Magnetic, Powdered Iron, Toroid-1850 — *See Vol. A*

Cores, Magnetic, Powdered Permalloy, Toroid-1850 — *See Vol. A*

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Counter/Timers-2900

Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... D•1128
§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
Dymec Inc., Winchester, MA 01890, 617-729-7870 ..... D•1241
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345-1347
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1505
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 .. B•1906
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1380
Acculex Corporation, Taunton, MA 02780 508-880-3660
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
Anadex Inc., Camarillo, CA 93012 805-987-9660
§ Aromat Corp., Matsushita Electrical Works Ltd., New Providence, NJ 07974 908-464-3550

§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
§ Banner Engineering Corp., Minneapolis, MN 55441 612-544-3164
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
† Digitec, Marion, OH 43302 614-387-3444
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electric Switches, Inc., Los Angeles, CA 90039 213-660-1310
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
ENM Company, Chicago, IL 60646 312-775-8400
§ ESE, El Segundo, CA 90245 213-322-2136
§ Extech Instruments Corp., Waltham, MA 02154 617-890-7440
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 201-825-9696
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Holt Inc., Irvine, CA 92718 714-859-8800
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
KineticSystems, Lockport, IL 60441 815-838-0005
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Martel Electronics, Salem, NH 03079 603-893-0886
Matrix Corp., Raleigh, NC 27610 919-231-8000
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
§ Pass & Seymour/Legrand, Pass & Seymour/Inc., Syracuse, NY 13221 315-468-6211
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001 812-386-1000
PPM, Inc., Cleveland, OH 44139 216-349-2300
Prema Precision Electronics, Inc., Montclair, CA 91763 714-621-7292
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Redington Counters, Windsor, CT 06095 203-688-6205
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Spectrum Corp., Houston, TX 77075 ..... 713-944-6200;1-800-392-5050(Sls)
§ Square D Co., Palatine, IL 60067 708-397-2600
§† Statek Corp., Orange, CA 92668 714-639-7810
§† Stemco Instruments, Colt Industries, Longview, TX 75607 214-643-3236
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Verdure Industries Inc., Omaha, NE 68124 402-691-8300
§ VGI, Inc., Vikay Industrial Pte. Ltd., Roseville, CA 95661 916-783-7878
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440

Counters, Bidirectional-2200

Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... D•1128
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1151
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 .. B•1906
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
† Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
† Atec, Inc., Houston, TX 77055 713-468-7971
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Chrono-log Corp., Havertown, PA 19083 215-853-1130
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ ESE, El Segundo, CA 90245 213-322-2136
† FOX METER INC., Elburn, IL 60119 708-365-2422
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
Interswitch, Wm. J. Purdy Co., Burlingame, CA 94010 415-347-8217
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
KineticSystems, Lockport, IL 60441 815-838-0005
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
PPM, Inc., Cleveland, OH 44139 216-349-2300
§ Redington Counters, Windsor, CT 06095 203-688-6205
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Secma, Inc., Secme, Irvine, CA 92714 714-261-0610
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
§ VGI, Inc., Vikay Industrial Pte. Ltd., Roseville, CA 95661 916-783-7878
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440
§† Wide Range Elctrns. Corp., Chesterfield, MISSOURI 63005 314-532-5887

Counters, Coil Winding-2200

§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 .. B•1906
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
Coil Winding Equipment Co., Oyster Bay, NY 11771 516-922-5660
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Redington Counters, Windsor, CT 06095 203-688-6205
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Counters, Decade-2200

Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
Babcock Display Products, Inc., A Subsidiary of Babcock, Inc., Anaheim, CA 92805 714-491-5100
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Centent Co., Santa Ana, CA 92707 714-979-6491
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ ESE, El Segundo, CA 90245 213-322-2136
† FOX METER INC., Elburn, IL 60119 708-365-2422
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Counters, Directional-2200

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906
Anadex Inc., Camarillo, CA 93012 805-987-9660
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Dynapar, Gurnee, IL 60031 312-662-2666

§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ ESE, El Segundo, CA 90245 213-322-2136
† FOX METER INC., Elburn, IL 60119 708-365-2422
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Secma, Inc., Secme, Irvine, CA 92714 714-261-0610
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Verdure Industries Inc., Omaha, NE 68124 402-691-8300
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440

Counters, Electromagnetic-2200

Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... B•1875, D•1128
§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
Electric Tachometer, Philadelphia, PA 19142 215-726-7723
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
§ Redington Counters, Windsor, CT 06095 203-688-6205
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Counters, Event-2200

Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... B•1875, D•1128
§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1224
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
EDI, Wood Dale, IL 60191, 708-860-5838 ..... B•1065
† Electrodynamics, Inc., A Talley Inds. Co., Rolling Meadows, IL 60008, 708-259-0740 ..... D•1134
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
† Oxley Inc., Branford, CT 06405, 203-488-1033 ..... B•1179
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1380
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
† Atec, Inc., Houston, TX 77055 713-468-7971
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Chrono-log Corp., Havertown, PA 19083 215-853-1130
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
† Digitec, Marion, OH 43302 614-387-3444
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ Dynapar, Gurnee, IL 60031 312-662-2666
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† **FOX METER INC., Elburn, IL 60119, 708-365-2422** ..... **D•1347**
§ **IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489** ..... **B•1723,1906-1907**
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
† Atec, Inc., Houston, TX 77055 713-468-7971
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
ENM Company, Chicago, IL 60646 312-775-8400
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
Jan Hardware Mfg. Co., Melville, NY 11747 718-361-0800
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Redington Counters, Windsor, CT 06095 203-688-6205
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 415-471-9717
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440

Counters, Universal-2900

§ **Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245** ..... **D•1129**
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. **B•1058-1064**
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... **D•1275**
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
Ballco Inc., Sneltville, GA 30278-1078 404-979-5900
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† FOX METER INC., Elburn, IL 60119 708-365-2422
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Verdure Industries Inc., Omaha, NE 68124 402-691-8300

Couplers, Acoustic-1900

§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
Digital Equip., Marlborough, MA 01752
§ Novatek Corporation, Coral Springs, FL 33065 305-341-7700
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
Soundcoat Co., Inc., Deer Park, NY 11729-5701 516-242-2200
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

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Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... **D•1022-1023**
North Hills Electronics, Glen Cove, NY 11542, 516-671-5700 ..... **A•2310,2312**
† **Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700** ..... **A•1827, D•1077**
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
Antenna Research Associates, Beltsville, MD 20705 301-937-8888
C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
† Daico Industries, Inc., Compton, CA 90220 213-631-1143
† Dielectric Communications, General Signal, Raymond, ME 04071 ..... 207-655-4555; 800-341-9678
Dowty Avionics, Arcadia, CA 91006 818-445-5955
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
Gabriel Electronics, Scarborough, ME 04074 207-883-5161
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Lance Industries, Sylmar, CA 91342-3832 818-367-1811
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
§† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† Maury Microwave Corp., Cucamonga, CA 91730 714-987-4715
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
† Microlab/FXR, Livingston, NJ 07039 201-992-7700
† Microphase, Norwalk, CT 06856 203-866-8000
Microwave Development Laboratories, Natick, MA 01760 508-655-0060
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† P.G. Electronics Ltd., Weston, Ont., CANADA M9M2Z8 416-741-7682
† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
Unadilla Antenna Mfg. Co., Andover, MA 01810 508-475-7831

Couplers, Communications, Acoustic, Telephone-1900

§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§† Keptel/Armiger, Tinton Falls, NJ 07724 ..... 800-526-3697;201-389-8800
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Telco Intercontinental, Houston, TX 77095 713-855-2218

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Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... **D•1126**
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803, 516-694-6700 ..... **A•1720**
† **American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100** ..... **B•1876-1877**
† **Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900** ..... **D•1130,1228**
Best Technology Inc., Seattle, WA 98109, 206-382-1300 ..... **B•1833**
† **Bicron Electronics, Canaan, CT 06018, 203-824-5125** ..... **B•1883**
Coilcraft, Cary, IL 60013, 708-639-2361 ..... **A•1187**
§ **CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518** ..... **A•2194**
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647, 402-563-6506 ..... **A•1907**
Flex-Core Div., Morlan & Assocs., Inc., Worthington, OH 43235, 614-889-6152 ..... **A•2228**
Isotek Corporation, Swansea, MA 02777, 508-673-2900 ..... **A•1925-1927**
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... **B•1912-1913, D•1289**
† **Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561** .. **B•1925-1933,1937**
† **Pearson Electronics, Inc., Palo Alto, CA 94303, 415-494-6444** ..... **A•2332**
§† **Vitec Electronics Corp., Visalia, CA 93291, 209-651-1535** ..... **A•2463**
§ **World Products Inc., Sonoma, CA 95476, 707-996-5201** ..... **A•2128-2129**
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§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§ Altech Corp., Somerville, NJ 08876 908-707-8484
† Automatic Coil Corp., A DSG Company, Miami, FL 33147 305-696-6660
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Cross Electronics, Warrendale, PA 15086 412-776-1591
Dale Electronics, Inc., El Paso Div., El Paso, TX 79926-6728 915-592-3253
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
Electric Device, Canfield, OH 44406 216-533-1111
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
† Electro National Corp., Canton, MS 39046 601-859-5511
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
GC International Inc., Richardson, TX 75085-1198 214-234-3240
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
Highland Technology, Inc., San Francisco, CA 94122 415-753-5814
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 708-543-6200
Ion Physics Co., Atkinson, NH 03811 603-893-6687
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
† KRL/Bantry Components, Inc., Manchester, NH 03103 603-668-3210
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
MetriCor, Inc., Woodinville, WA 98072 206-483-5577
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
Omega Engineering, Stamford, CT 06907 800-826-6342
Phase Control Electronics, Glendale, NY 11385 718-441-4278
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001 812-386-1000
§† RCD Components, Inc., Manchester, NH 03109 603-669-0054
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
† Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831 ..... 415-471-9717;800-221-7060
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Sprague Fil-Mag, San Diego, CA 92111-1416 619-569-6577
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instruments, Connector System, Attleboro, MA 02703 ..... 508-699-5269; 508-699-3450
Texas Instrs., Matls. & Controls Grp., Attleboro, MA 02703 508-699-3800
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
† Toroid Corp. of Maryland, Salisbury, MD 21801 301-860-0300
† Torwico Elctrns. Inc., Lakewood, NJ 08701 908-364-1800
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Vishay Resistive Systems, Malvern, PA 19355 215-644-1300
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668
† Wirebenders, Inc., Phoenix, AZ 85021-2824 602-861-1856

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§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700** ..... **D•2205,2207**
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§ **Kepco, Inc., Flushing, NY 11352, 718-461-7000** ..... **D•1837-1839**
§ **Power Designs, Inc., Westbury, NY 11590, 516-333-6200** ..... **D•1986**
† **Vaihalla Scientific, San Diego, CA 92121, 619-457-5576** ..... **D•1332-1333**
§ Action Instruments, San Diego, CA 92123 619-279-5726
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Analog Systems, Tucson, AZ 85731-7389 602-290-1818
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
§ Contact East, N. Andover, MA 01845 508-682-2000
† Electronic Development Corp., EDC, Boston, MA 02127-4198 617-268-9696
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Omega Engineering, Stamford, CT 06907 800-826-6342
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
§ TransKinetic Sys., Canton, MA 02021 617-828-3000
§ Voltex, Amityville, NY 11701 516-842-2772

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Dampers, Servo-4900

† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
Soundcoat Co., Inc., Deer Park, NY 11729-5701 516-242-2200
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100

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B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... **D•1081**
† **Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000** ..... **D•1158-1159**

† **Hopper Electronics, Phoenix, AZ 85021, 602-870-3093** ..... **D•1175**
† **ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600** ..... **D•1177**
§ **Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179** ..... **D•1179**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600** ..... **D•1182**
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... **D•1275,1277**
§ **Keithley MetraByte, Taunton, MA 02780, 508-880-3000** ..... **D•1184**
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§ **National Instruments Corp., Austin, TX 78730-5039, 512-794-0100** .. **D•1124,1189**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **C•1799, D•1101,1191,1422**
† **PPM, Inc., Cleveland, OH 44139, 216-349-2300** ..... **D•1311**
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... **A•1706-1707, D•1015,1192-1193**
† **TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411** ..... **D•1078,1194-1195**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100** ..... **D•1196,1199**
§ **Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385** .. **D•1425**
§ **Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020** ..... **D•1119**
Acromag Inc., Wixom, MI 48393-7037 313-624-1541
§ Acrosystems Corp., Beverly, MA 01915 508-927-8880
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Acurex Corp./Autodata Div., Mountain View, CA 94039 415-967-9100
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
# Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Peabody, MA 01960 508-977-3000
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Astro Dynamics, Inc., Woburn, MA 01801 617-935-4944
Astrosystems, Lake Success, NY 11042 516-328-1600
Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Bascom-Turner Instruments, Norwood, MA 02062 617-769-9660
Basicon, Inc., Portland, OR 97229 503-626-1012
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
Biomation Instruments, Almonte K0A1A0 613-256-2821
§† Braemar Corp., Burnsville, MN 55337 612-890-5135
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
CGRS Microtech, Langhorne, PA 19047 215-757-0284
§ Chessell Corp., Newtown, PA 18940 215-968-0660
† Climatronics, Bohemia, NY 11716 516-567-7300
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§† Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
§ Contec Microelectronics USA, San Jose, CA 95131 408-436-0340
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Creare Inc., Hanover, NH 03755 603-643-3800
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
§ Dancer Communications, Inc., Media, PA 19064-2334 215-543-8066
† Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Dataq Instruments, Inc., Akron, OH 44311 ..... 216-434-4284 ; 800-553-9006
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
DEPAC Corp., Rome, NY 13440 315-339-1265
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
† Digitec, Marion, OH 43302 614-387-3444
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
DSP Technology, Fremont, CA 94538-7338 415-657-7555
duTec, Inc., Jackson, MI 49204-0964 800-248-1632
Dymec Inc., Winchester, MA 01890 617-729-7870
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Associates, Inc., W. Long Branch, NJ 07764 201-229-1100
§ Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
Eltek Corporation, Hagerstown, IN 47346 317-489-6121
Environmental Telesis & Controls, Austin, TX 78718 512-835-0330
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
John Fluke Mfg. Co., Inc., Everett, WA 98206, WA 98203 206-347-6100
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Gordos, A Flint Industries Company, Rogers, AR 72756 501-636-5000
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
HDS Inc., Reston, VA 22091 703-620-6200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Howell Instruments, Ft. Worth, TX 76107 817-336-7411
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
§ Interactive Circuits Systems Ltd., Gloucester,Ont., CANADA K1J 9G2 ..... 613-749-9241; 1-800-267-9794
§ International Data Aquistion & Control, Inc., Amherst, NH 03031 603-673-0765
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
§ JMR Electronics, Bronx, NY 10461 212-597-6050
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
KineticSystems, Lockport, IL 60441 815-838-0005
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
Lambert Engineering Inc., Bend, OR 97701 503-388-2623
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Librascope Corp., Glendale, CA 91201 818-244-6541
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100 ..... 800-336-5917;703-953-4751
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
Loral Data Systems, Sarasota, FL 34230 813-371-0811
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
§ Macrodyne Inc., Clifton Pk., NY 12065 518-383-3800
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Measurements Group, Inc., Raleigh, NC 27611 919-365-3800
Meissner Industries, Dover, NJ 07801 201-366-1700
§ Metra Instruments, Inc., San Jose, CA 95131 408-432-1110
† Metraplex Corp., Frederick, MD 21701 301-662-8000
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
§ Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
Microstar Laboratories, Redmond, WA 98052 206-881-4286
Microvision Corp., Campbell, CA 95008 408-374-3158
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
§ Neff Instr., Monrovia, CA 91016 818-357-2281
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Octagon Systems, Westminster, CO 80030 303-430-1500
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
Pressure Systems, Inc., Hampton, VA 23666 804-865-1243
§ Pulse Instruments Co., Torrance, CA 90502 213-515-5330
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Schlumberger Instruments, Schlumberger Technlgs., Billerica, MA 01821 ..... 508-671-9700;1-800-225-5765
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
SCOPE Incorporated, Reston, VA 22090 703-471-5600
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
Signatec, Inc., Corona, CA 91720 714-734-3001
Signum, Inc., Woburn, MA 01801 617-933-4780
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Stoelting Co., Wood Dale, IL 60191 708-860-9700
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
§ Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
Systems Data, Inc., Akron, OH 44321 216-666-0085
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
TCA, Montebello, CA 90640 213-726-0303
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311

Data Collection Equipment, Hand Held-2000

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1013,1422**
† **Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202** ..... **D•1423**
Accu Data, Inc., Springville, UT 84663-0963 801-377-9156
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241

Applied Statistics Inc., St. Paul, MN 55117 612-481-0202
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Control Microsystems Inc., St. Laurent, QC, CANADA H4R 9Z7 514-745-1270
Control Module, Enfield, CT 06082 203-745-2433
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Epson America, Inc./OEM Div., Torrance, CA 90503 213-534-4500
Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
† Hand Held Products, Inc., Charlotte, NC 28226 704-541-1380
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Kelmet, Inc., San Dimas, CA 91773 714-599-0954
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
PPM, Inc., Cleveland, OH 44139 216-349-2300
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
Two Technologies,Inc., Horsham, PA 19044 215-441-5305
§ Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
Voice Connexion, Irvine, CA 92714 714-261-2366
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945

Data Collection Equipment, Modular-2000

American Control Technology, Inc., West Dundee, IL 60118-2100, 708-426-6780 ..... B•1645
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145-1148
Frequency Devices, Inc., Haverhill, MA 01832, 508-374-0761 ..... A•1674
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013,1422
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... D•1310
§ Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
Accu Data, Inc., Springville, UT 84663-0963 801-377-9156
Acromag Inc., Wixom, MI 48393-7037 313-624-1541
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Acurex Corp./Autodata Div., Mountain View, CA 94039 415-967-9100
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Analogic Corp., Peabody, MA 01960 508-977-3000
Applied Statistics Inc., St. Paul, MN 55117 612-481-0202
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
California Automation Inc., San Diego, CA 92121 619-452-1341
Cinch Connector Division, Labinal Components & Systems Inc., Elk Grove Village, IL 60007 312-981-6000
† Climatronics, Bohemia, NY 11716 516-567-7300
Comark Corp., Medfield, MA 02052 508-359-8161
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
Control Module, Enfield, CT 06082 203-745-2433
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Davidge Corporation, Buellton, CA 93427 805-688-9598
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
Environmental Telesis & Controls, Austin, TX 78718 512-835-0330
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100 ..... 800-336-5917;703-953-4751
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Measurements Group, Inc., Raleigh, NC 27611 919-365-3800
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
NAVAN Corporation, Media, PA 19063 215-543-8066
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
§ Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
§ Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
§ Visionary Electronics, San Francisco, CA 94118 415-751-8811
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945

Data Collection Equipment, Portable-2000

American Control Technology, Inc., West Dundee, IL 60118-2100, 708-426-6780 ..... B•1645
B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013,1422
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... D•1310
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
† Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
§ ACR Systems Inc., Surrey,B.C., CANADA V3W 4N8 604-591-1128
§ Acurex Corp./Autodata Div., Mountain View, CA 94039 415-967-9100
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Applied Statistics Inc., St. Paul, MN 55117 612-481-0202
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Climatronics, Bohemia, NY 11716 516-567-7300
Controlex, Inc., New Boston, NH 03070 603-487-5512
Control Module, Enfield, CT 06082 203-745-2433
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
DSP Technology, Fremont, CA 94538-7338 415-657-7555
† Hand Held Products, Inc., Charlotte, NC 28226 704-541-1380
† Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Kelmet, Inc., San Dimas, CA 91773 714-599-0954
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
Measurements Group, Inc., Raleigh, NC 27611 919-365-3800
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
TCA, Montebello, CA 90640 213-726-0303
§ Terra Technlg. Corp., Redmond, WA 98052 206-883-7300
Two Technologies,Inc., Horsham, PA 19044 215-441-5305
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
§ Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
† Warren-Knight Instrument Co., Warren Industries, Inc., Philadelphia, PA 19116 215-464-9300
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Data Compressors, Digital-2000

Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Avasem Corporation, San Jose, CA 95126 408-297-1201
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Loral Data Systems, Sarasota, FL 34230 813-371-0811
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911

Data Display Indicators — See Displays Indicator Lights (Vol. B)

Data Display Systems — See Displays, CRT (Vol. A), Terminals, Data Display (Vol. D)

Data Links, Fiber Optic-2475 — *See Vol. B*

Data Links, Freespace Communications-2475 — *See Vol. B*

Data Links, Optical-2000

AMP, Harrisburg, PA 17105, 717-564-0100;800-522-6752 ..... C•1175
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
Aborn Electronics Inc., San Jose, CA 95131 408-436-5444
§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
BT & D Technologies, Wilmington, DE 19803 302-479-0300
§† Codenoll Technology Corp., Yonkers, NY 10701 914-965-6300
Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301

† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ KEL Connectors, Inc., KEL Corp., Sunnyvale, CA 94086 408-720-9044
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Optelecom, Inc., Gaithersburg, MD 20877 301-840-2121
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Data Loggers-2325

American Control Technology, Inc., West Dundee, IL 60118-2100, 708-426-6780 ..... B•1645
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145
Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1417
B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
§ **Electronic Controls Design, Milwaukie, OR 97222, 503-659-6100 ..... D•1169**
§ **Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184**
† **Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1191,1307, 1422
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... D•1310
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
† **Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423**
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... D•1112-1115
§ **Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116**
§ Acrosystems Corp., Beverly, MA 01915 508-927-8880
§ ACR Systems Inc., Surrey,B.C., CANADA V3W 4N8 604-591-1128
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
AFE Displays Inc., Charlottesville, VA 22901 804-974-7801
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Analogic Corp., Peabody, MA 01960 508-977-3000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§† Braemar Corp., Burnsville, MN 55337 612-890-5135
BT & D Technologies, Wilmington, DE 19803 302-479-0300
California Automation Inc., San Diego, CA 92121 619-452-1341
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Climatronics, Bohemia, NY 11716 516-567-7300
Computer Devices, Nutting Lake, MA 01865 508-663-4980
Controlex, Inc., New Boston, NH 03070 603-487-5512
CTSI International Inc., Commack, NY 11725-5703 516-864-5260
§ Dancer Communications, Inc., Media, PA 19064-2334 215-543-8066
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Dataq Instruments, Inc., Akron, OH 44311 ..... 216-434-4284 ; 800-553-9006
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
† Digitec, Marion, OH 43302 614-387-3444
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Elcon Instruments, Inc., Annapolis, MD 21401 301-280-6686
Environmental Telesis & Controls, Austin, TX 78718 512-835-0330
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
Kelmet, Inc., San Dimas, CA 91773 714-599-0954
KineticSystems, Lockport, IL 60441 815-838-0005
Lambert Engineering Inc., Bend, OR 97701 503-388-2623
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
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§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Detectors, Light Intensity — See Meters, Light, Nonphotographic (Vol. D)

Detectors, Magnetic — See Meters, Gauss (Vol. D)

Detectors, Metal, Handheld-4100

Allen Technology, Sutton, NE 68979 402-773-5285
† Infinetics Inc., Friskem Div., Wilmington, DE 19802 302-658-2471

Detectors, Metal, Walk Through-4100

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Infinetics Inc., Friskem Div., Wilmington, DE 19802 302-658-2471

Detectors, Microwave-3450 — *See Vol. A*

Detectors, Null — See Indicators, Null (Vol. D)

Detectors, Phase Sensitive-2900

† **Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753**
Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
§ A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
§ Antex Electronics Corp., Gardena, CA 90248 213-532-3092
Autronics Corp., Arcadia, CA 91006 818-445-5470
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Evans Electronics, Berkeley, CA 94705 415-653-3083
§ FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 408-732-0880
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
§ Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
Phase Control Electronics, Glendale, NY 11385 718-441-4278
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831 ..... 415-471-9717;800-221-7060
Silicon Sensors, Dodgeville, WI 53533 608-935-2707
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220

Transmagnetics, Farmingdale, NY 11735 516-293-3100
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759

Detectors, Photovoltaic — See Cells, Photovoltaic (Vol. B)

Detectors, RF-2900

Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
Mini-Circuits Lab, Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† Alan Industries Inc., Columbus, IN 47202 812-372-8869
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
EG&G Optoelectronics, EG&G Canada Ltd., Vaudreuil, Quebec, CANADA J7V 8P7 514-424-3300
† Elcom Systems, Inc., Boca Raton, FL 33487 407-994-1774
† EMC Technology Inc, Cherry Hill, NJ 08034 609-429-7800
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
Hyletronics:Litton Industries, Littleton, MA 01460 617-486-8911
† KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
MACOM, Inc., Burlington, MA 01803 617-272-3000
§† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† Metropole Products Inc., Stafford, VA 22554 703-659-2132
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† Pasternack Enterprises, Irvine, CA 92713 714-261-1920
Peca, Inc., Bensalem, PA 19020 215-245-1550
† RLC Electronics, Inc., Mt. Kisco, NY 10549 914-241-1334
Rodann Electronics Mfg. Co., Brea, CA 92621 ..... 714-529-1301;800-366-7010
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Telonic/Berkeley, Berkeley Inds. Inc., Laguna Beach, CA 92652 714-494-9401
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Detectors, Radiation-2900

† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 .... D•1251
† AIL Systems, Inc., Eaton Corp., Deer Park, NY 11729 516-595-3094
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
† Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
† Infrared Industries, Inc., Orlando, FL 32826 407-282-7700
Keithley Instrs., Cleveland, OH 44139 800-552-1115
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
† Nuclear Research Corp., Warrington, PA 18976 215-343-5900
Philips Components Discrete Products Division, A North American Philips Company, Riviera Beach, FL 33404 407-881-3200
Philips Components Discrete Products Div., A North American Philips Co., Professional Components Grp, Slatersville, RI 02876 401-762-3800
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638
Whittaker Corp., Electronic Resources Div., Simi Valley, CA 93063 805-584-4100

Detectors, Resistance Temperature (RTDs) — See Thermometers, Resistance (Vol. D)

Detectors, Standing Wave-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Maury Microwave Corp., Cucamonga, CA 91730 714-987-4715
† Microlab/FXR, Livingston, NJ 07039 201-992-7700
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Teleplex, Inc., Alford Division, Woburn, MA 01801 617-935-8610
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070

Detectors, Tone-1900

BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311, 818-341-6161 ..... B•1879
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Frequency Devices, Inc., Haverhill, MA 01832 508-374-0761
NAVAN Corporation, Media, PA 19063 215-543-8066

Detectors, Ultraviolet-2900

† Centronic, Inc., The Morgan Crucible Company, Spec. Matls. & Tech Division, Newbury Park, CA 91320-1702, 805-499-5902 ..... B•1322
§ EG & G Vactec, St. Louis, MO 63132, 314-423-4900 ..... B•1319
† Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
§ American Ultraviolet, Murray Hill, NJ 07974 908-665-2211
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
† EG & G Judson, Montgomeryville, PA 18936 215-368-6900
Eltec Instruments Inc., Daytona Bch., FL 32120 904-253-5328
† Galileo Electro-Optics Corp., Sturbridge, MA 01566 508-347-9191
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
International Light, Newburyport, MA 01950-4092 508-465-5923
† Scientech, Inc., Boulder, CO 80303 ..... 303-444-1361;800-525-0522
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
† Silicon Sensors, Dodgeville, WI 53533 608-935-2707
Silonex Inc., Plattsburgh, NY 12901 518-561-3160
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
Spiricon, Inc., Logan, UT 84321 801-753-3729
Swan Associates, New Haven, CT 06534 203-387-3917
† Texas Optoelectronics, Inc., Garland, TX 75042 214-487-0085
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
§ UVP, Inc., San Gabriel, CA 91778 818-285-3123

Detectors, Vacuum-4100

§ Meriam Instrument, Scott Fetzer, Cleveland, OH 44102 216-281-1100

Detectors, Vibration — See Transducers, Vibration (Vol. B)

Detectors, Video-2900

† Alan Industries Inc., Columbus, IN 47202 812-372-8869
§ CCD Imaging, Fairchild Weston Systems, Inc., Milpitas, CA 95035 408-433-2500
† Colorado Video, Inc., Boulder, CO 80306 303-530-9580
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
† EMC Technology Inc, Cherry Hill, NJ 08034 609-429-7800
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
† Metropole Products Inc., Stafford, VA 22554 703-659-2132
† Microphase, Norwalk, CT 06856 203-866-8000
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Detectors, Voltage-2900

§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
† Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831, 415-471-9717;800-221-7060 ..... B•1578
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... A•2421
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Autronics Corp., Arcadia, CA 91006 818-445-5470
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Mag-Con, St. Paul, MN 55113 612-633-8820
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
§ Optrex/Satori, Torrance, CA 90503 213-214-1791
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
§ Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505 213-517-7770
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
WARREN G-V, GENERAL SIGNAL CORP., WHIPPANY, NJ 07981 201-386-1200
§ Western Electro-Mechanical Co., Inc., Oakland, CA 94607 415-452-1936
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Detectors (MIL), IR-2440 — *See Vol. B*

Detectors (MIL), Radar-2440 — *See Vol. B*

DIACs-4800 — *See Vol. A*

Dials, Instrument, Metal, Plastic, etc.-2400 — *See Vol. C*

Dials, Turns Counting-2400 — *See Vol. C*

Dielectric Heating Equipment-4100

NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056, 708-824-1133 ..... A•1699
Microdry, Inc., Crestwood, KENTUCKY 40014 502-241-8933
Nemeth Engineering Associates, Inc., Crestwood, KY 40014 502-241-1502
§ Phenix Technologies, Accident, MD 21520 301-746-8118
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 312-670-0150

Dielectrics — See Films (Vol. C), Insulation Materials (Vol. C)

Differentials, Mechanical — See Gears & Gear Mechanisms (Vol. B)

Digital Panel Meters — See Meters, Panel (Digital) (Vol. D)

Digital Tape Recorders — See Recorders, Computer Data (Vol. D)

Digitizers, Audio (Sonic)-2000

§ Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ Covox, Inc., Eugene, OR 97402 503-342-1271
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Mimic, Inc., Islington, MA 02090-0705 617-329-9593
Science Accessories Corp., Stratford, CT 06497 203-386-9978

Digitizers, Video-2000

§ Advanced Video Products, Littleton, MA 01460 508-486-0024
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Colorado Video, Inc., Boulder, CO 80306 303-530-9580
Comlinear Corp., Fort Collins, CO 80525 303-226-0500
§ Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301
§ Datacube, Inc., Peabody, MA 01960 508-535-6644
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
§ Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
New Media Graphics Corp., Billerica, MA 01821 508-663-0666
§ Perceptics Corp., Knoxville, TN 37922 615-966-9200
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Third Domain, Inc., Tucson, AZ 85731-7568 602-290-1820
Vista Systems, Inc., Peabody, MA 01960 508-532-1971

Digitizers, Pencil Follower (Incl. Coordinate & Graphic)-2000

§ ALTEK Corporation, Silver Springs, MD 20904-7802 301-572-2555
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
The Graphics Technology Co., Austin, TX 78746 512-328-9284
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Houston Instrument, AMETEK, Inc., Austin, TX 78753 512-835-0900
Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
§ Summagraphics Corp., Seymour, CT 06483 203-881-5400
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Digitizers, Transient & Waveform-2900

Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
DSP Technology, Fremont, CA 94538-7338 415-657-7555
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Keithley Instrs., Cleveland, OH 44139 800-552-1115
KineticSystems, Lockport, IL 60441 815-838-0005
Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Orion Instruments, Inc., Menlo Park, CA 94025 ..... 415-327-8800;800-767-4666
Pacific instruments Inc., Concord, CA 94520 415-827-9010
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Signatec, Inc., Corona, CA 91720 714-734-3001
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ TRW LSI Products INC., La Jolla, CA 92038 619-457-1000

Dimmers, Light — See Controls, Lamp Dimming, Flashing (Vol. D)

Diode Arrays (Incl. Photo)-3700 — *See Vol. B*

Diodes, Avalanche-4800 — *See Vol. A*

Diodes, Backward-4800 — *See Vol. A*

Diodes, Breakdown — See Diodes, Avalanche (Vol. A)

Diodes, Chip, Unpackaged-4800 — *See Vol. A*

Diodes, Electroluminescent (Radiating)-4800 — *See Vol. A*

Diodes, Frequency Multiplier-4800 — *See Vol. A*

Diodes, Germanium-4800 — *See Vol. A*

Diodes, Gunn-4800 — *See Vol. A*

Diodes, High Voltage (1,000 Volts & Over)-4800 — *See Vol. A*

Diodes, Hot Carrier-4800 — *See Vol. A*

Diodes, Impatt-4800 — *See Vol. A*

Diodes, Infrared-4800 — *See Vol. A*

Diodes, Laser-4800 — *See Vol. A*

Diodes, Light Emitting (LEDs)-3700 — *See Vol. B*

Diodes, Limiting-4800 — *See Vol. A*

Diodes, Liquid Crystal (LCDs)-3700 — *See Vol. B*

Diodes, Matched Pairs-4800 — *See Vol. A*

Diodes, Matched Quads-4800 — *See Vol. A*

Diodes, Microwave Detector-4800 — *See Vol. A*

Diodes, Microwave Mixer-4800 — *See Vol. A*

Diodes, Noise-4800 — *See Vol. A*

Diodes, Photoelectric-3700 — *See Vol. B*

Diodes, PIN-4800 — *See Vol. A*

Diodes, Power, Surface Mount-4800 — *See Vol. A*

Diodes, Schottky-4800 — *See Vol. A*

Diodes, Selenium — See Rectifiers, Selenium (Vol. A)

Diodes, Silicon-4800 — *See Vol. A*

Diodes, Step Recovery-4800 — *See Vol. A*

Diodes, Switching-4800 — *See Vol. A*

Diodes, Switching, Surface Mount-4800 — *See Vol. A*

Diodes, Temperature Compensating-4800 — *See Vol. A*

Diodes, Trigger — See Diodes, Avalanche (Vol. A)

Diodes, Tuning, Surface Mount-4800 — *See Vol. A*

Diodes, Tunnel-4800 — *See Vol. A*

Diodes, Varactor-4800 — *See Vol. A*

Diodes, Varactor, Surface Mount-4800 — *See Vol. A*

Diodes, Video Detector — See Diodes, Microwave Detector (Vol. A)

Diodes, Zener & Stabistors (Forward Reference Diodes)-4800 — *See Vol. A*

Diodes, Zener, Surface Mount-4800 — *See Vol. A*

Diodes (MIL)-2440 — *See Vol. B*

Diplexers, Antenna-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† AIL Systems, Inc., Eaton Corp., Deer Park, NY 11729 516-595-3094
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Alpha Components, Mechanicsburg, PA 17055 717-697-8595
† Chesterfield Products, Inc., Elmwood Park, NJ 07407 201-797-9655
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
† Gamma-f Corp., Electromagnetic Sciences, Inc., Torrance, CA 90505 213-539-6704
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
† Loral Microwave-Wavecom, Northridge, CA 91324 818-882-3010
† Metropole Products Inc., Stafford, VA 22554 703-659-2132
† Microphase, Norwalk, CT 06856 203-866-8000
Microwave Development Laboratories, Natick, MA 01760 508-655-0060
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Premier Microwave, Port Chester, NY 10573 914-939-8900
† Reactel, Inc., Rockville, MD 20850 301-279-5535
† Sage Laboratories, Inc., Natick, MA 01760 508-653-0844
† Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
Teleplex, Inc., Alford Division, Woburn, MA 01801 617-935-8610

Direction Finding Sets & Systems (MIL)-2440 — *See Vol. B*

Discharge Systems, Energy-4000

Energy Systems, Vancouver, WA 98682 206-896-8310
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
† Simmonds Precision Engine Systems, BF Goodrich Aerospace, Norwich, NY 13815 607-335-5000

Discriminators-1900

§† Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... A•1532,1541
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1369
† Frequency Selective Networks, Woodside, NY 11377, 718-424-7500 ..... A•1370
† McCoy Electronics Co., A Sub. of Oak Industries, Mt. Holly Springs, PA 17065, 717-486-3411 ..... A•1383
NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056, 708-824-1133 ..... A•1702
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Alpha Components, Mechanicsburg, PA 17055 717-697-8595
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
CTS Corporation, Elkhart, IN 46514 219-293-7511
CTS Corp., Frequency Controls business unit, (Formerly Knights Div.), Sandwich, IL 60548 815-786-8411
† Hughes Microelectronic Circuits Division, Newport Beach, CA 92658-8903 714-759-2952
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
† Networks International Corporation, Lenexa, KS 66215 913-469-6494
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
† Piezo Technology Inc., Orlando, FL 32804 407-298-2000
Polyphase Instrument, Ft. Washington, PA 19034 215-643-6950
§† Reeves-Hoffman Div., Dynamics Corporation of America, Carlisle, PA 17013 717-243-5929
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
Sokol Crystal Products, Inc., Mineral Point, WI 53565 608-987-3363

† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
† ST Microwave Corp., Sub. of Signal Technlg. Corp., Sunnyvale, CA 94086 408-730-6300
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Disks, Alignment, Flexible Disk Drive-2000

§ AVA Instrumentation, Inc., Ben Lomond, CA 95005 408-336-2281
§ Contact East, N. Andover, MA 01845 508-682-2000

Disks, Computer Memory — See Memory Systems, Disk (Vol. D)

Disks, Diagnostic, Flexible Disk Drive-2000

§ AVA Instrumentation, Inc., Ben Lomond, CA 95005 408-336-2281

Disks, Magnetic 3½"-2000

§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Epson America, Inc./OEM Div., Torrance, CA 90503 213-534-4500
§ Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§† Mitsubishi Electronics, Torrance, CA 90502 213-515-3993
§ TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056 708-803-6100
Tokin America, Inc., San Jose, CA 95134 408-432-8020

Disks, Magnetic, 5¼" Flexible-2000

§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
§ TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... A•1299
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Epson America, Inc./OEM Div., Torrance, CA 90503 213-534-4500
§ Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§† Mitsubishi Electronics, Torrance, CA 90502 213-515-3993
Omega Engineering, Stamford, CT 06907 800-826-6342
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473

Disks, Magnetic, 8" Flexible-2000

§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§† Mitsubishi Electronics, Torrance, CA 90502 213-515-3993
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056 708-803-6100

Disks, Magnetic, Front-loading Cartridge-2000

§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
ICI Inc., Placentia, CA 92670 714-579-7575
Mesa Technology Corp., Columbia, MD 21046 800-888-0567

Disks, Magnetic, Winchester Module-2000

§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† Trilobyte Computer Corporation, San Leandro, CA 94577 415-895-1100
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Zendex Corp., Dublin, CA 94568 415-828-3000

Disks, Memory, Flexible — See Memory Systems, Disk, Flexible (Vol. D)

Disks, Optical Encoder — See Encoders, Shaft Angle, Optical (Vol. B)

Dispensers, Adhesive-1600 — *See Vol. C*

Dispensers, DIP & IC — See Machines, Component Handling (Vol. D)

Display Modules-2450 — *See Vol. B*

Display Power Supplies — See Converters, DC to DC (Vol. D), Power Supplies, AC Output (Vol. D)

Displays, CRT-2450 — *See Vol. B*

Displays, Dot Matrix-2450 — *See Vol. B*

Displays, Edge Lighted & Back Lighted-2450 — *See Vol. B*

Displays, Electroluminescent-2450 — *See Vol. B*

Displays, Electromagnetic-2450 — *See Vol. B*

Displays, Electromechanical-2450 — *See Vol. B*

Displays, Fiber Optic-2450 — *See Vol. B*

Displays, Graphic-2450 — *See Vol. B*

Displays, Graphic Systems-2000

Apollo Display Technologies, Inc., Holtsville, NY 11742, 516-654-1143 ... B•1040
§ Babcock Display Products, Inc., A Subsidiary of Babcock, Inc., Anaheim, CA 92805, 714-491-5100 ..... B•1041
§† Densitron Corporation, Densitron International, Torrance, CA 90505, 213-530-3530 ..... B•1055
Hitachi America, Ltd., Electron Tube Division, Schaumburg, IL 60173, 708-517-1144 ..... B•1082
Optrex/Satori, Torrance, CA 90503, 213-214-1791 ..... B•1110
Sharp Electronics Corp., Microelectronics Grp., Camas, WA 98706, 206-834-2500 ..... B•1119-1121
† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Automation Displays Inc., Eau Claire, WI 54703 715-834-9595
† Aydin Corp., Horsham, PA 19044 215-657-7510
† CELCO, Mahwah, NJ 07430 201-327-1123
§ Conrac Display Products, Inc., Duarte, CA 91010 818-303-0095
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 402-563-6506
§ Futaba Corporation of America, Electronic Components Div., Schaumburg, IL 60173 708-884-1444
§ Graphic Strategies, Inc., Sunnyvale, CA 94089 408-745-6500
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
KMC Systems, Inc., Midland Pk., NJ 07432 201-447-0007
Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
§ Metra Instruments, Inc., San Jose, CA 95131 408-432-1110
New Media Graphics Corp., Billerica, MA 01821 508-663-0666
† Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Omnicomp Graphics Corp., Houston, TX 77043 713-464-2990
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100
Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Spectrum Corp., Houston, TX 77075 ..... 713-944-6200;1-800-392-5050(SIs)
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Vidco, Inc., Beaverton, OR 97005 503-641-1804
VL Electronics, Inc., Los Angeles, CA 90010-1603 213-738-8700
World Products Inc., Systems Devices Grp., Sonoma 95476 707-996-5201

Displays, Head Up (HUD)-2450 — *See Vol. B*

Displays, Indicator Lights-2450 — *See Vol. B*

Displays, Intelligent-2450 — *See Vol. B*

Displays, Laser-2450 — *See Vol. B*

Displays, Light-emitting Diode (LED)-2450 — *See Vol. B*

Displays, Lighted Segment-2450 — *See Vol. B*

Displays, Liquid Crystal (LCD)-2450 — *See Vol. B*

Displays, LCD, Sheets-2450 — *See Vol. B*

Displays, Message-2450 — *See Vol. B*

Displays, Multifunction-2450 — *See Vol. B*

Displays, Planar Gas Discharge-2450 — *See Vol. B*

Displays, Plasma-2450 — *See Vol. B*

Displays, Programmable-2450 — *See Vol. B*

Displays, Projection Type (CRT; Electromechanical; Film; Light Valve)-2450 — *See Vol. B*

Displays, Remote-2450 — *See Vol. B*

Displays, Status-2450 — *See Vol. B*

Displays, Storage Tube — See Displays, CRT (Vol. A)

Displays, Surface Mount-2450 — *See Vol. B*

Displays, Touch Sensitive (Infrared & Mechanical) — See Touch Monitors (Vol. D), Touch Panels (Vol. D), Touch Terminals (Vol. D)

Displays, Tube — See Tubes, Readout (Vol. A)

Displays, Vacuum Fluorescent-2450 — *See Vol. B*

Display Sets (MIL), Computer-2440 — *See Vol. B*

Dissipators, Heat — See Heat Sinks, Semiconductor (Vol. C), Heat Sinks, Soldering (Vol. C)

Distortion Analyzers, Indicators — See Analyzers, AF (Vol. D)

Distortion Correction, CRT-2450 — *See Vol. B*

Distributed Control Systems & Components-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1072
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
§ Action Instruments, San Diego, CA 92123 619-279-5726

§ Covid, Inc., Tempe, AZ 85281 602-966-2221
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
KineticSystems, Lockport, IL 60441 815-838-0005
§ Luft Instruments, Inc., Lincoln, MA 01773 617-259-9215
Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
† Square D Co., Palatine, IL 60067 708-397-2600
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500

Dividers, Analog-3130 — *See Vol. A*

Dividers, Frequency-3450 — *See Vol. A*

Dividers, Power (LF, HF, VHF, UHF)-3450 — *See Vol. A*

Dividers, Power, Microwave-3450 — *See Vol. A*

Dividers, Voltage-Also See Networks, Resistance; Transformers, Voltage Dividing-2900

Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Caddock Electronics, Inc., Riverside, CA 92507, 714-788-1700 ..... A•1853
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1761
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .. D•1763
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1257
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258-1262
† Jennings, San Jose, CA 95122-2696, 408-292-4025 ..... D•1274
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270-1272
† Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1917
† Pearson Electronics, Inc., Palo Alto, CA 94303, 415-494-6444 ..... A•2332
§† RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
† Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1323
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049,2054
State of the Art, Inc., State College, PA 16803-1797, 814-355-8004 ..... A•1986
Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, Wi 53201 414-382-2000
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
† Coast Coil Co., Coast Magnetics, Los Angeles, CA 90016 213-936-6188
Computron Display Systems, Xcel Corporation, Elk Grove Village, IL 60007 708-952-8800
§ Dale Electronics, Inc., Norfolk Div., Norfolk, NE 68701-2242 402-371-0080
Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
EECO Incorporated, Santa Ana, CA 92702-0659 714-835-6000
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Electrical Standards Div., E.S.R.S., Inc., N. Hollywood, CA 91605 818-765-4224
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
† Hycomp, Inc., Marlborough, MA 01752 508-485-6300
International Resistive Company, Boone, NC 28607 704-264-8861
§ K & M Electronics, W. Springfield, MA 01089 413-781-1350
KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
Kelvin Industries, Inc., Sherman Oaks, CA 91403-3501 818-990-1192
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
† Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
† NWL Transformers, Bordentown, NJ 08505 609-298-7300
§ Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
† Ohmtek Inc., Vishay, Niagara Falls, NY 14304 716-283-4025
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
Rosemount Analytical Inc., Cedar Grove, NJ 07009 800-367-7242
† Ross Engineering Corp., Campbell, CA 95008 408-377-4621
Shalitronix Corp., Selma, NC 27576 919-965-6346
† Tech Laboratories Inc., Palisades Pk, NJ 07650 201-944-2221
§ Techno Division, Dale Electronics, Inc., Van Nuys, CA 91405-1139 818-781-1642
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Victoreen, Inc., Solon, OH 44139-3395 ..... 216-248-9300;216-248-9043
§ Vishay Resistive Systems, Malvern, PA 19355 215-644-1300
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Doublers, Frequency — See Multipliers, Frequency (Vol. A)

Doublers, Voltage-Also See Rectifiers, Bridges & Assemblies-4800 — *See Vol. A*

Down Converters-3450 — *See Vol. A*

Drafting Machines-4200 — *See Vol. C*

Drafting Symbols, Dry Transfer, Pressure Sensitive, etc. (Incl. Lettering)-4200 — *See Vol. C*

Drawers, Sliding-1400 — *See Vol. C*

Drills & Accessories, Manual & Power-5400 — *See Vol. C*

Drivers & Decoders For Readouts-2450 — *See Vol. B*

Drivers, Chopper-1100

§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Anaheim Automation, Anaheim, CA 92801 714-992-6990
Bodine Electric Company, Chicago, IL 60618 312-478-3515
† Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
IXYS Corp., San Jose, CA 95131-1109 408-435-1900
Oriental Motor USA Corp., Super Vexta, Torrance, CA 90505-5217 213-515-2264
§† Silicon General, Garden Grove, CA 92641 714-898-8121
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK

Drivers, Hardware & Software-2000

§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124,1188,1296
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ Action Instruments, San Diego, CA 92123 619-279-5726
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Intec Controls Corp., Walpole, MA 02081 508-660-1221
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
Matrix Corp., Raleigh, NC 27610 919-231-8000

Drivers, Nut-5400 — *See Vol. C*

Drivers, Solenoid-4550 — *See Vol. B*

Drivers, Speaker-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
AES Corp., Peabody, MA 01960 508-535-7310
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§† Hartley Products, Wilmington, NC 28405 919-763-7422
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
§ MG Electronics, Hauppauge, NY 11788 516-582-3400
§ Motorola Ceramic Products, Components Division, Albuquerque, NM 87113 505-822-8801
§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Poly-Planar Inc., Warminster, PA 18974 215-675-7805
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911

Drivers, Surface Mount-1100

Teledyne Components, Mountain View, CA 94039-7267 415-968-9241

Drivers, Switch-3450 — *See Vol. A*

Drivers, Tube — See Drivers & Decoders for Readouts (Vol. B)

Drives & Drive Mechanisms (Dial)-2400 — *See Vol. C*

Drives/Subsystems, Core Disk Emulator-2000

Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095

Drives/Subsystems, Disk, 3½" Diskette-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1092
§ Action Instruments, San Diego, CA 92123 619-279-5726
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Computer Dynamics Sales, Greer, SC 29650 803-877-8700
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567

Drives/Subsystems, Disk, 3¼" Winchester-2000

Cedar Technology, Inc., Longmont, CO 80503 303-776-0472
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Matrix Corp., Raleigh, NC 27610 919-231-8000
§ Mesa Technology Corp., Columbia, MD 21046 800-888-0567
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Drives/Subsystems, Disk, 5¼" Diskette-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1092
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
† Cedar Technology, Inc., Longmont, CO 80503 303-776-0472

Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
Matrix Corp., Raleigh, NC 27610 919-231-8000
Mesa Technology Corp., Columbia, MD 21046 800-888-0567

Drives/Subsystems, Disk, 5¼" Winchester-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1093,1095
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
Matrix Corp., Raleigh, NC 27610 919-231-8000
§ Mesa Technology Corp., Columbia, MD 21046 800-888-0567
† Miltope Corp., Melville, NY 11747 516-420-0200
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Drives, Subsystems, Disk, 8" Diskette-2000

§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
† Miltope Corp., Melville, NY 11747 516-420-0200
NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Zendex Corp., Dublin, CA 94568 415-828-3000

Drives/Subsystems, Disk, 8" Winchester-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1094
Computer Dynamics Sales, Greer, SC 29650 803-877-8700
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
† Miltope Corp., Melville, NY 11747 516-420-0200
NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Zendex Corp., Dublin, CA 94568 415-828-3000

Drives/Subsystems, Disk, 14" Winchester-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725

Drives/Subsystems, Disk, Fixed-2000

§ Action Instruments, San Diego, CA 92123 619-279-5726
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Herstal Automation Ltd., Berkley, MI 48072 313-548-2001
§ Mesa Technology Corp., Columbia, MD 21046 800-888-0567
NEC Technologies, INc., Boxborough, MA 01719 508-264-8000

Drives/Subsystems, Disk, Fixed/Removable-2000

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Herstal Automation Ltd., Berkley, MI 48072 313-548-2001
§ Mesa Technology Corp., Columbia, MD 21046 800-888-0567
† Miltope Corp., Melville, NY 11747 516-420-0200
§ Mini Computer Technology, San Jose, CA 95131 408-435-1616

Drives/Subsystems, Disk Array-2000

§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•1119

Drives/Subsystems, Magnetic Tape, ¼" Cartridge-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Braemar Corp., Burnsville, MN 55337 612-890-5135
§ Cipher Data Products, Inc., an Archive Co., San Diego, CA 92131 619-578-9100
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
§ Mesa Technology Corp., Columbia, MD 21046 800-888-0567
† Miltope Corp., Melville, NY 11747 516-420-0200
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298

Drives/Subsystems, Magnetic Tape, Cassette-2000

§ International Electro Magnetics, Inc., Palatine, IL 60067, 708-358-4622 ... D•1036
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Amilon Corp., Woodside, NY 11377 718-274-1794
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Braemar Corp., Burnsville, MN 55337 612-890-5135
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
Herstal Automation Ltd., Berkley, MI 48072 313-548-2001
† Memtec Corp., Salem, NH 03079 603-893-8080
† Miltope Corp., Melville, NY 11747 516-420-0200

Drives/Subsystems, Magnetic Tape, Reel-to-Reel-2000

§ Cipher Data Products, Inc., an Archive Co., San Diego, CA 92131 619-578-9100
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
§ Digi-Data Corp., Jessup, MD 20794 301-498-0200
§ DILOG, Anaheim, CA 92806 ..... 714-937-5700;1-800-DILOG 32
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Mesa Technology Corp., Columbia, MD 21046 800-888-0567
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
† Miltope Corp., Melville, NY 11747 516-420-0200
† Qualistar Corp., Chatsworth, CA 91311 818-882-5822
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
§ Shinano Kenshi Corp. (SKC), N. Hollywood, CA 91605 818-764-4266
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Drives/Subsystems, Semiconductor Emulator-2000

Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
Vermont Research Corp., N. Springfield, VT 05150 802-886-2256
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Dry Transfer Letters & Numbers — See Kits, Marking (Vol. C)

Ducts, Wiring-6000 — *See Vol. C*

Ducts, Fiber Optic-2475 — *See Vol. B*

Dummy Loads, Electronic-2900

† The Carborundum Company, Electric Products, Niagara Falls, NY 14302, 716-278-2521 ..... A•1880-1881
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
§ Acme Electric Corporation, Cuba, NY 14727 716-968-2400
Advanced Power Products, Santa Barbara, CA 93101 805-965-0042
† Alan Industries Inc., Columbus, IN 47202 812-372-8869
§ Amphenol RF Operations, Amphenol Corporation, Danbury, CT 06810 .. 203-743-9272
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
Coaxial Dynamics, Cleveland, OH 44135 ..... 1-800-COAXIAL
Compac, Holbrook, NY 11741 516-585-3400
† Connecticut Microwave Corp., Cheshire,, CT 06410 203-250-9678
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
† Dielectric Communications, General Signal, Raymond, ME 04071 ..... 207-655-4555; 800-341-9678
† Elcom Systems, Inc., Boca Raton, FL 33487 407-994-1774
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
§† EMC Technology Inc, Cherry Hill, NJ 08034 609-429-7800
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
† KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
§† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† Microlab/FXR, Livingston, NJ 07039 201-992-7700
† Micro Mode Prods., El Cajon, CA 92020 619-449-3844
§ Microwave Development Laboratories, Natick, MA 01760 508-655-0060
§† Microwave Filter Inc., East Syracuse, NY 13057-0486 .... 315-437-3953;800-448-1666
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† NH Research, Irvine, CA 92714 714-474-3900
§ Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
† Quartzite Processing, Inc., Malden, MA 02148 617-322-3611
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 312-670-0150
§† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
Sivers IMA AB, Culver City, CA 90230 213-306-4248
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
Teleplex, Inc., Alford Division, Woburn, MA 01801 617-935-8610
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
† Torotel Prods. Inc., Grandview, MO 64030-3199 816-761-6314
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412

Dummy Loads, Microwave-2900

† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Alan Industries Inc., Columbus, IN 47202 812-372-8869
§ Amphenol RF Operations, Amphenol Corporation, Danbury, CT 06810 .. 203-743-9272
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
§ Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434

§† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
Microdry, Inc., Crestwood, KENTUCKY 40014 502-241-8933
§ Midwest Microwave, Saline, MI 48176-9569 ..... 313-429-4773;800-521-4410
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pasternack Enterprises, Irvine, CA 92713 714-261-1920
† Premier Microwave, Port Chester, NY 10573 914-939-8900
Pro Com Technology Inc., Farmingdale, NY 11735 ..... 516-293-4443;800-762-3785
† RLC Electronics, Inc., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., Natick, MA 01760 508-653-0844

Dummy Loads, Power-2900

Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258-1260,1262
Milwaukee Resistor Corp., Milwaukee, WI 53204, 414-271-9900 .... A•1953-1954
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
Advanced Power Products, Santa Barbara, CA 93101 805-965-0042
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Alan Industries Inc., Columbus, IN 47202 812-372-8869
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Phase Control Electronics, Glendale, NY 11385 718-441-4278
PPM, Inc., Cleveland, OH 44139 216-349-2300
Pro Com Technology Inc., Farmingdale, NY 11735 ..... 516-293-4443;800-762-3785
§† RCD Components, Inc., Manchester, NH 03109 603-669-0054
Relm Communications, Inc., Indianapolis, IN 46226 317-545-4281
† Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759

Dummy Loads, Programmable-2900

Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1262
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
Acme Electric Corporation, Cuba, NY 14727 716-968-2400
Advanced Power Products, Santa Barbara, CA 93101 805-965-0042
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
Kikusui International Corp., Torrance, CA 90503 ..... 213-371-4662;800-545-8784
† NH Research, Irvine, CA 92714 714-474-3900
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759

Dummy Loads, Resistive-2900

Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258-1260,1262
Milwaukee Resistor Corp., Milwaukee, WI 53204, 414-271-9900 .... A•1953-1954
§† RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
Advanced Power Products, Santa Barbara, CA 93101 805-965-0042
§ Amphenol RF Operations, Amphenol Corporation, Danbury, CT 06810 .. 203-743-9272
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
† NH Research, Irvine, CA 92714 714-474-3900
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
† Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
† Trompeter Electronics, Inc., Westlake Village, CA 91362-4047 818-707-2020

Dummy Loads (MIL), RF-2440 — *See Vol. B*

Duplexers, Microwave-3450 — *See Vol. A*

Duplexers, Nonmicrowave-1900

† Antenna Specialists, The Allen Group, Cleveland, OH 44139 216-349-8400
† Chesterfield Products, Inc., Elmwood Park, NJ 07407 201-797-9655
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
Relm Communications, Inc., Indianapolis, IN 46226 317-545-4281
§† Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165

Duplicators, Magnetic Tape-1300

§ Applied Data Communications, Tustin, CA 92680 714-731-9000
† Chalco Engrg. Corp., Chalco Industries, Inc., Gardena, CA 90248-1898 ... 213-321-0121; 213-323-5525
§ Shinano Kenshi Corp. (SKC), N. Hollywood, CA 91605 818-764-4266
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Video Automation Systems, Pound Ridge, NY 10576 914-764-4613

Dust Covers — See Covers, Protective (Vol. C)

DVMs — See Meters, Volt, Digital (Vol. D)

Earphones — See Headphones (Vol. D)

Earth Stations, TV, Receive Only-1900

Andrew Corp., Orland Pk., IL 60462 800-255-1479
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Prodelin Corporation, Conover, NC 28613 704-464-4141

Earth Stations; TV, Receive/Transmit-1900

Andrew Corp., Orland Pk., IL 60462 800-255-1479
† Aydin Corp., Horsham, PA 19044 215-657-7510
MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273

Edge Clips, Surface Mount-2500 — *See Vol. C*

Edge Connectors, Surface Mount-2100 — *See Vol. C*

Editing Equipment, Tape-1300

§ Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
§ Microtran Co. Inc., Valley Stream, NY 11582 516-561-6050

Ejectors & Extractors, PC Boards — See Pullers, Circuit Board (Vol. C)

Elastomers, Conductive — See Conductive Elastomers (Vol. C)

Elastomers, Heat Shrinkable — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C)

Electret — See Microphones, Condenser (Vol. D)

Electrical Measurement & Test Services — See Services, Electrical Measurement & Test (Vol. D)

Electrodes, Electroplating — See Electroplating Equipment & Supplies (Vol. D)

Electrodes, High Voltage-2900

High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Deringer Mfg. Co., Mundelein, IL 60060 708-566-4100
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
Phenix Technologies, Accident, MD 21520 301-746-8118

Electromagnets-1850 — *See Vol. A*

Electronic Counter Countermeasures (ECCM) Fixes (MIL)-2440 — *See Vol. B*

Electronic Countermeasures (ECM) (MIL), Cruise Missiles-2440 — *See Vol. B*

ECM Sets (MIL)-2440 — *See Vol. B*

ECM Systems (MIL)-2440 — *See Vol. B*

ECM Systems (MIL), Deceptive-2440 — *See Vol. B*

Electronic Intelligence (Elint) (MIL)-2440 — *See Vol. B*

Electronic Loads — See Dummy Loads (Vol. D)

Electronic Support Measures (ESM) Sets (MIL)-2440 — *See Vol. B*

Electronic Warfare (EW) Sets (MIL)-2440 — *See Vol. B*

Electroplating Equipment & Supplies-4100

Auric Corp., Newark, NJ 07114 201-242-4100
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
Fidelity Chemical Products Corp., Newark, NJ 07114 201-242-4110
§ HBS Equipment Corporation, Los Angeles, CA 90040 213-726-3033
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
§ Instant Board Circuits Grp., Novato, CA 94949 415-883-1717
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
McCoy Electronics Co., A Sub. of Oak Industries, Mt. Holly Springs, PA 17065 717-486-3411
§ Pace Inc., Laurel, MD 20723-1990 301-490-9860
Sel-Rex Div., OMI Intl. Corp., Nutley, NJ 07110 201-667-5200
† Technic, Inc., Providence, RI 02940-9650 401-781-6100

Electrostatic Discharge Guns - Also See Generators, ESD-2900

§† **NRD Inc., Subsidiary of Mark IV Inds., Inc., Grand Island, NY 14072, 716-773-7634 ..... D•2238**
§ **Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321**
Compliance Design Inc., Boxboro, MA 01719 508-264-4668
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 703-494-1900
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
§ Semtronics Corp., Peachtree City, GA 30269 404-487-6681
§ Simco Co., Hatfield, PA 19440 215-822-2171

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Emitter Location & Identification System (MIL), Automatic Ground Transportable-2440 — *See Vol. B*

Emitters/Detectors, Infrared-3700 — *See Vol. B*

Emitters, Fiber Optic-Also See Diodes, Laser-2475 — *See Vol. B*

Emulators, In-circuit-2900

American Arium, Formerly American Automation & Arium, Tustin, CA 92680-7207, 714-731-1661 ..... D•1217
Emulation Technology, Inc., Santa Clara, CA 95051, 408-982-0660 ..... C•1358
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1308
† **Sunrise Electronics, Inc., Glendora, CA 91740, 818-914-1926 ..... D•1329**
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Applied Microsystems Corp., Redmond, WA 98052 206-882-2000
§ Baradine Products Ltd., North Vancouver, B.C., CANADA V7L 4L3 604-988-9853
HILEVEL Technology, Irvine, CA 92718 714-727-2100
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
Huntsville Microsystems, Inc., Huntsville, AL 35801 205-881-6005
Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
§Φ MetaLink Corporation, Chandler, AZ 85244 602-926-0797
Microtek International/Dev. Sys. Div., Hillsboro, OR 97124 503-645-7333
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
Pentica Systems, Inc., Cambridge, MA 02139 617-577-1101
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Signum Systems Corp., Thousand Oaks, CA 91360 805-371-4608
Softaid, Inc., Columbia, MD 21045 301-964-8455
Sophia Systems & Technology, Palo Alto, CA 94304 ..... 415-493-6700;800-824-9294
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
Thorson Engineering Co., Snohomish, WA 98290 206-334-4214
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Zax Corp., Irvine, CA 92714 ..... 800-233-9817;800-421-0982

Emulators, RTS-2900

American Arium, Formerly American Automation & Arium, Tustin, CA 92680-7207, 714-731-1661 ..... D•1217
§ **Signum Systems Corp., Thousand Oaks, CA 91360, 805-371-4608 ..... D•1326**
§ S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175

Emulators, Terminal-2900

§ Data Race, Inc., San Antonio, TX 78230 512-558-1900
§ Direct Aid, Westlake Vl., CA 91362 ..... 818-889-1013;800-443-8080
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Industrial Computer Source, San Diego, CA 92111 619-279-0084
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
Network Software Associates, Inc., Laguna Hills, CA 92656 714-768-4013
§ Techland BLUELYNX, Cumberland, MD 21502 800-832-4526

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Encapsulation Services — See Services, Encapsulation (Vol. D)

Enclosures, Circuit Board, Module, & Relay Mounting-1400 — *See Vol. C*

Enclosures, CRT — See Mounts CRT (Vol. C)

Enclosures, Equipment & Panel Mounting-1400 — *See Vol. C*

Enclosures, Instrument, With Integral Connectors-1400 — *See Vol. C*

Enclosures, Keyboard-1400 — *See Vol. C*

Enclosures, Metal-1400 — *See Vol. C*

Enclosures, Nonmetallic-1400 — *See Vol. C*

Enclosures, Portable, Metallic & Nonmetallic-1400 — *See Vol. C*

Enclosures, Power Distribution-1400 — *See Vol. C*

Enclosures, Shielded-1400 — *See Vol. C*

Enclosures, Shipping, Metallic & Nonmetallic-1400 — *See Vol. C*

Enclosures, (MIL)-2440 — *See Vol. B*

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Encoders, Displacement, Linear-5500 — *See Vol. B*

Encoders, Fiber Optic-2475 — *See Vol. B*

Encoders, Magnetic Strip-5500 — *See Vol. B*

Encoders, Proof-2000

Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Litton Encoder Div., Chatsworth, CA 91311 818-341-6161

Encoders, Shaft Angle, Contacting-5500 — *See Vol. B*

Encoders, Shaft Angle, Magnetic-5500 — *See Vol. B*

Encoders, Shaft Angle, Optical-5500 — *See Vol. B*

Encoders, Shaft Position — See Encoders, Shaft Angle (Vol. B), Resolvers, Synchro (Vol. D)

Encoders, Tone-1900

† **Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... A•1541**
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
Dantel, Fresno, CA 93727 209-292-1111
Electrocom Industries, S. Bend, IN 46615 219-232-2743
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Frequency Devices, Inc., Haverhill, MA 01832 508-374-0761
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Palomar Engineers, Escondido, CA 92033 619-747-3343
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Encoders, Video-1900

† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854

Encoders, (MIL)-2440 — *See Vol. B*

Encryptors — See Security Systems, Data (Vol. D)

Engineering Reference Books — See Technical Books (Vol. D)

Energy Management Systems-2200

§ **Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179**
Optek Technology Inc., Carrollton, TX 75006, 214-323-2200 ..... B•1333
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
# ASC, Ogallala, NE 69153 308-284-3611
§ Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
California Automation Inc., San Diego, CA 92121 619-452-1341
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
Mep Controls, Bordentown, NJ 08505 609-298-7300
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Optimum Applied Systems, Dobbs Ferry, NY 10522-1696 914-693-9001
Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
§ Pass & Seymour/Legrand, Pass & Seymour/Inc., Syracuse, NY 13221 315-468-6211
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 604-652-5118
PPM, Inc., Cleveland, OH 44139 216-349-2300
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Solid State Systems, Kennesaw, GA 30144 404-423-2200
Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Via West Interface, Inc., Tucson, AZ 85705 ..... 602-623-5716;1-800-266-5716

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Epoxies — See Compounds, Enscapsulating, Molding, Potting (Vol. C), Adhesives (Vol. C)

Equalizers, Audio-1300

Allen Avionics, Inc., Mineola, NY 11501 516-248-8080
† Alpha Components, Mechanicsburg, PA 17055 717-697-8595
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
† ESC Electronics Corp., Palisades Pk., NJ 07650 201-947-0400
† Filter Products, Rockwell International, Costa Mesa, CA 92626 714-641-5311
† Frequency Selective Networks, Woodside, NY 11377 718-424-7500
§ Furman Sound, Inc., Greenbrae, CA 94904 415-927-1225
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Hisonic, Inc., Olathe, KS 66061 913-782-0012
† Kappa Technologies, Inc., Rahway, NJ 07065 ..... 908-396-9400;1-800-223-0603
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
Projects Unlimited, Dayton, OH 45414 513-890-1918
† Rockwell International, Costa Mesa, CA 92626 714-641-5311
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† TTE, Incorporated, W. Los Angeles, CA 90064 213-478-8224
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Equalizers, Delay-1900

† Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... A•1534,1537,1540,1545
† Frequency Selective Networks, Woodside, NY 11377, 718-424-7500 ..... A•1370
KR Electronics, Inc., Avenel, NJ 07001, 908-636-1900 ..... A•1682-1683
Allen Avionics, Inc., Mineola, NY 11501 516-248-8080
† Alpha Components, Mechanicsburg, PA 17055 717-697-8595
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
† Chesterfield Products, Inc., Elmwood Park, NJ 07407 201-797-9655
† ESC Electronics Corp., Palisades Pk., NJ 07650 201-947-0400
† Filter Products, Rockwell International, Costa Mesa, CA 92626 714-641-5311
† Hisonic, Inc., Olathe, KS 66061 913-782-0012
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
† Kappa Technologies, Inc., Rahway, NJ 07065 ..... 908-396-9400;1-800-223-0603
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† Rockwell International, Costa Mesa, CA 92626 714-641-5311
† TTE, Incorporated, W. Los Angeles, CA 90064 213-478-8224
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Equalizers, Phase-1900

† Frequency Selective Networks, Woodside, NY 11377, 718-424-7500 ..... A•1370
† Hisonic, Inc., Olathe, KS 66061, 913-782-0012 ..... A•2234
KR Electronics, Inc., Avenel, NJ 07001, 908-636-1900 ..... A•1682
Allen Avionics, Inc., Mineola, NY 11501 516-248-8080
† Alpha Components, Mechanicsburg, PA 17055 717-697-8595
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
† Chesterfield Products, Inc., Elmwood Park, NJ 07407 201-797-9655
† ESC Electronics Corp., Palisades Pk., NJ 07650 201-947-0400
† Filter Products, Rockwell International, Costa Mesa, CA 92626 714-641-5311
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
† Kappa Technologies, Inc., Rahway, NJ 07065 ..... 908-396-9400;1-800-223-0603
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† Rockwell International, Costa Mesa, CA 92626 714-641-5311
† Werlatone, Inc., Brewster, NY 10509 914-279-6187
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Erasers, Magnetic Tape (Bulk)-1300

§† Benjamin International, Inc., Plainview, NY 11803 516-753-0700
§ Hammond Manufacturing Co., Buffalo, NY 14225 716-894-5710
§ Microtran Co. Inc., Valley Stream, NY 11582 516-561-6050
§† Wide Range Elctrns. Corp., Chesterfield, MISSOURI 63005 314-532-5887

Erasing Equipment, EPROM-3130 — *See Vol. A*

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Etchants, Printed Circuit-1700 — *See Vol. C*

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Ethernet Extenders-2475 — *See Vol. B*

Evaporation Equipment, Electron Beam-4100

CHA Industries, Fremont, CA 94538 415-683-8554
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
Edwards High Vacuum International, Div. of the BOC Group, Wilmington, MA 01887 508-658-5410
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
Jori Resources, Ventura, CA 93003 805-642-2266
Temescal/Airco Coating Technology, The BOC Group, Inc., Fairfield, CA 94533 707-425-1010
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973

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Extractors, DIP, IC, & Pin Grid Array-5400 — *See Vol. C*

Eyelets-2500 — *See Vol. C*

Fabrics, Conductive-4525 — *See Vol. C*

Facsimile Equipment-1900

† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Computer Peripherals Inc., Newbury Pk., CA 91320 ..... 805-499-5751;800-854-7600
§ Data Race, Inc., San Antonio, TX 78230 512-558-1900
Electronic Modules, Inc., Dallas, TX 75238-1687 214-340-6789
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
§ Xerox Corporation, Rochester, NY 14644 800-832-6979
§ Xerox Imaging Systems, Inc., Xerox Corp., Sunnyvale, CA 94086 ..... 408-245-7900; 800-248-6550

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Fans, Axial-2600 — *See Vol. C*

Fans, Propeller-2600 — *See Vol. C*

Fans, Tubeaxial-2600 — *See Vol. C*

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Feedhorns, Satellite Antenna-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† Gamma-f Corp., Electromagnetic Sciences, Inc., Torrance, CA 90505 213-539-6704
§ Prodelin Corporation, Conover, NC 28613 704-464-4141

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Filters, AF-2750 — *See Vol. A*

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Filters, Air (for Clean Room)-2550

Air Filtration Products, Inc., Tuscon, AZ 85705 602-624-2272
§† Aluminum Filter, Carpinteria, CA 93013 805-684-7651
Baker Co., Inc., Sanford, ME 04073 1-800-992-2537
Cambridge Filter Corp., Syracuse, NY 13221-4906 315-457-1000
Daitron, Inc., Tigard, OR 97223 503-620-2879
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ MODULAIR, Reno, NV 89502 702-829-2033
§ Norgren, Littleton, CO 80120-1663 303-794-2611
† Spira Manufacturing Corp., North Hollywood, CA 91605 818-764-8222
† Topflight, York, PA 17404 ..... 717-843-9901;800-233-9386

Filters, Air (for Disk Drives)-2750 — *See Vol. A*

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Filters, Antenna-2750 — *See Vol. A*

Filters, Antialias-2750 — *See Vol. A*

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Filters, Low Pass-2750 — *See Vol. A*

Filters, Mechanical-2750 — *See Vol. A*

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Filters, Single Sideband-2750 — *See Vol. A*

Filters, Synchronous Tracking-2750 — *See Vol. A*

Filters, Telemetering-1900

† **Chesterfield Products, Inc., Elmwood Park, NJ 07407, 201-797-9655** .... **A•1662**
† **Communication Coil Inc., Chicago, IL 60634, 312-637-1333** ..... **A•1665**
Electronic Precision Components Corporation, Mt. Vernon, NY 10550-4430, 914-664-2333 ..... **A•1670**
† **KR Electronics, Inc., Avenel, NJ 07001, 908-636-1900** ..... **A•1682**
Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... **A•1753**
Morgan-Matroc, Vernitron Div., Bedford, OH 44146-5478, 216-232-8600 .. **B•1921**
† **TTE, Incorporated, W. Los Angeles, CA 90064, 213-478-8224** ..... **A•1708**
Advanced Filter Devices, Inc., Carlsbad, CA 92009 619-438-2074
† Alpha Components, Mechanicsburg, PA 17055 717-697-8595
† Andersen Laboratories, Bloomfield, CT 06002 203-286-9090
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
† Axel Electronics, Inc., Jamaica, NY 11418 718-291-3900
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
† Coast Coil Co., Coast Magnetics, Los Angeles, CA 90016 213-936-6188
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Dantel, Fresno, CA 93727 209-292-1111
§ De Coursey Engineering Laboratory, Culver City, CA 90230 ..... 213-EX7-9668
† EG & G Frequency Products Inc., EG & G Inc., Cincinnati, OH 45232 513-542-5555
† ESC Electronics Corp., Palisades Pk., NJ 07650 201-947-0400
§ EWC, Inc., Englishtown, NJ 07726 908-446-3110
† Filter Products, Rockwell International, Costa Mesa, CA 92626 714-641-5311
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
† Frequency Selective Networks, Woodside, NY 11377 718-424-7500
† Genisco Technology Corp., La Mirada, CA 90638 714-523-7001
† Hisonic, Inc., Olathe, KS 66061 913-782-0012
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
† K&L Microwave, Inc., Salisbury, MD 21801 301-749-2424
† Loral Microwave-Wavecom, Northridge, CA 91324 818-882-3010
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
McCoy Electronics Co., A Sub. of Oak Industries, Mt. Holly Springs, PA 17065 717-486-3411
Microwave Development Laboratories, Natick, MA 01760 508-655-0060
† Networks International Corporation, Lenexa, KS 66215 913-469-6494
OPT Industries, Inc., Phillipsburg, NJ 08865 908-454-2600
† Polyphase Instrument, Ft. Washington, PA 19034 215-643-6950
† RFI Corporation, Bay Shore, NY 11706 516-231-6400
† Rockwell International, Costa Mesa, CA 92626 714-641-5311
Sokol Crystal Products, Inc., Mineral Point, WI 53565 608-987-3363
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
† Telonic/Berkeley, Berkeley Inds. Inc., Laguna Beach, CA 92652 714-494-9401
† Torotron Corp., Mt. Vernon, NY 10550 914-664-2050
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

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Flashers-2200

§† **Amperite Co., Inc., Union City, NJ 07087, 201-864-9503** ..... **B•1414**
Hold-Heet Products Corp., Chicago, IL 60640, 312-728-4454;312-728-4455 ..... **B•1501**
† **Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200** ..... **B•1540**
† **Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831, 415-471-9717;800-221-7060** ..... **B•1578**
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... **D•1060**
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Cole Hersee Co., Boston, MA 02127-2467 617-268-2100
§ Durakool, Inc., American Electronic Components, Elkhart, IN 46514 219-264-1116
Enerco, Inc., Seattle, WA 98108 206-762-1422
§ Hughey & Phillips, Inc., Simi Valley, CA 93065 805-581-5591
§ Industrial Devices, Inc., Hackensack, NJ 07601 201-489-8989
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Lark Electronics, Inc., New York, NY 10040 212-569-0430
§ Leecraft Mfg., Long Island City, NY 11101 718-392-8800
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Vanguard Relay Corp., Warwick, RI 02886 401-732-0700
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

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Frequency Standards — See Standards, Frequency (Vol. D)

Frozen Epoxies -- See Compounds, Encapsulating, Molding, Potting (Vol. C)

Furnaces, Electric-4100

† Ajax Magnethermic Corp., Warren, OH 44482 216-372-8511
Aremco Products, Inc., Ossining, NY 10562 914-762-0685
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
§† Casso-Solar, Pomona, NY 10970 914-354-2500
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
The Grieve Corporation, Round Lake, IL 60073-9989 708-546-8225
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
§† L & L Special Furnace, Aston, PA 19014 215-459-9216
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
† Trent, Inc., Philadelphia, PA 19127 215-482-5000

Furnaces, Gas (Production)-4100

§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
The Grieve Corporation, Round Lake, IL 60073-9989 708-546-8225
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Furnaces, Infrared-4100

§† Casso-Solar, Pomona, NY 10970 914-354-2500
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
§ Zevatech, Inc., Morrisville, NC 27560 919-460-0111

Furnaces, Ultraviolet-4100

† American Ultraviolet, Murray Hill, NJ 07974 908-665-2211
§ Zevatech, Inc., Morrisville, NC 27560 919-460-0111

Furnaces, Vacuum-4100

† Ajax Magnethermic Corp., Warren, OH 44482 216-372-8511
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
§ Hull Corp., Hatboro, PA 19040 215-672-7800
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973

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Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1855
Panametrics, Waltham, MA 02154-3497 617-899-2740
Princo Instruments, Inc., Southampton, PA 18966
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
† Thunder Scientific Corp., Albuquerque, NM 87123 ..... 505-265-8701;800-872-7728

Gauges, Ionization-2900

§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
The Fredericks Company, Huntingdon Valley, PA 19006 215-947-2500
§ Leybold Inficon Inc., E. Syracuse, NY 13057 315-434-1100
† MKS Instruments, Inc., Andover, MA 01810 508-975-2350
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300

Gauges, Pressure-Also See Transducers, Pressure-2900

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307
Setra Systems, Inc., Acton, MA 01720, 508-263-1400;1-800-25-SETRA ..... B•1948-1949
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1384
Aerodyne Controls Corporation, Ronkonkoma, NY 11779 516-737-1900
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Bellofram Corporation, Newell, WV 26050 ..... 304-387-1200;800-727-5646
† Bourns Instruments Inc., Riverside, CA 92507 714-781-5148
§ Crystal Engineering Corp., Los Osos, CA 93402 ..... 805-528-2155;800-444-1850
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
DJ Instruments, Inc., N. Billerca, MA 01862 508-667-5301
EMICO Inc., Dublin, PA 18917 215-249-9330
† Entran Devices, Fairfield, NJ 07004 ..... 201-227-1002;800-635-0650
§ Extech Instruments Corp., Waltham, MA 02154 617-890-7440
† Faria, Thomas G., Corp., Uncasville, CT 06382-0983 203-848-9271
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
HBM, Inc., Marlboro, MA 01752 508-624-4500
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
† Kulite Semiconductor Prods., Inc., Leonia, NJ 07605 201-461-0900
§ Leybold Inficon Inc., E. Syracuse, NY 13057 315-434-1100
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
Martel Electronics, Salem, NH 03079 603-893-0886
Mensor Corporation, San Marcos, TX 78666 512-396-4200
§† MKS Instruments, Inc., Andover, MA 01810 508-975-2350
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
Norgren, Littleton, CO 80120-1663 303-794-2611
Princo Instruments, Inc., Southampton, PA 18966
Sensor Products, Inc., New York, NY 10010 212-675-0201
§ Snaptite/Allied, Erie, PA 16505 814-833-6131
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
§† Trans Metrics, Inc., Solon, OH 44139 216-248-2229
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121
§ Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Gauges, Strain-5500 — *See Vol. B*

Gauges, Temperature-2900

~~Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307~~
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
EMICO Inc., Dublin, PA 18917 215-249-9330
† Faria, Thomas G., Corp., Uncasville, CT 06382-0983 203-848-9271
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
HBM, Inc., Marlboro, MA 01752 508-624-4500
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
Linear Instruments, Spectra Physics Analytical, Reno, NV 89523 702-746-2200
§ Pacific Transducer Corp., Los Angeles, CA 90064-1482 213-478-1134
PPM, Inc., Cleveland, OH 44139 216-349-2300
Princo Instruments, Inc., Southampton, PA 18966
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
† Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121

Gauges, Torque-2900

Waters Manufacturing, Inc., Talley Industries, Wayland, MA 01778 508-358-2777

Gearheads & Speed Reducers - Also see gears and gear mechanisms-3500 — *See Vol. B*

Gears & Gear Mechanisms (Precision)-2500 — *See Vol. C*

Generator Groups (MIL), Signal-2440 — *See Vol. B*

Generators, AM-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
Analogic Corp., Peabody, MA 01960 508-977-3000
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050 516-883-1700
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Wavetek San Diego, Inc., Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, AM/FM-2900

† Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218-1219

Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... **D•2207**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... **D•1287**
§ Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... **D•1292**
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ..... 617-275-0850; 800-937-4688
Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Arbitrary Waveform-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... **D•1309**
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Gage Applied Sciences Inc., St. Laurent, Que., CANADA H4S 1E9 514-337-6893
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
PERX,Inc., Corte Madera, CA 94925 415-927-0155
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
XYZ Electronics, McCordsville, IN 46055 317-335-2128

Generators, Audio-2900

§ Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... **D•1032-1034**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... **D•1287-1288**
Alpha-M Corp., Dallas, TX 75229 214-406-0424
Amber Electric Design, St. Laurent, PQ., CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Energy Systems, Vancouver, WA 98682 206-896-8310
Frequency Devices, Inc., Haverhill, MA 01832 508-374-0761
† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050 516-883-1700
Julie Research Labs., New York, NY 10001 212-633-6625
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Star Micronics, Inc., OEM Division, Piscataway, NJ 08854 908-572-9512
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Bar, Dot & Crosshatch-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... **D•1287**
§† Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... **D•1315**
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Colorado Video, Inc., Boulder, CO 80306 303-530-9580
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361

Generators, Baud Rate-1900

§ Champion Technologies, Inc., Franklin Park, IL 60131, 708-451-1000 ..... **A•1321**
† Oscillatek, A Dover Technology Company, Olathe, KS 66062, 913-829-1777 ..... **A•1428-1429**
§ M-Tron Industries, Yankton, SD 57078 605-665-9321
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
SARONIX, Palo Alto, CA 94303 415-856-6900

Generators, Character-2325

§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... **D•1084**
§† Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... **D•1315**
Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
§ Anacom, Anaheim, CA 92805-6235 714-774-8080
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Aston Electronics, Inc., Aston Electronic Designs, Ltd., Olathe, KS 66062 913-782-4007
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Datachron Inc., Anaheim, CA 92805 714-385-1705
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
† Telpar, Inc., Addison, TX 75001 214-233-6631

Generators, Color Bar-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... **D•1286-1287**
§† Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... **D•1315**
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Telemet, Geotel Inc., Hauppauge, NY 11788 516-436-7260
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361

Generators, Digital Delay – See Generators, Timing, Digital (Vol. D)

Generators, Electrical Power-4000

† Georator Corp., Manassas, VA 22110-0070, 800-523-9938 ..... **D•2195-2198**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
† American Electronics, Fullerton, CA 92631 714-871-3020
§† Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
Electro-Pacific, Goleta, CA 93117 805-964-0751
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
Energy Systems, Vancouver, WA 98682 206-896-8310
† Globe Motors, Dayton, OH 45404 513-228-3171
† Pacific Scientific, Electro Kinetics Division, Santa Barbara, CA 93101 805-963-2055
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Simmonds Precision Engine Systems, BF Goodrich Aerospace, Norwich, NY 13815 607-335-5000
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
† Vernitech:Vernitron Corp., Deer Pk, NY 11729 516-586-5100

Generators, Electrostatic Discharge - Also See Electrostatic Discharge Guns-2900

Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... **D•1321**

Compliance Design Inc., Boxboro, MA 01719 508-264-4668
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 703-494-1900
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
Plastic Capacitors, Inc., Chicago, IL 60639 312-489-2229
§ S & H Inds., Hatfield, PA 19440 215-822-7211
§ Simco Co., Hatfield, PA 19440 215-822-2171
† Stag Microsystems Inc., Santa Clara, CA 95054 ..... 408-988-1118;1-800-227-8836
† Velonex, Santa Clara, CA 95050 408-727-7370

Generators, FM-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050 516-883-1700
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, FM/Stereo-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100

Generators, Frequency Synthesizer-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... **D•1287-1288**

Programmed Test Sources, Littleton, MA 01460, 508-486-3008 ..... **D•1312**

Anadex Inc., Camarillo, CA 93012 805-987-9660
Analogic Corp., Peabody, MA 01960 508-977-3000
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
Avasem Corporation, San Jose, CA 95126 408-297-1201
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
† Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
† Ferretec Inc., Fremont, CA 94539-7474 415-226-1216
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
M/A-COM Government Products, Inc., Hunt Valley, MD 21030 301-771-0077
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Rapid Systems Inc., Seattle, WA 98103 206-547-8311
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
Western Multiplex Corp., Belmont, CA 94002 415-592-8832
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Generators, Function-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... **D•1224**

Bel Fuse, Jersey City, NJ 07302, 201-432-0463 ..... **A•1499**

Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... **A•1541,1544**

§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... **D•2207**

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**

Krohn-Hite Corp., Avon, MA 02322, 508-580-1660 ..... **D•1279**

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... **D•1286-1288**

§ Action Instruments, San Diego, CA 92123 619-279-5726
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Analogic Corp., Peabody, MA 01960 508-977-3000
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Cal-Tek Engineering, Kingston, MA 02364 617-585-5666
† CELCO, Mahwah, NJ 07430 201-327-1123
§ Contact East, N. Andover, MA 01845 508-682-2000
§ E & L Instruments, Interplex Electronics, Inc., New Haven, CT 06512 800-368-0880
Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
Evans Electronics, Berkeley, CA 94705 415-653-3083
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Kikusui International Corp., Torrance, CA 90503 ..... 213-371-4662;800-545-8784
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
MTS Systems, Minneapolis, MN 55424 612-937-4000
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
PCA Electronics, Sepulveda, CA 91343 818-892-0761
† Perkin-Elmer Corp., Elctrn. Prods. Dept., Norwalk, CT 06859-0132 203-762-4786
Prema Precision Electronics, Inc., Montclair, CA 91763 714-621-7292
§ PROTEK Inc, Norwood, NJ 07648 201-767-7242
Rapid Systems Inc., Seattle, WA 98103 206-547-8311
Resonant Power Technology, Santa Clara, CA 95054 408-982-0200
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
Shapiro Scientific Inst., Corona del Mar, CA 92625 714-675-1024
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
† Velonex, Santa Clara, CA 95050 408-727-7370
§ Walker Scientific, Worcester, MA 01606 ..... 508-852-3674;508-853-3232;800-962-4638
XYZ Electronics, McCordsville, IN 46055 317-335-2128

Generators, Gating/Timing-2900

Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... **D•1229**

† TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... **D•1078,1194-1195**

CAL-AV, Inc., Campbell, CA 95008 408-371-0666
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
§ Pacific Atlantic Elctrns., Patronix, Inc., El Cerrito, CA 94530 415-237-5837
Panametrics, Waltham, MA 02154-3497 617-899-2740
Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700

Generators, Hall-5500 — *See Vol. B*

Generators, Harmonic-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Ferretec Inc., Fremont, CA 94539-7474 415-226-1216
§ Micro-Now Instr. Co., Inc., Skokie, IL 60076 708-677-4700
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411

Generators, High Power Pulse-2900

Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... **D•1222**

Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... D•1229
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cober Electronics, Stamford, CT 06902 203-327-0003
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
† Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Ion Physics Co., Atkinson, NH 03811 603-893-6687
Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Generators, Impulse-2900

Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1257
Berkeley Nucleonics Corp., Richmond, CA 94804 510-234-1100
§ Contact East, N. Andover, MA 01845 508-682-2000
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
† Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Ion Physics Co., Atkinson, NH 03811 603-893-6687
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
Picosecond Pulse Labs, Inc., Boulder, CO 80306 303-443-1249
† Velonex, Santa Clara, CA 95050 408-727-7370

Generators, Infrared — See Lamps, Infrared (Vol. B)

Generators, Ion - Also see Static Eliminating Materials and Equipment; Generators ESD-2900

S & H Inds., Hatfield, PA 19440 215-822-7211
§ Semtronics Corp., Peachtree City, GA 30269 404-487-6681

Generators, Light Pulse-2900

Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... D•1229
Antel Optronics Inc., Burlington, Ontario, CANADA L7M 1A6 416-335-5507
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
† INTELCO, Acton, MA 01720 508-264-4485
§ Monarch Instrument, Monarch International Inc., Amherst, NH 03031 ..... 603-883-3390; 800-999-3390
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Generators, Low Frequency-2900

§ **Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
§ Action Instruments, San Diego, CA 92123 619-279-5726
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Frequency Devices, Inc., Haverhill, MA 01832 508-374-0761
† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Julie Research Labs., New York, NY 10001 212-633-6625
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Vectron Laboratories, Inc., Norwalk, CT 06850 203-853-4433
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Marker-2900

§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
International Crystal Mfg., Oklahoma City, OK 73126 ... 504-236-3741; 1-800-426-9825
Kay Elemetrics Corp., Pine Brook, NJ 07058-2025 201-227-2000
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Generators, Microwave-3450 — *See Vol. A*

Generators, Noise, Random (Electrical)-2900

Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2192
Elgenco, Inc., Hurricane, UT 84737, 801-635-4954 ..... D•1244
† **MDF Products Inc., Danbury, CT 06811, 203-743-3579 ..... D•1293**
†Φ **Noise Com Inc., Paramus, NJ 07652, 201-261-8797 ..... A•1821, D•1304-1305**
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
§ Micro-Now Instr. Co., Inc., Skokie, IL 60076 708-677-4700
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Velonex, Santa Clara, CA 95050 408-727-7370
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Optical Signal — See Generators, Light Pulse (Vol. D)

Generators, Phase-2900

Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... A•1539
§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1273
† Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
† Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
Evans Electronics, Berkeley, CA 94705 415-653-3083
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Ryan International Corp., Columbus, OH 43229-6207 614-885-3303
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Programmable, Function-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Krohn-Hite Corp., Avon, MA 02322, 508-580-1660 ..... D•1279
Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
Analogic Corp., Peabody, MA 01960 508-977-3000
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Generators, Programmable, Pulse-2900

§† **Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... A•1532-1533,1539-1540,1544**
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
Berkeley Nucleonics Corp., Richmond, CA 94804 510-234-1100
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Stoelting Co., Wood Dale, IL 60191 708-860-9700
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Velonex, Santa Clara, CA 95050 408-727-7370
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Programmable, Synthesizers-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
§ **Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104** ..... D•1287-1288
Programmed Test Sources, Littleton, MA 01460, 508-486-3008 ..... D•1312
Analogic Corp., Peabody, MA 01960 508-977-3000
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Wavetek Microwave, Inc., (Formerly Pacific Measurement, Inc.), Sunnyvale, CA 94089 408-734-5780
Wavetek RF Products, Inc., (Formerly Wavetek Indiana, Inc.), Indianapolis, IN 46203-6109 317-788-9351
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Generators, Pseudorandom Bit Sequence (PRBS)-2900

Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
New Wave Instruments, Provo, UT 84604 801-373-4909

Generators, Pulse-2900

Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
§ **B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448** ..... D•1224
Bel Fuse, Jersey City, NJ 07302, 201-432-0463 ..... A•1499
Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... D•1229
§† **Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299** ..... A•1532-1533,1539-1540
§ **Epson America Inc., Component Sales Dept., Torrance, CA 90503, 213-787-6300** ..... A•1360
† **Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635, 602-459-1150** ..... B•1280-1282
§ Action Instruments, San Diego, CA 92123 619-279-5726
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1098 619-495-3200
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Cober Electronics, Stamford, CT 06902 203-327-0003
Colorado Data Systems, inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Disc Instruments, Honeywell, Costa Mesa, CA 92626 714-433-0343
§ Dynapar, Gurnee, IL 60031 312-662-2666
Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
† Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Evans Electronics, Berkeley, CA 94705 415-653-3083
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Global Specialties, interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Hameg, Inc., Port Washington, NY 11050 516-883-3337
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
† Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Ion Physics Co., Atkinson, NH 03811 603-893-6667
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300
IVO Industries, Inc., Eatontown, NJ 07724 ..... 908-542-5151;800-932-0489
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
§ Laser Diode, Inc., Morgan Crucible, New Brunswick, NJ 08901 201-249-7000
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
§ Pacific Atlantic Elctrns., Patronix, Inc., El Cerrito, CA 94530 415-237-5837
Panametrics, Waltham, MA 02154-3497 617-899-2740
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
Picosecond Pulse Labs, Inc., Boulder, CO 80306 303-443-1249
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
Republic Electronics Co., Hauppauge, NY 11788 516-273-9800
Resonant Power Technology, Santa Clara, CA 95054 408-982-0200
§ Rhombus Industries, Huntington Bch., CA 92649-1595 714-898-0960
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
Sensor Corp., Scottdale, PA 15683 412-887-4080
Seven Mountains Sci. Inc., Boalsburg, PA 16827 814-466-6559
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Velonex, Santa Clara, CA 95050 408-727-7370
Wavetek San Diego, Inc., Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Pulse, National Instrumentation Module (NIM)-2900

Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... D•1229
Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4 613-226-5772
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
† Velonex, Santa Clara, CA 95050 408-727-7370

Generators, RF-2900

§ **Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104** ..... D•1287-1288
§ **Marconi Instruments, Allendale, NJ 07401, 201-934-9050** ..... D•1292
Programmed Test Sources, Littleton, MA 01460, 508-486-3008 ..... D•1312
† **Servo Corporation of America, Hicksville, NY 11802-0907, 516-938-9700** ..... A•1827
† Ajax Magnethermic Corp., Warren, OH 44482 216-372-8511
Alfa Electronics, Inc., Princeton, NJ 08543-8039 609-275-0220
† American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
Cober Electronics, Stamford, CT 06902 203-327-0003
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
§ Contact East, N. Andover, MA 01845 508-682-2000
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-8333
Ehrhorn Technological Opers., Inc., Colorado Springs, COLORADO 80919 719-260-1191
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
International Crystal Mfg., Oklahoma City, OK 73126 ..... 504-236-3741; 1-800-426-9825
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
† Lepel Corp., Edgewood, NY 11717 516-586-3300
Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
Nemeth Engineering Associates, Inc., Crestwood, KY 40014 502-241-1502
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 312-670-0150
RE instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
§ Specc Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Vectron Laboratories, Inc., Norwalk, CT 06850 203-853-4433
Wavetek San Diego, Inc., Wavetek Corp., San Diego, CA 92123 619-279-2200
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

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Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1273
§ **Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104** ..... D•1286-1288
§ **Marconi Instruments, Allendale, NJ 07401, 201-934-9050** ..... D•1292
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
Programmed Test Sources, Littleton, MA 01460, 508-486-3008 ..... D•1312
§† **Quantum Data Inc., Elgin, IL 60123, 708-888-0450** ..... D•1315
§ Action Instruments, San Diego, CA 92123 619-279-5726
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
Cal-Scope, Excaltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
§ Contact East, N. Andover, MA 01845 508-682-2000
Direct Sound Corporation, New York, NY 10011 212-691-9050
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100

Frequency Devices, Inc., Haverhill, MA 01832 508-374-0761
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Lucas Epsco, Inc., Hopkinton, MA 01748-2204 508-435-2400
Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
Team Systems, Div. of Toyo Spectrum, Santa Clara, CA 95051 408-720-8877
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
§ Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Velonex, Santa Clara, CA 95050 408-727-7370
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361
Wavetek Microwave, Inc., (Formerly Pacific Measurement, Inc.), Sunnyvale, CA 94089 408-734-5780
Wavetek RF Products, Inc., (Formerly Wavetek Indiana, Inc.), Indianapolis, IN 46203-6109 317-788-9351

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Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
† Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Φ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Velonex, Santa Clara, CA 95050 408-727-7370

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Generators, Surge-2900

Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1257
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
§† KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
Resonant Power Technology, Santa Clara, CA 95054 408-982-0200
Φ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020

Generators, Sweep-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1224
Krohn-Hite Corp., Avon, MA 02322, 508-580-1660 ..... D•1279
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
§ Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... D•1292
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§† EIP Microwave, Inc., Milpitas, CA 95035 408-945-1477
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
M/A-COM Government Products, Inc., Hunt Valley, MD 21030 301-771-0077
§ Micro-Now Instr. Co., Inc., Skokie, IL 60076 708-677-4700
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Simpson Electric Co., Elgin, IL 60120 708-697-2260
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
§ Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
† Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638
Wavetek RF Products, Inc., (Formerly Wavetek Indiana, Inc.), Indianapolis, IN 46203-6109 317-788-9351
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Generators, Telephone Ringing-1900

Cambridge Electronics Laboratories, Somerville, MA 02144 617-629-2805
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
§ Viking Electronics, Hudson, WI 54016 715-386-8861

Generators, Time Code-2000

§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
† Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167
FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ..... A•1371
† TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194-1195
Datachron Inc., Anaheim, CA 92805 714-385-1705
§ ESE, El Segundo, CA 90245 213-322-2136
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Generators, Timing, Digital-2000

Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
Bel Fuse, Jersey City, NJ 07302, 201-432-0463 ..... A•1499
Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... D•1229
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
† Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167
FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ..... A•1371
† TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194-1195
CAL-AV, Inc., Campbell, CA 95008 408-371-0666
Datachron Inc., Anaheim, CA 92805 714-385-1705
§ Dataprobe, Englewood, NJ 07631 201-569-6464
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Interface Technology, Dynatech Corp., Glendora, CA 91740 818-914-2741
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Tone-2900

§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
AES Corp., Peabody, MA 01960 508-535-7310
Aptek Technologies, Inc., Aptek Microsystems, Deerfield Beach, FL 33442 305-421-8450
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
Frequency Devices, Inc., Haverhill, MA 01832 508-374-0761
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Sonicall, Inc., Signal Hill, CA 90806 213-490-2143
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854 908-572-9512
† Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
Western Multiplex Corp., Belmont, CA 94002 415-592-8832
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Generators, Tone Burst-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286-1287
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Solid State Electronics Corp., Northridge, CA 91324 ..... 818-993 8257
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Transient Line Voltage-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
Philips Components Discrete Products Division, A North American Philips Company, Riviera Beach, FL 33404 407-881-3200
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
Transmagnetics, Farmingdale, NY 11735 516-293-3100
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Velonex, Santa Clara, CA 95050 408-727-7370

Generators, UHF/VHF-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287-1288
Programmed Test Sources, Littleton, MA 01460, 508-486-3008 ..... D•1312
Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1327
SEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Dowty Avionics, Arcadia, CA 91006 818-445-5955
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Kay Elemetrics Corp., Pine Brook, NJ 07058-2025 201-227-2000
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
† Q-Tech Corp., Culver City, CA 90232-3510 213-836-7900
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Syntest Corp., Marlboro, MA 01752-9073 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Vectron Laboratories, Inc., Norwalk, CT 06850 203-853-4433
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Generators, Ultrasonic-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
§ Heat System, Inc., Farmingdale, NY 11735 516-694-9555
Instrument Research Co., Santa Barbara, CA 93103 805-962-8336
§† L & R Mfg. Co., Kearny, NJ 07032 201-991-5330
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 708-824-1133
Panametrics, Waltham, MA 02154-3497 617-899-2740
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§† Sonicor Instrument Corp., Copiague, NY 11726 516-842-3344
§ Sonobond Ultrasonics Inc., Inductotherm Industries, West Chester, PA 19382 ..... 215-696-4710;800-323-1269
Tekironix, Inc., Beaverton, OR 97077 800-835-9433
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020

Generators, Video Test-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§† Quantum Data Inc., Elgin, IL 60123 708-888-0450
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Team Systems, Div. of Toyo Spectrum, Santa Clara, CA 95051 408-720-8877

Generators, White Noise-2900

† MDF Products Inc., Danbury, CT 06811, 203-743-3579 ..... D•1293
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Generators, Word-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
§ Adtron Corporation, Chandler, AZ 85224 602-926-9324
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Interface Technology, Dynatech Corp., Glendora, CA 91740 818-914-2741
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Outlook Technology, Inc., Campbell, CA 95008 408-374-2990
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Pulse Instruments Co., Torrance, CA 90502 213-515-5330
† Step Engineering, Sunnyvale, CA 94088 ..... 408-733 7837
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

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Omega Engineering, Stamford, CT 06907, 800-326-6342 ..... D•1422
§ Western Graphtec, Irvine, CA 92718-2057, 714-770-6010;800-854-8385 .. D•1425
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-3002
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-3030
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 818-365-0101

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§ Atlas/Soundolier, Fenton, MO 63025, 314-349-3110 ..... C•1013
PacTec, LaFrance Corp., Philadelphia, PA 19153, 215-365-8400 .... C•1071-1072
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Fourjay Industries, Dayton, OH 45413-0617 513-890-6444
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ International Components Corp., Melville, NY 11747 516-293-1500
LaFrance Corp., Philadelphia, PA 19153-3893 215-365-3000
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2285
§ Quam-Nichols Co., Chicago, IL 60637 312-488-5800
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825

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† Cut Craft, Inc., Ft. Worth, TX 76102, 817-332-6151 ..... C•1688
§† Daburn Electronics & Cable Corp., Northvale, NJ 07647 201-768-5400
§† Instrument Specialties Co. Headquarters, Delaware Water Gap, PA 18327-0136 717-424-8510
§ Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652

Guides, Circuit Board-1400 — *See Vol. C*

Gyros (All Types)-2200

Condor Pacific Inds., Inc., Canoga Park, CA 91304 818-347-8331
† Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
† Humphrey, Inc., San Diego, CA 92123 619-565-6631
§† Systron-Donner Inertial Div., Concord, CA 94518 415-671-6400

Hall Effect Devices — See Generators, Hall (Vol. B), Magnetoresistors, Hall (Vol. A), Multipliers, Hall (Vol. A), Probes, Hall (Vol. A), Switches, Hall Effect (Vol. B)

Handlers, Integrated Circuit (Automatic)-4100

Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
§ Eraser Co., Syracuse, NY 13221 315-454-3237
Exatron Automatic Test Equip., San Jose, CA 95111 .... 408-629-7600;800-EXA-TRON
§† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§ Prologic Systems, Broomfield, CO 80020 303-460-0103
§ Quality Automation, Inc., Anaheim, CA 92805 714-491-8535

Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ Stag Microsystems Inc., Santa Clara, CA 95054 ..... 408-988-1118;1-800-227-8836
§ Sym-Tek Sys., Inc., San Diego, CA 92123 619-569-6800
Testronics, Richardson, TX 75081 214-238-8378
† Thermonics, Inc., Santa Clara, CA 95054 408-496-6838
§ TRIGON/ADCOTECH, Dynatech, Milpitas, CA 95035 408-946-4300

Handles For Cabinets, Circuit Boards, Racks, etc.-1400 — *See Vol. C*

Handsets, Chestsets, Headsets, etc.-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
§† Audiosears, Stamford, NY 12167 ..... 607-652-7305;800-533-7863
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Multi Products International, West Paterson, NJ 07424 201-890-1344
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† Roanwell, New York, NY 10014 212-989-1090
Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
§ Shure Brothers inc., Evanston, IL 60202-3696 708-866-2200
† Stanton Magnetics, Inc., Plainview, NY 11803-1511 516-349-0235
§† Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893

Hardware — See Fasteners (Vol. C), Clamps (Vol. C), Terminals (Vol. C), etc.

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Headers, Socket-2100 — *See Vol. C*

Headers, Strip-2100 — *See Vol. C*

Headers, Transistor & Diode-2500 — *See Vol. C*

Headphones-1300

† **RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057**
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
Audiosears, Stamford, NY 12167 ..... 607-652-7305;800-533-7863
§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
§† Centurion International, Inc., Lincoln, NE 68504 402-467-4491
CUI Stack Inc., Beaverton, OR 97005 503-643-4899
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Grado Laboratories, Brooklyn, NY 11220 718-435-5340
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
International Components Corp., Melville, NY 11747 516-293-1500
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§† R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
† Roanwell, New York, NY 10014 212-989-1090
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911

Heads, Magnetic Recording-1300

§† **International Electro Magnetics, Inc., Palatine, IL 60067, 708-358-4622 ... D•1036**
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... A•1299
§ American Magnetics Corporation, Group 4, Carson, CA 90745 213-775-8651
† Apollo Magnetics Corp., Los Angeles, CA 90057 213-381-2500
Applied Magnetics, Goleta, CA 93117 805-683-5353
† Brush Industries Inc., Sunbury, PA 17801-0638 ..... 717-286-5611;800-233-0362
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
† Mag-Head Engineering Co., Minneapolis, MN 55427 612-545-1321
§† Michigan Magnetics, Vermontville, MI 49096 517-726-0590
National Micronetics, Kingston, NY 12401 914-338-0333
Norton Associates, Inc., Copiague, NY 11726 516-842-4666
† Pacific Magnetics Corp., National City, CA 92050 619-474-8216
† Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233

Headsets (MIL)-2440 — *See Vol. B*

Heat Dissipators — See Heat Sinks, Semiconductor (Vol. C), Heat Sinks, Soldering (Vol. C)

Heaters, Display-5300 — *See Vol. B*

Heaters, Immersion-4100

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1946
Brinkmann Instruments, Inc., Westbury, NY 11590-9974 516-334-7500
Ogden Manufacturing Co., Arlington Heights, IL 60005 708-593-8050
Rodale Technical Sales Inc., Islip, NY 11751 516-277-5454
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Technic, Inc., Providence, RI 02940-9650 401-781-6100
† Trent, Inc., Philadelphia, PA 19127 215-482-5000

Heaters & Heating Elements (For Components & Equipment)-Also See Ovens-5300 — *See Vol. B*

Heat Exchangers & Systems-2600 — *See Vol. C*

Heat Guns, Production-5400 — *See Vol. C*

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Holders, Battery — See Retainers, Battery (Vol. C), Connectors, Battery (Vol. C)

Holders, Brush — See Brushes & Brush Assemblies (Vol. B)

Holders, Circuit Board (Production Type)-4100

§† **Atlee Inc., North Andover, MA 01845, 508-681-1003 ..... C•1014,1679**
§ **Bivar, Inc., Irvine, CA 92718, 714-951-8808 ..... C•1015**
§ **Calmark Corp., San Gabriel, CA 91776, 818-287-0451 ..... C•1019**
EG & G Birtcher, EG & G, Inc., El Monte, CA 91734-1268, 818-442-2572 ..... C•1028-1029
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
§ BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
§† Bud Industries, Inc., Willoughby, OH 44094-0431 216-946-3200
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Eraser Co., Syracuse, NY 13221 315-454-3237
§† Fancort Industries, Inc., W. Caldwell, NJ 07006 201-575-0610
§ Fastex, Illinois Tool Works, Des Plaines, IL 60016 312-299-2222
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ General Hardware Mfg., New York, NY 10013 212-431-6100
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§ Micro Electronic Systems, Inc., Bridgewater, CT 06752 203-350-5004
Pace Inc., Laurel, MD 20723-1990 301-490-9860
§ PanaVise Products, Inc., Sparks, NV 89431 702-353-2900
Parsons Manufacturing, Menlo Park, CA 94025-1476 415-324-4726
§ Richco Plastic Co., Chicago, IL 60680 312-539-4060
Schroff Incorporated, Warwick, RI 02886 401-732-3770
† Stevens Products, Inc., E. Orange, NJ 07019 201-672-2140
§ Technical Devices, Torrance, CA 90503 213-618-8437
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Titchener, E. H., & Co., Binghamton, NY 13902 607-772-1161
Unitrack Industries, Inc., West Chester, PA 19380 215-692-0800
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652

Holders, Crystal-2300 — *See Vol. A*

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Holders, Lamp — See Sockets, Lamp & Lamp Assemblies (Vol. B)

Holders, Test Lead-2900

§ Concord Electronics Corporation, New York, NY 10012 1-212-777-6571
E-Z Hook, Tektest Inc., Arcadia, CA 91006 818-446-6175
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
§ Schurter, Inc., Petaluma, CA 94952 707-778-6311
H H Smith, NT-T Inc., Meadville, PA 16335 814-724-6440
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990

Holders, Tube — See Retainers, Tube (Vol. A)

Holders & Carriers, Chip (Capacitor, IC, LSI)-2100 — *See Vol. C*

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Igniters, Electronic & Piezo-2300 — *See Vol. A*

Image Processing Systems — See Processors, Image (Vol. D)

Imagers, Thermal-2900

§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ Compix, Inc., Tigard, OR 97224 503-639-8496
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
Kyocera Northwest, Electronic Components Group, Vancouver, WA 98661 206-696-2840
Land Infrared, Land Instruments Intl. Inc., Bristol, PA 19007 ..... 215-781-0700; 800-523-8939
§† Mikron Instr., Wyckoff, NJ 07481 201-891-7330
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† UTI Instruments Co., San Jose, CA 95131 408-428-9400
† Xedar Corp., Boulder, CO 80301 303-443-6441

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Inclinometers-2900

Transducers & Systems, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... B•1947
§ Contact East, N. Andover, MA 01845 508-682-2000
† Edcliffe Div., BEI Electronics Co., Sylmar, CA 91342 818-362-7151
The Fredericks Company, Huntingdon Valley, PA 19006 215-947-2500
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-6000
† Spectron Glass & Electronics, Inc., Hauppauge, NY 11788 516-582-5600
Terra Technlg. Corp., Redmond, WA 98052 206-883-7300

Incremental Magnetic Recorders — See Recorders, Computer Data (Vol. D)

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Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... **D•1128**
§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... **D•1129**
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... **D•1084**
§† Curtis Instruments, Inc., Mt. Kisco, NY 10549, 914-666-2971 ..... **D•1132**
† Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... **D•1164**
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... **D•1342**
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ..... **B•1058-1064**
EDI, Wood Dale, IL 60191, 708-860-5838 ..... **B•1065**
† Electrodynamics, Inc., A Talley Inds. Co., Rolling Meadows, IL 60008, 708-259-0740 ..... **D•1134**
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... **D•1346**
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... **D•1385-1386**
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... **D•1349**
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... **B•1907**
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... **D•1365**
† Oxley Inc., Branford, CT 06405, 203-488-1033 ..... **B•1179**
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... **D•1375,1385-1386**
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... **D•1395**
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
† Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 203-271-6000
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§† Cramer Co., Old Saybrook, CT 06475 800-247-6784
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
C-Tek Inc., Wakefield, MA 01880 617-246-1720
† Digitec, Marion, OH 43302 614-387-3444
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
Electric Tachometer, Philadelphia, PA 19142 215-726-7723
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
EMICO Inc., Dublin, PA 18517 215-249-9330
§ ESE, El Segundo, CA 90245 213-322-2136
† Faria, Thomas G., Corp., Uncasville, CT 06382-0983 203-848-9271
† The Fredericks Company, Huntingdon Valley, PA 19006 215-947-2500
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 201-825-9696
Gruner, Advanced Components Industries, Inc., Torrance, CA 90501 213-328-0060
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-746-7900
§ J-B-T Instruments, Inc., New Haven, CT 06508-1818 203-776-1111
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
Ledtronics, Inc., Torrance, CA 90505 213-549-9995
Meylan Corporation, Upper Montclair, NJ 07043-1844 201-744-6400
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
PPM Inc., Cleveland, OH 44139 216-349-2300
§ Redington Counters, Windsor, CT 06095 203-688-6205
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§† Stemco Instruments, Colt Industries, Longview, TX 75607 214-643-3236
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440

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C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ JMR Electronics, Bronx, NY 10461 212-597-6050
Transmagnetics, Farmingdale, NY 11735 516-293-3100

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§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... **B•1889**
North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... **D•1306**
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... **B•1924**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1013,1307**
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§ ASI Instruments, Inc., Houston, TX 77024 800-245-7056
† Automation Prods., Inc., Houston, TX 77008 713-869-0361
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Bindicator, Port Huron, MI 48061-0009 313-987-2700
§ Chessell Corp., Newtown, PA 18940 215-968-0660
§ Curtis Industries, Milwaukee, WI 53219-0910 414-649-4200
† EG & G Flow Technology, Inc., Phoenix, AZ 85072 602-437-1315
† Faria, Thomas G., Corp., Uncasville, CT 06382-0983 203-848-9271
Fluid Components, Inc., San Marcos, CA 92069 619-744-6950
§† Gems Sensors Division, Div. of IMO Industries Inc., Plainville, CT 06062-1198 203-677-1311
Hersey Measurement Co., A Miller Industries Co., Spartanburg, SC 29305 ..... 803-574-8960;1-800-845-2102
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
† Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
Intek, Inc., Westerville, OH 43081 614-895-0301
§† Kay-Ray/Sensall, Inc., Mt. Prospect, IL 60056 708-803-5100
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
§† Kistler-Morse, Redmond, WA 98073 206-881-8000
§ Meriam Instrument, Scott Fetzer, Cleveland, OH 44102 216-281-1100
Micro Pneumatic Logic, inc., Fort Lauderdale, FL 33309-1786 305-973-6166
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
Penberthy, Inc., De Vlieg-Bullard, Prophetstown, IL 61277 815-537-2311
PMT Division, Ametek, Inc., Feasterville, PA 19053 215-355-6900

Princo Instruments, Inc., Southampton, PA 18966
Schlumberger Industries, Tranducers Div., Houston, TX 77082 713-558-2587
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
Sensotec, Inc., Columbus, OH 43212 614-486-7723
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Signal Systems International, Lavalette, NJ 08735 201-793-4668
† Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Viatran Corporation, Grand Isl. 14072 716-773-1700
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311
§ ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Indicators, Null-2900

† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Julie Research Labs., New York, NY 10001 212-633-6625
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

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Indicators, Phase Rotation-2200

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220
Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831, 415-471-9717;800-221-7060 ..... B•1578
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
† GreenLee Textron Inc.:Subsidiary of Textron Inc., Rockford, IL 61109 ... 815-397-7070
§ Lark Electronics, Inc., New York, NY 10040 212-569-0430
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759

Indicators, Phase Sequence-2200

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220
† Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831, 415-471-9717;800-221-7060 ..... B•1578
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§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026 314-343-8518
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
† GreenLee Textron Inc.:Subsidiary of Textron Inc., Rockford, IL 61109 ... 815-397-7070
§ Lark Electronics, Inc., New York, NY 10040 212-569-0430
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Ross Engineering Corp., Campbell, CA 95008 408-377-4621
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
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† Atec, Inc., Houston, TX 77055 713-468-7971
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
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§ Dynapar, Gurnee, IL 60031 312-662-2666
† Electric Tachometer, Philadelphia, PA 19142 215-726-7723
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§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
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§† Gems Sensors Division, Div. of IMO Industries Inc., Plainville, CT 06062-1198 203-677-1311
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† Humphrey, Inc., San Diego, CA 92123 619-565-6631
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
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Magnetoelastic Devices, Pittsfield, MA 01202 413-445-5608
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
§ Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
† Penn Keystone Corp., Wallingford, CT 06492 203-294-0537
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
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Sensor Corp., Scottdale, PA 15683 412-887-4080
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Teledyne Gurley, Troy, NY 12181 ..... 518-272-6300;800-759-1844
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
Trans-Tek, Ellington, CT 06029 203-872-8351
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
† Warren-Knight Instrument Co., Warren Industries, Inc., Philadelphia, PA 19116 215-464-9300
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§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
§ Chessell Corp., Newtown, PA 18940 215-968-0660
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
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† Howell Instruments, Ft. Worth, TX 76107 817-336-7411
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
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† Sterling Instruments, New Hyde Pk., NY 11040 516-328-3300
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
† Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
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§ Voice Connexion, Irvine, CA 92714 ... 714-261-2366

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† Boonton Electronics Corp., Randolph, NJ 07869 ... 201-584-1077
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 ... 418-683-0211
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Applied Data Systems, Baltimore, MD 21202 ... 800-541-2003;410-576-0335
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† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
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Colorado Data Systems, Inc., Englewood, CO 80110 ... 303-762-1640; 800-TEK-4VXI
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CYTEC Corp., Penfield, NY 14526 ... 716-381-4740;800-346-3117
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§ Emco Electronics, Lindenhurst, NY 11803 ... 516-845-7080

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IFR Sys. Inc., Wichita, KS 67215 316-522-4981
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
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† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
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Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
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† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
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Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311 305-587-5577
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Techron Div., Crown Intl., Inc., Elkhart, IN 46517 219-294-8300
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Telonic/Berkeley, Berkeley Inds. Inc., Laguna Beach, CA 92652 714-494-9401
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
UTI Instruments Co., San Jose, CA 95131 408-428-9400
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
† Velonex, Santa Clara, CA 95050 408-727-7370
§† Warren-Knight Instrument Co., Warren Industries, Inc., Philadelphia, PA 19116 215-464-9300
Wavetek Microwave, Inc., (Formerly Pacific Measurement, Inc.), Sunnyvale, CA 94089 408-734-5780
Wavetek RF Products, Inc., (Formerly Wavetek Indiana, Inc.), Indianapolis, IN 46203-6109 317-788-9351
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
§ WestCon, Marion, OH 43302 614-382-5771
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000
Ziatech, San Luis Obispo, CA 93401 805-541-0488
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Instruments, Test & Measuring, Personal Computer-2900

Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275,1277
§ Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... B•1924
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
† Sunrise Electronics, Inc., Glendora, CA 91740, 818-914-1926 ..... D•1329
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
§ Adtron Corporation, Chandler, AZ 85224 602-926-9324
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
Ancot, Menlo Park, CA 94025 415-322-5322
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Ariel Corporation, Highland Pk, NJ 08904 908-249-2900
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§# Biomation, Cupertino, CA 95014-0718 408-988-6800
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
§† Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§Φ MetaLink Corporation, Chandler, AZ 85244 602-926-0797
Microvision Corp., Campbell, CA 95008 408-374-3158
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
§ Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
PERX,Inc., Corte Madera, CA 94925 415-927-0155
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
§ SC Technology, Inc., Livermore, CA 94550 415-373-9230
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Total Power International, Inc., Lowell, MA 01850 508-453-7272
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
VMETRO, Inc., VMETRO as, Houston, TX 77042 713-266-6430

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Integrators, Electronic-2325

Curtis Instruments, Inc., Mt. Kisco, NY 10549, 914-666-2971 ..... D•1132
§ Vibra-Metrics, Inc., Hamden, CT 06514, 203-288-6158;1-800-8-SENS-IT .. B•1957
Comlinear Corp., Fort Collins, CO 80525 303-226-0500
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Evans Electronics, Berkeley, CA 94705 415-653-3083
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
# Indiana Microelectronics Center Corp. for Science & Technology, Fort Wayne, IN 46825 219-482-8200
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
Magnetic Instrumentation, Indianapolis, IN 46226 317-545-2102
† Marconi Circuit Technology Corp., Farmingdale, NY 11735 516-293-8636
§ Metrolab Instruments SA, Geneva, SWITZERLAND CH-1228 ..... (41-22)794 11 21
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3292;800-962-4636

Integrators, Mechanical & Electromechanical-2200

† Industrial Control Co., Rockledge, FL 32955 407-259-7105
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
† Vernitech/Vernitron Corp., Deer Pk., NY 11729 516-586-5100

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CTI Electronics, Stratford, CT 06497, 203-386-9779 ..... D•1085
§ Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1158
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 ..... B•1488, D•1170-1172
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ..... D•1176
Information Transfer Inc., Bloomfield, NY 14469, 716-657-7074 .... D•1180-1181
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183
§ Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1838
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
3M-Electronic Products Division, Austin, TX 78769-2963, 1-800-225-5373 Sls. & Prod. Info. ..... C•1464
Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... D•1295,1412-1413
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124,1188-1189,1296-1297
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1191,1307
† Telpar, Inc., Addison, TX 75001, 214-233-6631 ..... D•1117
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
WECO Electrical Connectors, Inc., Mooers, NY 12958, 518-298-4810 .... C•1566
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L6, 514-694-9136 ..... C•1568
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1395
Windek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 ..... D•1122-1123
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•1119
Action Instruments, San Diego, CA 92123 619-279-5726
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
§ ALTEK Corporation, Silver Springs, MD 20904-7802 301-572-2555
§ American Advantech Corp., San Jose, CA 95122 408-293-6786
§ American Computer Hardware Corp., Santa Ana, CA 92705 714-549-2688
§ Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372 2447;In Can.: 1-800-553-2448
Augat Inc., Attleboro, MA 02703 617-222-2202
Augat, Inc., Interconnection Products Group, Attleboro, MA 02703 508-222-2202
Bit 3 Computer Corporation, Minneapolis, MN 55431-1393 612-881-6955
Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ Covid, Inc., Tempe, AZ 85281 602-966-2221
C-Tek Inc., Wakefield, MA 01880 617-246-1720
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
Data I/O Corp., Redmond, WA 98073-9746 206-881-3444
§ Datatran Corp., Denver, CO 80223 303-778-0670
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
† DEI, Escondido, CA 92029 619-743-8344
DGH Corporation, Manchester, NH 03108 603-622-0452
† Electro Prep Inc. & N-E-D Cable, Wareham, MA, MA 02571 508-291-2880
ETM Electromatic Inc., Newark, CA 94560 415-797-1100
Garry Electronics an LPL Co., Langhorne, PA 19047 215-949-2300
GEC-Marconi Electronic Systems Corp., Wayne, NJ 07474-0975 201-633-6000
GECO, Millheim, PA 16854 814-349-5555
GEN/COMP Inc., Canton, MA 02021 617-828-2028
General Digital Corp., Enfield, CT 06082 203-741-7177
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
§ GMR Co., Venice, CA 90291 213-399-1490
§ Graphic Strategies, Inc., Sunnyvale, CA 94089 408-745-6500
§ Greenwich Instruments USA, Charlotte, NC 28205 704-376-1021
§ Gunther, W., GmbH, D 8500 Nurnberg 82, GERMANY ..... (0)911/65521 or 65526
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
Herstal Automation Ltd., Berkley, MI 48072 313-548-2001
HILEVEL Technology, Irvine, CA 92718 714-727-2100
HMW Enterprises, Inc., Etters, PA 17319 717-938-4691
§ ICI Inc., Placentia, CA 92670 714-579-7575
§ ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
† Information Control Corp., Los Angeles, CA 90045 213-641-8520
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Intelligent Interfaces, Inc., Stone Mountain, GA 30086 ... 404-381-9891;1-800-842-0888
§ Interlogic, San Jose, CA 95131 408-922-0520
KinedicSystems, Lockport, IL 60441 815-838-0005
KMC Systems, Inc., Midland Pk., NJ 07432 201-447-0007
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
§ Macrolink, Anaheim, CA 92807 714-777-3800
Micro/sys, Glendale, CA 91201-3010 818-244-4600
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
§ NTE Electronics, Inc., Bloomfield, NJ 07003 201-748-5089
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
Omnibyte Corp., W. Chicago, IL 60185 708-231-6880
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
Optrex/Satori, Torrance, CA 90503 213-214-1791
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
Quatech Inc., Akron, OH 44311 216-434-3154
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
RGB Spectrum, Berkeley, CA 94710 415-848-0180
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505 213-517-7770
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
Simulex Corporation, Tustin, CA 92680 714-730-1500
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
§ Via West Interface, Inc., Tucson, AZ 85705 ..... 602-623-5716;1-800-266-5716
VIZ Meteorological Instruments, Philadelphia, PA 19144-5782 215-844-2626
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945
Zendex Corp., Dublin, CA 94568 415-828-3000
Ziatech, San Luis Obispo, CA 93401 805-541-0488

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Ion, implanter, medium current-4100

§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973

Isolators, Antenna-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... **D•1022-1023**
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... **A•1832-1833**
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500

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Isolators, High Voltage-4050

GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... **D•1075**
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... **A•2233**
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Dymec Inc., Winchester, MA 01890 617-729-7870
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811

Isolators, Line-4050

§ **Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792** .... **D•2187**
† **Gerator Corp., Manassas, VA 22110-0070, 800-523-9938** .... **D•2195,2197-2198**
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... **A•2233**
Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... **D•2202-2203**
Xentek, inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... **D•2232-2233**
§ Action Instruments, San Diego, CA 92123 619-279-5726
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§† Control Concepts Corp., Liebert Corp., Binghamton, NY 13902-1380 607-724-2484
§ Electronic Specialists, Natick, MA 01760 ..... 508-655-1532;800-225-4876
§ Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Hammond Manufacturing Co., Buffalo, NY 14225 716-894-5710
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Siltronics Ltd., Dover, MA 02030 617-329-4068
Square D Co. Power Protection Systems, San Diego, CA 92123-1165 ... 619-279-0831
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943

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Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811

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Isolators, Signal (I, V,)-1900

† **American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100** ..... **B•1876-1877**
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Dymec Inc., Winchester, MA 01890 617-729-7870
Eicon Instruments, Inc., Annapolis, MD 21401 301-280-6686
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Martel Electronics, Salem, NH 03079 603-893-0886
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Pomona Electronics, Pomona, CA 91766 714-623-3463
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Tekworks, Inc., Morristown, NJ 07960 201-540-1096

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§ Action Instruments, San Diego, CA 92123 619-279-5726
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
IPAC Grp., Bethel Pk., PA 15102 412-831-9200

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ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
§† Fancort Industries, Inc., W. Caldwell, NJ 07006 201-575-0610
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§ PanaVise Products, Inc., Sparks, NV 89431 702-353-2900
§ Panduit Corp., Tinley Park, IL 60477-0981 800-777-3300
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652

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CTI Electronics, Stratford, CT 06497, 203-386-9779 ..... **D•1085**
† **Maurey Instrument Corp., Chicago, IL 60629, 312-581-4555** ..... **A•2050-2051**
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ..... **D•1139**
Adams Rite Products, Inc., Glendale, CA 91204 818-241-5121
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Machine Components Corp., Plainview, NY 11803 516-694-7222
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904

Joysticks, Potentiometer-2200

† **Maurey Instrument Corp., Chicago, IL 60629, 312-581-4555** ..... **A•2050-2052**
J. R. Merritt Controls, Inc., Norwalk, CT 06854, 203-855-9100;800-333-5762 ..... **D•1139**
Adams Rite Products, Inc., Glendale, CA 91204 818-241-5121
§ Altech Corp., Somerville, NJ 08876 908-707-8484
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054 619-757-7770
Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
Noble U.S.A., Inc., Rolling Meadows, IL 60008 708-364-6038
† Penny & Giles, Santa Monica, CA 90401 213-393-1497

Joystick, Toggle Switch-2200

Maurey Instrument Corp., Chicago, IL 60629, 312-581-4555 ..... **A•2051-2052**
§ Grayhill Inc., La Grange, IL 60525 708-354-1040
§† Machine Components Corp., Plainview, NY 11803 516-694-7222
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ Relay Specialties, Oakland, NJ 07436 201-337-1000

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Keyboards, Wireless-5150 — *See Vol. B*

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Keyers, Tone-1900

† Electrocom Industries, S. Bend, IN 46615 219-232-2743
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

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Kits, Breadboarding (For Engineers)-4200 — *See Vol. C*

Kits, Connector-2100 — *See Vol. C*

Kits, Enclosure Prototyping-1400 — *See Vol. C*

Kits, Fiber Optic-2475 — *See Vol. B*

Kits, Marking (Dial, Instrument, Equipment, etc.)-2400 — *See Vol. C*

Kits, Potentiometer, Rheostat-4750 — *See Vol. A*

Kits, Printed Circuit-1700 — *See Vol. C*

Kits, Programming Board-4200 — *See Vol. C*

Kits, Shielding-4525 — *See Vol. C*

Kits, Terminal-2100 — *See Vol. C*

Kits, Training Aid-4200 — *See Vol. C*

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Knobs, Locking, Control Shaft-2400 — *See Vol. C*

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Lamps, Deutenium-2460 — *See Vol. B*

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Lamps, Hollow Cathode-2460 — *See Vol. B*

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Lamps, Magnifying, Inspection-4100

Gilway Technical Lamp, Woburn, MA 01801, 617-935-4442 ..... **B•1162**
§ Contact East, N. Andover, MA 01845 508-682-2000
Electra-Tec, Impert Industries, Inc., Otsego, MI 49078 .... 800-225-3532;616-694-2058
§ Gates, Geo. W., & Co., Inc., Franklin Sq., NY 11010 516-352-2904
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ General Hardware Mfg., New York, NY 10013 212-431-6100
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§† Luxo Lamp Corp., Port Chester, NY 10573 914-937-4433
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Pace Inc., Laurel, MD 20723-1990 301-490-9860
§† Quality Technologies, Palo Alto, CA 93404 415-493-0400
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Waldmann Lighting Co., Wheeling, IL 60090 708-520-1060

Lamps, Mercury Vapor-2460 — *See Vol. B*

Lamps, Nanopulse-2460 — *See Vol. B*

Lamps, Neon-2460 — *See Vol. B*

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Laser Systems-4100

§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
§ BEA electro-optics, inc., Des Plaines, IL 60016 708-298-1420
BT & D Technologies, Wilmington, DE 19803 302-479-0300
Burleigh Instruments, Fishers, NY 14453 716-924-9355
Chicago Laser Systems, Inc., Chicago, IL 60634 312-282-2710
† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Control Laser Corp., Orlando, FL 32809 407-438-2500
† D. O. Industries, Rochester, NY 14623 716-359-4000
Eating Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
Exatron Automatic Test Equip., San Jose, CA 95111 .... 408-629-7600;800-EXA-TRON
§† General Laser, Inc., Scottsdale, AZ 85260 602-991-0674
GTE Government Systems Corp., Mountain View, CA 94039 415-966-2000
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
§† Laser Concepts, Omega Organization Intl., Seattle, WA 98133 206-364-7881
Lincoln Laser Co., Phoenix, AZ 85004 602-257-0407
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Ophir Technology Inc., Long Beach, CA 90810 213-834-0202
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
Quantronix, Smithtown, NY 11788 516-273-6900
Raytheon Co., Laser Products, Quincy, MA 02169 617-479-5300
§ RMF Products, Inc., Batavia, IL 60510 708-879-0020
Rolyn Optics Co., Covina, CA 91722-2199 ..... 818-915-5707/5717
§ SC Technology, Inc., Livermore, CA 94550 415-373-9230
Spectra-Physics Lasers Inc., Mountain View, CA 94039-7013 ..... 415-961-2550; 800-227-8054
Staffall Inc., Cranston, RI 02910 401-461-5554
Transonic Systems Inc., Ithaca, NY 14850 607-257-5300
U. S. Laser Corp., Wyckoff, NJ 07481 201-848-9200

Laser Components & Laser Accessories-3700 — *See Vol. B*

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Lead Assemblies, High Voltage-Also See Connectors; Cable Assemblies & Harnesses-6000 — *See Vol. C*

Lead Preparation Equipment, Surface Mount-4100

Automated Production Concepts, Wayne, NJ 07470 201-831-8300
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
Eastern Marking Machines, Hempstead, NY 11550 516-483-7070
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666
† Unit Design, Orange, CA 92665 714-282-8100

Leads, Test & Adapters-2900

ABL Electronics Supply, Inc., Yorktown Hgts., NY 10598, 914-962-2253 ..... C•1155
§ Emulation Technology, Inc., Santa Clara, CA 95051, 408-982-0660 ..... C•1358
§ Richard Hirschmann of America Inc., Riverdale, NJ 07457, 201-835-5002 ..... C•1398
Multi-Contact USA, Santa Rosa, CA 95401, 707-575-7575 ..... C•1476
† Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Alden Products Co., Brockton, MA 02403 508-583-0160
§ Augat/Pylon Co., Inc., Attleboro Falls, MA 02763 508-699-9800
§† Brim Electronics, Fair Lawn, NJ 07410 201-796-2886
† Coax Connection, Yorktown Hgts., NY 10598 ..... 914-962-2303;800-431-2103
Compac, Holbrook, NY 11741 516-585-3400
§ Concord Electronics Corporation, New York, NY 10012 1-212-777-6571
§† Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412 708-455-8830
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Daburn Electronics & Cable Corp., Northvale, NJ 07647 201-768-5400
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§† Excel Specialty Corp., Chicago, IL 60660 312-262-4781
§ E-Z Hook, Tektest Inc., Arcadia, CA 91006 818-446-6175
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§† Keystone Electronics Corp., Astoria, NY 11105-2017 718-956-8900
§ Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
Multi Products International, West Paterson, NJ 07424 201-890-1344
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
§† Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
† Rowe Industries, Inc., Toledo, OH 43612 419-729-9761
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Test Probes, Inc., San Diego, CA 92121 619-552-2090
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
§ Vaco Products, Chicago, IL 44139-3395 708-677-9500

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Light Choppers-3700 — *See Vol. B*

Light Pens-2000

§† Design Technology, El Cajon, CA 92020 619-440-7666
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500
† Information Control Corp., Los Angeles, CA 90045 213-641-8520
† Interactive Computer Products, Inc., Laguna Hills, CA 92653 714-770-5332
Opto Technology, Inc., Wheeling, IL 60090 708-537-4277

Light Sources, Fiber Optic - Also see Generators, Light Pulse-2475 — *See Vol. B*

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§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
§ Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2185-2187
D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1699
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2192
† Georator Corp., Manassas, VA 22110-0070, 800-523-9938 .... D•2195,2197-2198
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•2200-2201
Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•2202-2203
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2206-2207
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2209
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 ..... B•1941-1943
§ PolyPhaser Corporation, Minden, NV 89423-9000, 702-782-2511;800-325-7170 ..... B•1385
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2232-2233
† Acme Electric Corporation, Cuba, NY 14727 716-968-2400
§ Action Instruments, San Diego, CA 92123 619-279-5726
Albar, Inc., Lynnwood, WA 98036 ..... 206-771-4006;800-822-5227
Amber Inds., Inc., Dallas, TX 75379 214-490-9801
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Behlman Electronics, Inc., Ventura, CA 93003 805-642-0660
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Control Concepts Corp., Liebert Corp., Binghamton, NY 13902-1380 607-724-2484
§† Current Technology, Inc., Richardson, TX 75081-4802 214-238-5300
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
† DELTEC, San Diego, CA 92110 ..... 619-291-4211;800-854-2658
§ Electronic Specialists, Natick, MA 01760 ..... 508-655-1532;800-225-4876
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
§ E.P.D./General Power Corp., Anaheim, CA 92805-8508 ..... 714-520-0881; 1-800-343-1813
§ Falcon Electric, San Gabriel, CA 91776 818-287-6116
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
§ Hammond Manufacturing Co., Buffalo, NY 14225 716-894-5710
† International Power Machines, Garland, TX 75042 800-527-1208
§ ISOREG Corp., Littleton, MA 01460 508-486-9483
Marway Prods. Inc., Santa Ana, CA 92703 714-973-1800
§ MTE Corp., Menomonee Falls, WI 53051 414-253-8200
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
§† Oneac Corporation, Libertyville, IL 60048 708-816-6000,800-327-8801
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ Perma Power Elctrns., Chicago, IL 60648 312-763-0763
§† Power Integrity Corp., Greensboro, NC 27429-0682 ..... 919-379-9773;800-237-6260
§† Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
§ SAFE POWER, Acme Electric Corporation, Salt Lake City, UT 84116 ..... 801-539-0227; 1-800-325-5848
§ SL Waber, Inc., Mt. Laurel, NJ 08054 ..... 609-866-8888;800-257-8384
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§† Staco Energy Products Co., Dayton, OH 45403 513-253-1191
Staco Transpower, Components Corp. of America, Mt. Carmel, IL 62863 618-262-5555
§ Superior Electric, Bristol, CT 06010 203-582-9561
§† Teal Electronics Corporation, San Diego, CA 92121 ..... 619-693-6000;800-888-8325
§ Tripp-Lite, Chicago, IL 60610-4188 312-329-1777
§† Tycor International Inc., Calgary, Alberta, CANADA T2H 1L9 403-259-3200

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Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400

Loads, Electronic, Variable-Also See Dummy Loads-2900

Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... **D•1258-1263**
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... **D•1331**
§ Acme Electric Corporation, Cuba, NY 14727 716-968-2400
Advanced Power Products, Santa Barbara, CA 93101 805-965-0042
Astec America, Oceanside, CA 92054 619-439-4200
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
† Dielectric Communications, General Signal, Raymond, ME 04071 ..... 207-655-4555; 800-341-9678
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555
† Kikusui International Corp., Torrance, CA 90503 ..... 213-371-4662;800-545-8784
Melcher, Inc., Ashland, MA 01721 800-828-9712
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† NH Research, Irvine, CA 92714 714-474-3900
§ Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Raytheon Co., Microwave & Power Tube Div., Waltham, MA 02254 617-899-8400
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 312-670-0150
† RLC Electronics, Inc., Mt. Kisco, NY 10549 914-241-1334
† Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
† Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Locators, Static-2900

§ ACL Inc., Elk Grove, IL 60007 ..... 708-981-9212;1-800-782-8420
† Contact East, N. Andover, MA 01845 508-682-2000
§ Schonstedt Instrument Co., Reston, VA 22090 703-471-1050

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Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... **D•1220-1221**
Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... **D•1233**
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Tekworks, Inc., Morristown, NJ 07960 201-540-1096
Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

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Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... **D•1121**
TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... **D•2245**
§† Casso-Solar, Pomona, NY 10970 914-354-2500
† Control Laser Corp., Orlando, FL 32809 407-438-2500
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
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Headway Research, Inc., Garland, TX 75042 214-272-5431
§ Hull Corp., Hatboro, PA 19040 215-672-7800
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
† PTX-Pentronix Inc., Lincoln Park, MI 48146 313-388-3100
Quantum Chromodynamics, Inc., Torrance, CA 90501 213-320-5717
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
† Technic, Inc., Providence, RI 02940-9650 401-781-6100
Temescal/Airco Coating Technology, The BOC Group, Inc., Fairfield, CA 94533 707-425-1010
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300

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Machines, Automatic End Splice-4100

Autosplice, Inc., San Diego, CA 92121 619-535-0077
§ TS Products, Inc., Arleta, CA 91331-3429 818-896-6676

Machines, Capacitor Winding-4100

Hilton Industries, Inc., Subsidiary of Core Industries, Sarasota, FL 34232 813-371-2600
Necoa, Inc., Nittoku Engineering Group, Baltimore, MD 21237 301-574-4960

Machines, Cleaning & Degreasing-Also See Cleaners, Ultrasonic-4100

ACL Inc., Elk Grove, IL 60007 ..... 708-981-9212;1-800-782-8420
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
§ Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
§† Cyclo-Tronics, Inc., Wauconda, IL 60084 708-526-0800
† Electronic Controls Design, Milwaukie, OR 97222 503-659-6100
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§ Hollis Automation, Esterline Corporation, Nashua, NH 03063 603-889-1121
§† L & R Mfg. Co., Kearny, NJ 07032 201-991-5330
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§† Multicore Solders, Richardson, TX 75081 214-238-1214
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§† Sonicor Instrument Corp., Copiague, NY 11726 516-842-3344
† Technic, Inc., Providence, RI 02940-9650 401-781-6100
§ Technical Devices, Torrance, CA 90503 213-618-8437
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§† Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
† Unit Design, Orange, CA 92665 714-282-8100
S.S White Technologies Inc., Piscataway, NJ 08854-3761 908-752-8300

Machines, Coil Winding-4100

Adams-Maxwell Division, Coast Magnetics, Inglewood, CA 90302-1284 213-673-3245
§ Bachi, Inc., Itasca, IL 60143 708-773-5600
† Coast Coil Co., Coast Magnetics, Los Angeles, CA 90016 213-936-6188
Coil Winding Equipment Co., Oyster Bay, NY 11771 516-922-5660
§ Computerized Coil Winders, Inc., Danbury, CT 06810 203-744-6715
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
EPM Corporation, Baltimore, MD 21221 301-686-7800
Fisher-Baker Corp., Fort Pierce, FLA 34957 407-466-0750
† Gorman Machine Corp., Brockton, MA 02401 508-588-2900
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Necoa, Inc., Nittoku Engineering Group, Baltimore, MD 21237 301-574-4960
§ Productronics Inc., Fort Wayne, IN 46825 219-489-8201
† Samatic Winding Machine, Jenlor Ltd., Fayetteville, NY 13066 315-637-9080
Solatron Enterprises, Inglewood, CA 90302 213-678-4981
Universal Mfg., Co. Inc., Irvington, NJ 07111 201-374-9800

Machines, Component Handling, Feeding, Insertion & Sorting-4100

Die-Tech Inc., York Haven, PA 17370, 717-938-6771 ..... **C•1347**
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
Autosplice, Inc., San Diego, CA 92121 619-535-0077
Conforming Matrix, Toledo, OH 43611 419-729-3777
Creative Automation Co., Sun Valley, CA 91352 818-767-6090
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
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† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
Exatron Automatic Test Equip., San Jose, CA 95111 ..... 408-629-7600;800-EXA-TRON
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Necoa, Inc., Nittoku Engineering Group, Baltimore, MD 21237 301-574-4960
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
§ Penn Engineering & Manufacturing Corp., Danboro, PA 18916 ..... 215-766-8853; 800-237-4736
Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000
§ Royonic Inc., Valencia, CA 91355 805-257-0303
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§ TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056 708-803-6100
† Thermonics, Inc., Santa Clara, CA 95054 408-496-6838
§ TRIGON/ADCOTECH, Dynatech, Milpitas, CA 95035 408-946-4300
Trio-Tech International, San Fernando, CA 91340 818-365-9200

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† Aremco Products, Inc., Ossining, NY 10562 914-762-0685
† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Control Laser Corp., Orlando, FL 32809 407-438-2500
MMI-Mirco Machines, Inc., Santa Clara, CA 95052 408-727-0100
Raytheon Co., Laser Products, Quincy, MA 02169 617-479-5300
U. S. Laser Corp., Wyckoff, NJ 07481 201-848-9200

Machines, Hermetic Sealing-4100

† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Control Laser Corp., Orlando, FL 32809 407-438-2500
† Lepel Corp., Edgewood, NY 11717 516-586-3300
Raytheon Co., Laser Products, Quincy, MA 02169 617-479-5300
U. S. Laser Corp., Wyckoff, NJ 07481 201-848-9200

Machines, Induction Heating (Electronic)-4100

† Lepel Corp., Edgewood, NY 11717 516-586-3300
Nemeth Engineering Associates, Inc., Crestwood, KY 40014 502-241-1502
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 312-670-0150

Machines, Lead Cutting & Forming-4100

AMP, Harrisburg, PA 17105, 717-564-0100;800-522-6752 ..... **C•1175**
Automated Production Concepts, Wayne, NJ 07470 201-831-8300

AZCO Corp., Elmwood Park, NJ 07407 201-791-1428
Burndy Corporation, An FCI Company, Norwalk,, CT 06852 203-838-4444
§ Contact East, N. Andover, MA 01845 508-682-2000
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† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
§ Eraser Co., Syracuse, NY 13221 315-454-3237
† Fancort Industries, Inc., W. Caldwell, NJ 07006 201-575-0610
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§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666
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Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000
§† Technical Devices, Torrance, CA 90503 213-618-8437
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990

Machines, Magnet Wire Twisting-4100

§ Eraser Co., Syracuse, NY 13221 315-454-3237

Machines, Marking & Numbering-4100

Allen Avionics, Inc., Mineola, NY 11501 516-248-8080
† Autoroll Machine Corporation, Middleton, MA 01949 508-777-2160
§ BEA electro-optics, inc., Des Plaines, IL 60018 708-298-1420
§† Brady, W. H., Co., Indl. Prods. Div., Milwaukee, WI 53201 1-800-537-8791
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Control Laser Corp., Orlando, FL 32809 407-438-2500
§ Lindem Marking Machines, Hempstead, NY 11550 516-483-7070
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
EPC Identification Sys., Rohnert Park, CA 94928 707-585-8811
Exatron Automatic Test Equip, San Jose, CA 95111 ..... 408-629-7600;800-EXA-TRON
GTI/Electronics Div. Hadley PA 16130 412-253-3161
Markem Corp., Keene, NH 03431 603-352-1130
§† Pioneer Components, Brooklyn, NY 11234 718-444-3880
Quantum Chromodynamics, Inc., Torrance, CA 90501 213-320-5717
Solatron Enterprises, Inglewood, CA 90302 213-678-4981
Telesis Controls Corp., Chillocothe, OH 45601 614-642-3200
§ TRIGON/ADCOTECH, Dynatech, Milpitas, CA 95035 408-946-4300
WiringAnalyzers, Inc., Edmonds, WA 98020-0417 ..... 800-221-5979 (excl. CA)

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† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
Control Laser Corp., Orlando, FL 32809 407-438-2500
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
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Quantronix, Smithtown, NY 11788 516-273-6900
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§ TRIGON/ADCOTECH, Dynatech, Milpitas, CA 95035 408-946-4300

Machines, Mask Alignment & Exposure-4100

Research Devices, Inc., Piscataway, NJ 08854 908-572-4800

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Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hull Corp., Hatboro, PA 19040 215-672-7800
§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666

Machines, Plating-4100

§ HBS Equipment Corporation, Los Angeles, CA 90040 213-726-3033
§ Instant Board Circuits Grp., Novato, CA 94949 415-883-1717
§† Kepro Circuit Systems, Fenton, MO 63026-2992 314-343-1630
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666
Sel-Rex Div., OMI Intl. Corp., Nutley, NJ 07110 201-667-5200
† Technic, Inc., Providence, RI 02940-9650 401-781-6100

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Aremco Products, Inc., Ossining, NY 10562 914-762-0685
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§† Cyclo Tronics, Inc., Wauconda, IL 60084 708-526-0800
§ Foredom Elec. Co., Blackstone Inds. inc., Bethel, CT 06801 203-792-8622
§ Instant Board Circuits Grp., Novato, CA 94949 415-883-1717
§† Kepro Circuit Systems, Fenton, MO 63026-2992 314-343-1630

Machines, Terminal Installing-4100

AMP, Harrisburg, PA 17105, 717-564-0100;800-522-6752 ..... C•1175
† DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350
§ Panduit Corp., Tinley Park, IL 60477-0981, 800-777-3300 ..... C•1481-1482
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Autosplice, Inc., San Diego, CA 92121 619-535-0077
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§† FISHERTECH, Fisher Gauge Limited, Peterborough, Ontario, CANADA K9J 6Y9 705-748-9522
Mark Eyelet Inc., AMP, Inc., Wolcott, CT 06716 203-756-8847
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† Nichifu America, Inc., Pottstown, PA 19464 215-323-7120
§ Paladin Corp., Newbury Park, CA 91320 805-499-0318
† Patton-MacGuyer Inc., Providence, RI 02905 401-941-6000
Scanbe, Unit of Zero Corporation, El Monte, CA 91731 619-452-9333
Sjoberg, C., & Son, Inc., Cranston, RI 02910 401-461-8220
† U.S. Terminals Inc., Cincinnati, OH 45243 513-561-8145
Zierick Manufacturing Corp., Mt. Kisco, NY 10549 ..... 914-666-2911;800-882-8020

Machines, Ultrasonic Bonding-4100

§† Sonobond Ultrasonics Inc., Inductotherm Industries, West Chester, PA 19382 ..... 215-696-4710;800-323-1269

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Machines, Wafer Alignment — See Machines, Mask Alignment & Exposure (Vol. D)

Machines, Wire Marking, Manual & Automatic-4100

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§† Brady, W. H., Co., Indl. Prods. Div., Milwaukee, WI 53201 1-800-537-8791
Burndy Corporation, An FCI Company, Norwalk,, CT 06852 203-838-4444
§ Contact East, N. Andover, MA 01845 508-682-2000
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
Eubanks Engineering, Monrovia, CA 91016 818-357-7011
Garry Electronics an LPL Co., Langhorne, PA 19047 215-949-2300
Wiring Analyzers, Inc., Edmonds, WA 98020-0417 ..... 800-221-5979 (excl. CA)
§ Zippertubing Co., Los Angeles, CA 90061 213-321-3901

Machines, Wire Measuring & Cutting-4100

DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350
AZCO Corp., Elmwood Park, NJ 07407 201-791-1428
Burndy Corporation, An FCI Company, Norwalk,, CT 06852 203-838-4444
§ Contact East, N. Andover, MA 01845 508-682-2000
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
§ Eraser Co., Syracuse, NY 13221 315-454-3237
Eubanks Engineering, Monrovia, CA 91016 818-357-7011
Hanscom, H. F., Co., Inc., Providence, RI 02905 401-941-1455
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MOLEX, Inc., Lisle, IL 60532 708-969-4550
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§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§† Western Electronic Products Co., San Clemente, CA 92672 714-492-4677

Machines, Wire Stripping, Laser-4100

† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
§† General Laser, Inc., Scottsdale, AZ 85260 602-991-0674
Quantum Chromodynamics, Inc., Torrance, CA 90501 213-320-5717
Raytheon Co., Laser Products, Quincy, MA 02169 617-479-5300
§† Western Electronic Products Co., San Clemente, CA 92672 714-492-4677

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Magnetic Instrumentation, Indianapolis, IN 46226, 317-545-2102 ..... D•1290
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
§ Axial Magnetics, Tencal Inc., Simi Valley, CA 93065 805-527-0900
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
The Electrodyne Company, Inc., Batavia, OH 45013 513-732-2822
Jobmaster Corp., Randallstown, MD 21133-0207 410-655-1400
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202
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§ Tokin America, Inc., San Jose, CA 95134 408-432-8020

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Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1226-1227
† EMDS, Inc., Gaithersburg, MD 20877, 301-840-5710 ..... D•1245
Magnetic Instrumentation, Indianapolis, IN 46226, 317-545-2102 ..... D•1290
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
Develco, Inc., San Jose, CA 95134-2306 408-945-6500
§ EG&G Geometrics, Div. of EG&G Inc., Sunnyvale, CA 94089 408-734-4616
† E M S Development Corp., Farmingdale, NY 11735 516-293-7900
† Humphrey, Inc., San Diego, CA 92123 619-565-6631
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MEDA, Inc., Macintyre Electronics Design Assocs., Reston, VA 22090 703-471-1445
§ Metrolab Instruments SA, Geneva, SWITZERLAND CH-1228 ..... (41-22)794 11 21
† Schonstedt Instrument Co., Reston, VA 22090 703-471-1050
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§ Tensor, Austin, TX 78761 512-251-4131

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† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
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§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943

Maintenance, Self, Computers-2000

Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707

Manufacturing, Turnkey-4100

§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•2239
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ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
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Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Trionics, Inc., St. Charles, IL 60174 312-232-9117
Xetel Corporation, Austin, TX 78753 512-834-2266

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Telesis Controls Corp., Chillicothe, OH 45601 614-642-3200

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AMP, Harrisburg, PA 17105, 717-564-0100;800-522-6752 ..... C•1175
Crosspoint, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ... B•1673
CYTEC Corp., Penfield, NY 14526, 716-381-4740;800-346-3117 ..... D•1240
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† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
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Biddle Instruments, Blue Bell, PA 19422 215-646-9200
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§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
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† INTELCO, Acton, MA 01720 508-264-4485
Kaman Instrumentation, Colo Springs, CO 80907 1-719-599-1892
KineticSystems, Lockport, IL 60441 815-838-0005
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Media, Magnetic — See Disks, Magnetic (Vol. D), Tape, Magnetic (Vol. D)

Megaphones — See Amplifiers (Vol. D)

Memories, DRAM, Surface Mount-3130 — *See Vol. A*

Memories, RAM, Surface Mount-3130 — *See Vol. A*

Memory Devices/Controllers, Bipolar, Add-in-2000

AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Eventide, Inc., Little Ferry, NJ 07643 ..... 201-641-1200;800-446-7878
Intelligent Interfaces, Inc., Stone Mountain, GA 30086 ... 404-381-9891;1-800-842-0888
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926

Memory Devices/Controllers, Bipolar, Add-on-2000

Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Terminal Data Corp., Rockville, MD 20855 301-921-8282
VMETRO, Inc., VMETRO as, Houston, TX 77042 713-266-6430

Memory Devices/Controllers, Bubble, Add-on-2000

† Bubbl-Tec, Dublin, CA 94568 415-829-8705

Memory Devices/Controllers, CCD, Add-in-2000

§ Computer Peripherals Inc., Newbury Pk, CA 91320 ..... 805-499-5751;800-854-7600
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926

Memory Devices/Controllers, Magnetic Core, Add-in-2000

Orientation Inc., Hudson, MA 01749 508-568-0509

Memory Devices/Controllers, Magnetic Core, Add-on-2000

Orientation Inc., Hudson, MA 01749 508-568-0509

Memory Devices/Controllers, MOS, Add-in-2000

§ Rohm Corporation, Rohm Electronics Division, Antioch, TN 37013, 615-641-2020 ..... A•1742
Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
Benchmarq Microelectronics, Inc., Carrollton, TX 75006 214-407-0011
Dataram Corp., Princeton, NJ 08543-7528 ..... 609-799-0071;800-822-0071
§ Diversified Technlg., Ridgeland, MS 39157 601-856-4121
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Eventide, Inc., Little Ferry, NJ 07643 ..... 201-641-1200;800-446-7878
§ GENROCO, Inc., Slinger, WI 53086-9407 414-644-8700
§ ICI Inc., Placentia, CA 92670 714-579-7575
§ Macrolink, Anaheim, CA 92807 714-777-8800
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Western Digital Corp., Irvine, CA 92718 714-932-6000

Memory Devices/Controllers, MOS, Add-on-2000

Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
Avelem, Gargilesse, FRANCE 36190 33-54478672
Benchmarq Microelectronics, Inc., Carrollton, TX 75006 214-407-0011
Diversified Technlg., Ridgeland, MS 39157 601-856-4121
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Eventide, Inc., Little Ferry, NJ 07643 ..... 201-641-1200;800-446-7878
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926

Memory Systems, Bubble-2000

† Bubbl-Tec, Dublin, CA 94568 415-829-8705
† Librascope Corp., Glendale, CA 91201 818-244-6541
§† Radstone Technology, Montvale, NJ 07645 ..... 201-391-2700;800-368-2738

Memory Systems, Core-2000

† Digital Data Systems, Ft. Lauderdale, FL 33313 305-792-3290

Memory Systems, Delay Line-2000

Anders, Inc., Simsbury, CT 06070 203-658-7666
† Control Electronics, Neurotech Corp., Farmingdale, NY 11735 516-694-0125

Memory Systems, Disk-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1092-1095
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 .. D•1119,2239
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Digital Equip., Marlborough, MA 01752
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
KMS Advanced Products, Inc., Ann Arbor, MI 48106-1868 313-769-1780
† Librascope Corp., Glendale, CA 91201 818-244-6541
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
§ Mini Computer Technology, San Jose, CA 95131 408-435-1616
Mitronics, Rolling Hills, CA 90274 213-377-2022
NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Orientation Inc., Hudson, MA 01749 508-568-0509
Peripherals, Costa Mesa, CA 92626 ..... 714-540-4925;800-468-6888
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473

Memory Systems, Disk, Flexible-2000

Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Digital Equip., Marlborough, MA 01752
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Rohm Corporation, Rohm Electronics Division, Antioch, TN 37013 615-641-2020
† Terminal Data Corp., Rockville, MD 20855 301-921-8282

Memory Systems, Semiconductor-2000

Philips ECG, North American Philips Co., Williamsport, PA 17701, 717-323-4691 ..... A•2118
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 .. D•1119,2239
Adtron Corporation, Chandler, AZ 85224 602-926-9324
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Avasem Corporation, San Jose, CA 95126 408-297-1201
Basicon, Inc., Portland, OR 97229 503-626-1012
Benchmarq Microelectronics, Inc., Carrollton, TX 75006 214-407-0011
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Dallas Semiconductor, Dallas, TX 75067 214-450-0400
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
Datakey, Inc., Burnsville, MN 55337 612-890-6850
Dataram Corp., Princeton, NJ 08543-7528 ..... 609-799-0071;800-822-0071
† Densepac Microsystems, Inc., Garden Grove, CA 92641-1428 ..... 714-898-0007; 800-64-CHIPS
† Digital Data Systems, Ft. Lauderdale, FL 33313 305-792-3290
Digital Equip., Marlborough, MA 01752
§ Diversified Technlg., Ridgeland, MS 39157 601-856-4121
† Librascope Corp., Glendale, CA 91201 818-244-6541
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
§ Macrolink, Anaheim, CA 92807 714-777-8800
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
§† Micron Technology, Inc., Boise, ID 83706 208-386-3900
Mitronics, Rolling Hills, CA 90274 213-377-2022
§† Monolithic Sys. Corp., Englewood, CO 80112 303-790-7400
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
§† Radstone Technology, Montvale, NJ 07645 ..... 201-391-2700;800-368-2738
§ Sanyo Semiconductor Corp., Allendale, NJ 07401 201-825-8080
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Vermont Research Corp., N. Springfield, VT 05150 802-886-2256
† White Technology, Inc., Bowmar Instrument Corp., Phoenix, AZ 85040 .. 602-437-1520

Memory Systems, Tape-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Amilon Corp., Woodside, NY 11377 718-274-1794
Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Braemar Corp., Burnsville, MN 55337 612-890-5135
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Digital Equip., Marlborough, MA 01752
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Memtec Corp., Salem, NH 03079 603-893-8080
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
§ Mini Computer Technology, San Jose, CA 95131 408-435-1616
Mitronics, Rolling Hills, CA 90274 213-377-2022
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725

Message Repeaters, Telephone-1900

§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
Cognitronics, Stamford, CT 06906 203-327-5307

Meter Cases — See Enclosures, Equipment & Panel Mounting (Vol. C)

Meter Controllers — See Relays, Meter (Vol. B)

Meter Expanders — See Multipliers, Meter (Vol. D)

Meters, Acceleration — See Accelerometers (Vol. B)

Meters, Admittance-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900

Meters, Ampere, AC-2900

§ Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1130,1228
Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518 ..... A•2194
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1346
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§† International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275-1276
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
† Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 ..... B•1925-1928,1932-1933
Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1370
† Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1324
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1376,1378,2075
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717 ..... D•1338-1339
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Allen Technology, Sutton, NE 68979 402-773-5285
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
Analogic Corp., Peabody, MA 01960 508-977-3000
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
§† Ballantine Laboratories, Noise Unlimited inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Digitec, Marion, OH 43302 614-387-3444
§ Dixson, Inc., Grand Junction, CO 81503 303-244-1241
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
† Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
EMICO Inc., Dublin, PA 18917 215-249-9330
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
Gossen/Texmate, Vista, CA 92083-8397 619-598-9899
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
Larson Instrument, Orangeburg, NY 10962 914-359-3800
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104

§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 604-652-5118
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
† Velonex, Santa Clara, CA 95050 408-727-7370
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121
§† WestCon, Marion, OH 43302 614-382-5771
§ Western Electro-Mechanical Co., Inc., Oakland, CA 94607 415-452-1936

Meters, Ampere, DC-2900

§ Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1130,1228
Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8578 ..... A•2194
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1346
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275-1276
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
† Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 ..... B•1929-1933
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Seico Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-9673 ..... D•1370
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1376,1378,2075
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717 ..... D•1338-1339
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Analogic Corp., Peabody, MA 01960 508-977-3000
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Chauvin Arnoux, Chauvin Arnoux-Facnor, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
† Digitec, Marion, OH 43302 614-387-3444
§ Dixson, Inc., Grand Junction, CO 81503 303-244-1241
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
EMICO Inc., Dublin, PA 18917 215-249-9330
† Faria, Thomas G., Corp., Uncasville, CT 06382-0983 203-848-9271
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
Gossen/Texmate, Vista, CA 92083-8397 619-598-9899
Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§† Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
† Velonex, Santa Clara, CA 95050 408-727-7370
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Ampere, RF-2900

Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1228
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1248
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1324
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1376,1378,2075
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Gossen/Texmate, Vista, CA 92083-8397 619-598-9899
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
Larson Instrument, Orangeburg, NY 10962 914-359-3900
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† O.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Meters, Ampere, True RMS-2900

B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1223
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1346
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1376,1378,2075
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717 ..... D•1338-1339
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Analogic Corp., Peabody, MA 01960 508-977-3000
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
§ Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
§ Contact East, N. Andover, MA 01845 508-682-2000
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Digitec, Marion, OH 43302 614-387-3444
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
Gossen/Texmate, Vista, CA 92083-8397 619-598-9899
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260

Metrosonics, Inc., Rochester, NY 14692-3075 ... 716-334-7300
Multi-Amp Corp., TBG, Dallas, TX 75237 ... 214-333-3201
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 ... 619-535-2155
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ... 02236 61530
Ohio Semitronics, Inc., Columbus, OH 43212 ... 614-486-9561
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 ... 715-723-1141
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 ... 604-652-5118
PPM, Inc., Cleveland, OH 44139 ... 216-349-2300
Q.V.S., Inc., East Orange, NJ 07017 ... 201-673-3996
Sensitive Research Instruments, Mt. Vernon, NY 10550 ... 914-699-9717
§ Simpson Electric Co., Elgin, IL 60120 ... 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 ... 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 ... 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 ... 419-358-5015
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 ... 216-238-2550
§† WestCon, Marion, OH 43302 ... 614-382-5771

Meters, Ampere Hour-2900

§ Curtis Instruments, Inc., Mt. Kisco, NY 10549, 914-666-2971 ... D•1132
§ Gralex Industries, Norwood, NJ 07648, 800-486-4499 ... D•1348-1349
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ... D•1352-1357
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1374,1376,1378,2075
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ... D•1332-1333
A & D Elec. Instrs., Glendale, NY 11385 ... 718-275-6516
§ ARGA Controls, Pasadena, CA 91105 ... 213-682-3314
Controlex, Inc., New Boston, NH 03070 ... 603-487-5512
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 ... 800-368-2516
Gossen/Texmate, Vista, CA 92083-8397 ... 619-598-9899
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 ... 614-275-0530
§ HBS Equipment Corporation, Los Angeles, CA 90040 ... 213-726-3033
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 ... 602-748-7900
§ Kraft Dynatronix, Inc., Amery, WI 54001 ... 715-268-8118;800-826-7172
Ohio Semitronics, Inc., Columbus, OH 43212 ... 614-486-9561
† Technic, Inc., Providence, RI 02940-9650 ... 401-781-6100
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 ... 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 ... 305-757-8811
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 ... 707-938-2121

Meters, Attenuation-2900

Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1374,1376
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 ... 603-753-6362
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 ... 418-683-0211
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ... 800-331-3440 (in CA); 800-227-8409
Hewlett-Packard Co., Cupertino, CA 95014 ... 800-752-0900
† INTELCO, Acton, MA 01720 ... 508-264-4485
† Loral Microwave Narda, Hauppauge, NY 11788 ... 516-231-1700
Lucas Weinschel, Gaithersburg, MD 20884-6001 ... 301-948-3434
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ... 805-388-8378;800-426-8688
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 ... 800-874-7123

Meters, Audio Level-2900

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ... D•1343
§ Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ... D•1371
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1374,1376
A & D Elec. Instrs., Glendale, NY 11385 ... 718-275-6516
§ Audio Precision, Inc., Beaverton, OR 97075 ... 503-627-0832
§ Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 ... 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 ... 603-753-6362
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 ... 508-481-7000
§ Contact East, N. Andover, MA 01845 ... 508-682-2000
Crompton Modutec, Manchester, NH 03103 ... 603-669-5121;800-METERS-1
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 ... 800-368-2516
§ Dixson, Inc., Grand Junction, CO 81503 ... 303-244-1241
§ Electrodata, Inc., Bedford Heights, OH 44128 ... 216-663-3333
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 ... 516-334-0870
§ ESE, El Segundo, CA 90245 ... 213-322-2136
† Ideal Precision Meter, Brooklyn, NY 11222 ... 212-383-6904
§ International Instruments, A Prime Technology Company, N. Branford, CT 06471 ... 203-481-5721
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ... 516-231-6900; 1-800-645-5104
§ LFE Instruments, Clinton, MA 01510-3099 ... 508-835-1000
Marconi Instruments, Allendale, NJ 07401 ... 201-934-9050
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 ... 416-751-6262
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 ... 516-345-3100
§ Northeast Innovations, Inc., Concord, NH 03302 ... 603-736-8260
† Q.V.S., Inc., East Orange, NJ 07017 ... 201-673-3996
Sencore, Sioux Falls, SD 57107 ... 1-800-736-2673; 605-339-0100
† Shogyo International Corp., Great Neck, NY 11021 ... 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 ... 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 ... 708-697-2260
§ Triplett Corporation, Bluffton, OH 45817-9987 ... 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ... 214-348-8800;800-527-4642

Meters, Bar Graph-2950

B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ... D•1223
Excel Technology Intl. Corp., Belle Mead, NJ 08502, 908-874-4747 .. B•1069-1072
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ... D•1350
§† International Microtronics, Tucson, AZ 85714, 602-748-7900 ... D•1352-1357
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1378,2075
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ... D•1395-1396,1398-1405
§ Babcock Display Products, Inc., A Subsidiary of Babcock, Inc., Anaheim, CA 92805 ... 714-491-5100
† Bowmar Telecommunications Div., Acton, MA 01720 ... 508-263-8365
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 ... 708-882-5757
Crompton Modutec, Manchester, NH 03103 ... 603-669-5121;800-METERS-1
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 ... 402-563-6506
† Data Check Corporation, San Diego, CA 92126 ... 619-578-0101
Datel, Inc., Mansfield, MA 02048-1194 ... 508-339-3000
§† Dixson, Inc., Grand Junction, CO 81503 ... 303-244-1241
§ Everlight - USA, Glendora, CA 91740 ... 213-697-5067
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 ... 206-347-6100
Gossen/Texmate, Vista, CA 92083-8397 ... 619-598-9899
§ Idea, Inc., Brea, CA 92621 ... 213-697-4332
§† I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 ... 602-748-7900
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 ... 516-345-3100
Mors Technologies Inc., Mors Group-France, Delson, Quebec, CANADA J0L 1G0 ... 514-638-4150
M. System Technology, Inc., Dallas, TX 75244 ... 800-544-3181
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 ... 514-745-0310
Sensotec, Inc., Columbus, OH 43212 ... 614-486-7723
§ Simpson Electric Co., Elgin, IL 60120 ... 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ... 215-673-5600;800-343-1199
§ Triplett Corporation, Bluffton, OH 45817-9987 ... 419-358-5015
† UCE, Inc., Norwalk, CT 06854 ... 203-838-7509

Meters, Battery Capacity-2900

§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1374
Christie Electric Corp., Gardena, CA 90248 ... 213-715-1402
Dranetz Technologies, Inc., Edison, NJ 08818-4019 ... 908-287-3680
§ Emco Electronics, Lindenhurst, NY 11803 ... 516-845-7080
Hickok Electrical Instrument Company, Cleveland, OH 44108 ... 216-541-8060
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 ... 602-748-7900
Shokai Far East Ltd., Peekskill, NY 10566 ... 914-736-3500

Meters, Capacitance, Inductance-2900

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ... D•1248-1249
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ... D•1258,1264-1265
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ... D•1275
§ MINT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ... D•1295,1412-1413
Alfa Electronics, Inc., Princeton, NJ 08543-8089 ... 609-275-0220
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 ... 516-593-5600
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 ... 216-349-0370
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 ... 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 ... 619-495-3200
† Boonton Electronics Corp., Randolph, NJ 07869 ... 201-584-1077
Cambridge Technology, Inc., Watertown, MA 02172 ... 617-923-1181
§ Contact East, N. Andover, MA 01845 ... 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 ... 800-368-2516
§ Emco Electronics, Lindenhurst, NY 11803 ... 516-845-7080
Fieldpiece Instruments, Buena Park, CA 90621 ... 714-992-1239
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ... 800-331-3440 (in CA); 800-227-8409
Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 ... 203-624-3103
Hameg, Inc., Port Washington, NY 11050 ... 516-883-3837
§ Harris Corp., Dracon Div., Camarillo, CA 93012 ... 805-987-9511
§ Hewlett-Packard Co., Cupertino, CA 95014 ... 800-752-0900
International Instrumentation, Inc., Westlake Vlg., CA 91361 ... 805-495-7673
MSI Electronics, Inc., Woodside, NY 11377 ... 718-672-6500
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 ... 619-535-2155
Omega Engineering, Stamford, CT 06907 ... 800-826-6342
RE Instruments Corp., Westlake, OH 44145 ... 216-871-7617
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 ... 800-245-4501
† Sencore, Sioux Falls, SD 57107 ... 1-800-736-2673; 605-339-0100
† Shogyo International Corp., Great Neck, NY 11021 ... 516-466-0911
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 ... 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 ... 800-874-7123

Meters, Clamp-on-2900

§ Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ... D•1130
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ... D•1343
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ... D•1289
§ AEMC Corporation, Boston, MA 02111 ... 617-451-0227;800-343-1391
Alfa Electronics, Inc., Princeton, NJ 08543-8089 ... 609-275-0220
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 ... 516-593-5600
Ballco Inc., Snellville, GA 30278-1078 ... 404-979-5900

§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
§ Extech Instruments Corp., Waltham, MA 02154 617-890-7440
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
Transonic Systems Inc., Ithaca, NY 14850 607-257-5300
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
§ Western Electro-Mechanical Co., Inc., Oakland, CA 94607 415-452-1936

Meters, Coercivity-2900

§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337

Meters, Conductance-2900

§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1248
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Contact East, N. Andover, MA 01845 508-682-2000
† FOX METER INC., Elburn, IL 60119 708-365-2422
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Meters, Counting Rate, Nuclear-2900

§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Gralex Industries, Norwood, NJ 07648 800-486-4499
† Nuclear Research Corp., Warrington, PA 18976 215-343-5900
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405

Meters, Decibel Indicating-2900

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
§ International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Amber Electric Design, St. Laurent, PQ,, CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
§ Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Chesterfield Products, Inc., Elmwood Park, NJ 07407 201-797-9655
§ Contact East, N. Andover, MA 01845 508-682-2000
† Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Dixson, Inc., Grand Junction, CO 81503 303-244-1241
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
† GreenLee Textron Inc.:Subsidiary of Textron Inc., Rockford, IL 61109 ... 815-397-7070
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Meters, Deviation-2900

§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1380
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1395
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
† FOX METER INC., Elburn, IL 60119 708-365-2422
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617

Meters, Digital ESR-2900

EDI, Wood Dale, IL 60191, 708-860-5838 ..... B•1065
Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650 ..... B•1901
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345-1347
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1380
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ International Instruments, A Prime Technology Company, N. Branford, CT 06471 203-481-5721
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100

Meters, Digital RPM-2900

Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... B•1875
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650 ..... B•1901
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345-1347
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1380
Analogic Corp., Peabody, MA 01960 508-977-3000
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
Controlex, Inc., New Boston, NH 03070 603-487-5512
§ Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
DCI Inc., Olathe, KS 66062 913-782-5672
EDI, Wood Dale, IL 60191 708-860-5838
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ IVO Industries, Inc., Eatontown, NJ 07724 ..... 908-542-5151;800-932-0489
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
† Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Digital, 2-wire, 4-20 mA Current Loop-2950

Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1228
CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518 ..... A•2194
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
Entran Devices, Fairfield, NJ 07004, 201-227-1002;800-635-0650 ..... B•1893
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348-1349
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363,1366
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1380-1381,1387
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1397-1398
Acculex Corporation, Taunton, MA 02780 508-880-3660
Analogic Corp., Peabody, MA 01960 508-977-3000
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Biddle Instruments, Blue Bell, PA 19422 215-646-9200

Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
DCI Inc., Olathe, KS 66062 913-782-5672
EDI, Wood Dale, IL 60191 708-860-5838
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
§ Global Components & Controls, Eatontown, NJ 07724 201-389-1470
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Kurz Instruments Inc., Monterey, CA 93940 800-424-7356
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Martel Electronics, Salem, NH 03079 603-893-0886
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
Precise Sensors, Inc., Monrovia, CA 91016 818-358-4578
§ Precision Digital Corp., Natick, MA 01760 508-655-7300
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
Viatran Corporation, Grand Isl. 14072 716-773-1700
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Dissolved Oxygen-2900

Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Omega Engineering, Stamford, CT 06907 800-826-6342

Meters, Distortion & Noise-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
Amber Electric Design, St. Laurent, PQ., CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Data Check Corporation, San Diego, CA 92126 619-578-0101
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Krohn-Hite Corp., Avon, MA 02322 508-580-1660
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Edgewise-2950

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•1385-1386
§† International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,1385-1386,2075
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 203-271-6000
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
§† Dixson, Inc., Grand Junction, CO 81503 303-244-1241
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
EMICO Inc., Dublin, PA 18917 215-249-9330
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
§ Larson Instrument, Orangeburg, NY 10962 914-359-3800
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550

Meters, Elapsed Time — See Indicators, Elapsed Time (Vol. D)

Meters, Electrometer-2900

§ International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275-1276
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
§ Simco Co., Hatfield, PA 19440 215-822-2171

Meters, EMC — See Meters, RFI (Vol. D)

Meters, FM Deviation-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Field Strength-2900

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1003
Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1226-1227
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
† Anritsu, Oakland, NJ 07436 ..... 201-337-1111;800-255-7234
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
§ Holaday Industries, Inc., Eden Prairie, MN 55344 612-934-4920
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
§ Metrolab Instruments SA, Geneva, SWITZERLAND CH-1228 ..... (41-22)794 11 21
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Peca, Inc., Bensalem, PA 19020 215-245-1550
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Semtronics Corp., Peachtree City, GA 30269 404-487-6681
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Simco Co., Hatfield, PA 19440 215-822-2171
§ Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638

Meters, Fluid Flow-2200

§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
Accusonic Division, Ferranti O.R.E. Inc., Falmouth, MA 02541 508-548-5800
§ Analogic Corp., Peabody, MA 01960 508-977-3000
† Astro Dynamics, Inc., Woburn, MA 01801 617-935-4944
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
† Brooks Instrument Div., Emerson Elec. Co., Hatfield, PA 19440 215-362-3500
Cole-Parmer Instrument Company, Chicago, IL 60648 ..... 708/647-7600
† Computer Instruments Corp., Westbury, NY 11590 516-476-8400
Controlex, Inc., New Boston, NH 03070 603-487-5512
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Delta Controls Corp., Shreveport, LA 71107 318-424-8471
§ Dieterich Standard, A Dover Industries Company, Boulder, CO 80301 303-530-9600
† Digitec, Marion, OH 43302 614-387-3444
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ Efector, Inc., Exton, PA 19341 ..... 215-524-2000;800-441-8246
† EG & G Flow Technology, Inc., Phoenix, AZ 85072 602-437-1315
Fluid Components, Inc., San Marcos, CA 92069 619-744-6950
§ Harwil, Santa Monica, CA 90404 213-829-2310
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Intek, Inc., Westerville, OH 43081 614-895-0301
† Kurz Instruments Inc., Monterey, CA 93940 800-424-7356
Marsh-McBirney, Inc., Frederick, MD 21701 ..... 800-368-2723;301-874-5599
Omega Engineering, Stamford, CT 06907 800-826-6342
Panametrics, Waltham, MA 02154-3497 617-899-2740
Rosemount Analytical Inc., Cedar Grove, NJ 07009 800-367-7242
Schlumberger Industries, Tranducers Div., Houston, TX 77082 713-558-2587
Teledyne Gurley, Troy, NY 12181 ..... 518-272-6300;800-759-1844
Toshiba Instrumentation Div., Toshiba Intl. Corp., Tulsa, OK 74134 918-252-3548
Transonic Systems Inc., Ithaca, NY 14850 607-257-5300
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057

Meters, Flux-2900

Magnetic Instrumentation, Indianapolis, IN 46226, 317-545-2102 ..... D•1290
Magnos, Hudson, MA 01749, 508-562-1173 ..... D•1291
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516

Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
§ JMR Electronics, Bronx, NY 10461 212-597-6050
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717

Meters, Frequency-2900

CP Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518 ..... A•2194
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
EDI, Wood Dale, IL 60191, 708-860-5838 ..... B•3065
John Fluke Mfg. Co., Inc., Everett, Wa 98206 WA 98203, 206-347-6100 ..... D•1248-1249
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368
§ Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ International Microtronics, Tucson, AZ 85714, 602-746-7900 ..... D•1352-1357
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1379,1381
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1397-1398
Acculex Corporation, Taunton, MA 02780 508-880-3660
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 203-271-6000
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Alpha Industries, Inc., Woburn, MA 01801 617-935-5150
§ Analogic Corp., Peabody, MA 01960 508-977-3000
† Anritsu, Oakland, NJ 07436 ..... 201-337-1111;800-255-7234
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
Balfco Inc., Snellville, GA 30278-1078 404-979-5900
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Bell, F. W., Inc., Orlando, FL 32807 407-678-6900
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ..... 617-275-0850; 800-937-4688
Controlex, Inc., New Boston, NH 03070 603-487-5512
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† Data Check Corporation, San Diego, CA 92126 619-573-0101
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ ElliWell-USA Ltd, ElliWell, S.P.A., NYC, NY 10022 212-832-9393
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
Esterline Angus Instrument Corp, Indianapolis, IN 46224 317-244-7611
§ Extech Instruments Corp., Waltham, MA 02154 617-890-7440
Fiann Microwave Inc., Cambridge, MA 02139 1-800-937-3772
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ I.M.C. (International Microtronics Corp.), Tuscon, AZ 85714 602-746-7900
§† J-B-T Instruments, Inc., New Haven, CT 06508-1818 203-776-1111
Keithley Instrs., Cleveland, OH 44139 800-552-1115
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
§ Mariel Electronics, Salem, NH 03079 603-893-0886
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
Multi Amp Corp., TBC, Dallas, TX 75207 214-333-3201
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
§ Optoelectronics, Inc., Ft. Lauderdale, Fl. 33334 305-771-2050
† Premier Microwave, Port Chester, NY 10573 914-939-8900
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Sivers IMA AB, Culver City, CA 90230 213-306-4248
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Frequency Deviation-2900

† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1345,1347
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374,1379,1381
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Data Check Corporation, San Diego, CA 92126 619-573-0101
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
† Trametrics Inc., Baker Hughes Incorporated, Austin, TX 78725-2100 512-929-2051
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Meters, Galvanometer-2900

Shalltronix Corp., Selma, NC 27576, 919-965-6346 ..... D•1325
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Esterline Angus Instrument Corp., Indianapolis, IN 46224 ..... 317 244-7611
General Scanning Recorder Products Division, Arlington, MA 02174 617-641-2702
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§† Wide Range Elctrns. Corp., Chesterfield, MISSOURI 63005 314-532-5887

Meters, Gauss-2900

Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1226-1227
Jobmaster Corp., Randallstown, MD 21133-0207, 410-655-1400 ..... A•1235
Magnetic Instrumentation, Indianapolis, IN 46226, 317-545-2102 ..... D•1290
Magnos, Hudson, MA 01749, 508-562-1173 ..... D•1291
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1374
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cryomagnetics, Inc., Oak Ridge, TN 37830 615-482-9551
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202
Memtec Corp. Salem, NH 03079 603-893-6080
§ Metrolab Instruments SA, Geneva, SWITZERLAND CH-1228 ..... (41-22)794 11 21
§ Micro-Now Instr. Co., Inc., Skokie, IL 60076 708-677-4700

Meters, Hand Held-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1223,1225
§ Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1130,1226-1228
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
Jobmaster Corp., Randallstown, MD 21133-0207, 410-655-1400 ..... A•1235
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287-1288
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
ACL Inc., Elk Grove, IL 60007 ..... 708-981-9212;1-800-782-8420
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
§ Atkins Technical Inc., Gainesville, FL 32608 904-378-5555
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Crystal Engineering Corp., Los Osos, CA 93402 ..... 805-528-2155;800-444-1850
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
† INTELCO, Acton, MA 01720 508-264-4485
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688

§ Moisture Register Products Div., Aqua Measuré Instrument Co., LaVerne, CA 91750-0369 714-392-5833
§ Mouser Electronics, Mansfield, TX 76063 800-346-6873
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
§ Semtronics Corp., Peachtree City, GA 30269 404-487-6681
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Humidity-2900

Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Analogic Corp., Peabody, MA 01960 508-977-3000
§ Atkins Technical Inc., Gainesville, FL 32608 904-378-5555
Cole-Parmer Instrument Company, Chicago, IL 60648 ..... 708/647-7600
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
EWC, Inc., Englishtown, NJ 07726 908-446-3110
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Panametrics, Waltham, MA 02154-3497 617-899-2740
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
Stephens Analytical, Inc., Montreal, Que., CA H4S 1L1 514-332-1230
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
† Thunder Scientific Corp., Albuquerque, NM 87123 ..... 505-265-8701;800-872-7728

Meters, Illuminated Scale-2950

§ International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1356
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... C•1799
Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1371
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Bell, F. W., Inc., Orlando, FL 32807 407-678-6900
§ Contact East, N. Andover, MA 01845 508-682-2000
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Dixson, Inc., Grand Junction, CO 81503 303-244-1241
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
EMICO Inc., Dublin, PA 18917 215-249-9330
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
§ Gralex Industries, Norwood, NJ 07648 800-486-4499
§† Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Lamb Industries, Inc., Portland, OR 97225 ..... 503-297-8878;800-824-9374
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Texmate, Inc., Vista, CA 92083-8397 619-598-9899
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Meters, Impedance-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
† Data Check Corporation, San Diego, CA 92126 619-578-0101
Electro-Dynamics Dev. Co., Issaquah, WA 98027-4038 206-392-2493
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Marconi Instruments, Allendale, NJ 07401 201-934-9050
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Sescom, Inc., Henderson, NV 89015-4249 702-565-3400
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Kilovolt-2900

Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1248
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1257
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1278
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
† Ross Engineering Corp., Campbell, CA 95008, 408-377-4621 ..... D•1319
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1323
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Electrical Standards Div., E.S.R.S., Inc., N. Hollywood, CA 91605 818-765-4224
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Jennings, San Jose, CA 95122-2696 408-292-4025
Larson Instrument, Orangeburg, NY 10962 914-359-3800
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
† Oram High Voltage, Dayton, TX 77535 409-258-5553
Rutherford Research, Rutherford, NJ 07070 201-933-2091
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
† Velonex, Santa Clara, CA 95050 408-727-7370
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550

Meters, Laser Energy — See Monitors, Laser Energy (Vol. D)

Meters, Light (Nonphotographic)-2900

A E G Corporation, Telefunken Semiconductors Div., Somerville, NJ 08876-1269 201-231-8300
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
§ BEA electro-optics, inc., Des Plaines, IL 60016 708-298-1420
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
† GreenLee Textron Inc.:Subsidiary of Textron Inc., Rockford, IL 61109 ... 815-397-7070
† Hoffman Engineering Corp., Stamford, CT 06902 203-325-8933
† International Light, Newburyport, MA 01950-4092 508-465-5923
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Oriel Corp., Stratford, CT 06497-0872 203-377-8282
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ UVP, Inc., San Gabriel, CA 91778 818-285-3123

Meters, Megohm-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1255
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207

Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... **D•1275-1276**
§† **Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046** ..... **D•1313**
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... **D•1318**
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... **D•1327**
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... **D•1374**
† **Valhalla Scientific, San Diego, CA 92121, 619-457-5576** ..... **D•1332-1333**
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§ Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
† GreenLee Textron Inc.:Subsidiary of Textron Inc., Rockford, IL 61109 815-397-7070
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Omega Engineering, Stamford, CT 06907 800-826-6342
† Oram High Voltage, Dayton, TX 77535 409-258-5553
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Phenix Technologies, Accident, MD 21520 301-746-8118
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Torotron Corp., Mt. Vernon, NY 10550 914-664-2050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
† Velonex, Santa Clara, CA 95050 408-727-7370
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550

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Meters, Micro Ohm-2900

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. **D•1249**
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... **D•1255**
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... **D•1275**
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... **D•1333**
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Meters, Microwave-2900

† **General Microwave Corporation, Amityville, NY 11701, 516-226-8900** .... **D•1251**
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Holaday Industries, Inc., Eden Prairie, MN 55344 612-934-4920
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Republic Electronics Co., Hauppauge, NY 11788 516-273-9800
Sivers IMA AB, Culver City, CA 90230 213-306-4248
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Meters, Modulation-2900

§ ARGA Controls, Pasadena, CA 91105 213-682-3314
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Meters, Moving Coil-2950

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... **D•1343**
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... **D•1385-1386**
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... **D•1351**
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... **D•1378,1385-1386,2075**
§ **Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717** ..... **D•1338-1339**
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Dixson, Inc., Grand Junction, CO 81503 303-244-1241
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
Mitech ELectronics Corp., Otsego, MI 49078 616-694-9471
Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Meters, Moving Iron-2950

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... **D•1343**
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... **D•1385-1386**
§ **Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721** ..... **D•1373**
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... **D•1378,1385-1386,2075**
§ **Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717** ..... **D•1338-1339**
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Meters, Moving Scale-2950

Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... **D•1373**
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199

Meters, Multifunction (Analog)-2900

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... **D•1248-1249**
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... **D•1385-1386**
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... **D•1349**
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... **D•1275**
§ **Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104** ..... **D•1288**
† **Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300** ..... **D•1294**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1307**
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... **D•1378,1385-1387,2075**
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§† Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ Contact East, N. Andover, MA 01845 508-682-2000
† Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ Goldstar Precision Co. Ltd., Lucky Goldstar, Cerritos, CA 90701 213-404-0101
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
§ Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
† Vertox Co., Garden Grove, CA 92643 714-530-4541
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550

Meters, Multifunction (Digital)-2900

§ **B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448** ..... **D•1223-1225**
Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... **D•1227**

Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270
§ Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275-1276
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307
Ross Engineering Corp., Campbell, CA 95008, 408-377-4621 ..... D•1319
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1376,1378,1380-1381,1387,2075
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1395
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
† Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
American Microsemiconductor, Inc., Madison, NJ 07940 201-377-9566
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§† Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ Contact East, N. Andover, MA 01845 508-682-2000
§† Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Digitec, Marion, OH 43302 614-387-3444
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Goldstar Precision Co. Ltd., Lucky Goldstar, Cerritos, CA 90701 213-404-0101
Gossen/Texmate, Vista, CA 92083-8397 619-598-9899
Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
Prema Precision Electronics, Inc., Montclair, CA 91763 714-621-7292
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Noise & Sound Level-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Nonconductive Coating Thickness-2900

Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516

Meters, Null-2950

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1248
§ International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1351
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1376
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§† Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Dixson, Inc., Grand Junction, CO 81503 303-244-1241
† FOX METER INC., Elburn, IL 60119 708-365-2422
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Julie Research Labs., New York, NY 10001 212-633-6625
Keithley Instrs., Cleveland, OH 44139 800-552-1115
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Ohm-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1346
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1255
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
§ Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1278
† PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375-1376
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ Contact East, N. Andover, MA 01845 508-682-2000
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§# Instrumentation Services, Inc., Minneapolis, MN 55427 612-544-8916

§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† Millivac Instruments, Inc., Schenectady, NY 12301 518-355-8300
§ Mouser Electronics, Mansfield, TX 76063 800-346-6873
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Omega Engineering, Stamford, CT 06907 800-826-6342
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Shalltronix Corp., Selma, NC 27576 919-965-6346
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
§† WestCon, Marion, OH 43302 614-382-5771

Meters, Optical Power-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1214-1215
† Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218
Berkeley Nucleonics Corp., Richmond, CA 94804, 510-234-1100 ..... D•1229
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
§ BEA electro-optics, inc., Des Plaines, IL 60016 708-298-1420
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
† INTELCO, Acton, MA 01720 508-264-4485
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Panel (Analog)-2950

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1368
§ Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1371
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§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
§ Contact East, N. Andover, MA 01845 508-682-2000
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
† FOX METER INC., Elburn, IL 60119 708-365-2422
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Space Electronics, Inc., Berlin, CT 06037 203-829-0001
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§† WestCon, Marion, OH 43302 614-382-5771

Meters, RFI-2900

§ **John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1248**
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, S Unit-2900

A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310

Meters, Slope — See Inclinometer (Vol. D)

Meters, Snap-around — See Meters, Clamp-on (Vol. D)

Meters, Standing Wave Ratio-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
Sivers IMA AB, Culver City, CA 90230 213-306-4248
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Meters, Static Decay-2900

§† **NRD Inc., Subsidiary of Mark IV Inds., Inc., Grand Island, NY 14072, 716-773-7634 ..... D•2238**
† Chapman Corp., Portland, ME 04104 207-773-4726
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
§ Simco Co., Hatfield, PA 19440 215-822-2171

Meters, Taut Band-2950

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1351
Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1371
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§† Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550

Meters, Temperature (Contacting)-2900

Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
§ **Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344**
§ **John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249**
† **FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1346**
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•1382
§ **International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357**
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
§ **Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1363-1364,1366**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307,1368-1369
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,1382,2075
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1401
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Acculex Corporation, Taunton, MA 02780 508-880-3660
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Atkins Technical Inc., Gainesville, FL 32608 904-378-5555
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ Burling Instruments, Inc., Chatham, NJ 07928-0298 201-635-9481
§ Contact East, N. Andover, MA 01845 508-682-2000
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Cryomagnetics, Inc., Oak Ridge, TN 37830 615-482-9551
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
DCI Inc., Olathe, KS 66062 913-782-5672
† Digitec, Marion, OH 43302 614-387-3444
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§† Edsyn, Inc., Van Nuys, CA 91406 ..... 818-989-2324;213-873-5115
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
Electric Tachometer, Philadelphia, PA 19142 215-726-7723
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ E-Squared Technology Corp., Ventura, CA 93003 805-644-9544
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
§† Gordon Co.:Watlow, Richmond, IL 60071 815-678-2211
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
§ Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Instrulab, Dayton, OH 45404 513-223-2241
§ J-B-T Instruments, Inc., New Haven, CT 06508-1818 203-776-1111
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
Larson Instrument, Orangeburg, NY 10962 914-359-3800
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§ Martel Electronics, Salem, NH 03079 603-893-0886
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300

§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Pacific Transducer Corp., Los Angeles, CA 90064-1482 213-478-1134
§ Precision Digital Corp., Natick, MA 01760 508-655-7300
Princo Instruments, Inc., Southampton, PA 18966
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
† Thermo Electric, Saddle Brook, NJ 07662 201-843-5800
† Thermometrics, Inc., Edison, NJ 08817-4695 908-287-2870
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
† VirTis Co., Gardiner, NY 12525 ..... 914-255-5000; 800-431-8232
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121
WestCon, Marion, OH 43302 614-382-5771
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711
Xitron Technologies, San Diego, CA 92121 619-458-9852
§ Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Meters, Temperature, Dial type (Noncontacting) — See Pyrometers (Vol. D)

Meters, Temperature, Infrared-2900

§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Raytek, Inc., Santa Cruz, CA 95060-1820 408-458-1110
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
† Williamson Corporation, Concord, MA 01742 508-369-9607

Meters, Thermal Transfer-2900

Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717

Meters, Time Interval — See Timers, Interval (Vol. D)

Meters, Vacuum Tube Volt (VTVM)-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Meters, VAR-2900

§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
§† Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
PPM, Inc., Cleveland, OH 44139 216-349-2300
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
Xitron Technologies, San Diego, CA 92121 619-458-9852

Meters, Vibration-2900

Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
§ Vibra-Metrics, Inc., Hamden, CT 06514, 203-288-6158;1-800-8-SENS-IT .. B•1957
Alpha-M Corp., Dallas, TX 75229 214-406-0424
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† CEC Instruments, Imo Industries Inc., San Dimas, CA 91773 714-394-4410
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Epic, Inc., New York, NY 10038 212-349-2470
Metrix Instrument Co., Houston, TX 77043 713-461-2131
Meylan Corporation, Upper Montclair, NJ 07043-1844 201-744-6400
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Space Electronics, Inc., Berlin, CT 06037 203-829-0001
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Meters, Volt, AC-2900

B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1223
Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238
CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518 ..... A•2194
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1248-1249
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1346
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§† International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1351
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275-1276
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1360
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1370
† Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1324
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1376,1379,1381
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1401
§ Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717 ..... D•1338-1339
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Acculex Corporation, Taunton, MA 02780 508-880-3660
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Amber Electric Design, St. Laurent, PQ,, CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
§ Analogic Corp., Peabody, MA 01960 508-977-3000
† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
§ Bell, F. W., Inc., Orlando, FL 32807 407-678-6900
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
† Bowmar Telecommunications Div., Acton, MA 01720 508-263-8365
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
§ Contact East, N. Andover, MA 01845 508-682-2000
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Digitec, Marion, OH 43302 614-387-3444
Dixson, Inc., Grand Junction, CO 81503 303-244-1241
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
† Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
EMICO Inc., Dublin, PA 18917 215-249-9330
§ Extech Instruments Corp., Waltham, MA 02154 617-890-7440
Fieldpiece Instruments, Buena Park, CA 90621 714-992-1239
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
Hipotronics Inc., Brewster, NY 10509 914-279-8091
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
International Microelectronics, Arlington, TX 76003 817-561-2244
† Jennings, San Jose, CA 95122-2696 408-292-4025
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Julie Research Labs., New York, NY 10001 212-633-6625

§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ Martel Electronics, Salem, NH 03079 603-893-0886
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
§ Mouser Electronics, Mansfield, TX 76063 800-346-6873
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
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§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 604-652-5118
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
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§† Transtector Systems, Inc., Hayden Lake, ID 83835 800-829-2901
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§† WestCon, Marion, OH 43302 614-382-5771

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† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
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§ Contact East, N. Andover, MA 01845 508-682-2000
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Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
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North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1368-1369
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† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
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§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391

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Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
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Meters, Volt, Sampling-2900

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Precision Filters, Ithaca, NY 14850 607-277-3550
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
TEGAM, Inc., Madison, OH 44057 800-666-1010
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
§† WestCon, Marion, OH 43302 614-382-5771
Xitron Technologies, San Diego, CA 92121 619-458-9852

Meters, VU-2900

International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1355
§ Selco Products Co., SEL Sales, Inc., Buena Park, CA 90621, 714-521-8673 ..... D•1371
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
Bartlett Instrument Co., Ft. Madison, IA 52627 319-372-8366
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Dixson, Inc., Grand Junction, CO 81503 303-244-1241
EMICO Inc., Dublin, PA 18917 215-249-9330
§ Furman Sound, Inc., Greenbrae, CA 94904 415-927-1225
† Ideal Precision Meter, Brooklyn, NY 11222 212-383-6904
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
§ International Instruments, A Prime Technology Company, N. Branford, CT 06471 203-481-5721
§ LFE Instruments, Clinton, MA 01510-3099 508-835-1000
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Techron Div., Crown Intl., Inc., Elkhart, IN 46517 219-294-8300
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Meters, Watt-2900

§ Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1228
† Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ International Microtronics, Tucson, AZ 85714, 602-748-7900 ..... D•1352-1357
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... D•1289
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1324
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1376,1380,1387
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717 ..... D•1338-1339
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Controlex, Inc., New Boston, NH 03070 603-487-5512
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
§ ENI, Div. of Astec America, Inc., Rochester, NY 14623 716-427-8300
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Greibach Instruments Div., Mt. Vernon, NY 10550 914-699-9717
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
Highland Technology, Inc., San Francisco, CA 94122 415-753-5814
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Larson Instrument, Orangeburg, NY 10962 914-359-3800
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 604-652-5118
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
† Scientech, Inc., Boulder, CO 80303 ..... 303-444-1361;800-525-0522
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
Voltech, Inc., Ashland, MA 01721 508-881-7329
Wavetek Microwave, Inc., (Formerly Pacific Measurement, Inc.), Sunnyvale, CA 94089 408-734-5780
§ Weschler Instruments, Hughes Corp., Cleveland, OH 44136 216-238-2550
§† WestCon, Marion, OH 43302 614-382-5771
Xitron Technologies, San Diego, CA 92121 619-458-9852

Meters, Watt Hour-2900

Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1376,1380,1387
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
A & D Elec. Instrs., Glendale, NY 11385 718-275-6516
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Controlex, Inc., New Boston, NH 03070 603-487-5512
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
Highland Technology, Inc., San Francisco, CA 94122 415-753-5814
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ Norma Messtechnik Optik, Elektronik GmbH., Wr. Neudorf, AUSTRIA 2351 ..... 02236 61530
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
Xitron Technologies, San Diego, CA 92121 619-458-9852

Meters, Watt, RF-2900

Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1376,1380,1387
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Coaxial Dynamics, Cleveland, OH 44135 ..... 1-800-COAXIAL
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
International Light, Newburyport, MA 01950-4092 508-465-5923
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428

Meters, Wave-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Burleigh Instruments, Fishers, NY 14453 716-924-9355
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428

Meters, Waveguide — See Meters, Microwave (Vol. D)

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Microcircuit Production Equip.-4100

§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Eraser Co., Syracuse, NY 13221 315-454-3237
† Fancort Industries, Inc., W. Caldwell, NJ 07006 201-575-0610
§ Hull Corp., Hatboro, PA 19040 215-672-7800
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200

Microcircuits — See Integrated Circuits (Specific Types) (Vol. A)

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Microphone Accessories (Incl. Stands, Holders, Booms)-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
† Audiosears, Stamford, NY 12167 ..... 607-652-7305;800-533-7863
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§† Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† Roanwell, New York, NY 10014 212-989-1090
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Microphones, Bone Conduction-1300

† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§† Centurion International, Inc., Lincoln, NE 68504 402-467-4491
Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121

Microphones, Carbon-1300

† RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
† Audiosears, Stamford, NY 12167 ..... 607-652-7305;800-533-7863
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† Roanwell, New York, NY 10014 212-989-1090
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200

Microphones, Cardioid-1300

† RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
† Knowles Electronics, Inc., Itasca, IL 60143 708-250-5100
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§† Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200

Microphones, Ceramic-1300

Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 .. B•1922-1923
† RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
International Microelectronics, Arlington, TX 76003 817-561-2244
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
† Knowles Electronics, Inc., Itasca, IL 60143 708-250-5100
Motorola Ceramic Products, Components Division, Albuquerque, NM 87113 505-822-8801
Mouser Electronics, Mansfield, TX 76063 800-346-6873
§ Murata Manufacturing Co., Ltd., Nagaoka-Kyo-Shi, Kyoto, JAPAN 617 ... 075-951-9111
Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
Sonicall, Inc., Signal Hill, CA 90806 213-490-2143

Microphones, Condenser (Incl. Electret)-1300

CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... D•1031
† RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
§† Aiphone, Bellevue, WA 98005 206-455-0510
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
C-S Electronic Sales, Inc., Frankfort, IN 46041 317-659-1874
§ Ercona, Patchogue, NY 11772 516-758-0700
§ Heath Co., St. Joseph, MI 49085 616-982-3200
International Microelectronics, Arlington, TX 76003 817-561-2244
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 516-937-3475
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
† Knowles Electronics, Inc., Itasca, IL 60143 708-250-5100
Mouser Electronics, Mansfield, TX 76063 800-346-6873
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§† Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Microphones, Crystal-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
International Microelectronics, Arlington, TX 76003 817-561-2244
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
Mouser Electronics, Mansfield, TX 76063 800-346-6873
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911

Microphones, Dynamic-1300

CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... D•1031
† RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
† Audiosears, Stamford, NY 12167 ..... 607-652-7305;800-533-7863
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Heath Co., St. Joseph, MI 49085 616-982-3200
International Microelectronics, Arlington, TX 76003 817-561-2244
† Kulite Semiconductor Prods., Inc., Leonia, NJ 07605 201-461-0900
§ MG Electronics, Hauppauge, NY 11788 516-582-3400
Mouser Electronics, Mansfield, TX 76063 800-346-6873
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§† Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
† Roanwell, New York, NY 10014 212-989-1090
Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893

Microphones, Lavalier-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200

Microphones, Magnetic-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
Audiosears, Stamford, NY 12167 ..... 607-652-7305;800-533-7863
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
† Knowles Electronics, Inc., Itasca, IL 60143 708-250-5100
§ Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
† Roanwell, New York, NY 10014 212-989-1090
Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Microphones, Omnidirectional-1300

RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
International Microelectronics, Arlington, TX 76003 817-561-2244
† Knowles Electronics, Inc., Itasca, IL 60143 708-250-5100
§ Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
Mouser Electronics, Mansfield, TX 76063 800-346-6873
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§† Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Microphones, Subminiature-1300

§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Ercona, Patchogue, NY 11772 516-758-0700
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
† Knowles Electronics, Inc., Itasca, IL 60143 708-250-5100
Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500

Microphones, Wireless-1300

Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ AKG Acoustics, Inc., San Leandro, CA 94577 415-351-3500
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§† Primo Company Limited, Tokyo, JAPAN 181 0422-43-3121
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200

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Microprocessor Development Systems-2900

American Arium, Formerly American Automation & Arium, Tustin, CA 92680-7207, 714-731-1661 ..... D•1217
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4656 ..... D•1308
§ Signum Systems Corp., Thousand Oaks, CA 91360, 805-371-4608 ..... D•1326
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 .... D•1122
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Applied Microsystems Corp., Redmond, WA 98052 206-882-2000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Atlanta Signal Processors, Inc., Atlanta, GA 30308 404-892-7265
Byte Craft Limited, Waterloo, Ont., CAN N2J 4E4 519-888-6911
Computer Dynamics Sales, Greer, SC 29650 803-877-8700
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
Digital Equip., Marlborough, MA 01752
§ Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ GMR Co., Venice, CA 90291 213-399-1490
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Intergraph Corp., Advanced Processor Division, Palo Alto, CA 94303 415-494-8800
Matrix Corp., Raleigh, NC 27610 919-231-8000
Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
Micro/sys, Glendale, CA 91201-3010 818-244-4600
Microtek International/Dev. Sys. Div., Hillsboro, OR 97124 503-645-7333
§ Mitsubishi Elctrns. America, Inc., Elctrn. Device Grp., Sunnyvale, CA 94086 408-730-5900
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 508-588-6110
§ NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
Omnibyte Corp., W. Chicago, IL 60185 708-231-6880
§ Pacific Microcomputers, Signal Technology, San Diego, CA 92121 619-453-8649
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Microscopes, Scanning, Laser, Acoustic-4100

Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000
§ Carl Zeiss, Inc., Thornwood, NY 10594 914-747-1800

Microscopes-3700 — *See Vol. B*

Microscopes, Measuring-2900

† CELCO, Mahwah, NJ 07430 201-327-1123
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
Rolyn Optics Co., Covina, CA 91722-2199 ..... 818-915-5707/5717
§† Vision Engineering, Inc., New Milford, CT 06776 203-355-3776
§ Carl Zeiss, Inc., Thornwood, NY 10594 914-747-1800

Microwave Comb Generator — See Generators, Microwave (Vol. D)

Microwave Integrated Circuits (MICs)-3450 — *See Vol. A*

Microwave Receivers — See Receivers, Microwave (Vol. D)

Microwave Systems, Local Distribution-3450 — *See Vol. A*

Mirrors, Front Surface-3700 — *See Vol. B*

Mirrors, Rear Surface-3700 — *See Vol. B*

Mixers, Audio-1300

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Furman Sound, Inc., Greenbrae, CA 94904 415-927-1225
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

Mixers, Microwave-3450 — *See Vol. A*

Mixers, RF-3450 — *See Vol. A*

Modems — See Modulator/Demodulators, Data (Vol. D)

Modems, Broadband RF-1900

Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227
§ C-COR Elctrns., State College, PA 16801 ..... 814-238-2461;800-233-2267
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
† ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Modems, CATV-1900

Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1738
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300

Modems, Communications, Eliminator/Line Driver-1900

Extrusion Technology, Inc., Randolph, MA 02368, 617-963-7200 ..... C•1051
§ S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Cermetek Microelectronics Inc., Sunnyvale, CA 94089 408-752-5000
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Dataprobe, Englewood, NJ 07631 201-569-6464
† DEI, Escondido, CA 92029 619-743-8344
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
§ Frequency Selective Networks, Woodside, NY 11377 718-424-7500
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Greenwich Instruments USA, Charlotte, NC 28205 704-376-1021
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
§ S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
§† TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
§ Universal Data Systems, Inc., Motorola Information Systems Group, Huntsville, AL 35805-1993 205-430-8000

Modems, Communications, Line Receivers-1900

† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ... D•1070,1073-1074
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227-1229
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231
§† Canoga-Perkins Corp., Chatsworth, CA 91311 818-718-6300
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
§ Computer Peripherals Inc., Newbury Pk., CA 91320 ..... 805-499-5751;800-854-7600
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ Frequency Selective Networks, Woodside, NY 11377 718-424-7500
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
Microplex, Inc., Anaheim, CA 92806 714-634-1535
Rohm Corporation, Rohm Electronics Division, Antioch, TN 37013 615-641-2020
§† TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Visionary Electronics, San Francisco, CA 94118 415-751-8811

Modems, Communications, Long Haul-1900

§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Cermetek Microelectronics Inc., Sunnyvale, CA 94089 408-752-5000
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Comspec Digital Products Inc., Houston, TX 77043 713-461-4487
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Data Race, Inc., San Antonio, TX 78230 512-558-1900
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† Electrocom Industries, S. Bend, IN 46615 219-232-2743
§ Frequency Selective Networks, Woodside, NY 11377 718-424-7500
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
§ Penril DataComm Networks, Gaithersburg, MD 20878 301-921-8600
Rockwell Int'l:Semiconductor Products Division, Newport Beach, CA 92660 714-833-4600
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
§† TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
§† Terminal Data Corp., Rockville, MD 20855 301-921-8282
§ Universal Data Systems, Inc., Motorola Information Systems Group, Huntsville, AL 35805-1993 205-430-8000

Modems, Communications, Short Haul (Limited Distance)-1900

Extrusion Technology, Inc., Randolph, MA 02368, 617-963-7200 ..... C•1051
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1738
§ S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
§# Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
† Force, Inc., Christiansburg, VA 24073 703-382-0462
§ Frequency Selective Networks, Woodside, NY 11377 718-424-7500
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§† Honeywell Microswitch Div., Richardson, TX 75081 214-470-4271
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
§ Penril DataComm Networks, Gaithersburg, MD 20878 301-921-8600
§† TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
§ Universal Data Systems, Inc., Motorola Information Systems Group, Huntsville, AL 35805-1993 205-430-8000
§ Visionary Electronics, San Francisco, CA 94118 415-751-8811

Modems, FAX-2000

Extrusion Technology, Inc., Randolph, MA 02368, 617-963-7200 ..... C•1051
Data Race, Inc., San Antonio, TX 78230 512-558-1900

Modems, Wireless-1900

Extrusion Technology, Inc., Randolph, MA 02368, 617-963-7200 ..... C•1051
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
† Electrocom Industries, S. Bend, IN 46615 219-232-2743
† ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
Megadata Corp., Bohemia, NY 11716 516-589-6800
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
§ Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Modular Telephone Cords — See Cable, Telephone (Vol. D)

Modulation Transfer Analyzers — See Analyzers, Transfer Function (Vol. D)

Modulator/Demodulators, Data-2000

† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1073-1074
† Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227
§ S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
Avasem Corporation, San Jose, CA 95126 408-297-1201
Aydin Corp., Horsham, PA 19044 215-657-7510
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
California Microwave, Sunnyvale, CA 94086 408-732-4000
§† Canoga-Perkins Corp., Chatsworth, CA 91311 818-718-6300
† CATEL Telecommunications, Fremont, CA 94537 415-659-8988
† Climatronics, Bohemia, NY 11716 516-567-7300
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Conklin Instrument Corp., Pleasant Valley, NY 12569 914-635-2136
Dantel, Fresno, CA 93727 209-292-1111
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† Electrocom Industries, S. Bend, IN 46615 219-232-2743
§† Exar Corp., San Jose, CA 95161-9007 408-732-7970
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Intra-computer, Jamacia, NY 11418 718-297-5500
† ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
† Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
Micro Electronic Technologies, Hopkinoon, MA 01748 508-435-9057
Microplex, Inc., Anaheim, CA 92806 714-634-1535
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
Network Software Associates, Inc., Laguna Hills, CA 92656 714-768-4013
§ Novatek Corporation, Coral Springs, FL 33065 305-341-7700
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
§† Penril DataComm Networks, Gaithersburg, MD 20878 301-921-8600
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
RE Instruments Corp., Westlake, OH 44145 216-871-7617
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
§ Rockwell Int'l:Semiconductor Products Division, Newport Beach, CA 92660 714-833-4600
§ Sierra Semiconductor Corp., San Jose, CA 95132 408-263-9300
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§† Silicon General, Garden Grove, CA 92641 714-898-8121
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§† TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600

Modulator/Demodulators, Laser-3700 — ***See Vol. B***

Modulators, AM-1900

† Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240
E.P.D./General Power Corp., Anaheim, CA 92805-8508, 714-520-0881;1-800-343-1813 ..... D•1069
† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 .... A•1749
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
† Mini-Circuits Lab., Brooklyn, NY 11235-0003, 718-934-4500 ..... A•1753
† CATEL Telecommunications, Fremont, CA 94537 415-659-8988
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Modulators, FM-1900

E.P.D./General Power Corp., Anaheim, CA 92805-8508, 714-520-0881;1-800-343-1813 ..... D•1069
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† CATEL Telecommunications, Fremont, CA 94537 415-659-8988
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ..... 617-275-0850; 800-937-4688
Dantel, Fresno, CA 93727 209-292-1111
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
Loral Data Systems, Sarasota, FL 34230 813-371-0811
† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
RE Instruments Corp., Westlake, OH 44145 216-871-7617
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Modulators, Light-3700 — ***See Vol. B***

Modulators, Magnetic-2200

† American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100 ..... B•1876-1877
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† Transmagnetics, Farmingdale, NY 11735 516-293-3100

Modulators, Microwave-3450 — ***See Vol. A***

Modulators, Phase-1900

General Microwave Corporation, Amityville, NY 11701, 516-226-8900 .... A•1749
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Corvus Microwave Inc., Syracuse, NY 13211-2100 315-437-4400
† Daico Industries, Inc., Compton, CA 90220 213-631-1143
† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† Microwave Applications Group, Santa Maria, CA 93455 805-928-5711
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291

Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Vectronics Microwave Corp., Middlesex, NJ 08846 908-356-2377
Wavetek San Diego, Inc., Wavetek Corp., San Diego, CA 92123 619-279-2200

Modulators, Pulse-3450 — *See Vol. A*

Modulators, RF-1900

E.P.D./General Power Corp., Anaheim, CA 92805-8508, 714-520-0881;1-800-343-1813 ..... D•1069
General Microwave Corporation, Amityville, NY 11701, 516-226-8900 .... A•1749
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
§† ATV Research, Inc., Dakota City, NE 68731 402-987-3771
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† CATEL Telecommunications, Fremont, CA 94537 415-659-8988
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
† Corvus Microwave Inc., Syracuse, NY 13211-2100 315-437-4400
§ Data-Design Labs., Cucamonga, CA 91730 714-987-2511
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† M/A-COM Control Components Div., M/A-COM, Merrimack, NH 03054-4343 603-424-4111
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
MicroSignals Inc., LI.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Murata Manufacturing Co., Ltd., Nagaoka-Kyo-Shi, Kyoto, JAPAN 617 ... 075-951-9111
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
Peca, Inc., Bensalem, PA 19020 215-245-1550
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
Wavetek RF Products, Inc., (Formerly Wavetek Indiana, Inc.), Indianapolis, IN 46203-6109 317-788-9351

Modulators, Satellite Antennas-1200

Japan Electronic Manufacturers Agency, Inc.; Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400

Modulators, Video-2200

California Microwave, Sunnyvale, CA 94086 408-732-4000
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260

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Modules, CAMAC-2900

CAL-AV, Inc., Campbell, CA 95008 408-371-0666
DSP Technology, Fremont, CA 94538-7338 415-657-7555
Highland Technology, Inc., San Francisco, CA 94122 415-753-5814
KineticSystems, Lockport, IL 60441 815-838-0005
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000

Modules, Control & Switching-2200

Advanced Systems Concepts, Inc., Altadena, CA 91001, 818-791-0983 .. D•1144
§ Altech Corp., Somerville, NJ 08876, 908-707-8484 ..... C•1166
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
Crosspoint, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ... B•1673
§ Crydom Company, Lakewood, CA 90711-3699, 213-865-3536 ..... A•2086-2092, B•1450-1455
CYTEC Corp., Penfield, NY 14526, 716-381-4740;800-346-3117 ..... D•1240
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 .. D•1173
§ Grayhill Inc., La Grange, IL 60525, 708-354-1040 ..... B•1490-1491
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1505
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710, 813-347-2181 ..... A•1751
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212
Philips ECG, North American Philips Co., Williamsport, PA 17701, 717-323-4691 ..... A•2118
§ Powerex, Westinghouse, GE, Mitsubishi, Youngwood, PA 15697, 412-925-7272 ..... A•2117
Weidmuller Inc., Richmond, VA 23236, 804-794-2877 ..... C•1579
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1397-1398
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Antex Electronics Corp., Gardena, CA 90248 213-532-3092
† Capitol Switch Inc., Bethel, CT 06801 203-744-3300
Catalyst Research, Mine Safety Appliances Co., Inc., Owings Mills, MD 21117 301-356-2400
† CATEL Telecommunications, Fremont, CA 94537 415-659-8988
§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
§ Gunther, W., GmbH, D 8500 Nurnberg 82, GERMANY ..... (0)911/65521 or 65520
Heinemann Electric Co., Lawrenceville, NJ 08648-0800 609-882-4800
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
§ Interloop, San Jose, CA 95131 408-922-0520
§ International Rectifier Corp., El Segundo, CA 90245 213-772-2000
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
IXYS Corp., San Jose, CA 95131-1109 408-435-1900
KineticSystems, Lockport, IL 60441 815-838-0005
KMC Systems, Inc., Midland Pk., NJ 07432 201-447-0007
§ Lutze, Inc., West Caldwell, NJ 07006 ..... 201-227-2371;800-447-2371
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001 812-386-1000
Preferred Electronics, Inc., Westfield, MA 01086 ..... 413-568-2301;1-800-553-6374
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Rockwell Int'l:Semiconductor Products Division, Newport Beach, CA 92660 714-833-4600
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
§ Semikron, Inc., Hudson, NH 03051-0066 ..... 603-883-8102;1-800-258-1308
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§ Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136

Modules, Data Acquisition-2325

Advanced Electronic Packaging, Huntington Beach, CA 92646, 714-969-1150 ..... A•1719
American Control Technology, Inc., West Dundee, IL 60118-2100, 708-426-6780 ..... B•1645
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1148
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 .... D•1150
† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152-1153, 1157
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159-1160
F-P Electronics, Mississauga, Ont., CANADA L4W 2P1, 416-624-3020 ... B•1075
General Scanning Recorder Products Division, Arlington, MA 02174, 617-641-2702 ..... D•1419
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 ..... D•1171-1173
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348
§ Grayhill Inc., La Grange, IL 60525, 708-354-1040 ..... B•1490-1491
† ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 ... D•1176-1177
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275,1277
§ Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124,1188,1296-1297
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1854-1855,1946, C•1799, D•1101,1191,1307,1368-1369,1422
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... A•1706-1707, D•1015,1192-1193
Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1397-1398
§ Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
§ Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702

Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Basicon, Inc., Portland, OR 97229 503-626-1012
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
Cinch Connector Division, Labinal Components & Systems Inc., Elk Grove Village, IL 60007 312-981-6000
Compu-Mech Inc., Toledo, OH 43607 419-535-6702
§† Computer Products, Inc., Measurement & Control Div., Pompano Beach, FL 33069 305-974-5500
§ Contec Microelectronics USA, San Jose, CA 95131 408-436-0340
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
Control Module, Enfield, CT 06082 203-745-2433
§ Dancer Communications, Inc., Media, PA 19064-2334 215-543-8066
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
DGH Corporation, Manchester, NH 03108 603-622-0452
† Digitec, Marion, OH 43302 614-387-3444
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
Dymec Inc., Winchester, MA 01890 617-729-7870
Eltek Corporation, Hagerstown, IN 47346 317-489-6121
E-T-A Circuit Breakers, Chicago, IL 60648 708-647-8303
† Force, Inc., Christiansburg, VA 24073 703-382-0462
§ Giddings & Lewis-Nexes Automation, Giddings & Lewis, Inc., Fond du Lac, WI 54936-1658 414-921-7100
§ GW Instruments, Inc., Somerville, MA 02143 617-625-4096
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
§ Interloop, San Jose, CA 95131 408-922-0520
§ International Data Aquistion & Control, Inc., Amherst, NH 03031 603-673-0765
§ International Technologies, Inc., Warwick, RI 02888 401-781-5595
KineticSystems, Lockport, IL 60441 815-838-0005
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100 ..... 800-336-5917;703-953-4751
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998 213-828-7496
Micro Industries, Westerville, OH 43081 614-895-0404
† Micro Networks, Unitrode Corporation, Worcester, MA 01606 508-852-5400
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
NAVAN Corporation, Media, PA 19063 215-543-8066
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
Velonex, Santa Clara, CA 95050 408-727-7370
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136
WestCon, Marion, OH 43302 614-382-5771
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

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Advanced Electronic Packaging, Huntington Beach, CA 92646, 714-969-1150 ..... A•1719
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
F-P Electronics, Mississauga, Ont., CANADA L4W 2P1, 416-624-3020 ... B•1075
Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
Markenrich Corp., Duarte, CA 91010 818-359-9190
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

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Modules, NIM-2900

Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
Berkeley Nucleonics Corp., Richmond, CA 94804 510-234-1100
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Power Dynamics Inc., West Orange, NJ 07052 201-736-5722
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652

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Monitors, Current-2200

Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
† American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100 ..... B•1876-1877
§ Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1130,1228
Bicron Electronics, Canaan, CT 06018, 203-824-5125 ..... B•1883
§ CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518 ..... A•2194
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
Laurel Electronics, Inc., Newport Beach, CA 92663, 714-646-6846 .. D•1359-1361
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1538-1539
† Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 .. B•1925-1933,1937
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307,1368-1369
† Pearson Electronics, Inc., Palo Alto, CA 94303, 415-494-6444 ..... A•2332
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
† Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1379
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dearborn Wire & Cable, Inc., Wheeling, IL 60090 ..... 708-459-1000; 800-323-0198
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
EMICO Inc., Dublin, PA 18917 215-249-9330
† FOX METER INC., Elburn, IL 60119 708-365-2422
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
† Ion Physics Co., Atkinson, NH 03811 603-893-6687
§ Linear Instruments, Spectra Physics Analytical, Reno, NV 89523 702-746-2200
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
Skyway Magnetics, Warner Springs, CA 92086 619-782-3342
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Monitors, Data Link-1900

Densitron Corporation, Densitron International, Torrance, CA 90505, 213-530-3530 ..... B•1055
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333

§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
Omega Engineering, Stamford, CT 06907 800-826-6342
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Monitors, Error Rate-1900

§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

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Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... B•1875
FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ..... A•1371
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1350-1351
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1538-1539
§ Altech Corp., Somerville, NJ 08876 908-707-8484
† American Aerospace Controls, Farmingdale, NY 11735 516-694-5100
§ Analogic Corp., Peabody, MA 01960 508-977-3000
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
† Autronics Corp., Arcadia, CA 91006 818-445-5470
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
DCI Inc., Olathe, KS 66062 913-782-5672
† Digitec, Marion, OH 43302 614-387-3444
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
† FOX METER INC., Elburn, IL 60119 708-365-2422
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
§† Leach Corporation, Buena Pk., CA 90622-5032 714-739-0770
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Sensor Corp., Scottdale, PA 15683 412-887-4080
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Monitors, High Resolution-2000

Data Ray Corp., Westminster, CO 80234, 1-800-926-5556; 303-451-1300 ..... B•1050-1053
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
Chromatics, Tucker, GA 30084 404-493-7000
† Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Conrac Display Products, Inc., Duarte, CA 91010 818-303-0095
DataLux Corp., Winchester, VA 22601 703-662-1500
§ Image Systems Corp., Hopkins, MN 55343 612-935-1171
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100
†# Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Monitors, Humidity-2200

ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Analogic Corp., Peabody, MA 01960 508-977-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
§ Intra-computer, Jamacia, NY 11418 718-297-5500
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
Stephens Analytical, Inc., Montreal, Que., CA H4S 1L1 514-332-1230
Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
† Thunder Scientific Corp., Albuquerque, NM 87123 ..... 505-265-8701;800-872-7728

Monitors, Laser Energy-2200

† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Photon, Inc., Santa Clara, CA 95054-3432 408-492-9449
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811
† Scientech, Inc., Boulder, CO 80303 ..... 303-444-1361;800-525-0522
Swan Associates, New Haven, CT 06534 203-387-3917

Monitors, Line & Program-1900

D1 International, Inc., Huntington, NY 11743, 516-673-6866 ..... D•1343
§ Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348-1349
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1538-1539
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
§ Altech Corp., Somerville, NJ 08876 908-707-8484
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ ROH, Portland Instrument, Glendale, CA 91201 818-500-0137
§† Superior Electric, Bristol, CT 06010 203-582-9561
Unitrode Corp., Watertown, MA 02172 617-926-0404
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Monitors, Modulation-2900

Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... D•1292
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Monitors, Phase & Phase Angle-2900

Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1538-1539
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1387
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
† Basic Measuring Instruments, Foster City, CA 94404 415-570-5355
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Superior Electric, Bristol, CT 06010 203-582-9561
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220

Monitors, Phase Sequence & Loss-2200

Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
§ CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518 ..... A•2194
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1538-1539
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Altech Corp., Somerville, NJ 08876 908-707-8484
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
† Autronics Corp., Arcadia, CA 91006 818-445-5470
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
§ Buchanan, Amerace Corporation, Livingston, NJ 07039 201-992-8400
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Go Switch, Louisville, KY 40233 502-969-2386
§ Lark Electronics, Inc., New York, NY 10040 212-569-0430
§† Leach Corporation, Buena Pk., CA 90622-5032 714-739-0770
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Monitors, Power, AC & DC-2200

Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... D•1126
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156

† **American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100** ..... **B•1876-1877**
§ **Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900** ..... **D•1228**
§ **Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911** ..... **D•1008**
§ **Gralex Industries, Norwood, NJ 07648, 800-486-4499** ..... **D•1348-1349**
International Instruments, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... **D•1350-1351**
§† **Leach Corporation, Buena Pk., CA 90622-5032, 714-739-0770** ..... **B•1535**
† **Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200** ..... **B•1538-1539**
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... **D•2212-2213**
Ohio Semitronics, Inc., Columbus, OH 43212, 614-486-9561 ..... **B•1925-1937**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1368-1369**
† **Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202** ..... **D•1423**
Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831, 415-471-9717;800-221-7060 ..... **B•1578**
§† **Superior Electric, Bristol, CT 06010, 203-582-9561** ..... **A•2421**
Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... **D•1332-1333**
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§ Altech Corp., Somerville, NJ 08876 908-707-8484
Analogic Corp., Peabody, MA 01960 508-977-3000
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Basic Measuring Instruments, Foster City, CA 94404 415-570-5355
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
§ Buchanan, Amerace Corporation, Livingston, NJ 07039 201-992-8400
California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
§ Contact East, N. Andover, MA 01845 508-682-2000
§ CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026 314-343-8518
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dearborn Wire & Cable, Inc., Wheeling, IL 60090 ..... 708-459-1000; 800-323-0198
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Specialists, Natick, MA 01760 ..... 508-655-1532;800-225-4876
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
Energy Systems, Vancouver, WA 98682 206-896-8310
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§ Intra-computer, Jamacia, NY 11418 718-297-5500
Lambert Engineering Inc., Bend, OR 97701 503-388-2623
Lark Electronics, Inc., New York, NY 10040 212-569-0430
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
Motortest, Inc., Columbus, OH 43229 614-882-7821
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† Oneac Corporation, Libertyville, IL 60048 708-816-6000,800-327-8801
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 604-652-5118
PPM, Inc., Cleveland, OH 44139 216-349-2300
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Sigma Electronics Inc., Houston, TX 77099 ..... 713-933-4700;800-874-7121
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
† Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
Unitrode Corp., Watertown, MA 02172 617-926-0404
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Monitors, Power, AF-1300

Active Control Instrumentation, Key Largo, FL 33037, 305-451-1000 ..... **D•1126**
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ Electro Industries, Div. E.I. Elctrns., Inc., Westbury, NY 11590 516-334-0870
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100

Monitors, Power Failure-2200

Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... **D•1008**
§ **CR Magnetics, Inc. (Formerly Current Ring Co., Inc.), Fenton, MO 63026, 314-343-8518** ..... **A•2194**
† **Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200** ..... **B•1538-1539**
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... **D•2212-2213**
Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
§ Altech Corp., Somerville, NJ 08876 908-707-8484
† Basic Measuring Instruments, Foster City, CA 94404 415-570-5355
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
§ Contact East, N. Andover, MA 01845 508-682-2000
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Lark Electronics, Inc., New York, NY 10040 212-569-0430
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
§ Oneac Corporation, Libertyville, IL 60048 708-816-6000,800-327-8801
Power Measurement Ltd., Victoria, BC, CANADA V8X 3X1 604-652-5118
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Sofrel, Inc., Eden Prairie, MN 55344 ..... 612-937-8835;1-800-8-SOFREL
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§ Superior Electric, Bristol, CT 06010 203-582-9561
Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Monitors, Power, Microwave-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† General Microwave Corporation, Amityville, NY 11701 516-226-8900
Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428

Monitors, Power, RF-2900

§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
Coaxial Dynamics, Cleveland, OH 44135 ..... 1-800-COAXIAL
† Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
† General Microwave Corporation, Amityville, NY 11701 516-226-8900
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Maury Microwave Corp., Cucamonga, CA 91730 714-987-4715
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428

Monitors, Response Time-2900

Waschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... **D•1405**
Ion Physics Co., Atkinson, NH 03811 603-893-6687

Monitors, Television, Fiberoptic-2475 — *See Vol. B*

Monitors, Temperature-Also See Controls, Temperature-5300 — *See Vol. B*

Monitors, Torque/Speed-2200

† FOX METER INC., Elburn, IL 60119 708-365-2422
§ Monarch Instrument, Monarch International Inc., Amherst, NH 03031 ..... 603-883-3390; 800-999-3390
Motortest, Inc., Columbus, OH 43229 614-882-7821
Torq Corp., Bedford, OH 44146 216-232-4100
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440

Monitors, Touch — See Touch Monitors (Vol. D)

Monitors, Vibration-2200

R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
Space Electronics, Inc., Berlin, CT 06037 203-829-0001

Monitors, Video-1900

Computron Display Systems, Xcel Corporation, Elk Grove Village, IL 60007, 708-952-8800 ..... **B•1057**
Data Ray Corp., Westminster, CO 80234, 1-800-926-5556; 303-451-1300 ..... **B•1050-1053**
Digitran Division, Xcel Corporation, Ontario, CA 91761, 714-391-4321 ..... **B•1805**
† **Infodex, Inc., Wolcott, CT 06716, 203-879-4944** ..... **B•1016-1017,1090**
§ **Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104** ..... **D•1286**
Omni Vision Inc., Glendale Heights, IL 60139, 708-893-1720 ..... **B•1109**
§ **SAMTRON DISPLAYS, INC., SAMSUNG Electron Devices, La Mirada, CA 90638, 213-802-8425** ..... **B•1114-1115**
Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... **A•1827**
§ ‖ **Stanley Co. INC., Stanley Electric Co. LTD., Irvine, CA 92714, 1-800-LED-LCD1** ..... **B•1198**
Wells-Gardner Elctrns. Corp., Chicago, IL 60639, 312-252-8220 ..... **B•1133**
§ A.C. Interface Inc., Rancho Santa Margarita, CA 92688 714-858-1866
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
§ A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
Aiphone, Bellevue, WA 98005 206-455-0510
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ ATV Research, Inc., Dakota City, NE 68731 402-987-3771
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Colorado Video, Inc., Boulder, CO 80306 303-530-9580
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Conrac Display Products, Inc., Duarte, CA 91010 818-303-0095
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
§ Dotronix, New Brighton, MN 55112 612-633-1742
Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Graphic Strategies, Inc., Sunnyvale, CA 94089 408-745-6500
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
§ Heath Co., St. Joseph, MI 49085 616-982-3200
HMW Enterprises, Inc., Etters, PA 17319 717-938-4691

Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
§† Mitsubishi Electronics, Torrance, CA 90502 213-515-3993
Peter Parts & Assocs., Webster, NY 14580 716-265-2540
† Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Video Monitors, Inc., Dotronix, Inc., Eau Claire, WI 54703 715-834-7785

Monitors, Voltage — See Meters, Volt (Vol. D)

Monitors, Waveform — See Oscilloscopes (Vol. D)

Monitors (MIL), Data-2440 — ***See Vol. B***

Motor & Generator Armatures, Rotors, Stators-3500 — ***See Vol. B***

Motor Assemblies with Integral Tachometer/Encoder-3500 — ***See Vol. B***

Motor Generator Sets-4000

† Georator Corp., Manassas, VA 22110-0070, 800-523-9938 ..... D•2195-2198
† Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1318
† Ajax Magnethermic Corp., Warren, OH 44482 216-372-8511
† American Electronics, Fullerton, CA 92631 714-871-3020
Arc Systems, Inc., Hauppauge, NY 11788 516-582-8020
§† Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
† EEMCO, Datron, Inc., Los Angeles, CA 90039 818-247-7060
Electro-Pacific, Goleta, CA 93117 805-964-0751
EPE Technologies, Inc., Subsidiary of Merlin Gerin, Costa Mesa, CA 92626 714-557-1636
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
§ Howard Industries, Inc., Milford, IL 60953 815-889-4105
§ Pacific Scientific Co., Rockford, IL 61109 815-226-3100
Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
† Power Systems & Controls, Inc., Richmond, VA 23230 804-355-2803
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
† Unitron Inc., Dallas, TX 75238 214-340-8600

Motorized Components — See Potentiometers, Motorized (Vol.), Rheostats, Motorized (Vol.), Transformers, Variable, Motorized

Motorized Micropositioners-4900

§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
Stoelting Co., Wood Dale, IL 60191 708-860-9700

Motorized Potentiometers — See Potentiometers, Motorized

Motorized Translation Stages-4900

§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
§ Daedal, Harrison City, PA 15636 412-744-4451
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477

Motor Speed Drives — See Controls, Motor Speed (Vol. D)

Motors, Brush, DC-3500 — ***See Vol. B***

Motors, Brushless, DC-3500 — ***See Vol. B***

Motors, Clock & Timing-3500 — ***See Vol. B***

Motors, Control-3500 — ***See Vol. B***

Motors, DC Timing-3500 — ***See Vol. B***

Motors, Drag Cup-3500 — ***See Vol. B***

Motors, Fractional Horsepower-3500 — ***See Vol. B***

Motors, Gearhead-3500 — ***See Vol. B***

Motors, Gyro-3500 — ***See Vol. B***

Motors, Hysteresis-3500 — ***See Vol. B***

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Motors, Servo-4900

Advanced Technology Company, Vista, CA 92083, 619-727-7430 ... B•1235-1237
† BEI Motion Systems Company, Kimco Magnetics Div., San Marcos, CA 92069, 619-744-5671 ..... B•1879
§ Bodine Electric Company, Chicago, IL 60618, 312-478-3515 ..... B•1248
† Clifton Precision, Litton Systems, Inc., Clifton Hgts., PA 19018, 215-622-1000 ..... B•1251
† Eastern Air Devices, Inc., Dover, NH 03820, 603-742-3330 ..... B•1254
Eltrol Corporation, Canoga Park, CA 91304, 818-709-0131 ..... B•1255
Fasco Industries, Inc., Hawker Siddelem No. 200, Chesterfield, MO 63017, 314-532-3505 ..... C•1623
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495 ..... B•1276
Infranor, Naugatuck, CT 06770, 203-729-8258;800-BE-SERVO ..... B•1279
Magtech Controls, Vernitron Corporation, San Diego, CA 92073, 619-428-5581 ..... B•1294
MFM Technology, Inc., Affiliate of Unitrode Corp., Ronkonkoma, NY 11779, 516-467-5151 ..... B•1297
§† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•2243
† Motor Technology, Inc., Dayton, OH 45429, 513-294-1041 ..... B•1303-1304
PITTMAN, Penn Engrg. & Mfg. Corp., Harleysville, PA 19438, 215-256-6601 ..... B•1308-1309
Servo-Tek Products Co., Hawthorne, NJ 07506, 201-427-3100 ..... B•1310
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1314
Synektron Corporation, Portland, OR 97223, 503-684-3090 ..... B•1317
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
† Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1031,1318
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
† American Electronics, Fullerton, CA 92631 714-871-3020
Lamb Electric Division, Ametek, Inc., Kent, OH 44240 216-673-3451
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
Arc Systems, Inc., Hauppauge, NY 11788 516-582-8020
† Astro Instrument Corp., Deerfield, FL 33442-3019 305-698-6000
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Barber Colman Co. (A Siebe Co.), Motor Division, Rockford, IL 61125-7040 815-397-7400
Bertsch U.S., Vista, CA 92083 619-727-7420
Buehler Products, Inc., Raleigh, NC 27636 919-469-8522
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
† Computer Optical Products, Inc., Sub. of Hathaway Corp., Chatsworth, CA 91311-6910 818-882-0424
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
§ Daedal, Harrison City, PA 15636 412-744-4451
† Electric Indicator Company Inc., Norwalk, CT 06851 203-847-5861
§ Empire Magnetics, Rohnert Park, CA 94928 707-584-2801
Escap Products, Hauppauge, NY 11788 516-234-3900
Ge Fanuc Automation North America Inc., Charlottesville, VA 22906 ..... 804-978-5000; 800-648-2001
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
† Globe Motors, Dayton, OH 45404 513-228-3171
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Hansen Manufacturing Company, Inc., Subsidiary of IMC Magnetics Corp., Princeton, IN 47670-0023 812-385-3415
§† Harowe Servo Controls, Inc:A Fasco Co., West Chester, PA 19380 215-692-2700
† Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
H D Systems, Inc., Hauppauge, NY 11788 516-231-6630
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
† IMC Magnetics Corp., Eastern Div., Westbury, NY 11590 516-334-7070
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
§† Inertial Motors, Doylestown, PA 18901 215-345-1010
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
§ Japanese Products Corp., Elmsford, NY 10523 914-592-8880
Litton Encoder Div., Chatsworth, CA 91311 818-341-6161
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
Micronel U.S., Vista, CA 92083 619-727-7400
Motor-Tronics, Inc., Vista, CA 92083 619-727-7430
† Novatronics Inc., Stratford, Ontario, CANADA N5A 6V6 519-271-3880
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§† Pacific Scientific Co., Rockford, IL 61109 815-226-3100
Papst Mechatronic Corp., Newport, RI 02840 401-849-8810
Parvex Servo Systems, GEC Alsthom International, Inc., Spring Valley, NY 10977 914-425-6908
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
Portescap U.S., Inc., Hauppauge, NY 11788 516-234-3900
§ Powertron, Contraves Goerz Corp., Charlotte, NC 28210 704-525-8962
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 612-942-3600
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
§ Shinano Kenshi Corp. (SKC), N. Hollywood, CA 91605 818-764-4266
† Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
† Transicoil Inc., Robinson-Halpern Products, Trooper, PA 19403 215-539-4400
Unico, Franksville, WI 53126-0505 414-886-5678
† Valley Electromagnetics, ECM Motor Co., Elkhorn, WI 53121 414-723-6400
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
§ Westamp, Santa Monica, CA 90404 213-393-0401

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Motors, Universal, AC or DC Operation-3500 — *See Vol. B*

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Mounts, Antenna-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Andrew Corp., Orland Pk., IL 60462 800-255-1479
† Craig Systems Corp., Eastern Technologies, Ltd., Amesbury, MA 01913-4848 508-388-5662
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† Gabriel Electronics, Scarborough, ME 04074 207-883-5161
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Microflect Co., Inc., Salem, OR 97309-0985 503-363-9267
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
§ Sinclair Radio Laboratories Ltd., Aurora, ONT., CANADA L4G 3G9 416-727-0165
§ Sitco Antennas Div.of Simplicity Tool Corp., Portland, OR 97220 503-253-2000

Mounts, CRT & Accessories-2500 — *See Vol. C*

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Mounts, Satellite Antennas-1900

Andrew Corp., Orland Pk., IL 60462 800-255-1479
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774

Mounts, Shock & Vibration-2500 — *See Vol. C*

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Multiplexers, Analog-2325

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1145
Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412, 708-455-8830 ..... C•1743
§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... B•1889
CYTEC Corp., Penfield, NY 14526, 716-381-4740;800-346-3117 ..... D•1240
† Datel, Inc., Mansfield, MA 02048-1194, 508-339-3000 ..... D•1159-1160
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 .. D•1171
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Information Transfer Inc., Bloomfield, NY 14469, 716-657-7074 ..... D•1181
† Integrated Microwave, San Diego, CA 92121-1009, 619-259-2600 ... A•1678-1679
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100, 800-336-5917;703-953-4751 ..... B•1222
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1191
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227-1228
§ Action Instruments, San Diego, CA 92123 619-279-5726
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analogic Corp., Peabody, MA 01960 508-977-3000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Coastcom, Concord, CA 94527 510-825-7500
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
Conklin Instrument Corp., Pleasant Valley, NY 12569 914-635-2136
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
CYBRID INCORPORATED, Woodcliff Lake, NJ 07675 201-307-0426
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
Elecsys,Inc., Div. of C & C Jetronic, Princeton, NJ 08540 609-921-2726
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
Keithley Instrs., Cleveland, OH 44139 800-552-1115
KineticSystems, Lockport, IL 60441 815-838-0005
Lentronics, Prism Systems Inc., Burnaby, B.C., CANADA V5A 1X7 604-421-8733
Loral Data Systems, Sarasota, FL 34230 813-371-0811
Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
§ Neff Instr., Monrovia, CA 91016 818-357-2281
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§† Siliconix, Inc., Santa Clara, CA 95054 408-988-8000
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
Tustin Electronics Co., Anaheim, CA 92807 714-777-5800
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Multiplexers, Digital-2325

† Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300 ..... D•1150-1151
§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 .. D•1171
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Information Transfer Inc., Bloomfield, NY 14469, 716-657-7074 ..... D•1181
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100, 800-336-5917;703-953-4751 ..... B•1222
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1191
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227-1228
§ S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Atlantic Scientific Corporation, Melbourne, FL 32901 1-800-544-4737
Automation Displays Inc., Eau Claire, WI 54703 715-834-9595
Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§† Canoga-Perkins Corp., Chatsworth, CA 91311 818-718-6300
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
§ Coastcom, Concord, CA 94527 510-825-7500
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
Conklin Instrument Corp., Pleasant Valley, NY 12569 914-635-2136
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Dantel, Fresno, CA 93727 209-292-1111
† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
Elecsys,Inc., Div. of C & C Jetronic, Princeton, NJ 08540 609-921-2726
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
§# Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
† GEC-Marconi Electronic Systems Corp., Wayne, NJ 07474-0975 201-633-6000
GEN/COMP Inc., Canton, MA 02021 617-828-2008
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
KineticSystems, Lockport, IL 60441 815-838-0005
KMC Systems, Inc., Midland Pk., NJ 07432 201-447-0007
Loral Data Systems, Sarasota, FL 34230 813-371-0811
Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
Loral TerraCom, Sub. of Loral Corp., San Diego, CA 92123 619-278-4100
† Manage, Inc., Fibre Optics Elctrns. Sys. Grp., Chicopee, MA 01014 413-592-9123

Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998 213-828-7496
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
§ Neff Instr., Monrovia, CA 91016 818-357-2281
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
§† Phoenix Data, Inc., Phoenix, AZ 85017 ..... 602-278-8528;800-828-4327
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
§† Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wieland Inc., New Rochelle, NY 10801 914-633-0222

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Multiplexers, Frequency Division-1900

Frequency Devices, Inc., Haverhill, MA 01832, 508-374-0761 ..... A•1674
† Integrated Microwave, San Diego, CA 92121-1009, 619-259-2600 ... A•1678-1679
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Lentronics, Prism Systems Inc., Burnaby, B.C., CANADA V5A 1X7 604-421-8733
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
† Metraplex Corp., Frederick, MD 21701 301-662-8000
† Metropole Products Inc., Stafford, VA 22554 703-659-2132
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Reactel, Inc., Rockville, MD 20850 301-279-5535
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Sage Laboratories, Inc., Natick, MA 01760 508-653-0844
† Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Multiplexers, Statistical-1900

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
§ Data Race, Inc., San Antonio, TX 78230 512-558-1900
§ EDA Instruments, Inc., Toronto, ON, CANADA M4H1H1 416-425-7800
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
§† Penril DataComm Networks, Gaithersburg, MD 20878 301-921-8600
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
§† TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
§† Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
§ Universal Data Systems, Inc., Motorola Information Systems Group, Huntsville, AL 35805-1993 205-430-8000

Multiplexers, Time Division-1900

† Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227
§ S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231
Aydin Corp., Horsham, PA 19044 215-657-7510
§† Canoga-Perkins Corp., Chatsworth, CA 91311 818-718-6300
§ Coastcom, Concord, CA 94527 510-825-7500
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
† DEI, Escondido, CA 92029 619-743-8344
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
† Metraplex Corp., Frederick, MD 21701 301-662-8000
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
Penril DataComm Networks, Gaithersburg, MD 20878 301-921-8600
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
§ TEK-COM /Prentice Corp., San Jose, CA 95131 408-435-9515
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
§ Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
§ Universal Data Systems, Inc., Motorola Information Systems Group, Huntsville, AL 35805-1993 205-430-8000

Multiplexers, Transmission-1900

§ Gordos, A Flint Industries Company, Rogers, AR 72756, 501-636-5000 .. D•1171
† Integrated Microwave, San Diego, CA 92121-1009, 619-259-2600 ... A•1678-1679
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227-1228
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
Elecsys,Inc., Div. of C & C Jetronic, Princeton, NJ 08540 609-921-2726
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Marconi Instruments, Allendale, NJ 07401 201-934-9050
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
† Microphase, Norwalk, CT 06856 203-866-8000
† Reactel, Inc., Rockville, MD 20850 301-279-5535
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Multiplexers, Video-1900

§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227-1228
§ Coastcom, Concord, CA 94527 510-825-7500
† Colorado Video, Inc., Boulder, CO 80306 303-530-9580
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Elecsys,Inc., Div. of C & C Jetronic, Princeton, NJ 08540 609-921-2726
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
§ Keithley Instrs., Cleveland, OH 44139 800-552-1115
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§† Siliconix, Inc., Santa Clara, CA 95054 408-988-8000

Multipliers, Analog-2325

† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196
Action Instruments, San Diego, CA 92123 619-279-5726
Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analog Systems, Tucson, AZ 85731-7389 602-290-1818
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Reliance Comm/Tec, Reliance Electric, Cleveland, OH 44117 800-245-4501
Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§† Silicon General, Garden Grove, CA 92641 714-898-8121
† Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746

Multipliers, Channel Electron-2325

Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Galileo Electro-Optics Corp., Sturbridge, MA 01566 508-347-9191
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Murata Manufacturing Co., Ltd., Nagaoka-Kyo-Shi, Kyoto, JAPAN 617 ... 075-951-9111

Multipliers, Crystal-1900

† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1830
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746

Multipliers, Diode-1900

Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1831
Electronic Devices, Inc., Yonkers, NY 10710 914-965-4400
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
MACOM, Inc., Burlington, MA 01803 617-272-3000
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
Φ Micro Quality Semiconductor, Inc., Microsemi Corp., Garland, TX 75042 214-272-7811
† Semtech, Newbury Park, CA 91320 805-498-2111
† Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
† Voltage Multipliers, Inc., Visalia, CA 93291 209-651-1402
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Multipliers, Frequency-3450 — *See Vol. A*

Multipliers, Hall-4800 — *See Vol. A*

Multipliers, Magnetic Analog-2200

† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196**
† American Aerospace Controls, Farmingdale, NY 11735 516-694-5100
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600

Multipliers, Meter-2900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Ross Engineering Corp., Campbell, CA 95008 408-377-4621
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717

Multipliers, Servo-4900

Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196**
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
† Industrial Control Co., Rockledge, FL 32955 407-259-7105

Nameplates-2400 — *See Vol. C*

Network Processors-1900

† Aydin Corp., Horsham, PA 19044 215-657-7510
§ Encoder Products, Sandpoint, ID 83864 208-263-8541
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010

Networks, Computer, Local Area-2000

Anco Electronics, Inc., Rancho Cucamonga, CA 91730, 1-800-545-ANCO ..... D•1080
Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1229
§ **S.I. Tech, Batavia, IL 60510, 708-232-8640 ..... B•1231**
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Ballard Technology, Seattle, WA 98117 206-782-8704
Brand-Rex, BICC, Willimantic, CT 06226-1128 203-456-8000
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
California Automation Inc., San Diego, CA 92121 619-452-1341
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
§ Carol Cable Co. Inc., Pawtucket, RI 02862 401-728-7000
§† Clearpoint Research Corp., Hopkinton, MA 01748 508-435-2000
§† Codenoll Technology Corp., Yonkers, NY 10701 914-965-6300
§ Coherent Communications Sys. Corp., Hauppauge, NY 11788 516-231-1550
§ Comdata Corp., Morton Grove, IL 60053 708-470-9600
Computer System Products, Minneapolis, MN 55447 ..... 612-476-6866;800-422-2537
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Cooper Industries/Belden Div., Richmond, IN 47375 ..... 317-983-5200;800-BELDEN-1
Datamedia Corporation, Nashua, NH 03063 603-886-1570
§ Digital Products, Inc., Watertown, MA 02172 ..... 617-924-1680;800-243-2333
§ Dupont Electro-Optic Products, Dupont Electronics, Research Triangle Park, NC 27709 ..... 1-800-888-LAN1;919-481-5100
Ergotron, Inc., Eagan, MN 55122 612-452-8135
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
§# Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ IDEAssociates, Inc., Billerica, MA 01821 508-663-6878
Interoptics, Purdy Group, Burlingame, CA 94010 415-347-7727
† ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
§ Leviton Telcom, Leviton Manufacturing, Bothell, WA 98021-4416 ..... 206-485-4288; 206-486-2222
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
§ Pan International (USA), Inc., Rancho Cucamonga, CA 91730 714-945-1365
Penril DataComm Networks, Gaithersburg, MD 20878 301-921-8600
§ PUREDATA, Richmond Hill, Ont., CANADA L4B 1B4 416-731-6444
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725
Racore Computer Products, Inc., Los Gatos, CA 95030 408-374-8290
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
The Software Link, Inc., Norcross, GA 30092 404-448-5465
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Square D Co., Palatine, IL 60067 708-397-2600
§ Teleterminal Corp., Greenland, NH 03840 603-431-1200
§† Terminal Data Corp., Rockville, MD 20855 301-921-8282
§ Thomas & Betts Corporation, Electronics Div., Greenville, SC 29616-2401 803-676-2900
§ Western Digital Corp., Irvine, CA 92718 714-932-6000
§ Xylogics, Inc., Burlington, MA 01803 800-225-3317
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Networks, Crossover, Attenuator (Audio)-1300

† **Frequency Selective Networks, Woodside, NY 11377, 718-424-7500 ..... A•1370**
Mills Resistor Co., Los Alamitos, CA 90720, 213-598-2454 ..... A•1949
§ Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 402-563-6506
§ Dale Electronics, Inc., Norfolk Div., Norfolk, NE 68701-2242 402-371-0080
Electronic Precision Components Corporation, Mt. Vernon, NY 10550-4430 914-664-2333
§ Hartley Products, Wilmington, NC 28405 919-763-7422
International Components Corp., Melville, NY 11747 516-293-1500
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† TTE, Incorporated, W. Los Angeles, CA 90064 213-478-8224
Vishay Resistive Systems, Malvern, PA 19355 215-644-1300

Networks, Digital Data, Equipment-1900

Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1229
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Cooper Industries/Belden Div., Richmond, IN 47375 ..... 317-983-5200;800-BELDEN-1
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
§ EDA Instruments, Inc., Toronto, ON, CANADA M4H1H1 416-425-7800
§# Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Zaki Corporation, Marlboro, MA 01752 508-480-0201

Networks, Directional Antenna Phasing-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
§† Anaren Microwave, Inc., E. Syracuse, NY 13057 315-432-8930
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
Electronic Precision Components Corporation, Mt. Vernon, NY 10550-4430 914-664-2333
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
† Merrimac Industries, West Caldwell, NJ 07006 201-575-1300
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
† Microwave Applications Group, Santa Maria, CA 93455 805-928-5711
† Premier Microwave, Port Chester, NY 10573 914-939-8900
† Transco Products, Inc., Subsidiary of Datron Systems Inc., Camarillo, CA 93012 805-987-8007
TRM, Inc., Manchester, NH 03103 603-627-6000
Vishay Resistive Systems, Malvern, PA 19355 215-644-1300

Networks, Hybrid-2000

Allen Co., Inc., Robert G., N. Hollywood, CA 91605, 818-765-8300; 800-999-3711 ..... A•1842
† **International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ..... A•1730**
† **Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... A•1732-1733, D•1820**
Piconics, Incorporated, Tyngsboro, MA 01879, 508-649-7501 ..... A•1975
§† **RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982**
U.S. Sensor Corp., Orange, CA 92667, 714-639-1000 ..... B•1871
Vishay Resistive Systems, Malvern, PA 19355, 215-644-1300 ..... A•2008
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
Anderson Electronics, Hollidaysburg, PA 16648 814-695-4428
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
§ Cermetek Microelectronics Inc., Sunnyvale, CA 94089 408-752-5000
CTS Corporation, Elkhart, IN 46514 219-293-7511
† CTS Corp., Frequency Controls business unit, (Formerly Knights Div.), Sandwich, IL 60548 815-786-8411
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 402-563-6506
§ Dale Electronics, Inc., Norfolk Div., Norfolk, NE 68701-2242 402-371-0080
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
† Film Microelectronics Inc., Peabody, MA 01960 508-532-9913
Gordos, A Flint Industries Company, Rogers, AR 72756 501-636-5000

Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
† Hybrid Designs, Inc., Costa Mesa, CA 92626 714-557-9933
† Hycomp, Inc., Marlborough, MA 01752 508-485-6300
† Hy-Tec Industries, Div. of Topo Industries, Inc., Shoreham, NY 11786 ... 516-924-8686
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
§ International Resistive Company, Boone, NC 28607 704-264-8861
KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
§ Kyocera Northwest, Electronic Components Group, Vancouver, WA 98661 206-696-2840
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
LTI, Inc., Carol Stream, IL 60188 708-668-8886
† Magnetic Component Engineering Co., Culver City, CA 90230 213-398-4761
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
† Micro Hybrids, Inc., Medford, NY 11763 516-732-3448
Microplex, Inc., Anaheim, CA 92806 714-634-1535
Micro Technology Inc., Menomonee Falls, WI 53051 414-783-6080
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
† Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
Olektron Corp., Signal Technology Corp., Webster, MA 01570 508-943-7440
Philips Circuit Assemblies:A Division of North American Philips Corp., New Berlin, WI 53151 414-785-6506
Philips Circuit Assemblies:North American Philips Corp., Slatersville, RI 02876-2078 401-762-3800
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
§ Raltron Electronics, Miami, FL 33172 305-593-6033
† Sipex Corp., Custom Monolithic Prods. Div., Billerica, MA 01821 508-667-8700
The Software Link, Inc., Norcross, GA 30092 404-448-5465
Spectrum Control, Inc., Erie, PA 16505 814-455-0966

Networks, Hybrid Substrates-3130 — *See Vol. A*

Networks, Ladder-4700 — *See Vol. A*

Networks, LC-2700 — *See Vol. A*

Networks, Line Impedance Stabilization-1900

Anco Electronics, Inc., Rancho Cucamonga, CA 91730, 1-800-545-ANCO ..... D•1080
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212-2213
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Dale Electronics, Inc., Norfolk Div., Norfolk, NE 68701-2242 402-371-0080
MICRO DATA SYSTEMS, Thomasville, GA 31799 912-226-1709
Pan International (USA), Inc., Rancho Cucamonga, CA 91730 714-945-1365
Sprague Electric Company, Distribution Division, Mansfield, MA 02048-9102 508-339-8900
§ Tepro of Florida, Clearwater, FL 33575 813-796-1044
† Velonex, Santa Clara, CA 95050 408-727-7370

Networks, Matching-1900

§ Caddock Electronics, Inc., Riverside, CA 92507, 714-788-1700 ..... A•1853
† Frequency Selective Networks, Woodside, NY 11377, 718-424-7500 ..... A•1370
Mills Resistor Co., Los Alamitos, CA 90720, 213-598-2454 ..... A•1949
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§† RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
§ Ultronix, Inc., A Company of Vishay, Grand Junction, CO 81502, 303-242-0810 ..... A•1992
† Vishay Resistive Systems, Malvern, PA 19355, 215-644-1300 ..... A•2008
Allen Bradley Co., Electronic Components Div., A Rockwell International Co., El Paso, TX 79936 ..... 915-592-4888;800-592-4888
§† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 402-563-6506
Dale Electronics, Inc., Norfolk Div., Norfolk, NE 68701-2242 402-371-0080
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Elcom Systems, Inc., Boca Raton, FL 33487 407-994-1774
Electronic Precision Components Corporation, Mt. Vernon, NY 10550-4430 914-664-2333
† ESC Electronics Corp., Palisades Pk, NJ 07650 201-947-0400
General Resistance, A Prime Technology Company, N. Branford, CT 06471 203-481-5721
Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
† Integrated Microwave, San Diego, CA 92121-1009 619-259-2600
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
Kelvin Industries, Inc., Sherman Oaks, CA 91403-3501 818-990-1192
† KRL/Bantry Components, Inc., Manchester, NH 03103 603-668-3210
§ Kyocera Northwest, Electronic Components Group, Vancouver, WA 98661 206-696-2840
† Microplex, Inc., Anaheim, CA 92806 714-634-1535
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Premier Microwave, Port Chester, NY 10573 914-939-8900
RCL-Shallcross, Inc., Smithfield, NC 27577 919-934-5181
Solitron Devices, Inc., Semiconductor Group, Riviera Beach, FL 33404-9978 ..... 407-848-4311;800-888-8763
Sprague Electric Company, Distribution Division, Mansfield, MA 02048-9102 508-339-8900
§ Tepro of Florida, Clearwater, FL 33575 813-796-1044
† TTE, Incorporated, W. Los Angeles, CA 90064 213-478-8224
Western Multiplex Corp., Belmont, CA 94002 415-592-8832
† Wilcoxon Research, Rockville, MD 20850 301-330-8811

Networks, Phase-2700 — *See Vol. A*

Networks, Pulse Forming-2700 — *See Vol. A*

Networks, Rejection — See Filters (Vol. A)

Networks, RC-2000

§ Bourns, Inc., Electronic Components Sls., Riverside, CA 92507-2114, 714-781-5500;800-782-2070;801-750-7200 ..... A•1848-1849
Mills Resistor Co., Los Alamitos, CA 90720, 213-598-2454 ..... A•1949
† Piconics, Incorporated, Tyngsboro, MA 01879, 508-649-7501 ..... A•1975
§† RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
Rohm Corporation, Rohm Electronics Division, Antioch, TN 37013, 615-641-2020 ..... A•1984
Sprague Electric Company, Distribution Division, Mansfield, MA 02048-9102, 508-339-8900 ..... A•1138
State of the Art, Inc., State College, PA 16803-1797, 814-355-8004 ..... A•1986
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
§ ASC, Ogallala, NE 69153 308-284-3611
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
† BG Electronics, EPC Corp., Mt. Vernon, NY 10550-4430 914-664-5591
§† CTS Corporation, Elkhart, IN 46514 219-293-7511
§ CTS Corp., Resistor Network business unit, (Formerly CTS Corp., Berne Div.), Berne, IN 46711 219-589-3111
§ Custom Electronics, Oneonta, NY 13820 607-432-3880
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647 402-563-6506
§ Dale Electronics, Inc., Norfolk Div., Norfolk, NE 68701-2242 402-371-0080
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
† Electro-Films, Inc., Warwick, RI 02886 401-738-9150
§ Electronic Film Capacitors, Inc., Waterbury, CT 06705 203-755-5629
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Engineered Components Co., San Luis Obispo, CA 93403-8121 805-544-3800
† ESC Electronics Corp., Palisades Pk, NJ 07650 201-947-0400
† F-Dyne Elctrns., Bridgeport, CT 06605 203-367-6431
† Frequency Selective Networks, Woodside, NY 11377 718-424-7500
Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
† Hybrid Designs, Inc., Costa Mesa, CA 92626 714-557-9933
† Hy-Tec Industries, Div. of Topo Industries, Inc., Shoreham, NY 11786 ... 516-924-8686
§ International Resistive Company, Boone, NC 28607 704-264-8861
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
Kelvin Industries, Inc., Sherman Oaks, CA 91403-3501 818-990-1192
† KRL/Bantry Components, Inc., Manchester, NH 03103 603-668-3210
Kyocera Northwest, Electronic Components Group, Vancouver, WA 98661 206-696-2840
LTI, Inc., Carol Stream, IL 60188 708-668-8886
Meissner Industries, Dover, NJ 07801 201-366-1700
† Micro Hybrids, Inc., Medford, NY 11763 516-732-3448
† Microplex, Inc., Anaheim, CA 92806 714-634-1535
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
§ Murata Manufacturing Co., Ltd., Nagaoka-Kyo-Shi, Kyoto, JAPAN 617 ... 075-951-9111
† Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
Ohmtek Inc., Vishay, Niagara Falls, NY 14304 716-283-4025
Philips Circuit Assemblies:A Division of North American Philips Corp., New Berlin, WI 53151 414-785-6506
§ Raltron Electronics, Miami, FL 33172 305-593-6033
Rtron Corp., Skokie, IL 60076 708-679-7180
† Southern Electronics, F-Dyne, Burbank, CA 91502 818-845-2458
§† Standard Condenser Corp., Skokie, IL 60076 708-675-3133
§ Tepro of Florida, Clearwater, FL 33575 813-796-1044
† Thinco Div., Hull Corp., Hatboro, PA 19040 215-672-7800
† TTE, Incorporated, W. Los Angeles, CA 90064 213-478-8224
Ultronix, Inc., A Company of Vishay, Grand Junction, CO 81502 ..... 303-242-08 . J
† United Supertek, Inc., San Jose, CA 95131-1101 408-922-0730
Vishay Resistive Systems, Malvern, PA 19355 215-644-1300
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Networks, Resistance-4700 — *See Vol. A*

Networks, Resistance, Trimmer-4700 — *See Vol. A*

Networks, Resistance, Voltage Divider-4700 — *See Vol. A*

Networks, Video-2700 — *See Vol. A*

Networks, (MIL), Resistance-2440 — *See Vol. B*

Noise Sources-2900

Elgenco, Inc., Hurricane, UT 84737, 801-635-4954 ..... D•1244
† MDF Products Inc., Danbury, CT 06811, 203-743-3579 ..... D•1293
† Noise Com Inc., Paramus, NJ 07652, 201-261-8797 ..... A•1821, D•1304-1305

Nuclear EMP (NEMP) Protectors-4300 — *See Vol. B*

Nuclear Penetrations-2900

† Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372

Null Detectors — See Indicators, Null (Vol. D)

Nuts, Metal-2500 — *See Vol. C*

Nuts, Plastic — See Fasteners, Nonmetallic (Vol. C)

Oils — See Lubricants (Vol. C)

Opamps — See Amplifiers, Operational (Vol. D)

Optical Breadboards-4200 — *See Vol. C*

Optical Character Readers (OCR)-2000

† **Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884** ..... **B•1342,1344**
Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301
Telesis Controls Corp., Chillicothe, OH 45601 614-642-3200
§ Xerox Imaging Systems, Inc., Xerox Corp., Sunnyvale, CA 94086 ..... 408-245-7900; 800-248-6550

Optical Component Mounts & Accessories-3700 — *See Vol. B*

Optical-Coupler Isolators — See Isolators, Opto (Vol. B)

Optical Design Service — See Services, Optical Design (Vol. D)

Optical Disk Drives-2000

§ Applied Data Communications, Tustin, CA 92680 714-731-9000
Computer Devices, Nutting Lake, MA 01865 508-663-4980
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Herstal Automation Ltd., Berkley, MI 48072 313-548-2001
§ RACET Computes, Ltd., Brea, CA 92621 714-579-1725

Optical Radiation Measuring-2900

Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
§ Laser Precision Corp., Utica, NY 13502 315-797-4449
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
† Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700

Optical Signal Sources — See Generators, Light Pulse (Vol. D)

Optical Time Domain Reflectometer (OTDR)-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... **D•1214**
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688

Optocouplers-3700 — *See Vol. B*

Optocouplers, Surface Mount-3700 — *See Vol. B*

Oscillators, Audio (Module)-2300 — *See Vol. A*

Oscillators, Audio (Test) — See Generators, Audio (Vol. D)

Oscillators, Beat Frequency (BFO)-2300 — *See Vol. A*

Oscillators, Bias-2300 — *See Vol. A*

Oscillators, Bridge (Test)-2900

Microsonics, Inc., Weymouth, MA 02188, 617-337-4200 ..... **A•1401**
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808

Oscillators, Cavity-2300 — *See Vol. A*

Oscillators, Clock-2300 — *See Vol. A*

Oscillators, Crystal Controlled (Module)-2300 — *See Vol. A*

Oscillators, Decade (Test)-2900

§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700** ..... **D•2207**
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Statek Corp., Orange, CA 92668 714-639-7810

Oscillators, Digitally Compensated Crystal (DCXO)-2300 — *See Vol. A*

Oscillators, LC-2300 — *See Vol. A*

Oscillators, Low Frequency (Module)-2300 — *See Vol. A*

Oscillators, Microwave-3450 — *See Vol. A*

Oscillators, Oven-2300 — *See Vol. A*

Oscillators, Power (Module)-2300 — *See Vol. A*

Oscillators, Programmable-2300 — *See Vol. A*

Oscillators, Pulse (Module)-2300 — *See Vol. A*

Oscillators, Pulse (Test) — See Generators, Pulse (Vol. D)

Oscillators, RC (Module)-2300 — *See Vol. A*

Oscillators, RF (Module)-2300 — *See Vol. A*

Oscillators, RF (Test) — See Generators, RF (Vol. D)

Oscillators, Sinusoidal (Module)-2300 — *See Vol. A*

Oscillators, Sinusoidal (Test) — See Generators, Function (Vol. D)

Oscillators, Square Wave (Module)-2300 — *See Vol. A*

Oscillators, Square Wave (Test) — See Generators, Function (Vol. D)

Oscillators, Surface Mount-2300 — *See Vol. A*

Oscillators, Sweep — See Generators, Sweep (Vol. D)

Oscillators, Telemetry-1900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... **D•1067**
† **Q-Tech Corp., Culver City, CA 90232-3510, 213-836-7900** ..... **A•1444**
† Andersen Laboratories, Bloomfield, CT 06002 203-286-9090
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
CTS Corporation, Elkhart, IN 46514 219-293-7511
CTS Corp., Frequency Controls business unit, (Formerly Knights Div.), Sandwich, IL 60548 815-786-8411
Dantel, Fresno, CA 93727 209-292-1111
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
† Greenray Inds., Inc., Mechanicsburg, PA 17055 717-766-0223
Isotemp Research, Inc., Charlottesville, VA 22903 804-295-3101
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
McCoy Electronics Co., A Sub. of Oak Industries, Mt. Holly Springs, PA 17065 717-486-3411
Ovenaire-Audio-Carpenter, Oak Crystal Inc., Charlottesville, VA 22901 .. 804-977-8050
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
† Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411

Oscillators, Temperature Compensated-2300 — *See Vol. A*

Oscillators, Test Equipment — See Generators (Specific Types) (Vol. D)

Oscillators, Timable-2300 — *See Vol. A*

Oscillators, Trigger Coherent-2300 — *See Vol. A*

Oscillators, Tuning Fork Controlled - Also see Resonators-2300 — *See Vol. A*

Oscillators, UHF/VHF (Module)-2300 — *See Vol. A*

Oscillators, UHF/VHF (Test) — See Generators, UHF/VHF (Vol. D)

Oscillators, Ultrasonic (Module)-2300 — *See Vol. A*

Oscillators, Ultrasonic (Test) — See Generators, Ultrasonic (Vol. D)

Oscillators, Voltage Controlled Crystal (VCXO)-2300 — *See Vol. A*

Oscillators, YIG-2300 — *See Vol. A*

Oscillators (MIL), Crystal &/or Ovens-2440 — *See Vol. B*

Oscillators (MIL), VCO, Solid State, RF-2440 — *See Vol. B*

Oscillographs, Direct Writing-3000

MFE Instruments, Stocker & Yale, Inc., Beverly, MA 01915-0490, 508-921-9104;800-472-4633 ..... **D•1421**
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... **D•1422**
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... **D•1310**
§† Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Gulton Graphic Instruments Div., A Mark IV Company, E. Greenwich, RI 02818 ..... 800-343-7929;401-884-6800
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
§ Western Graphtec, Irvine, CA 92718-2067 ..... 714-770-6010;800-854-8385

Oscilloscope Accessories-2975

B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... **D•1407**
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. **D•1409**
† **Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784** ..... **D•1411**
§ **Pomona Electronics, Pomona, CA 91766, 714-623-3463** ..... **C•1494**
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
# Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Contact East, N. Andover, MA 01845 508-682-2000
§ CUI Stack Inc., Beaverton, OR 97005 503-643-4899
† Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Goldstar Precision Co. Ltd., Lucky Goldstar, Cerritos, CA 90701 213-404-0101
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000

James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Digital-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
§ MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... D•1295,1412-1413
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§† Gage Applied Sciences Inc., St. Laurent, Que., CANADA H4S 1E9 514-337-6893
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, General Purpose-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1408
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
§ MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... D•1295,1412-1413
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biomation, Cupertino, CA 95014-0718 408-988-6800
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
† Contact East, N. Andover, MA 01845 508-682-2000
† Data Check Corporation, San Diego, CA 92126 619-578-0101
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
§ Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, High Frequency (Above 200 MHz)-2975

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
† Gage Applied Sciences Inc., St. Laurent, Que., CANADA H4S 1E9 514-337-6893
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Low Frequency (DC to 3 MHz)-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1409
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
† Data Check Corporation, San Diego, CA 92126 619-578-0101
Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Kikusui International Corp., Torrance, CA 90503 ..... 213-371-4662;800-545-8784
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
§ Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Mid Frequency (DC to 200 MHz)-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
# Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Contact East, N. Andover, MA 01845 508-682-2000
† Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Goldstar Precision Co. Ltd., Lucky Goldstar, Cerritos, CA 90701 213-404-0101
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hauman, Inc., San Jose, CA 95131 408-434-0888
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433

LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
Panasonic Factory Automation Co., Matsushita Elect. Corp. of America, Franklin Park, IL 60131 ..... 708-452-2410;708-452-2650
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Multibeam-2975

B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Multiple Channel-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
# Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Contact East, N. Andover, MA 01845 508-682-2000
† Data Check Corporation, San Diego, CA 92126 619-578-0101
† Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Marconi Instruments, Allendale, NJ 07401 201-934-9050
§ Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Portable, Battery Operated-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1409
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
† Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-1295
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
# Biomation, Cupertino, CA 95014-0718 408-988-6800
§ Contact East, N. Andover, MA 01845 508-682-2000
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Programmable-2975

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biomation, Cupertino, CA 95014-0718 408-988-6800
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Sampling-2975

ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Storage-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 ..... D•1408-1409
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286,1288
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Analogic Corp., Peabody, MA 01960 508-977-3000
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biomation, Cupertino, CA 95014-0718 408-988-6800
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hameg Instruments, Oceanside, CA 92056 619-630-4080
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770

§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Oscilloscopes, Triggered Sweep-2975

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1408
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1411
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1286
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hauman, Inc., San Jose, CA 95131 408-434-0888
§ Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Omega Engineering, Stamford, CT 06907 800-826-6342
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Outlets, Electrical — See Boxes, Junction, Outlets & Wall Plates (Vol. C)

Outlets, Power, International-2100 — *See Vol. C*

Ovens, Adhesive Caring-4100

Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
Centech Corporation, Minneapolis, MN 55420 612-881-8245
† Glenro, Inc., Paterson, NJ 07501-1715 ..... 201-279-5900;800-922-0106
The Grieve Corporation, Round Lake, IL 60073-9989 708-546-8225
Sikama International, Inc., Santa Barbara, CA 93117 805-683-6379
§ Zevatech, Inc., Morrisville, NC 27560 919-460-0111

Ovens, Aging, Burn-in, Life Test-2550

Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
† Alpha-M Corp., Dallas, TX 75229 214-406-0424
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
§† Associated Environmental Systems, Eastern Technologies, Amesbury, MA 01913-4848 508-388-7241
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
The Grieve Corporation, Round Lake, IL 60073-9989 708-546-8225
† Gruenberg Oven Co., Inc., Williamsport, PA 17701 717-326-1755
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
§† Solid State Testing, Inc., Burlington, MA 01803 617-272-0972
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311 305-587-5577
† Trent, Inc., Philadelphia, PA 19127 215-482-5000
† Trio-Tech International, San Fernando, CA 91340 818-365-9200

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Ovens, Drying (for Electronic Instruments)-4100

Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Casso-Solar, Pomona, NY 10970 914-354-2500
† Despatch Industries, Minneapolis, MN 55418 612-781-5363
† Glenro, Inc., Paterson, NJ 07501-1715 ..... 201-279-5900;800-922-0106
The Grieve Corporation, Round Lake, IL 60073-9989 708-546-8225
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
† Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Lunaire Environmental, Inc., Lunaire Limited, Williamsport, PA 17701 717-326-1770
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
Sikama International, Inc., Santa Barbara, CA 93117 805-683-6379

Ovens, Electric — See Furnaces, Electric (Vol. D)

Ovens, IR, for Surface Mount Devices-4600 — *See Vol. C*

Ovens, Vacuum-4100

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
† Bemco, Simi Valley, CA 93065 805-583-4970
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
The Grieve Corporation, Round Lake, IL 60073-9989 708-546-8225
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
§ Hull Corp., Hatboro, PA 19040 215-672-7800
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
† Standard Environmental Systems, Inc., Totowa, NJ 07512 201-256-2200

Packages, Integrated Circuit-3130 — *See Vol. A*

Packaging Materials, Antistatic-1400 — *See Vol. C*

Packaging Materials, Foam & Plastic-1400 — *See Vol. C*

Packaging Panels, Integrated Circuits — See Boards, Plug-in (Vol. C)

Packaging Services — See Services, Packaging (Vol. D)

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Pads, Transistor Mounting-2100 — *See Vol. C*

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Paints, Finishing-1600 — *See Vol. C*

Paints, Metallic, Conductive-1600 — *See Vol. C*

Paints, Radioactive — See Coatings, Radioactive (Vol. C)

Paints, Resistive-Also See Inks for Thick Film Microcircuits-1600 — *See Vol. C*

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Panels, Electroluminescent-2450 — *See Vol. B*

Panels, Fuse-4300 — *See Vol. B*

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Panels, Meter — See Enclosures, Circuit Board, Module, & Relay Mounting (Vol. C)

Panels, Patch — See Panels, Jack (Vol. C)

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Panels, Relay Rack — See Enclosures, Circuit Board, Module, & Relay Mounting (Vol. C)

Panels, Touch — See Touch Panels (Vol. D)

Paper Tape Equipment, Punch-2000

Aztec Industries, Inc., Mesa, AZ 85210 ..... 602-833-3131;800-729-3132
† Chalco Engrg. Corp., Chalco Industries, Inc., Gardena, CA 90248-1898 ... 213-321-0121; 213-323-5525
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Teleterminal Corp., Greenland, NH 03840 603-431-1200
Trend DLC, Card Technology, Paramus, NJ 07652 201-845-7373

Paper Tape Equipment, Reader-2000

† Chalco Engrg. Corp., Chalco Industries, Inc., Gardena, CA 90248-1898 ... 213-321-0121; 213-323-5525
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Teleterminal Corp., Greenland, NH 03840 603-431-1200

Paper Tape Equipment, Reader/Punch-2000

† Chalco Engrg. Corp., Chalco Industries, Inc., Gardena, CA 90248-1898 ... 213-321-0121; 213-323-5525
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Opto Technology, Inc., Wheeling, IL 60090 708-537-4277
Teleterminal Corp., Greenland, NH 03840 603-431-1200
Trend DLC, Card Technology, Paramus, NJ 07652 201-845-7373

Paper, Graphic Recording-3000

§† Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415-1417
MFE Instruments, Stocker & Yale, Inc., Beverly, MA 01915-0490, 508-921-9104;800-472-4633 ..... D•1421
§ Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
§ Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851

Computer Instruments Div., Hempstead, NY 11550 516-483-8200
† Fitchburg Coated Products, Technographics, Inc., Scranton, PA 18501 .. 717-347-2035
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Gulton Graphic Instruments Div., A Mark IV Company, E. Greenwich, RI 02818 ..... 800-343-7929;401-884-6800
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Linear Instruments, Spectra Physics Analytical, Reno, NV 89523 702-746-2200
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
Omega Engineering, Stamford, CT 06907 800-826-6342
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 818-365-0101
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Paper, Thermal-2000

§† Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1417
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641 312-539-6045
Lydall Inc., Manning Div., Troy, NY 12181 518-273-6320
Markem Corp., Keene, NH 03431 603-352-1130

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PC Instruments — See Instruments, Test & Measuring, Personal Computer (Vol. D)

Peak Sense & Hold Amplifiers — See Amplifiers, Peak Sense & Hold (Vol. D)

Peltier (Thermoelectric) Heat Pumps — See Cooling/Heating Modules, Thermoelectric (Vol. B)

Perforators, Paper Tape (Electrically Powered)-2000

† Chalco Engrg. Corp., Chalco Industries, Inc., Gardena, CA 90248-1898 ... 213-321-0121; 213-323-5525
Teleterminal Corp., Greenland, NH 03840 603-431-1200

Personal Computer Instruments — See Instruments, Test & Measuring, Personal Computer (Vol. D)

Phones — See Handsets, Chestsets, Headphones, Headsets, etc. (Vol. D)

Photocells & Phototubes — See Cells, Photoconductive (Vol. B)

Photodetectors, GaAs-3700 — ***See Vol. B***

Photodectectors, Silicon-3700 — ***See Vol. B***

Photoelectric Equipment — See Alarms, Controls, Photoelectric (Vol. B)

Photoelectric Tubes — See Cells, Photoconductive (Vol. B)

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Photographic Services — See Services, Photographic (Vol. D)

Photometers — See Meters, Light (Vol. D)

Photoresistors-3700 — ***See Vol. B***

Phototransistors, Surface Mount-4800 — ***See Vol. A***

Pick and Place Equipment, Automatic-4100

Aremco Products, Inc., Ossining, NY 10562 914-762-0685
AZCO Corp., Elmwood Park, NJ 07407 201-791-1428
§ Contact East, N. Andover, MA 01845 508-682-2000
Creative Automation Co., Sun Valley, CA 91352 818-767-6220
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
MOLEX, Inc., Lisle, IL 60532 708-969-4550
Motion Science Inc., San Jose, CA 95112 408-993-0300
§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666
§ Norgren, Littleton, CO 80120-1663 303-794-2611
Reliability, Incorporated, Houston, TX 77218 713-492-0550
§† Zevatech, Inc., Morrisville, NC 27560 919-460-0111

Pick and Place Equipment, Manual-4100

Automated Production Concepts, Wayne, NJ 07470 201-831-8300
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Cooper Tools, Raleigh, NC 27622 919-781-7200
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§ Norgren, Littleton, CO 80120-1663 303-794-2611
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000

Pickups, Magnetic, Proximity, Torque, Vibration, etc. — See Transducers, Specific Type (Vol. B)

Pickups, Telephone (For Recording)-1300

§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
International Components Corp., Melville, NY 11747 516-293-1500
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511

Piezoelectric Ceramics-2300 — ***See Vol. A***

Pilot Lights — See Lights, Indicator (Vol. B)

Pin Grid Arrays — See Sockets, Pin Grid Array (Vol. C)

Pin Straighteners, Tube-5400 — ***See Vol. C***

Pins, Cotter, Dowel, Taper, etc.-2500 — ***See Vol. C***

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Pins, Mechanical-2500 — ***See Vol. C***

Plastic Raw Materials, Liquids, Pellets, Powders, Resins-1600 — ***See Vol. C***

Plastics, Custom Molding — See Services, Custom Molding, Plastic (Vol. D)

Plastics, Encapsulating — See Compounds, Encapsulating, Molding, Potting (Vol. C)

Plastics Fabrication — See Services, Plastics Fabrication (Vol. D)

Plastics, Heat Shrinkable — See Caps, Forms & Tapes, Heat Shrinkable (Vol. C), Tubing, Heat Shrinkable (Vol. C)

Plated Wire Memory Systems — See Memory Systems (Vol. D)

Plates, Instructional, Name, Silk Screen — See Nameplates (Vol. B)

Plates, Multihole-2500 — ***See Vol. C***

Platforms, Thermal — See Thermal Platforms (Vol. D)

Plating Services — See Services, Plating (Vol. D)

Players, Magnetic Tape — See Recorders, Magnetic Tape (Vol. D)

Pliers-5400 — ***See Vol. C***

Plotters/Hard-Copy Devices-2000

B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1409
Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
† Allen Datagraph, Inc., Salem, NH 03079 603-893-1983
Bascom-Turner Instruments, Norwood, MA 02062 617-769-9660
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ Fujitsu Component of America, Inc., Subsidiary of Fujitsu Microelectronics, Inc., San Jose, CA 95135 408-922-9000
† Gulton Graphic Instruments Div., A Mark IV Company, E. Greenwich, RI 02818 ..... 800-343-7929;401-884-6800
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Houston Instrument, AMETEK, Inc., Austin, TX 78753 512-835-0900
Image Graphics, Inc., Shelton, CT 06484 203-926-0100
§ Kipp & Zonen, Enraf-Nonius, Bohemia, NY 11716 ..... 516-589-2885;800-645-1025
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Precision Image Corporation, Redwood City, CA 94063 ..... 415-366-8900; 1-800-338-3377
§† The Recorder Company, San Marcos, TX 78667 512-629-1400
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Plotters, X-Y, & Accessories-3000

John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203, 206-347-6100 .. D•1409
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1288
†# Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
† Allen Datagraph, Inc., Salem, NH 03079 603-893-1983
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Contact East, N. Andover, MA 01845 508-682-2000
Data Technology, Inc., Woburn, MA 01811 617-935-8820
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ Electronic Associates, Inc., W. Long Branch, NJ 07764 201-229-1100
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Houston Instrument, AMETEK, Inc., Austin, TX 78753 512-835-0900
Image Graphics, Inc., Shelton, CT 06484 203-926-0100
§ Kipp & Zonen, Enraf-Nonius, Bohemia, NY 11716 ..... 516-589-2885;800-645-1025
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900

Omega Engineering, Stamford, CT 06907 800-826-6342
§ PIC Design, Remington Technologies, Inc., Middlebury, CT 06762 203-758-8272
§ Precision Image Corporation, Redwood City, CA 94063 ..... 415-366-8900; 1-800-338-3377
§† The Recorder Company, San Marcos, TX 78667 512-629-1400
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
Venable Industries, Inc., Torrance, CA 90505 213-539-2522
§ Via West Interface, Inc., Tucson, AZ 85705 ..... 602-623-5716;1-800-266-5716
Zeta Graphics Corp., Martinez, CA 94553 415-372-7568

Plug & Jack Sets-2100 — *See Vol. C*

Plug Adapters-2100 — *See Vol. C*

Plug Buttons-2500 — *See Vol. C*

Plug Caps & Shells-2100 — *See Vol. C*

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Polarizers-3700 — *See Vol. B*

Polarizers, Satellite Antennas-1200

Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1022-1023
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774

Position Control Systems, Servo — See Controls, Servo Systems (Vol. D)

Positioning Systems, Multiple Axis, Computer Guided-4100

EDO Corporation, Electro-Ceramic Division, Salt Lake City, UT 84115, 801-486-2115 ..... A•1357
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495 ..... B•1276-1277
Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635, 602-459-1150 ..... B•1280-1282
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140,2243
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
§† B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
Burleigh Instruments, Fishers, NY 14453 716-924-9355
§ Centent Co., Santa Ana, CA 92707 714-979-6491
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 707-584-7558
§ Daedal, Harrison City, PA 15636 412-744-4451
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-6370;1-800-343-4912
EDO Corp., Electro-Acoustic Div., Salt Lake City, UT 84115 801-486-7481
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
† McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Microvision Corp., Campbell, CA 95008 408-374-3158
Oriel Corp., Stratford, CT 06497-0872 203-377-8282
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
† Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
ST Research Corporation, Newington, VA 22122 703-550-7000
† Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 516-328-3970
Transmagnetics, Farmingdale, NY 11735 516-293-3100
§† Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

Posts, Binding-2100 — *See Vol. C*

Posts, Harness Board-2500 — *See Vol. C*

Potentiometer Elements-4750 — *See Vol. A*

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Power Distribution Modules-4000

Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;in Can.: 1-800-553-2448 ..... D•1615-1616
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2185-2187,2189
Corcom, Inc., Libertyville, IL 60048, 708-680-7400 ..... C•1331
Leach Corporation, Buena Pk., CA 90622-5032, 714-739-0770 ..... B•1529-1531,1534-1535
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212-2213
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1898
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
Optima Electronic Packaging Systems, Tucker, GA 30084-5088, 404-496-4000 ..... C•1064
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... C•1484
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
WECO Electrical Connectors, Inc., Mooers, NY 12958, 518-298-4810 ..... C•1568
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4, 514-694-9136 ..... C•1568

Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
§ Automatic Switch Co., Florham Park, NJ 07932 ... 1-201-966-2000
§† Aydin Corporation (West), San Jose, CA 95119-1371 ... 408-629-1100
§† Brooks Power Systems, Bensalem, PA 19020 ... 215-244-0264;1-800-523-1551
Deltron, Inc., N. Wales, PA 19454-9990 ... 215-699-9261
Elgin Electronics, Erie, PA 16509-3570 ... 814-864-4921
Energy Systems, Vancouver, WA 98682 ... 206-896-8310
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ... 201-288-4477; 800-447-5639
EPE Technologies, Inc., Subsidiary of Merlin Gerin, Costa Mesa, CA 92626 ... 714-557-1636
Everest Electronic Equipment, Buford, GA 30518 ... 404-932-2900
Everest Electronic Equipment, Inc., Anaheim, CA 92806 ... 714-634-2200
† International Power Machines, Garland, TX 75042 ... 800-527-1208
† Modular Devices, Shirley, NY 11967 ... 516-345-3100
§† Oneac Corporation, Libertyville, IL 60048 ... 708-816-6000,800-327-8801
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ Power Dynamics Inc., West Orange, NJ 07052 ... 201-736-5722
Rogers Corporation, Power Distribution Div., Mesa, AZ 85205 ... 602-830-3370

Power Line Monitor Printers – See Printers, Event (Vol. D)

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AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ... D•1507-1510
Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ... D•1511
† Acopian Technical Company, Easton, PA 18044, 215-258-5441 ... D•1549
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ... D•1588-1593
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ... D•1599-1603
§ Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606,1613
§ AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ... D•1615-1616
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ... D•1631
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ... D•2183
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ... D•1663
Corcom, Inc., Libertyville, IL 60048, 708-680-7400 ... C•1331
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ... D•1700,1703,1705
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ... D•1755-1757
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ... D•1758,1761
Globtek, Inc., N. Bergen, NJ 07047, 201-861-0246 ... C•1386
Hauman, Inc., San Jose, CA 95131, 408-434-0888 ... D•1783
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ... D•2211
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ... D•2212-2213
† Modular Devices, Shirley, NY 11967, 516-345-3100 ... D•1901-1906
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ... D•1908-1910
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ... D•2221
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ... D•2222
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1966-1968,1973
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ... D•1986
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ... D•1988,1997-1998
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ... D•2224
QMI/NIEC, Twin Oaks, CA 93518, 805-867-2555 ... A•2126
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ... D•2016-2019
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ... D•2028
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ... D•2049,2051
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ... D•2058-2068
§ Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ... D•2134
WECO Electrical Connectors, Inc., Mooers, NY 12958, 518-298-4810 .... C•1568
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4, 514-694-9136 ... C•1568
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
† Advanced Analog, Intech, Santa Clara, CA 95050 ... 408-988-2702
Advanced High Voltage Co. Inc., Tucson, AZ 85751 ... 818-997-7222;602-721-2424
§† Aydin Corporation (West), San Jose, CA 95119-1371 ... 408-629-1100
§† Bailey Controls Co., Wickliffe, OH 44092 ... 216-585-8500
California DC, Newbury Park, CA 91320 ... 805-499-3621
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Dynapower Corporation, Farmington Hills, MI 48333 ... 313-553-4300
Dynapower Corporation, S. Burlington, VT 05407 ... 802-860-7200
ELMA Electronic Inc., Fremont, CA 94538 ... 415-656-3400
Energy Systems, Vancouver, WA 98682 ... 206-896-8310
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ... 201-288-4477; 800-447-5639
Falcon Electric, San Gabriel, CA 91776 ... 818-287-6116
Fuses Unlimited, D.E.I., Van Nuys, CA 91406 ... 818-786-8111
Hitran Corporation, Flemington, NJ 08822-9943 ... 908-782-5525
Kaut & Bux Manufacturing Co., Mundelein, IL 60060 ... 708-949-8505
† M.S. Kennedy Corp., Cicero, NY 13039 ... 315-699-9201
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 ... 201-385-0500
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 ... 508-475-7831
Motorola Inc., Auto. & Indl. Elctrns., Elctrn. Sys. Comps. Div., Northbrook, IL 60062 ... 708-205-2867
NIEC-BASISTA, Richfield, OH 44286 ... 216-659-9287
§ Power Dynamics Inc., West Orange, NJ 07052 ... 201-736-5722
Power Pac, Shelton, CT 06484 ... 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 ... 203-726-1300
Powertech, Inc., Fairlawn, NJ 07410 ... 201-791-5050
Power Trends, Inc., Batavia, IL 60510 ... 708-406-0900
Richard-Lee Co., Cranford, NJ 07016 ... 201-276-0710
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ... 908-851-0644;800-367-5566
§ Schurter, Inc., Petaluma, CA 94952 ... 707-778-6311
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
§ Shindengen America Inc., Westlake Vl., CA 91361 ... 800-634-3654
† Sierra West Power Systems, Las Cruces, NM 88001 ... 505-522-8828
Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 ... 708-439-2800
Technipower, A Penril Co., Danbury, CT 06813 ... 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 ... 201-385-0500
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5 ... 416-630-8108
† Teledyne Microelectronics, Los Angeles, CA 90066 ... 213-822-8229;213-870-9831
† Trio Laboratories, Inc., Plainview, NY 11803 ... 516-349-0400
§ USD Products , Div. of Bussmann, Chicago, IL 60656 ... 708-867-4600
Voltex, Amityville, NY 11701 ... 516-842-2772
Xylog Corp., Hackensack, NJ 07601 ... 201-489-4040

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Power Supplies, AC to DC Adapter-4000

§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ... D•1544-1547
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ... A•2168, D•1597
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ... D•1599
§ Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606,1608,1613
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ... D•1621-1622
Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ... D•2166
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ... D•1631
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ... D•1008,1646,1648
 # CCP/Technical Devices, Dayton, OH 45414, 513-890-7881 ... D•1649
§ CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ... D•1695
D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ... D•1698-1699
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ... D•1700,1703
† Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ... D•1709-1710
§† Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ... D•1717
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ... D•1741
§ EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ... D•1742
EWC, Inc., Englishtown, NJ 07726, 908-446-3110 ... A•2224,2226
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ... D•1752-1753
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ... D•1755-1756
§ Globtek, Inc., N. Bergen, NJ 07047, 201-861-0246 ... D•1775
§ Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ... D•1776-1777
HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ... D•1785
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ... D•1267
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1808-1809
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ... D•1823-1825
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ... D•1871,2210
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ... D•1877
§ LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ... D•1880, 1884-1885
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ... D•1892-1895
† Modular Devices, Shirley, NY 11967, 516-345-3100 ... D•1901
§ Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ... A•1736
NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ... D•1915
† Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337 ... D•1960-1961
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ... D•1974-1976
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ... D•1985-1986
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ... D•1987
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ... D•2008-2009
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ... D•2017
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ... D•2025
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ... D•2027
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ... D•2037
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ... D•2058-2068
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ... D•1380
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ... D•2027
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Adtech Power Inc., Anaheim, CA 92806 ... 714-634-9211
§ Ault, Incorporated, Minneapolis, MN 55428 ... 612-493-1900
§† Aydin Corporation (West), San Jose, CA 95119-1371 ... 408-629-1100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 ... 416-828-2400
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
BICC-VERO Electronics, Inc., Hamden, CT 06514 ... 203-288-8001
† Bikor, Microsemi Corporation, Torrance, CA 90501 ... 213-539-6320
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Computer Power Inc., High Bridge, NJ 08829 ... 908-638-8000;800-526-5088
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ... (0271) 863781
§ CPS, Inc., Fremont, CA 94538-6517 ... 415-657-6363
C-S Electronic Sales, Inc., Frankfort, IN 46041 ... 317-659-1874
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 ... 416-826-1141
Datel, Inc., Mansfield, MA 02048-1194 ... 508-339-3000

§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Electroid Co., Div.of Valcor Engrg. Corp., Springfield, NJ 07081 201-467-8100
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
Elgin Electronics, Erie, PA 16509-3370 814-864-4921
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Engineering Design & Sls., Danville, VA 24541 804-792-6405
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ GN National Electric Inc., Walnut, CA 91789 ..... 714-598-1919;714-598-1337; 800-321-1266
§ Heath Co., St. Joseph, MI 49085 616-982-3200
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
International Converter Corp., Colorado Springs, CO 80915 719-570-6900
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 516-937-3475
§ James Electronics, Chicago, IL 60618 312-463-6500
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... + 31-5440-71111
Omega Engineering, Stamford, CT 06907 800-826-6342
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliance Comm/Tec, Reliance Electric, Cleveland, OH 44117 800-245-4501
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Stancor, White-Rodgers, Logansport, IN 46947 219-722-2244
†# Tauber Elctrns. Inc., San Diego, CA 92117 619-274-7242
§ Techni-Tool, Plymouth Meetino, PA 19462 215-825-4990
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
Total Power International, Inc., Lowell, MA 01850 508-453-7272
Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Voltex, Amityville, NY 11701 516-842-2772
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136
§ West Electronic Sales Team, Westminster, CA 92683 .... 714-898-0120;213-495-5569

Power Supplies, AC Input, Less than 5 W Output-4000

AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
† Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1594-1597
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Behiman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008,1641,1647-1648
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1686-1687
§ CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... D•1695
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1698
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1710
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1727
Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440 ..... D•1731
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1746
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755
Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1776-1777
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1800,1805
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1823-1824
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1906
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1736
Penn-Tran Corp.,Sub. of Spectrum Elctrns. Inc., Wingate, PA 16880, 814-355-1521 ..... D•1918
Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337 ..... D•1961
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1967
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1989
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2053
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
American Monarch, Minneapolis, MN 55421 612-788-9161
† Anadyne Power Supply Division, Santa Fe Springs, CA 90670-5216 213-921-9364
§ Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cell-Con, Inc., Exton, PA 19341 215-363-8552
Collmer Semiconductor, Inc., Dallas, TX 75244 ..... 800-527-0251;214-233-1589
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Omega Engineering, Stamford, CT 06907 800-826-6342
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
Power Pac, Shelton, CT 06484 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
Precise Sensors, Inc., Monrovia, CA 91016 818-358-4578
Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§ Stancor, White-Rodgers, Logansport, IN 46947 219-722-2244
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, 5 to 25 W Output-4000

AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
† Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1581
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1594-1597
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606,1608,1613
§ Ault, Incorporated, Minneapolis, MN 55428, 612-493-1900 ..... D•1613-1619
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1621-1622, 1624
Behiman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008,1641,1644-1645,1647-1648
 # CCP/Technical Devices, Dayton, OH 45414, 513-890-7881 ..... D•1649
§ Computer Products inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, inc., Oxnard, CA 93033, 805-486-4565; ..... D•1681-1682,1686-1687
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1698-1699
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1710
Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440 ..... D•1731
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1745-1746
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755-1757
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1761
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1765
Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1776-1777
Hauman, Inc., San Jose, CA 95131, 408-434-0888 ..... D•1782
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1801,1805
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1823-1825
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901,1906
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910

MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 .... D•1912
Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
Penn-Tran Corp.,Sub. of Spectrum Elctrns. Inc., Wingate, PA 16880, 814-355-1521 .... D•1918
Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337 ..... D•1960-1961
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1966-1968
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1976
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1989,1994,1996
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2008-2009
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2032
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 .... D•2043-2045
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 .... D•2048,2052-2054
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2111
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2141
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
§ Alpha Dist. Corp., Richfield, OH 44286 ..... 216-659-7100; 1-800-628-0841
American Monarch, Minneapolis, MN 55421 612-788-9161
§# American Skynet Electronic Co., Milpitas, CA 95035 408-945-6355
AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
† CEC Electronics Corp., Hauppauge, NY 11788 516-582-4422
Cell-Con, Inc., Exton, PA 19341 215-363-8552
Collmer Semiconductor, Inc., Dallas, TX 75244 ..... 800-527-0251;214-233-1589
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Electronic Innovations Corp., Englewood, CO 80110 303-789-0424
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
Hameg Instruments, Oceanside, CA 92056 619-630-4080
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
Industrial Test Equipment Co., Inc., Port Washington, NY 11050 516-883-1700
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Power Pac, Shelton, CT 06484 203-925-0123
Power Trends, Inc., Batavia, IL 60510 708-406-0900
§ Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
§ Shindengen America Inc., Westlake Vl, CA 91361 800-634-3654
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Power Supplies, 25 to 150 W Output-4000

Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580-1581
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1595,1597
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606,1608-1610,1613
§ Ault, Incorporated, Minneapolis, MN 55428, 612-493-1900 ..... D•1619
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1621-1622, 1624
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Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1644-1645
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... D•1653-1654
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1680-1689
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1698
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1710
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
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Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1720,1724, 1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1729
Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440 ..... D•1731
Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1745,1747-1748
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1751
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755-1757
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758,1761
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1765
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•2075
§ Hauman, Inc., San Jose, CA 95131, 408-434-0888 ..... D•1783
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1791
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801,1805
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1823,1825
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1897
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901,1906
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... A•2316
Penn-Tran Corp.,Sub. of Spectrum Elctrns. Inc., Wingate, PA 16880, 814-355-1521 ..... D•1918
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1976
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1980,1982-1983,1986
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1989-1991,1994-1996,1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2001
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2008-2011
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2016
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2024
Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 .... D•2028,2030,2032
§ Shindengen America Inc., Westlake Vl, CA 91361, 800-634-3654 ... D•2034-2035
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038,2042-2046
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2051-2053
Switching Systems International, Placentia, CA 92670, 714-996-0909 .... D•2057
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1018
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071-2072
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,2075
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110-2112
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2230-2231
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2141
Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
American Monarch, Minneapolis, MN 55421 612-788-9161
§# American Skynet Electronic Co., Milpitas, CA 95035 408-945-6355

AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
#BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Electronic Innovations Corp., Englewood, CO 80110 303-789-0424
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0765
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
§Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
§International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
†Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
§Lutze, Inc., West Caldwell, NJ 07006 ..... 201-227-2371;800-447-2371
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
†NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
§Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
§Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
†Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
†Teapo Electronic Corp. of America, Norcross, GA 30071 404-449-6220
Technipower, A Pearl Co., Danbury, CT 06812 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3827
§U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9954
Valor Electronics, San Diego, CA 92121-2245 619-458-1471
§Vector-VIZ Instrument Div. of The Vactor Grp. Inc., Newburgh, NY 12550 800-627-0943
§†Vicor Corp., Andover, MA 01810 508-470-2900
§Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94539 415-438-5950
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL

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Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1344-1347
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Adtech Power Inc., Anaheim, CA 92805, 714-634-9211 ..... D•1580-1582
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1586-1593
†Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
†Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9619 ..... D•1605
Aslan Computer Corporation, S. El Monte, CA 91733, 818-575-5271 ..... D•1585-1587
§Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1610,1613
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Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
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Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1710
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EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 .... D•1714-1715
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1718,1720,1722,1724-1725,1727
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Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1748
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1751
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758-1759
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1763,1766
§Haumen, Inc., San Jose, CA 95131, 408-434-0888 ..... D•1783
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International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1805
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1929
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
†Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2015, 201-385-0500 ..... D•1896-1899
†Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901,1904
§Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Orem High Voltage, Dayton, TX 77535, 409-236-3555 ..... D•1916
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1964-1965
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1982-1983,1986
§Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1989-1996,1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000-2002
†Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2008
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014-2017
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2024
Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027
†RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 .... D•2029-2031,2033
§Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2039,2042-2045
Spellman High Voltage Electrns. Corp., Hauppauge, NY 11788, 516-349-8686 ..... D•2049,2051-2052
Switching Systems International, Placentia, CA 92670, 714-996-0909 ..... D•2056-2057
Technon Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1018
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-636-2105 ..... D•2071-2073
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110
§UNIPOWER CORPORATION, Pompano Bch., FL 33069-4303, 305-974-2442 ..... D•2117
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2230-2231
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2141-2143
Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145
Abbott Technologies, Inc. Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
†Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
†ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
American Monarch, Minneapolis, MN 55421 612-788-9161
§#American Skynet Electronic Co., Milpitas, CA 95035 408-945-6355
#BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
†California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
†CEC, Orange, CA 92665 714-637-2970
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
Christie Electric Corp., Gardena, CA 90248 213-715-1402
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0765
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
§Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
§International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
JMK, Inc., Amherst, NH 03031 603-886-4100
§Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
†Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300

NCR Power Systems, Lake Mary, FL 32746 407-323-9250
§† Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714 714-975-1222
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3637
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Westcor Corporation, Los Gatos, CA 95032 408-395-7050

Power Supplies, 400 to 1000 W Output-4000

Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580-1581,1583
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ... D•1606-1607,1609-1610
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... D•1655,1657
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701-1702
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1710
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 .... D•1714-1715
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1718-1720,1724-1725,1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728-1729,2191
Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1751
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758-1759
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1763,1767-1768
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•2075
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1791
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1805
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1807
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1832
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1899
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1916
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1965
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1992,1998-1999
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000,2002
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014-2015,2017-2019
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2024
Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2033
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2039,2041-2043,2046
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048-2049,2052,2054
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1018
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071,2073
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,2075
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
§ UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2230-2231
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2141,2143
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
American Monarch, Minneapolis, MN 55421 612-788-9161
§# American Skynet Electronic Co., Milpitas, CA 95035 408-945-6355
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
† CEC, Orange, CA 92665 714-637-2970
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
Christie Electric Corp., Gardena, CA 90248 213-715-1402
Converter Power, Inc., Beverly, MA 01915 508-927-8158
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
§ GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
† HC Power Inc., Irvine, CA 92714-5716 714-261-2200
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
§ Lutze, Inc., West Caldwell, NJ 07006 ..... 201-227-2371;800-447-2371
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Modular Devices Inc., Torrance, CA 90503 213-542-8561
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
§† Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Urban Electronics, Dover, MA 02030 617-329-4068
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§† Vicor Corp., Andover, MA 01810 508-470-2900
§ Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Westcor Corporation, Los Gatos, CA 95032 408-395-7050

Power Supplies, 1000 to 1500 W Output-4000

Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580-1581,1583
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1589,1591-1593
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1607,1610
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713

EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1714
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1718-1720,1724-1725,1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728,2191
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1751
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758-1759
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1763
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•2075
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1791
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2202
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1831-1835
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1898
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1916
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1965
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1998-1999
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2017-2019
§ Shindengen America Inc., Westlake VL, CA 91361, 800-634-3654 ..... D•2034
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2039-2040
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2048,2054
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1018
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,2075
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
§ UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
American Monarch, Minneapolis, MN 55421 612-788-9161
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-3620;800-356-2244
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
† CEC, Orange, CA 92665 714-637-2970
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
Christie Electric Corp., Gardena, CA 90248 213-715-1402
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† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
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Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§ U.S. Eico Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
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§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
† HC Power Inc., Irvine, CA 92714-5716 714-261-2200
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Modular Devices Inc., Torrance, CA 90503 213-542-8561
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
OPT Industries, Inc., Phillipsburg, NJ 08865 908-454-2600
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Power Pac, Shelton, CT 06484 203-925-0123
† RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Urban Electronics, Dover, MA 02030 617-329-4068
§ U.S. Eico,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§† Vicor Corp., Andover, MA 01810 508-470-2900
Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, 1500 to 3000 W Output-4000

Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1581
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1607
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Electrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
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Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1763,1769
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•2075
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1791
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
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Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1898
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Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1964
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
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§ Shindengen America Inc., Westlake VL, CA 91361, 800-634-3654 ..... D•2034
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Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
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Elgin Electronics, Erie, PA 16509-3570 814-864-4921
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High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Modular Devices, Shirley, NY 11967 516-345-3100
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
OPT Industries, Inc., Phillipsburg, NJ 08865 908-454-2600
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
† RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
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Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
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Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Greater than 3000 W Output-4000

Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1607
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1718,1720,1722,1727
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1763,1770-1771,1773
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•2075
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1831,1833-1835
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1875
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1898
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... D•1914
NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1916
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2220
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ... D•2040
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2047-2048,2054-2055
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•2075
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131
American Monarch, Minneapolis, MN 55421 612-788-9161
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
† CEC Electronics Corp., Hauppauge, NY 11788 516-582-4422
Christie Electric Corp., Gardena, CA 90248 213-715-1402
Converter Power, Inc., Beverly, MA 01915 508-927-8158
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174 904-677-7070
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
† HC Power Inc., Irvine, CA 92714-5716 714-261-2200
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Modular Devices, Shirley, NY 11967 516-345-3100
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
OPT Industries, Inc., Phillipsburg, NJ 08865 908-454-2600
Phenix Technologies, Accident, MD 21520 ..... 301 746 8118
Plasma Research Corp., Oakland, CA 94619 415-530-1468
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Urban Electronics, Dover, MA 02030 617-329-4068
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§† Vicor Corp., Andover, MA 01810 508-470-2900
Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Avalanche, Photodiodes-4000

† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1735
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
American Monarch, Minneapolis, MN 55421 612-788-9161
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995

Power Supplies, AC Output-4050

† Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2151
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•2154-2155
Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156-2158
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... A•2168, D•1595-1597
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599-1600
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1607,1609
† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2160-2163,2165
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168-2172, 2174
Belmont Instrument Corp., Billerica, MA 01821, 508-663-0212 ..... D•2176
† California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244 ..... D•2179-2180
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423, 716-538-4421 ..... D•2182
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2185-2189
† D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1698
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... A•2204, D•1708,1710
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1729,2191-2193
† Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... B•1066,1151, D•1741
Energy, Ltd., Bladensburg, MD 20710, 301-699-1144 ..... D•2194
EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
§ Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758
† Georator Corp., Manassas, VA 22110-0070, 800-523-9938 ..... D•2195-2198
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•2202-2203
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204-2207
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208-2209
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1881-1882,1884-1885
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1904
§ Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216,2219-2221
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... D•2222
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1976
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•2037
Singer Data Products, Inc., Bensenville, IL 60106, 708-860-6500 ..... D•1111
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049
§† Staco Energy Products Co., Dayton, OH 45403, 513-253-1191 ..... A•2413
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1018
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•2108-2109
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132
U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2139,2230-2231
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
† American Monarch, Minneapolis, MN 55421 612-788-9161
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
§† Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
§ Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
† Autronics Corp., Arcadia, CA 91006 818-445-5470
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Cambridge Electronics Laboratories, Somerville, MA 02144 617-629-2805
Cell-Con, Inc., Exton, PA 19341 215-363-8552
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665

† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ Contact East, N. Andover, MA 01845 508-682-2000
Converter Concepts, Inc., Pardeeville, WI 53954 608-429-2144
CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Cross Electronics, Warrendale, PA 15086 412-776-1591
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
CVDS Inc., Pte. Claire,Que., CANADA H9P 1C2 514-694-9320
† DELTEC, San Diego, CA 92110 ..... 619-291-4211;800-854-2658
§ Dimensions Unlimited, Inc., St. Paul, MN 55109 612-770-5630
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
Dynapower Corporation, S. Burlington, VT 05407 802-860-7200
† EG & G Rotron, Custom Div., Woodstock, NY 12498 914-679-5201
Electric Device, Canfield, OH 44406 216-533-1111
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
† Electronic Development Associates, Inc., Dix Hills, NEW YORK 11746 .. 516-673-3881
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
Elma Engineering, Palo Alto, CA 94303 415-494-7303
E-L Products Corp., Sub.of Astronics Co., E. Aurora, NY 14052 716-655-0800
Energy Systems, Vancouver, WA 98682 206-896-8310
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Engineering Design & Sls., Danville, VA 24541 804-792-6405
EPE Technologies, Inc., Subsidiary of Merlin Gerin, Costa Mesa, CA 92626 714-557-1636
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
EWC, Inc., Englishtown, NJ 07726 908-446-3110
Falcon Electric, San Gabriel, CA 91776 818-287-6116
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
GENERAL POWER CORPORATION, Anaheim, CA 92815 714-956-9321
Gorden Pacific Electronics, Inc, Placentia, CA 92670 714-993-6970
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Hipotronics Inc., Brewster, NY 10509 914-279-8091
† Humphrey, Inc., San Diego, CA 92123 619-565-6631
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
§ James Electronics, Chicago, IL 60618 312-463-6500
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
Jerome Industries Corp., Elizabeth, NJ 07201 908-353-5700
§ La Marche Mfg., Des Plaines, IL 60018 708-299-1188
Litton Electron Devices, San Carlos, CA 94070 415-591-8411
† LocTite Luminescent Sys., Inc., LocTite Corp., Lebanon, NH 03766 603-448-3444
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Magnetek Triad, Huntington, IN 46750 219-356-7100
Marway Prods. Inc., Santa Ana, CA 92703 714-973-1800
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Micro Power Intl., Inc., San Diego, CA 92126 ..... 619-271-0831;619-271-5942
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07521-2915 201-385-0500
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
§† Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... + 31-5440-71111
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
† NH Research, Irvine, CA 92714 714-474-3900
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
§ Optrex/Satori, Torrance, CA 90503 213-214-1791
† Oram High Voltage, Dayton, TX 77535 409-258-5553
¡ Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Performance Controls, Inc., Horsham, PA 19044 215-675-6500
Phenix Technologies, Accident, MD 21520 301-746-8118
Plasma Research Corp., Oakland, CA 94619 415-530-1468
Power Conversion Products, Crystal Lake, IL 60014 815-459-9100
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
Power Pac, Shelton, CT 06484 203-925-0123
§† Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
† Ratelco, Power Systems, Seattle, WA 98109-5589 206-624-7770
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ S & H Inds., Hatfield, PA 19440 215-822-7211
Sanford-Miller Corp., Lynbrook, NY 11563 ..... 516-593-2025;800-645-5900
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
Skyway Magnetics, Warner Springs, CA 92086 619-782-3342
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§† Square D Co. Power Protection Systems, San Diego, CA 92123-1165 ... 619-279-0831
§ Stancor, White-Rodgers, Logansport, IN 46947 219-722-2244
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§† Superior Electric, Bristol, CT 06010 203-582-9561
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
† Tech Laboratories inc., Palisades Pk., NJ 07650 201-944-2221
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
† Teledyne Inet, Teledyne, inc., Torrance, CA 90506 213-325-5040
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
† Transmagnetics, Farmingdale, NY 11735 516-293-3100
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
§† Tripp-Lite, Chicago, IL 60610-4188 312-329-1777
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Uniptex Corp., St. Paul, MN 55117 612-490-1936
† Unitron Inc., Dallas, TX 75238 214-340-8600
Φ U.S. Instrument Rentals, inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
Versadata Inc., Bensenville, IL 60106 708-766-6755
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Voltex, Amityville, NY 11701 516-842-2772
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
World Products Inc., Systems Devices Grp., Sonoma 95476 707-996-5201
Xylog Corp., Hackensack, NJ 07601 201-489-4040

Power Supplies, Bipolar-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1607
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1641-1647
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1684-1685,1688-1689
† Custom Power Systems, Ronkonkoma, NY 11779-3998, 516-467-5328 ... D•1697
† Del Electrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1790
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1709
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1714
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1722,1727
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3625 ..... D•1732
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... D•1740
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1763,1766,1768,1771
Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 ..... D•1786
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1791
International Power DC Power Supplies, inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1731
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801-1802,1805
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
§ Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... D•1914
NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1916
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1966-1967,1969
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1981-1983,1986
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1996
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2008
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028-2029,2031,2033
Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034

Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
† **Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300** .... D•1017-1018
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071-2072
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131
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† **Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940** ..... D•2141-2143
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Acon, Inc., South Easton, MA 02375 508-230-8022
American Monarch, Minneapolis, MN 55421 612-788-9161
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
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Astrosystems, Lake Success, NY 11042 516-328-1600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
Converter Concepts, Inc., Pardeeville, WI 53954 608-429-2144
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
D & B Power, Inc., Bayshore, NY 11706 516-586-5955
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
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Electrostatics, San Diego, CA 92111 619-279-1414
† E M S Development Corp., Farmingdale, NY 11735 516-293-7900
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Entran Devices, Fairfield, NJ 07004 ..... 201-227-1002;800-635-0650
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Hipotronics Inc., Brewster, NY 10509 914-279-8091
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
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LH Research, Inc., Tustin, CA 92680 1-800-547-2537
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§ Martel Electronics, Salem, NH 03079 603-893-0886
† Micro Power Intl., Inc., San Diego, CA 92126 ..... 619-271-0831;619-271-5942
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
Modular Devices Inc., Torrance, CA 90503 213-542-8561
MPC, Div. of Consulting Systems, Danville, NH 03819 603-642-5913
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
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Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
† Power Functions Engineering, Garland, TX 75042 214-278-0996
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Pac, Shelton, CT 06484 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
§ Pulse Instruments Co., Torrance, CA 90502 213-515-5330
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† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ S & H Inds., Hatfield, PA 19440 215-822-7211
§ Sanyo Semiconductor Corp., Allendale, NJ 07401 201-825-8080
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Sorensen Company, Chicago, IL 60630 ..... 312-775-0843;1-800-525-2024
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
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Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
§ Valor Electronics, San Diego, CA 92121-2245 619-458-1471
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§† Vicor Corp., Andover, MA 01810 508-470-2900
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Walker Power, Inc., Warner, NH 03278 603-456-3111
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CPC, Inc., Fremont, CA 94539-5017 415-657-3363
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† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
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† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
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Electric Device, Canfield, OH 44406 216-533-1111
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Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
§ Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Elma Engineering, Palo Alto, CA 94303 415-494-7303
Endicott Research Group, Endicott, NY 13760 607-754-9187
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
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Phase Control Electronics, Glendale, NY 11385 718-441-4278
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† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
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† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9811
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Torotron Corp., Mt. Vernon, NY 10550 914-664-2050
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Tmac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
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§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9130
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§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ..... D•1826-1827
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830,1832-1833
§ Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1157 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1899
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... D•1914
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1976,1981,1986
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1996-1997
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 ..... D•2004-2005
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027

RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2047,2055
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1018
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2141-2143
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Ajax Magnethermic Corp., Warren, OH 44482 216-372-8511
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
American Monarch, Minneapolis, MN 55421 612-788-9161
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
† CEC, Orange, CA 92665 714-637-2970
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
Electric Device, Canfield, OH 44406 216-533-1111
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Endicott Research Group, Endicott, NY 13760 607-754-9187
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
† Good-All Electric, Inc., Fort Collins, CO 80524 ..... 303-484-3080;800-826-7891
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Jerome Industries Corp., Elizabeth, NJ 07201 908-353-5700
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
† Logitek, Inc., Ronkonkoma, NY 11779 516-467-4200
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Marathon Power Technologies, Waco, TX 76714-8233 817-776-0650
Melcher, Inc., Ashland, MA 01721 800-828-9712
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Oram High Voltage, Dayton, TX 77535 409-258-5553
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Phase Control Electronics, Glendale, NY 11385 718-441-4278
† Power Functions Engineering, Garland, TX 75042 214-278-0996
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§ Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Teco Corp., Winnisquarn, NH 03289 603-524-1998
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Walker Power, Inc., Warner, NH 03278 603-456-3111
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136
Weir Electronics, Inc., Weir Elctrns., Ltd., Annapolis, MD 21403 301-268-0122
† Wilcoxon Research, Rockville, MD 20850 301-330-8811

Power Supplies, DC Input, AC Output-4050

Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2150-2151
Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156-2157
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ... D•2160-2161,2164-2165
Belmont Instrument Corp., Billerica, MA 01821, 508-663-0212 ..... D•2176
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423, 716-538-4421 ..... D•2182
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Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2191
§ Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
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Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2220
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2230
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
American Monarch, Minneapolis, MN 55421 612-788-9161
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Cambridge Electronics Laboratories, Somerville, MA 02144 617-629-2805
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
§ Electroid Co., Div.of Valcor Engrg. Corp., Springfield, NJ 07081 201-467-8100
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
E-L Products Corp., Sub.of Astronics Co., E. Aurora, NY 14052 716-655-0800
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
Industrial Test Equipment Co., Inc., Port Washington, NY 11050 516-883-1700
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§ Laube Technology, Woodland Hills, CA 91367 818-703-1188
† LocTite Luminescent Sys., Inc., LocTite Corp., Lebanon, NH 03766 603-448-3444
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Modular Devices, Shirley, NY 11967 516-345-3100
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714 714-975-1222
Power Pac, Shelton, CT 06484 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
Versadata Inc., Bensenville, IL 60106 708-766-6755
Voltex, Amityville, NY 11701 516-842-2772
World Products Inc., Systems Devices Grp., Sonoma 95476 707-996-5201

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Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606
Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; .... D•1687
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
† CEC, Orange, CA 92665 714-637-2970
Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
International Power Sources, Inc., Ashland, MA 01721 508-881-7434
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
Skynet Electronics, Milpitas, CA 95035 408-945-6355
Switching Systems International, Placentia, CA 92670 714-996-0909
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Encapsulated-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510

† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1608
§ AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1616
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1641-1647
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1709
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1735-1736,1738
† Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... B•1066,1151, D•1740
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1745
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .. D•1763
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
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Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801-1803,1805
International Power Sources, Inc., Ashland, MA 01721, 508-881-7404 ..... D•1807-1809
† Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1822-1823, 1825
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
§ LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1451, D•1880,1883-1885
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901-1902,1904-1905
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1966-1968,1970-1971
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1978,1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038-2039
† Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049,2053
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
American Monarch, Minneapolis, MN 55421 612-788-9161
† Anadyne Power Supply Division, Santa Fe Springs, CA 90670-5216 213-921-9364
Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880 508-977-3000
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
† Babcock, Inc., Orange, CA 92667 714-633-3700
Babcock Display Products, Inc., A Subsidiary of Babcock, Inc., Anaheim, CA 92805 714-491-5100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Cambridge Electronics Laboratories, Somerville, MA 02144 617-629-2805
Cell-Con, Inc., Exton, PA 19341 215-363-8552
§ Centent Co., Santa Ana, CA 92707 714-979-6491
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
† D & B Power, Inc., Bayshore, NY 11706 516-586-5955
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
Engineering Design & Sls., Danville, VA 24541 804-792-6405
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Intronics, Inc., Canton, MA 02021 617-828-4992
† K & M Electronics, W. Springfield, MA 01089 413-781-1350
KNIGHTFIRE TECHNOLOGY, Coral Springs, FL 33071 305-344-3682
Magnetek Triad, Huntington, IN 46750 219-356-7100
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
Melcher, Inc., Ashland, MA 01721 800-828-9712
Mesa Power Systems, Escondido, CA 92029 619-489-8162
§ MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
Power Pac, Shelton, CT 06484 203-925-0123
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995
Power Trends, Inc., Batavia, IL 60510 708-406-0900
Precise Sensors, Inc., Monrovia, CA 91016 818-358-4578
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
† Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
Teco Corp., Winnisquam, NH 03289 603-524-1998
§ Toko America, Inc., Mt. Prospect., IL 60056 708-297-0070
Transformer Technologies, Inc., Mt. Vernon, NY 10550 914-668-1600
† Tri-Mag, Inc., Visalia, CA 93291 209-651-2222
Universal Voltronics Corp. Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§† Vicor Corp., Andover, MA 01810 508-470-2900
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
† Wasatch High Voltage, Salt Lake City, UT 84115 801-265-9561
Xylog Corp., Hackensack, NJ 07601 201-489-4040

Power Supplies, Enclosed-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
† Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580,1583
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1594-1595
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599,1603
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1610
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1621-1622, 1624
† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ... D•2160-2163,2165-2166
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1626

Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168,2170,2174-2175
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1646,1648
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... D•1653,1657
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; .... D•1680
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2187,2189
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... D•1699
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700,1705
† Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... A•2201-2202,2204
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
† EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 .... D•1714-1715
§† Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1718-1720,1722,1724,1726-1727
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728,2191
§ Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440 ..... D•1731
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1738
Enegren Electronics, Inc., Olathe, KS 66062, 913-782-4720 ..... A•2210
Energy, Ltd., Bladensburg, MD 20710, 301-699-1144 ..... D•2194
EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
§ Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1750
† Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758-1759,1761
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1763-1765,1768,1770-1771,1773
Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1776-1777
† HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1784-1785
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792-1793
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208-2209
International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1802,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1822-1823, 1825
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871,2210
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
† LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1899
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901,1904
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
§ Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
† Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1916-1917
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... D•2222
† Penn-Tran Corp.,Sub. of Spectrum Elctrns. Inc., Wingate, PA 16880, 814-355-1521 ..... D•1918
Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337 ..... D•1960-1961
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1964
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1980,1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1996-1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000,2002
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014-2019
† Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2020-2021
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2025
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028-2029,2031-2032
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ... D•2034-2035
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•2037
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038-2039,2041,2043,2045-2046
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2047,2049-2053,2055
Staco Energy Products Co., Dayton, OH 45403, 513-253-1191 ..... A•2413
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
† Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110-2111
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
§ UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2136-2139,2230-2231
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2141-2143
† Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145

Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
American Monarch, Minneapolis, MN 55421 612-788-9161
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
Astrosystems, Lake Success, NY 11042 516-328-1600
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Boschert, Inc., Computer Products/Boschert, Fremont, CA 94538 415-657-6700
† Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ California DC, Newbury Park, CA 91320 805-499-3621
† CEC, Orange, CA 92665 714-637-2970
Cell-Con, Inc., Exton, PA 19341 215-363-8552
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
Converter Concepts, Inc., Pardeeville, WI 53954 608-429-2144
Converter Power, Inc., Beverly, MA 01915 508-927-8158
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ..... (0271) 863781
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
DELTEC, San Diego, CA 92110 ..... 619-291-4211;800-854-2658
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Endicott Research Group, Endicott, NY 13760 607-754-9187
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Engineering Design & Sls., Danville, VA 24541 804-792-6405
Ericsson Components, Inc., Richardson, TX 75081 214-480-8300
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Falcon Electric, San Gabriel, CA 91776 818-287-6116
FDK America, Inc., Fuji Electrochemical Co. Ltd., San Jose, CA 95134 .. 408-432-8331
Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GC International Inc., Richardson, TX 75085-1198 214-234-3240
GENERAL POWER CORPORATION, Anaheim, CA 92815 714-956-9321
§ Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Intronics, Inc., Canton, MA 02021 617-828-4992

§James Electronics, Chicago, IL 60618 312-463-6500
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
§Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
†Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
†MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Magnetek Triad, Huntington, IN 46750 219-356-7100
†Magnetico Inc., Holtsville, NY 11742 516-654-1166
Matrix Corp., Raleigh, NC 27610 919-231-8000
†Melcher, Inc., Ashland, MA 01721 800-828-9712
†Mep Controls, Bordentown, NJ 08505 609-298-7300
Mesa Power Systems, Escondido, CA 92029 619-489-8162
MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
Modular Devices Inc., Torrance, CA 90503 213-542-8561
§Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
†North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
OPT Industries, Inc., Phillipsburg, NJ 08865 908-454-2600
†Orbit Instrument of Cal., Orbit Instrument Corp., Cypress, CA 90630 714-527-0561
†Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
§Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714 714-975-1222
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
†Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
†Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
§†Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
†Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995
§†Powertron Corp., Sparta, NJ 07871 201-579-5599
Precision Components, Inc., Addison, IL 60101 312-543-6400
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§Relay Specialties, Oakland, NJ 07436 201-337-1000
§S & H Inds., Hatfield, PA 19440 215-822-7211
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
§Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
†Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
Switching Systems International, Placentia, CA 92670 714-996-0909
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
†Teapo Electronic Corp. of America, Norcross, GA 30071 404-449-6220
†Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
†Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
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†Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Urban Electronics, Dover, MA 02030 617-329-4068
§U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§†Vicor Corp., Andover, MA 01810 508-470-2900
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Walker Power, Inc., Warner, NH 03278 603-456-3111
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
†Wasatch High Voltage, Salt Lake City, UT 84115 801-265-9561
Weir Electronics, Inc., Weir Elctrns., Ltd., Annapolis, MD 21403 301-268-0122
†Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

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Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
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Aibar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 .... D•2187
†Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... A•2201-2202,2204, D•1708
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1722,1726
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Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•2203
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§Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
†Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
†Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
§Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132
§U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
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†ACME-URDC, Inc., West Jordan, UT 84084 801-561-9385
American Monarch, Minneapolis, MN 55421 612-788-9161
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§†Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
†CEC, Orange, CA 92665 714-637-2970
Charles Inds. Ltd., Charles Center, Rolling Meadows, IL 60008 708-806-6300
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
§Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
†CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
§Elgin Electronics, Erie, PA 16509-3570 814-864-4921
†ETM Electromatic Inc, Newark, CA 94560 415-797-1100
GC International Inc., Richardson, TX 75085-1198 214-234-3240
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
§Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
Magnetek Triad, Huntington, IN 46750 219-356-7100
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
§Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Pac, Shelton, CT 06484 203-925-0123
§†Powertron Corp., Sparta, NJ 07871 201-579-5599
†Preferred Electronics, Inc., Westfield, MA 01086 ..... 413-568-2301;1-800-553-6374
§Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
†Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
§S & H Inds., Hatfield, PA 19440 215-822-7211
§Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
§Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
†Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Voltex, Amityville, NY 11701 516-842-2772
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940
Xylog Corp., Hackensack, NJ 07601 201-489-4040
§Zambre Co., Inc., Mountain View, CA 94043 415-968-9176
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, High Voltage-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
†Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
†Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168,2170-2171,2173,2175
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700-1705
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1709
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1722
†EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1738
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758-1761
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1762-1765,1767-1773
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1791
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792-1793
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830-1835
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896,1898
†NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1916
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1973
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1982-1983,1986
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1996
†Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005

† Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2020-2022
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2047-2055
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131-2132
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
A.L.E. Sys., Inc., Ashland, MA 01721 508-881-5252
American Monarch, Minneapolis, MN 55421 612-788-9161
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
† Condenser Products Corp., Brooksville, FL 34609 904-796-3561
Converter Power, Inc., Beverly, MA 01915 508-927-8158
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Dexter Scientific, Palatka, FL 32177 904-328-2450
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
Keltron Corp., High Voltage Power Supply Div., Waltham, MA 02154 617-894-8700
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
Nemeth Engineering Associates, Inc., Crestwood, KY 40014 502-241-1502
Phenix Technologies, Accident, MD 21520 301-746-8118
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
Standard Magnetic Corp., Anaheim, CA 92806 714-630-9751
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Trek, Incorporated, Medina, NY 14103-0231 716-798-3140
Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Power Supplies, Isolated-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2149-2150
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
† Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580,1583
† Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599,1603
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1607
§ AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;in Can.: 1-800-553-2448 ..... D•1616
Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2161,2166
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1626
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168-2171,2173-2175
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637-1639
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ... D•1008,1641-1647
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Colimer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1680,1683-1689
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2187,2189
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1694
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700,1704
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1709
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1724,1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728,2191
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1735-1736
Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... D•1740
§ EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1744-1745
† Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758
Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1776
HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1784-1785
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792
Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•2203
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204,2207
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208-2209
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
† Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810,1816-1818
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1822
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
† Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1894
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901,1904-1905
§ Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2220-2221
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... A•2316
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1964
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1966-1971,1973
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1996-1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2001
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2008-2009
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014-2015
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027
RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028-2031
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2034
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038-2039
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049
Switching Systems International, Placentia, CA 92670, 714-996-0909 ..... D•2056-2057
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 ..... D•1017
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
§ UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
§ Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Wilcoxon Research, Rockville, MD 20850, 301-330-8811 ..... B•1959
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2136,2138-2139,2230
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2141-2143
Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Acon, Inc., South Easton, MA 02375 508-230-8022
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
American Monarch, Minneapolis, MN 55421 612-788-9161
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
Astrosystems, Lake Success, NY 11042 516-328-1600
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
† Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944

Brown Applied Technology Inc., Scarborough,Ont, CANADA M1P 4S6 .. 416-298-0560
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Contact East, N. Andover, MA 01845 508-682-2000
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES .... (0271) 863781
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-0261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
U.S. Elco Inc., Santa Clara, CA 95054 .... 1-800-888-ELCO
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Electrostatics, San Diego, CA 92111 619-279-1414
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
GC International Inc., Richardson, TX 75085-1198 214-234-3240
GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE .... (0256) 810808
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
KNIGHTFIRE TECHNOLOGY, Coral Springs, FL 33071 305-344-3632
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
† Mep Controls, Bordentown, NJ 08505 609-298-7300
§ MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
Nedap N.V., Groenlo, HOLLAND 7140 AA .... +31-5440-71111
NJE Corporation, Dayton, NJ 03810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
† Oram High Voltage, Dayton, TX 77535 409-258-5553
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§ Power/Mate Corporation, San Diego, CA 92110 .... 800-843-8544;619-299-3800
Powermetics LTD., Leics, ENG LE11 1DX 0509 214153
§† Power Star, Inc., Irvine, CA 92713 .... 714-261-5377;800-854-9420
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
† Power Ten, Inc., Sunnyvale, CA 94086 408-733-5959
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
† PPM, Inc., Cleveland, OH 44139 216-349-2300
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ S & H Inds., Hatfield, PA 19440 215-822-7211
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 603-893-2330
§ Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-8355
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
Texmate, Inc., Vista, CA 92083-8397 619-598-9899
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
§ U.S. Elco,Inc., Santa Clara, CA 95054 .... 1-800-888-ELCO
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
§† Vicor Corp., Andover, MA 01810 508-470-2900
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Walker Power, Inc., Warner, NH 03278 603-456-3111
Wall Industries, Exeter, NH 03833 .... 603-778-2300;800-321-WALL
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xylog Corp., Hackensack, NJ 07601 201-489-4040
§ Zambre Co., Inc., Mountain View, CA 94043 415-968-9176
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Lab (Incl. Metered Units)-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 .... D•1507-1510
Acopian Technical Company, Easton, PA 18044, 215-258-5441 .... D•1549
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 .... D•2156
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 .... D•1595
Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 .... D•1599
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 .... D•1626
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 .... D•2168-2174
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 .... D•1631
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 .... D•2183
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 .... D•1700-1701
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 .... D•1712-1713
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 .... D•1719-1720,1726-1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 .... D•1729
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 .... D•1732-1733
Energy, Ltd., Bladensburg, MD 20710, 301-699-1144 .... D•2194
§ Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 .... D•1743
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 .... D•1752-1753
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .... D•1763-1765
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 .... D•2075
§ Hauman, Inc., San Jose, CA 95131, 408-434-0888 .... D•1782
Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 .... D•1786-1787
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 .... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 .... D•1792
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 .... D•2207
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 .... D•2208-2209
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 .... D•1832,1834-1835
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 .... D•1837-1839
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 .... D•2211
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 .... D•1288
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 .... D•1891
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 .... D•1121
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 .... D•1896-1897
Northern Ampower Corp., Novi, MI 48374, 313-349-4660 .... D•1914
† Oram High Voltage, Dayton, TX 77535, 409-258-5553 .... D•1917
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 .... D•2216,2218,2220
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1966,1969
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 .... D•1979-1986
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 .... D•2027
Shindengen America Inc., Westlake VL, CA 91361, 800-634-3654 .... D•2034
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 .... D•2038-2039
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 .... D•2048-2049,2051,2053-2054
§ Staco Energy Products Co., Dayton, OH 45403, 513-253-1191 .... A•2413
Technon Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1018-1019
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 .... D•1378,2075
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 .... D•2077
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 .... D•2108-2109
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 .... D•2131
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 .... D•2027
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 .... D•1337
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 .... D•2136,2139,2230
Abacus Controls Inc. Somerville, NJ 08876 908-526-6010
A.L.E. Sys., Inc., Ashland, MA 01721 508-881-5252
Alfa Electronics, Inc. Princeton, NJ 08543-8069 609-275-0220
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
† Avtel Div., Unitron Inc., Dallas, TX 75236 214-340-8600
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Burleigh Instruments, Fishers, NY 14453 716-924-9355
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
Cal-Scope, Excelitron Inc., Sunnyvale, CA 94086 .... 408-730-4573; 1-800-828-3547
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Collmer Semiconductor, Inc., Dallas, TX 75244 .... 800-527-0251;214-233-1589
§ Contact East, N. Andover, MA 01845 508-682-2000
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES .... (0271) 863781
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
Electric Device, Canfield, OH 44406 216-533-1111
Elgar/Intepro Systems, San Diego, CA 92121 .... 619-458-0261;1-800-733-5427
Elma Engineering, Palo Alto, CA 94303 415-494-7303
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174 904-677-7070
§ Gates, Geo. W., & Co., Inc., Franklin Sq., NY 11010 516-352-2904
GENERAL POWER CORPORATION, Anaheim, CA 92815 714-956-9321
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE .... (0256) 810808
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Goldstar Precision Co. Ltd., Lucky Goldstar, Cerritos, CA 90701 213-404-0101
Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Heath Co., St. Joseph, MI 49085 616-982-3200
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525

Hoffman Engineering Corp., Stamford, CT 06902 203-325-8933
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
International Power Sources, Inc., Ashland, MA 01721 508-881-7434
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
§ Laser Diode, Inc., Morgan Crucible, New Brunswick, NJ 08901 201-249-7000
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
§ LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
Omega Engineering, Stamford, CT 06907 800-826-6342
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
§ Plastic Capacitors, Inc., Chicago, IL 60639 312-489-2229
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995
† Power Ten, Inc., Sunnyvale, CA 94086 408-738-5959
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
Prema Precision Electronics, Inc., Montclair, CA 91763 714-621-7292
§† PTS Corporation, Bloomington, IN 47401 812-824-9331
Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
† Ratelco, Power Systems, Seattle, WA 98109-5589 206-624-7770
S & H Inds., Hatfield, PA 19440 215-822-7211
Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tri-Mag, Inc., Visalia, CA 93291 209-651-2222
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
Voltex, Amityville, NY 11701 516-842-2772
Weir Electronics, Inc., Weir Elctrns., Ltd., Annapolis, MD 21403 301-268-0122
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
Xylog Corp., Hackensack, NJ 07601 201-489-4040

Power Supplies, Laser-4000

† **Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819** ..... D•1605
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700-1701,1703
† **EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626** ..... D•1732-1735,1737
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830,1834-1835
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132-2133
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
Converter Power, Inc., Beverly, MA 01915 508-927-8158
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351

Power Supplies, Laser Diodes-4000

† **Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819** ..... D•1605
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1703
† **EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626** ..... D•1732-1733,1735
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
† **Modular Devices, Shirley, NY 11967, 516-345-3100** ..... D•1906
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Optima Precision, Inc., West Linn, OR 97068 ..... 800-544-4118;503-638-2525
† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995
Precision Electro-Optics, Inc., Chatham, NJ 07928 201-635-8811
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220

Power Supplies, Linear-4000

§ **AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225** ..... D•1507-1510
† **Abbott Electronics, Los Angeles, CA 90034, 213-202-8820** ..... D•1523
§ **Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630** ..... D•1511
§ **Acme Electric Corporation, Cuba, NY 14727, 716-968-2400** ..... D•1544-1547
† **Acopian Technical Company, Easton, PA 18044, 215-258-5441** ..... D•1549
§ **Adtech Power Inc., Anaheim, CA 92806, 714-634-9211** ..... D•1580-1581
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† **Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500** ..... D•1588-1593
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... A•2168, D•1594, 1597
† **Arnold Magnetics, Camarillo, CA 93012, 805-484-4221** ..... D•1599
§ **Astec America, Oceanside, CA 92054, 619-439-4200** ..... D•1606-1608,1613
§ **Ault, Incorporated, Minneapolis, MN 55428, 612-493-1900** ..... D•1618-1619
§ **B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448** ..... D•1626
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
§ **Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660** ..... D•2168-2169, 2172
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ **Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911** ..... D•1008,1646-1648
† **California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244** ..... D•2181
CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423, 716-538-4421 ..... A•2189, D•2182
§ **Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565;** ..... D•1681-1682,1686-1687,1689
§ **Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666** ..... D•1694
§ **CUI Stack Inc., Beaverton, OR 97005, 503-643-4899** ..... D•1695
† **Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328** ..... D•1697
† **D & B Power, Inc., Bayshore, NY 11706, 516-586-5955** ..... D•1698-1699
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... A•2201-2204, D•1708
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ..... D•1712-1713
§† **Electromech, Inc., Kearny, NJ 07032, 201-997-0950** ..... D•1717
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1719-1720,1726-1727
§ **Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440** ..... D•1731
† **EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626** ..... D•1732
§ **Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410** ..... D•1743
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755-1756
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758,1760
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1763
§ **Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970** ..... D•1777
§ **Hauman, Inc., San Jose, CA 95131, 408-434-0888** ..... D•1782
Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 ..... D•1786
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204,2207
§ **International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900** ..... D•1779-1781
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1808-1809
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1823-1824
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830-1831
§ **Keithley Instrs., Cleveland, OH 44139, 800-552-1115** ..... D•1275
§ **Kepco, Inc., Flushing, NY 11352, 718-461-7000** ..... D•1837-1839
† **Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784** ..... D•1873,2211
† **Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200** ..... D•1877
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1880,1882,1884-1885
Magnum Opus Custom Elctrn. Engrg., iselin, NJ 08830, 908-283-4925 ..... D•1121
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1899
† **Modular Devices, Shirley, NY 11967, 516-345-3100** ..... D•1901
§ **Multi Products International, West Paterson, NJ 07424, 201-890-1344** ..... D•1913
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... D•1914
† **Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433** ..... D•2218,2220-2221
Penn-Tran Corp.,Sub. of Spectrum Elctrns. Inc., Wingate, PA 16880, 814-355-1521 ..... D•1918
† **Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337** ..... D•1960
† **Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885** ..... D•1966-1968
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1976
§ **Power Designs, Inc., Westbury, NY 11590, 516-333-6200** ..... D•1978,1980,1985-1986
§ **Power-One, Inc., Camarillo, CA 93012, 805-987-8741** ..... D•1988-1989,1996-1997
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000,2002
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2008
† **Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959** ..... D•2013
§ **Ritz Electronics/Reico, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616** ..... D•2027

† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•2037
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038-2039
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
† Techron Div., Crown Intl., Inc., Elkhart, IN 46517, 219-294-8300 .... D•1017-1019
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
§ Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 .... D•2141
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
† Advanced Analog, Intech, Santa Clara, CA 95050 408-988-2702
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Advanced High Voltage Co. Inc., Tucson, AZ 85751 ..... 818-997-7222;602-721-2424
American Monarch, Minneapolis, MN 55421 612-788-9161
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
§ Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Charles Inds. Ltd., Charles Center, Rolling Meadows, IL 60008 708-806-6300
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
§ Contact East, N. Andover, MA 01845 508-682-2000
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ..... (0271) 863781
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
Electric Device, Canfield, OH 44406 216-533-1111
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Electrostatics, San Diego, CA 92111 619-279-1414
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Encore Electronics, Inc., Saratoga Springs, NY 12866 518-584-5354
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
Energy Systems, Vancouver, WA 98682 206-896-8310
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
§ Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
§ James Electronics, Chicago, IL 60618 312-463-6500
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
§ Martel Electronics, Salem, NH 03079 603-893-0886
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Mesa Power Systems, Escondido, CA 92029 619-489-8162
MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
MPC, Div. of Consulting Systems, Danville, NH 03819 603-642-5913
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
Oram High Voltage, Dayton, TX 77535 409-258-5553
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
† Precision Power Systems, Longmont, CO 80501 303-443-6250
† Preferred Electronics, Inc., Westfield, MA 01086 ..... 413-568-2301;1-800-553-6374
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
§ Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ S & H Inds., Hatfield, PA 19440 215-822-7211
§ Sanyo Semiconductor Corp., Allendale, NJ 07401 201-825-8080
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 603-893-2330
Seven Mountains Sci. Inc., Boalsburg, PA 16827 814-466-6559
Shindengen America Inc., Westlake Vl., CA 91361 800-634-3654
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§ Stancor, White-Rodgers, Logansport, IN 46947 219-722-2244
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Teco Corp., Winnisquam, NH 03289 603-524-1998
Texmate, Inc., Vista, CA 92083-8397 619-598-9899
Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Transformer Technologies, Inc., Mt. Vernon, NY 10550 914-668-1600
UPSystems, Inc., Subsidiary of Chloride Power Elec., Caledonia, NY 14423 716-538-4421
† Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Voltex, Amityville, NY 11701 516-842-2772
Walker Power, Inc., Warner, NH 03278 603-456-3111
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Linear, Medical-4000

§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1608,1613
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168,2172
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1680-1682
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1709
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1976
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1985-1986
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132-2133
American Monarch, Minneapolis, MN 55421 612-788-9161
§ Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
D & B Power, Inc., Bayshore, NY 11706 516-586-5955
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Power Pac, Shelton, CT 06484 203-925-0123
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402 805-528-5858
Sorensen Company, Chicago, IL 60630 ..... 312-775-0843;1-800-525-2024
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Logic Level (Incl. Microprocessor) — See Power Supplies, AC Input, Up to 30 VDC Output (Vol. D)

Power Supplies, Microwave — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Power Supplies, Multiple Output-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
† Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580-1583
Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ... D•1594,1596-1597

† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1610,1613
§ Ault, Incorporated, Minneapolis, MN 55428, 612-493-1900 ..... D•1618-1619
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1620-1621
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1626
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168,2173
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ... D•1008,1641-1648
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... D•1653-1657
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1680-1689
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2185,2187,2189
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700-1702,1705
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708-1710
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
† EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1715
§† Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1722,1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1726
§ Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440 ..... D•1731
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1735,1737
EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
§ Epsco Incorporated, Itasca, IL 60143-1120, 708-250-0410 ..... D•1743
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ..... D•1744,1746,1748
ETI Systems, Polaris Indl. Entprs., Oceanside, CA 92054, 619-757-7770 ..... A•2040
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1751
† Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755-1757
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1763-1764
§ Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1777
§ Hauman, Inc., San Jose, CA 95131, 408-434-0888 ..... D•1782-1783
† HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1784-1785
Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 ..... D•1786-1787
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792-1793
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... D•1797
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
§ International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1801,1803-1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1806
† Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810,1816-1818
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... A•2241, D•1822-1824
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830,1832
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1288
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
§ LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1880,1882,1884-1885
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1894
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896,1898
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901-1902,1904-1905
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
§ Multi Products International, West Paterson, NJ 07424, 201-890-1344 ... D•1913
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
† Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1917
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2218
Pico Electronics, Inc., Mt. Vernon, NY 10552, 914-699-5514;800-431-1064 ..... D•1919
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1965
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1966-1967,1969-1971,1973
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1978-1981,1985-1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ... D•1988-1996,1998-1999
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000-2002
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2007-2011
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
§ Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014-2016,2018-2019
† Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 ..... D•2020-2022
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2024-2025
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028-2033
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ... D•2034-2035
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038-2039,2041-2044,2046
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049
Switching Systems International, Placentia, CA 92670, 714-996-0909 ..... D•2056-2057
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071-2073
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110-2111
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
§ UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131-2132
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
§ Valor Electronics, San Diego, CA 92121-2245, 619-458-1471 ..... D•2134
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2136-2137,2139
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2141-2143
† Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145

Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Acon, Inc., South Easton, MA 02375 508-230-8022
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Babcock, Inc., Orange, CA 92667 714-633-3700
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
† B C Systems, Inc., Setauket, NY 11790 516-751-9370
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Boschert, Inc., Computer Products/Boschert, Fremont, CA 94538 415-657-6700
† Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ California DC, Newbury Park, CA 91320 805-499-3621
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
† CEC, Orange, CA 92665 714-637-2970
† Christie Électric Corp., Gardena, CA 90248 213-715-1402
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Conver Corp., Sunnyvale, CA 94086 408-739-9111
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ..... (0271) 863781
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
† D & B Power, Inc., Bayshore, NY 11706 516-586-5955
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Electrostatics, San Diego, CA 92111 619-279-1414

Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
Endicott Research Group, Endicott, NY 13760 607-754-9187
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Engineering Design & Sls., Danville, VA 24541 804-792-6405
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
§ Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Intronics, Inc., Canton, MA 02021 617-828-4992
§ James Electronics, Chicago, IL 60618 312-463-6500
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
KNIGHTFIRE TECHNOLOGY, Coral Springs, FL 33071 ..... 305 344 3692
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Mesa Power Systems, Escondido, CA 92029 619-489-8162
† Micro Power Intl., Inc., San Diego, CA 92126 ..... 619-271-0831;619-271-5942
§ MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
Modular Devices Inc., Torrance, CA 90503 213-542-8561
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
† Orbit Instrument of Cal., Orbit Instrument Corp., Cypress, CA 90630 714-527-0561
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Power Conversion Products, Crystal Lake, IL 60014 815-459-9100
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
† Power Functions Engineering, Garland, TX 75042 214-278-0996
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
§† Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
Precision Components, inc., Addison, IL 60101 312-543-6400
† Preferred Electronics, Inc., Westfield, MA 01086 ..... 413-568-2301;1-800-553-6374
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ S & H Inds., Hatfield, PA 19440 215-822-7211
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
Seven Mountains Sci. Inc., Boalsburg, PA 16827 814-466-6559
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
§ Topward Instruments, Div. of Hauman, Inc., San Jose, CA 95131 408-434-0888
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
Transformer Technologies, Inc., Mt. Vernon, NY 10550 914-668-1600
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Urban Electronics, Dover, MA 02030 617-329-4068
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§† Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
§† Vicor Corp., Andover, MA 01810 508-470-2900
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Walker Power, Inc., Warner, NH 03278 603-456-3111
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wasatch High Voltage, Salt Lake City, UT 84115 801-265-9561
Weir Electronics, Inc., Weir Elctrns., Ltd., Annapolis, MD 21403 301-268-0122
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Open Frame-4000

Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580-1582
Alhar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1620-1621
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... D•1653,1657
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... D•1659
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1680-1689
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700
† Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... A•2201-2202,2204, D•1708
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1714
§† Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
§ EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1747-1748
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1750
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1763,1770-1771,1773
† High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1792-1793
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1809
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 .. C•1451, D•1883
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1898-1899
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974-1976
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1990,1995-1996,1999
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000,2002
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 .... D•2008,2010-2011
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ..... D•2035
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038,2043-2046
Switching Systems International, Placentia, CA 92670, 714-996-0909 ..... D•2056-2057
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071-2073
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107

† **Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222** ..... **D•2111-2112**
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... **D•2131**
§ **U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984** ..... **D•2027**
Voltex, Amityville, NY 11701, 516-842-2772 ..... **D•2135**
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... **D•2137,2139**
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... **D•2141-2143**
† **Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733** ..... **D•2145**
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
† American Electronics, Fullerton, CA 92631 714-871-3020
† Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Astrosystems, Lake Success, NY 11042 516-328-1600
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
Bertsch U.S., Vista, CA 92083 619-727-7420
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Boschert, Inc., Computer Products/Boschert, Fremont, CA 94538 415-657-6700
† Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ California DC, Newbury Park, CA 91320 805-499-3621
† CEC, Orange, CA 92665 714-637-2970
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ Conver Corp., Sunnyvale, CA 94086 408-739-9111
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ..... (0271) 863781
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
D & B Power, Inc., Bayshore, NY 11706 516-586-5955
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
Electrostatics, San Diego, CA 92111 619-279-1414
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
§ Falcon Electric, San Gabriel, CA 91776 818-287-6116
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
§ Golden Pacific Electronics, Inc, Placentia, CA 92670 714-993-6970
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Industrial Test Equipment Co., Inc., Port Washington, NY 11050 516-883-1700
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
International Converter Corp., Colorado Springs, CO 80915 719-570-6900
International Instrumentation, Inc., Westlake Vlg, CA 91361 805-495-7673
ITT PowerSystems Corp., Galion, OH 44833-0688 419-468-5200
§ James Electronics, Chicago, IL 60618 312-463-6500
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Magnetek Triad, Huntington, IN 46750 219-356-7100
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Modular Devices Inc., Torrance, CA 90503 213-542-8561
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
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† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
† Oram High Voltage, Dayton, TX 77535 409-258-5553
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
† Precision Power Systems, Longmont, CO 80501 303-443-6250
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
§ Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
† Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402 805-528-5858
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
Resonant Power Technology, Santa Clara, CA 95054 408-982-0200
RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
§ S & H Inds., Hatfield, PA 19440 215-822-7211
Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
† Teapo Electronic Corp. of America, Norcross, GA 30071 404-449-6220
Technipower, A Penril Co., Danbury, CT 06813 203-746-7001
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Teco Corp., Winnisquam, NH 03289 603-524-1998
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
Transformer Technologies, Inc., Mt. Vernon, NY 10550 914-668-1600
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Valor Electronics, San Diego, CA 92121-2245 619-458-1471
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Walker Power, Inc., Warner, NH 03278 603-456-3111
Weir Electronics, Inc., Weir Elctrns., Ltd., Annapolis, MD 21403 301-268-0122
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
Xylog Corp., Hackensack, NJ 07601 201-489-4040
§ Zambre Co., Inc., Mountain View, CA 94043 415-968-9176
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

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Power Supplies, Plug In-4000

§ **AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225** ..... **D•1507-1510**
† **Acopian Technical Company, Easton, PA 18044, 215-258-5441** ..... **D•1549**
A.J.'s Power Source, Land-O-Lakes, FL 34639, 800-933-7725 ..... **D•1584**
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... **D•1590**
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... **D•1595-1597**
† **Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819** ..... **D•1605**
§ **Ault, Incorporated, Minneapolis, MN 55428, 612-493-1900** ..... **D•1619**
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... **D•1621,1624**
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... **D•1631**
CCP/Technical Devices, Dayton, OH 45414, 513-890-7881 ..... **D•1649**
Collmer Semiconductor, Inc., Dallas, TX 75244, 800-527-0251;214-233-1589 ..... **D•1659**
Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... **D•2185,2187,2189**
§ **CUI Stack Inc., Beaverton, OR 97005, 503-643-4899** ..... **D•1695**
† **Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328** ... **D•1697**
D & B Power, Inc., Bayshore, NY 11706, 516-586-5955 ..... **D•1698-1699**
† **Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000** ..... **D•1700**
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... **A•2201,2203-2204, D•1708,1710**
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... **D•1712-1713**
§† **Electromech, Inc., Kearny, NJ 07032, 201-997-0950** ..... **D•1717**
§ **Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440** ..... **D•1731**
† **EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626** ... **D•1732-1733**
EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... **D•1742**
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... **D•1746-1747**
EWC, Inc., Englishtown, NJ 07726, 908-446-3110 ..... **A•2224,2226**
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... **D•1755-1757**
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... **D•1760**
§ **Globtek, Inc., N. Bergen, NJ 07047, 201-861-0246** ..... **D•1775**
§ **Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970** ..... **D•1776-1777**
International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... **D•1779-1781**
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... **D•1807-1809**
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... **A•2241, D•1822-1825**
§ **Kepco, Inc., Flushing, NY 11352, 718-461-7000** ..... **D•1837-1839**
§ **LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600** ..... **D•1878-1882,1884-1885**
† **Modular Devices, Shirley, NY 11967, 516-345-3100** ..... **D•1901,1904**
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... **D•1911**
§ **Multi Products International, West Paterson, NJ 07424, 201-890-1344** ... **D•1913**
† **NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900** ..... **D•1299**
§ **Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566** ..... **D•1014**
† **Optima Electronic Packaging Systems, Tucker, GA 30084-5088, 404-496-4000** ..... **C•1064**
§ **Pillar Industries, Inc., Duarte, CA 91010, 818-358-1337** ..... **D•1960-1961**
† **Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885** ..... **D•1970,1973**
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... **D•1974-1976**
† **Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000** .... **D•2004-2005**
§ **Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229** ..... **D•2224**
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... **D•2014**
§ **Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616** ..... **D•2027**
RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... **D•2028-2030**
† **Shogyo International Corp., Great Neck, NY 11021, 516-466-0911** ..... **A•2391, D•2037**

Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... **D•2049**
§ **Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790** ..... **D•2058-2068**
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... **D•2107**
§ **UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442** ..... **D•2117**
§ **U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984** ..... **D•2027**
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... **D•2139,2230**
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Acon, Inc., South Easton, MA 02375 508-230-8022
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
Anaheim Automation, Anaheim, CA 92801 714-992-6990
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
Coil Con, Inc., Exton, PA 19341 215-363-8552
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
§ CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
† Cuesta Systems Corporation, San Luis Obispo, CA 93401 ..... 805-541-4160; 800-332-3440
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Diversified Technlg., Ridgeland, MS 39157 601-856-4121
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§ Dynatech Computer Power, Inc., Scotts Valley, CA 95066 408-438-5760
U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Electroid Co., Div.of Valcor Engrg. Corp., Springfield, NJ 07081 201-467-8100
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Engineering Design & Sls., Danville, VA 24541 804-792-6405
Ensign Corp., Burr Ridge, IL 60521 708-325-9343
L.H. Frost Limited, Oakville,Ont., CANADA L6H 2R4 416-844-6681
GC International Inc., Richardson, TX 75085-1198 214-234-3240
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
House of Batteries, Costa Mesa, CA 92627 ..... 714-642-8222;800-432-3385
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
International Converter Corp., Colorado Springs, CO 80915 719-570-6900
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 516-937-3475
§ James Electronics, Chicago, IL 60618 312-463-6500
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091 708-251-3600
§† JMK, Inc., Amherst, NH 03031 603-886-4100
KNIGHTFIRE TECHNOLOGY, Coral Springs, FL 33071 305-344-3682
§ Laube Technology, Woodland Hills, CA 91367 818-703-1188
† Melcher, Inc., Ashland, MA 01721 800-828-9712
Mesa Power Systems, Escondido, CA 92029 619-489-8162
§ MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
Omega Engineering, Stamford, CT 06907 800-826-6342
Peter Parts & Assocs., Webster, NY 14580 716-265-2540
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
Power Conversion Products, Crystal Lake, IL 60014 815-459-9100
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
Power-One, Inc., Camarillo, CA 93012 805-987-8741
Power Pac, Shelton, CT 06484 203-925-0123
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
Precision Components, Inc., Addison, IL 60101 312-543-6400
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
Reliability, Incorporated, Houston, TX 77218 713-492-0550
R.F. Electronics, Inc., Irvine, CA 92714-5517 714-263-0661
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
Schroff Incorporated, Warwick, RI 02886 401-732-3770
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§† Skyway Magnetics, Warner Springs, CA 92086 619-782-3342
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Staco Transpower, Components Corp. of America, Mt. Carmel, IL 62863 618-262-5555
§ Stancor, White-Rodgers, Logansport, IN 46947 219-722-2244
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Toroid Corp. of Maryland, Salisbury, MD 21801 301-860-0300
Transmagnetics, Farmingdale, NY 11735 516-293-3100
§ Tripp-Lite, Chicago, IL 60610-4188 312-329-1777
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Precision, Low Noise-4000

§ **Acme Electric Corporation, Cuba, NY 14727, 716-968-2400** ..... **D•1544-1547**
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... **D•1579**
† **Arnold Magnetics, Camarillo, CA 93012, 805-484-4221** ..... **D•1599**
† **Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819** ..... **D•1605**
§ **Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660** ..... **D•2168,2170-2171,2174**
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... **D•1631**
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... **D•1641**
† **California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244** ..... **D•2181**
† **CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422** ..... **D•1650-1651**
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... **D•1656**
§ **Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700** ..... **D•1663**
† **Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328** ... **D•1697**
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... **D•1709**
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... **D•1712-1713**
† **EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626** ... **D•1732-1733**
§ **Hauman, Inc., San Jose, CA 95131, 408-434-0888** ..... **D•1782**
Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 ..... **D•1786-1787**
Interelectronics Corp., Congers, NY 10920, 914-EL8-8000 ..... **D•1797**
§ **International Power Devices Inc., Brighton, MA 02135, 617-782-3331** ..... **D•1799,1805**
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... **D•1833,1835**
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... **D•1873,2211**
† **Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200** ..... **D•1877**
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... **D•1896**
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... **D•1914**
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... **D•1970**
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... **D•1974-1976**
§ **Power Designs, Inc., Westbury, NY 11590, 516-333-6200** ..... **D•1978-1984,1986**
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... **D•1988,1995-1996**
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... **D•2007-2008**
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... **D•2024-2025**
RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... **D•2028,2032**
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... **D•2049**
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... **D•2072**
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... **D•2131-2132**
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... **D•2139**
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
† Avtel Div., Unitron Inc., Dallas, TX 75238 214-340-8600
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Energy Systems, Vancouver, WA 98682 206-896-8310
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
Intronics, Inc., Canton, MA 02021 617-828-4992
§ Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Melcher, Inc., Ashland, MA 01721 800-828-9712
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
Power Pac, Shelton, CT 06484 203-925-0123
† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995

Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402 805-528-5858
Skynet Electronics, Milpitas, CA 95035 408-945-6355
Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
Valor Electronics, San Diego, CA 92121-2245 619-458-1471
Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Printed Circuit Board Mounting-4000

Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1607,1610
AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1616
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1621
Bel Fuse, Jersey City, NJ 07302, 201-432-0463 ..... D•1629-1630
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1647-1648
CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1723
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1736,1738
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ... D•1807
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 .. C•1451, D•1883
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901-1902,1904
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... A•2316
Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1966-1968,1973
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2029-2030
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
Intronics, Inc., Canton, MA 02021 617-828-4992
† LocTite Luminescent Sys., Inc., LocTite Corp., Lebanon, NH 03766 603-448-3444
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Power Pac, Shelton, CT 06484 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
Power Trends, Inc., Batavia, IL 60510 708-406-0900
Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§† Vicor Corp., Andover, MA 01810 508-470-2900
Wall Industries, Exeter, NH 03833 ..... 603-778-2300,800-321-WALL
Wilmore Electronics Co., Inc., Hillsborough, NC 27278 919-732-9351
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Printed Circuit Card-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1590
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1607,1610
§ AT&T Microelectronics, Allentown, PA 18103, 1-800-372-2447;In Can.: 1-800-553-2448 ..... D•1615-1616
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1621
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1648
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1723
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
† Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... B•1066,1151, D•1740
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1744-1746
EWC, Inc., Englishtown, NJ 07726, 908-446-3110 ..... A•2224
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .. D•1763
† High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1801-1803,1805
International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1822
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901-1902,1904
MPC, Div. of Consulting Systems, Danville, NH 03819, 603-642-5913 .... D•1911
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1736
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 .... D•1966,1970-1971
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2024-2025
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ... D•2034-2035
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ... D•2038
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056, 708-803-6100 ..... D•2069
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•2108-2109
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2137,2139,2230
AES Corp., Peabody, MA 01960 508-535-7310
Anaheim Automation, Anaheim, CA 92801 714-992-6990
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
† CEC Electronics Corp., Hauppauge, NY 11788 516-582-4422
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033 ..... 805-486-4565;
Control Technology, Inc., Oklahoma City, OK 73116 405-840-3163
§ Conver Corp., Sunnyvale, CA 94086 408-739-9111
CPS, Inc., Fremont, CA 94538-6517 415-657-6363
D & B Power, Inc., Bayshore, NY 11706 516-586-5955
† Delta Products Corporation, Fremont, CA 94538 415-770-0660
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
§ E & L Instruments, Interplex Electronics, Inc., New Haven, CT 06512 800-368-0880
U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§† Electromech, Inc., Kearny, NJ 07032 201-997-0950
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Electrostatics, San Diego, CA 92111 619-279-1414
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§† FDK America, Inc., Fuji Electrochemical Co., Ltd, San Jose, CA 95134 .. 408-432-8331
Golden Pacific Electronics, Inc, Placentia, CA 92670 714-993-6970
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
Kikusui International Corp., Torrance, CA 90503 ..... 213-371-4662;800-545-8784
KNIGHTFIRE TECHNOLOGY, Coral Springs, FL 33071 305-344-3682
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
§ MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... + 31-5440-71111
† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Pac, Shelton, CT 06484 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
§† Powertron Corp., Sparta, NJ 07871 201-579-5599
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
† RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 .. 603-893-2330
Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355

§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
Transmagnetics, Farmingdale, NY 11735 516-293-3100
U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Valor Electronics, San Diego, CA 92121-2245 619-458-1471
§† Vicor Corp., Andover, MA 01810 508-470-2900
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Voltex, Amityville, NY 11701 516-842-2772
Walker Power, Inc., Warner, NH 03278 603-456-3111
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Westcor Corporation, Los Gatos, CA 95032 408-395-7050
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Programmable-4000

AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
Advanced High Voltage Co. Inc., Tucson, AZ 85751, 818-997-7222;602-721-2424 ..... D•1579
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168,2170,2173-2175
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
† California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244 ..... D•2181
CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1684-1685
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700,1702
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
† Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1720-1722,1724,1726-1727
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728-1729
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
† Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1753
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758-1761
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 ..... D•1763,1765-1770
§ Hauman, Inc., San Jose, CA 95131, 408-434-0888 ..... D•1783
Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 ..... D•1786
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788-1790
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830,1832-1835
§ Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1896-1897
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901,1906
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Northern Ampower Corp., Novi, MI 48374, 313-349-4860 ..... D•1914
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
† Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1917
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216,2218,2220-2221
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1978-1981,1985-1986
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1996
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038-2040,2043
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049-2050
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1378,2075
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•2108-2109
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131-2132
Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
AES Corp., Peabody, MA 01960 508-535-7310
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Babcock, Inc., Orange, CA 92667 714-633-3700
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Contact East, N. Andover, MA 01845 508-682-2000
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
Electric Device, Canfield, OH 44406 216-533-1111
Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
Energy Systems, Vancouver, WA 98682 206-896-8310
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Gossen/Texmate, Vista, CA 92083-8397 619-598-9899
Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
ITT PowerSystems Corp., Galion, OH 44833-0688 419-468-5200
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Mep Controls, Bordentown, NJ 08505 609-298-7300
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
† NH Research, Irvine, CA 92714 714-474-3900
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
Power Switch Corporation, Lodi, NJ 07644 201-478-5788
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
Powertron Corp., Sparta, NJ 07871 201-579-5599
§ Pulse Instruments Co., Torrance, CA 90502 213-515-5330
Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Thern EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§† Vicor Corp., Andover, MA 01810 508-470-2900
Voltex, Amityville, NY 11701 516-842-2772
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Proportional (to Input) Output-4000

§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1704
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ..... D•1732-1733,1736
† Endicott Research Group, Endicott, NY 13760, 607-754-9187 ..... B•1066,1151
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758,1760

Hewlett-Packard Co., Cupertino, CA 95014, 800-752-0900 ..... D•1786
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ..... D•1788
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735 516-293-4100
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Halmar Electronics, Inc., High Voltage Engrg. Corp., Columbus, OH 43204 614-275-0530
§ Hauman, Inc., San Jose, CA 95131 408-434-0888
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Jerome Industries Corp., Elizabeth, NJ 07201 908-353-5700
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... + 31-5440-71111
† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586

Power Supplies, Redundant-4000

§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580,1583
A.J.'s Power Source, Land-O-Lakes, FL 34639, 800-933-7725 ..... D•1584
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1607
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1784-1785
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ..... D•1826
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1898
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2018-2019
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028-2030
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038,2043
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
§ Beaver Labs, Kingston, MA 02364 617-585-5666
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ Cal-Tek Engineering, Kingston, MA 02364 617-585-5666
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
§ International Power DC Power Supplies, Inc., Camarillo, CA 93010 805-987-7900
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Modular Devices Inc., Torrance, CA 90503 213-542-8561
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
Power Pac, Shelton, CT 06484 203-925-0123
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Urban Electronics, Dover, MA 02030 617-329-4068
Valor Electronics, San Diego, CA 92121-2245 619-458-1471
§† Vicor Corp., Andover, MA 01810 508-470-2900
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Voltex, Amityville, NY 11701 516-842-2772
Walker Power, Inc., Warner, NH 03278 603-456-3111
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Standby (Emergency)-4000

† Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2149
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1608,1610
§ Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2187,2189
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2191
§† Gates Energy Products, Inc., Gainesville, FL 32602, 904-462-3911 ..... D•1458-1460,1462-1465
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208-2209
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... D•1825
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•2108-2109
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
AES Corp., Peabody, MA 01960 508-535-7310
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
†# Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
† American Monarch, Minneapolis, MN 55421 612-788-9161
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
§† Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
§ Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Beaver Labs, Kingston, MA 02364 617-585-5666
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
§ Cal-Tek Engineering, Kingston, MA 02364 617-585-5666
§ C&D Charter Power Systems, Plymouth Meeting, PA 19462 215-828-9000
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
§ Clary Corp., Precision Instrs. Div., San Gabriel, CA 91776 818-287-6111
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Technology, Inc., Oklahoma City, OK 73116 405-840-3163
CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
† Cuesta Systems Corporation, San Luis Obispo, CA 93401 ..... 805-541-4160; 800-332-3440
† DELTEC, San Diego, CA 92110 ..... 619-291-4211;800-854-2658
§ Dynatech Computer Power, Inc., Scotts Valley, CA 95066 408-438-5760
EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ E.P.D./General Power Corp., Anaheim, CA 92805-8508 ..... 714-520-0881; 1-800-343-1813
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
§ Falcon Electric, San Gabriel, CA 91776 818-287-6116
† FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
† Hitran Corporation, Flemington, NJ 08822-9943 908-782-5525
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716 516-563-3388
ITT PowerSystems Corp., Galion, OH 44833-0688 419-468-5200
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
§ Lortec Power Systems, Inc., Elyria, OH 44035-2214 216-327-5050

† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
† NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Perma Power Elctrns., Chicago, IL 60648 312-763-0763
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
Power Pac, Shelton, CT 06484 203-925-0123
Power-Pak, Inc., Morton Grove, IL 60053 708-966-6000
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
† Ratelco, Power Systems, Seattle, WA 98109-5589 206-624-7770
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
§ SAFE POWER, Acme Electric Corporation, Salt Lake City, UT 84116 ..... 801-539-0227; 1-800-325-5848
Sanford-Miller Corp., Lynbrook, NY 11563 ..... 516-593-2025;800-645-5900
§ Sola, A Unit of General Sign, Elk Grove Village, IL 60007-5600 708-439-2800
Spectra Lux Corp., Kirkland, WA 98034 206-747-0560
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
§ Superior Electric, Bristol, CT 06010 203-582-9561
Sutton Designs, Inc., Ithaca, NY 14850 800-326-8119
†# Tauber Elctrns. Inc., San Diego, CA 92117 619-274-7242
† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
§ Tripp-Lite, Chicago, IL 60610-4188 312-329-1777
† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Xenotronix Inc., Valencia, CA 91355 805-257-4793
Xylog Corp., Hackensack, NJ 07601 201-489-4040

Power Supplies, Submodular-4000

§ AAK Corp, Haverhill, MA 01832, 508-373-3769;800-886-2225 ..... D•1507-1510
† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1607-1608,1610
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1620
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Burr-Brown Corp., Tucson, AZ 85734, 602-746-1111 ..... D•1637-1639
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1641-1647
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1700,1705
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1708
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1724,1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1729
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
† Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755-1757
Gamma High Voltage Resch. Inc., Ormond Beach, FL 32174, 904-677-7070 ..... D•1758,1760
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1805
† Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1736
† NWL Transformers, Bordentown, NJ 08505, 609-298-7300 ..... D•1915
§ Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2221
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... A•2316
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1970-1971
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028-2029
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071,2073
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•2108-2109
Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... D•2110-2112
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ... D•2139
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
§ Anaheim Automation, Anaheim, CA 92801 714-992-6990
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
† Babcock, Inc., Orange, CA 92667 714-633-3700
† B C Systems, Inc., Setauket, NY 11790 516-751-9370
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
CPS, Inc., Fremont, CA 94538-6517 415-657-6363
D & B Power, Inc., Bayshore, NY 11706 516-586-5955
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 408-734-2020
U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
Electro-Pacific, Goleta, CA 93117 805-964-0751
Electrostatics, San Diego, CA 92111 619-279-1414
Endicott Coil Co., Inc., Binghamton, NY 13905 607-797-1263
Endicott Research Group, Endicott, NY 13760 607-754-9187
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Interelectronics Corp., Congers, NY 10920 ..... 914-EL8-8000
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
Magnetek Triad, Huntington, IN 46750 219-356-7100
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
Melcher, Inc., Ashland, MA 01721 800-828-9712
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† Modular Devices, Shirley, NY 11967 516-345-3100
MPC, Div. of Consulting Systems, Danville, NH 03819 603-642-5913
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... + 31-5440-71111
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Power Pac, Shelton, CT 06484 203-925-0123
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
Power Trends, Inc., Batavia, IL 60510 708-406-0900
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Switching Systems International, Placentia, CA 92670 714-996-0909
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586
Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Urban Electronics, Dover, MA 02030 617-329-4068
Valor Electronics, San Diego, CA 92121-2245 619-458-1471
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

Power Supplies, Switching-4000

† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
§ Abbott Technologies, Inc. Power Supplies Division, Sun Valley, CA 91352, 818-504-0644,1-800-367-8200,818-841-3630 ..... D•1511
§ Acme Electric Corporation, Cuba, NY 14727, 716-968-2400 ..... D•1544-1547
Acopian Technical Company, Easton, PA 18044, 215-258-5441 ..... D•1549
§† Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580,1582-1583
Advanced Analog, Intech, Santa Clara, CA 95050, 408-988-2702 ..... D•1548
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599-1603
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Aslan Computer Corporation, S. El Monte, CA 91733, 818-575-5271 ..... D•1585-1587
§ Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606-1610
Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2164,2166
Basler Elec., Electronic Product Group, Highland, IL 62249, 618-654-2341;800-645-2074 ..... D•1627
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168-2169, 2171
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631,1636

Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211, 714-544-6665 ..... D•1653-1657
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423, 716-538-4421 ..... A•2189, D•2182
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Computron Display Systems, Xcel Corporation, Elk Grove Village, IL 60007, 708-952-8800 ..... B•1057
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1683-1685,1689
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 .... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
† Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 .. D•1700,1702-1703,1705
† Delta Products Corporation, Fremont, CA 94538, 415-770-0660 ..... D•1706
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... A•2201-2204, D•1708
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
† EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 .... D•1714-1715
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... D•1717
Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1718,1725, 1727
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2192
§ Elpac Power Systems, Elpac Electronics, Inc., Santa Ana, CA 92705, 714-979-4440 ..... D•1731
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
EPD Electronics, Inc., Gardena, CA 90247, 213-515-4996 ..... D•1742
Ericsson Components, Inc., Richardson, TX 75081, 214-480-8300 ... D•1744-1748
Farnell Advance Power, Solon, OH 44139, 216-349-0755 ..... D•1749-1751
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
Friwo, Friemann & Wolf, Frederick, MD 21702, 301-694-7479 ..... D•1755,1757
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .. D•1763
§ Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1776
† HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1784-1785
High Voltage Technology Inc., Yonkers, NY 10701, 914-423-6636 ... D•1788,1790
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208
International Power DC Power Supplies, Inc., Camarillo, CA 93010, 805-987-7900 ..... D•1779-1781
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799-1803,1805
§ International Power Sources, Inc., Ashland, MA 01721, 508-881-7434 ..... D•1807-1809
† Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
Jerome Industries Corp., Elizabeth, NJ 07201, 908-353-5700 ..... A•2241, D•1823-1825
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1830-1833
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
KGS Electronics, Inc., Pasadena, CA 91103, 818-798-0786 ..... D•1871
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873
LH Research, Inc., Tustin, CA 92680, 1-800-547-2537 ..... D•1874-1875
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... D•1877
§ LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1451, D•1880,1882-1885
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
† Magnetico Inc., Holtsville, NY 11742, 516-654-1166 ..... A•2264
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212
† Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1895
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1898-1899
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Opamp Labs, Inc., Los Angeles, CA 90038, 213-934-3566 ..... D•1014
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2221
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... A•2316, D•2222
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1965
† Polytron Devices, Inc., Paterson, NJ 07544, 201-345-5885 ..... D•1969
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974,1976
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1978-1979,1985-1986
§ Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1990-1996,1998-1999
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000,2002
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2007-2008
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
† Power Ten, Inc., Sunnyvale, CA 94086, 408-738-5959 ..... D•2013
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154, 619-575-1100 ..... D•2014-2015,2017-2019
Resonant Power Technology, Santa Clara, CA 95054, 408-982-0200 ..... D•2024-2025
§ Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0, 519-696-2616 ..... D•2027
† RO Associates, Inc., Sunnyvale, CA 94088, 408-744-1450 ..... D•2028
§ Shindengen America Inc., Westlake Vl., CA 91361, 800-634-3654 ... D•2034-2035
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ..... D•2038,2040-2041,2043-2046
Spellman High Voltage Elctrns. Corp., Plainview, NY 11803, 516-349-8686 ..... D•2049
Switching Systems International, Placentia, CA 92670, 714-996-0909 ..... D•2056-2057
§ Tamura Corporation of America, Carson, CA 90746-3518, 213-638-1790 ..... D•2058,2068
†# Tauber Elctrns. Inc., San Diego, CA 92117, 619-274-7242 ..... D•1496
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 ..... D•2071,2073
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
Tracewell Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ..... C•1120,1122-1123
† Tri-Mag, Inc., Visalia, CA 93291, 209-651-2222 ..... A•1646,1648, D•2110-2112
ULTRA VOLT, Ronkonkoma, NY 11779, 800-876-POWER ..... D•2115
UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2131
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Voltex, Amityville, NY 11701, 516-842-2772 ..... D•2135
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2139,2230-2231
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083, 619-727-0940 ..... D•2142-2143
† Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
† ACME-URDC, Inc., West Jordan, UT 84084 801-561-9385
Acon, Inc., South Easton, MA 02375 508-230-8022
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
† Advanced Conversion Tech., Middletown, PA 17057 717-939-2300
A.L.E. Sys., Inc., Ashland, MA 01721 508-881-5252
† Analog Modules, Inc., Longwood, FL 32750 407-339-4355
Arrow Hart Components, Cooper Industries, Charlottesville, VA 22906-9050 804-974-5100
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
§ Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
Autec Power Systems, Chatsworth, CA 91311 818-341-6123
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† Babcock, Inc., Orange, CA 92667 714-633-3700
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
† B C Systems, Inc., Setauket, NY 11790 516-751-9370
§ BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
Boschert, Inc., Computer Products/Boschert, Fremont, CA 94538 415-657-6700
† Brandt Electronics, Inc., Mountain View, CA 94043 415-967-4944
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ California DC, Newbury Park, CA 91320 805-499-3621
California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Candela Laser Corporation, Wayland, MA 01778 508-358-7637
† CEC, Orange, CA 92665 714-637-2970
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Conver Corp., Sunnyvale, CA 94086 408-739-9111
Converter Power, Inc., Beverly, MA 01915 508-927-8158
§† Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ..... (0271) 863781
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dotronix, New Brighton, MN 55112 612-633-1742
§ U.S. Elco Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
† Electronic Development Associates, Inc., Dix Hills, NEW YORK 11746 .. 516-673-3881
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
† Electro Physics Co., Inc., Waukegan, IL 60085 708-249-5801
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008
GC International Inc., Richardson, TX 75085-1198 214-234-3240
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996

GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
§ Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
Integrated Power Designs, Inc., Lawrenceville, NJ 08648 609-896-2122
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
ITT PowerSystems Corp., Galion, OH 44833-0688 419-468-5200
§ James Electronics, Chicago, IL 60618 312-463-6500
K & M Electronics, W. Springfield, MA 01089 413-781-1350
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
KNIGHTFIRE TECHNOLOGY, Coral Springs, FL 33071 305-344-3682
§ Kraft Dynatronix, Inc., Amery, WI 54001 ..... 715-268-8118;800-826-7172
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
† Mep Controls, Bordentown, NJ 08505 609-298-7300
Mesa Power Systems, Escondido, CA 92029 619-489-8162
Micro Power Intl., Inc., San Diego, CA 92126 ..... 619-271-0831;619-271-5942
§† MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
Modular Devices Inc., Torrance, CA 90503 213-542-8561
MPC, Div. of Consulting Systems, Danville, NH 03819 603-642-5913
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
† NH Research, Irvine, CA 92714 714-474-3900
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
NMB Technologies, Chatsworth, CA 91311 818-341-3355
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Onan Power/Electronics, Minneapolis, MN 55344 612-943-4600
OPT Industries, Inc., Phillipsburg, NJ 08865 908-454-2600
† Oram High Voltage, Dayton, TX 77535 409-258-5553
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
Panasonic Industrial Co., Milpitas, CA 95035 408-946-7200
Performance Controls, Inc., Horsham, PA 19044 215-675-6500
Perma Power Elctrns., Chicago, IL 60648 312-763-0763
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
† Powercube Corp., Sub. Unitrode Corp., Billerica, MA 01821 617-667-9500
† Power Functions Engineering, Garland, TX 75042 214-278-0996
Powerline,Inc., Chloride Power Elctrns., Ashland, MA 01721 508-881-7329
† Power Magne-Tech Corporation, Perth Amboy, NJ 08861 908-826-4700
§† Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
† Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
† Power Technology, Inc., Little Rock, AR 72219-1117 501-568-1995
Precision Components, Inc., Addison, IL 60101 312-543-6400
† Preferred Electronics, Inc., Westfield, MA 01086 ..... 413-568-2301;1-800-553-6374
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
§ Quality Power Systems, Inc., Pearland, TX 77581 ..... 713-997-1700;800-992-1701
† Rantec Microwave & Electronics, Esco Electronics, Chatsworth, CA 91311 818-885-8223
† Reich Associates, Inc., Lakehills, TX 78063 512-751-3220
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
§ Sanyo Semiconductor Corp., Allendale, NJ 07401 201-825-8080
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
§ Semiconductor Circuits, Inc., Astec America, Inc., Windham, NH 03087 603-893-2330
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Siemens Components, Inc., Special Products Div., Iselin, NJ 08830 201-321-3400
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§† Skyway Magnetics, Warner Springs, CA 92086 619-782-3342
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§ Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
Supertek Electronics, Inc., Arlington Heights, IL 60005 312-981-5655
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
Taylor Electronics, Inc., Tempe, AZ 85283 602-838-4523
§ TDK Corporation of America, Electronic Components & Material, Mount Prospect, IL 60056 708-803-6100
† Teapo Electronic Corp. of America, Norcross, GA 30071 404-449-6220
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tecnetics Inc., Computer Products, Boulder, CO 80303 303-442-3837
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Urban Electronics, Dover, MA 02030 617-329-4068
§ U.S. Elco,Inc., Santa Clara, CA 95054 ..... 1-800-888-ELCO
§ Valor Electronics, San Diego, CA 92121-2245 619-458-1471
§† Varian Associates, Electron Device Business, Palo Alto, CA 94304 ..... 415-493-4000; 800-544-4636
† Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
§† Vicor Corp., Andover, MA 01810 508-470-2900
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Walker Power, Inc., Warner, NH 03278 603-456-3111
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Wasatch High Voltage, Salt Lake City, UT 84115 801-265-9561
Weir Electronics, Inc., Weir Elctrns., Ltd., Annapolis, MD 21403 301-268-0122
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Westcor Corporation, Los Gatos, CA 95032 408-395-7050
Xylog Corp., Hackensack, NJ 07601 201-489-4040
§ Zambre Co., Inc., Mountain View, CA 94043 415-968-9176
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Switching, Battery Backup-4000

§ Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621, 201-385-0500 ..... D•1588-1593
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
§ Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1650-1651
Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
Conversion Devices, Inc., Brockton, MA 02401, 508-559-0880 ..... D•1690-1691
Converter Concepts, Inc., Pardeeville, WI 53954, 608-429-2144 ..... D•1692-1693
† Custom Power Systems, Ronkonkoma, NY 11779-9998, 516-467-5328 ... D•1697
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012, 605-296-3462/3487 ..... D•1709
† EG & G Power Systems, Inc., Covina, CA 91724, 818-967-9521 ..... D•1715
Ferranti Venus, Inc., Ferranti International, Farmingdale, NY 11735, 516-293-4100 ..... D•1752-1753
† HC Power Inc., Irvine, CA 92714-5716, 714-261-2200 ..... D•1784
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... D•2208
International Power Devices Inc., Brighton, MA 02135, 617-782-3331 ..... D•1799,1805
JETA Power Systems, Inc., Signal Hill, CA 90806, 213-427-0095 ... D•1826-1827
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
§ Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915, 201-385-0500 ..... D•1898
Pioneer Magnetics, Santa Monica, CA 90404, 213-829-6751 ..... D•1963-1965
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1985-1986
§ Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988,1998
Power Pac, Shelton, CT 06484, 203-925-0123 ..... D•2000-2002
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Power Switch Corporation, Lodi, NJ 07644, 201-478-5788 ..... D•2007-2008
Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO, 519-696-2616 ..... D•2027
Tectrol, Inc., Downsview, Ontario, CANADA M3J 3E5, 416-630-8108 .... D•2071
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Total Power International, Inc., Lowell, MA 01850, 508-453-7272 ..... D•2107
UNIPOWER CORPORATION, Pompano Bch., FL 33069-4803, 305-974-2442 ..... D•2117
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503, 213-316-9984 ..... D•2027
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2139,2230-2231
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† ATC Power Systems, Inc., Nashua, NH 03063 603-882-1366
Ault, Incorporated, Minneapolis, MN 55428 612-493-1900
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Beaver Labs, Kingston, MA 02364 617-585-5666
Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
§ Cal-Tek Engineering, Kingston, MA 02364 617-585-5666
† CEC, Orange, CA 92665 714-637-2970
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
§ CSB/Taiwan Kobe Battery Co., Ltd., Ft. Worth, TX 76116 817-732-2258
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
† Cuesta Systems Corporation, San Luis Obispo, CA 93401 ..... 805-541-4160; 800-332-3440
Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
§ Dynatech Computer Power, Inc., Scotts Valley, CA 95066 408-438-5760
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
§ Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
Energy, Ltd., Bladensburg, MD 20710 301-699-1144
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ E.P.D./General Power Corp., Anaheim, CA 92805-8508 ..... 714-520-0881; 1-800-343-1813
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
GC International Inc., Richardson, TX 75085-1198 214-234-3240
GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051

§ Golden Power Systems, Inc., Simi Valley, CA 93065 805-582-4400
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716 516-563-3388
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
LH Research, Inc., Tustin, CA 92680 1-800-547-2537
† Logitek, Inc., Ronkonkoma, NY 11779 516-467-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Melcher, Inc., Ashland, MA 01721 800-828-9712
Mesa Power Systems, Escondido, CA 92029 619-489-8162
† Modular Devices, Shirley, NY 11967 516-345-3100
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NCR Power Systems, Lake Mary, FL 32746 407-323-9250
Nedap N.V., Groenlo, HOLLAND 7140 AA ..... +31-5440-71111
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
Oeco Corp., Milwaukie, OR 97222 503-659-7932
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Power Conversion Products, Crystal Lake, IL 60014 815-459-9100
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
Power Systems, Inc., Bloomfield, CT 06002 203-726-1300
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
§ Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
RO Associates, Inc., Sunnyvale, CA 94088 408-744-1450
§ Rose Electronics, Inc., Energy Products Group, San Jose, CA 95131 408-943-0440
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
Schroff Incorporated, Warwick, RI 02886 401-732-3770
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Skynet Electronics, Milpitas, CA 95035 408-945-6355
§ SL Waber, Inc., Mt. Laurel, NJ 08054 ..... 609-866-8888;800-257-8384
Sutton Designs, Inc., Ithaca, NY 14850 800-326-8119
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
§ Tamura Corporation of America, Carson, CA 90746-3518 213-638-1790
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
Urban Electronics, Dover, MA 02030 617-329-4068
† Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273
§† Vicor Corp., Andover, MA 01810 508-470-2900
Viking Industrial Products, Marlboro, MA 01752 508-481-4600
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Xenotronix Inc., Valencia, CA 91355 805-257-4793
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

Power Supplies, Switching, Medical-4000

Adtech Power Inc., Anaheim, CA 92806, 714-634-9211 ..... D•1580
Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
† Ascent Power Technology, Concord, Ont., CANADA L4K3C3, 416-660-9819 ..... D•1605
Behlman Electronics, Inc., Ventura, CA 93003, 805-642-0660 ..... D•2168-2169
† CEC Electronics Corp., Hauppauge, NY 11788, 516-582-4422 ..... D•1651
§ Computer Products Inc., Power Conversion America, Fremont, CA 94537-5102, 510-657-6700 ..... D•1663
§ Condor D.C. Power Supplies, Inc., Oxnard, CA 93033, 805-486-4565; ..... D•1680-1682,1684-1685
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732-1733
Joule Power, Inc., Boxborough, MA 01719, 508-263-9712 ..... D•1829
Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
§ Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006, 503-646-4700 ..... D•1912
Potrans International Inc., Potrans Electrical Corp., Ltd., Irvine, CA 92714, 714-975-1222 ..... D•1974,1976
Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1985-1986
Power General, Unitrode Corp., Canton, MA 02021, 617-828-6216 ..... D•1987
† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549, 914-241-1300 ..... D•2132-2133
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Brown Applied Technology Inc., Scarborough,Ont., CANADA M1P 4S6 .. 416-298-0560
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Converter Concepts, Inc., Pardeeville, WI 53954 608-429-2144
Converter Power, Inc., Beverly, MA 01915 508-927-8158
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
† Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
Modular Devices Inc., Torrance, CA 90503 213-542-8561
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
Power Components Co., Vanguard Electronics Co., Gardena, CA 90248 213-323-8120
Skynet Electronics, Milpitas, CA 95035 408-945-6355
Switching Systems International, Placentia, CA 92670 714-996-0909
§† Vicor Corp., Andover, MA 01810 508-470-2900
Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

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† Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2149
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† Advance Conversion Devices Co.Unit of Transitor Dvcs., Inc., Cedar Knolls, NJ 07927, 201-267-1900 ..... D•2156-2158
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† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
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† Avionic Instruments, Avenel, NJ 07001, 908-382-7100 ..... D•2160-2161
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§ Best Power Technology, Inc., Necedah, WI 54646, 608-565-7200;800-356-5794 ..... D•2177
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§ Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2185,2187,2189
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† Power Supply Concepts Inc., Florida, NY 10921, 914-651-5000 .... D•2004-2005
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† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•2108-2109
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§ Adcour, Inc., Sharon, MA 02067 617-784-8123
† American Monarch, Minneapolis, MN 55421 612-788-9161
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
§† Atlas Energy Systems, Inc., Irvine, CA 92713 714-863-0900
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
† B C Systems, Inc., Setauket, NY 11790 516-751-9370
§ Beaver Labs, Kingston, MA 02364 617-585-5666
† Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
§ Brooks Electronics, Philadelphia, PA 19140 215-228-4433
§† Brooks Power Systems, Bensalem, PA 19020 ..... 215-244-0264;1-800-523-1551
§ Cal-Tek Engineering, Kingston, MA 02364 617-585-5666
§ C&D Charter Power Systems, Plymouth Meeting, PA 19462 215-828-9000
Chloride Electro Networks, Chloride Power Electronics, Inc., Caledonia, NY 14423 716-538-4421
§† Clary Corp., Precision Instrs. Div., San Gabriel, CA 91776 818-287-6111
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Technology, Inc., Oklahoma City, OK 73116 405-840-3163
Converter Concepts, Inc., Pardeeville, WI 53954 608-429-2144
Coutant Lambda Ltd., Ilfracombe, Devon, ENGLAND EX34 8ES ..... (0271) 863781
§ CSB/Taiwan Kobe Battery Co., Ltd., Ft. Worth, TX 76116 817-732-2258
† CTS of Canada, Ltd., Streetsville, ONTARIO, CAN. L5M 1Y9 416-826-1141
† Cuesta Systems Corporation, San Luis Obispo, CA 93401 ..... 805-541-4160; 800-332-3440
§† Current Technology, Inc., Richardson, TX 75081-4802 214-238-5300
† Custom Power Systems, Ronkonkoma, NY 11779-9998 516-467-5328
† DELTEC, San Diego, CA 92110 ..... 619-291-4211;800-854-2658
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012 ..... 605-296-3462/3487
§Φ Dynamic Power Systems, Div. Onset International Corp., Nesconset, NY 11767-2611 516-361-6771
Eagle-Picher, Seneca, MO 64865 417-776-2256
EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
§ Electronic Specialists, Natick, MA 01760 ..... 508-655-1532;800-225-4876
§ Emerson Computer Power, Irvine, CA 92718 714-380-1005
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
§ E.P.D./General Power Corp., Anaheim, CA 92805-8508 ..... 714-520-0881; 1-800-343-1813
EPE Technologies, Inc., Subsidiary of Merlin Gerin, Costa Mesa, CA 92626 714-557-1636
§ ET&T Corporation, Costa Mesa, CA 92626 714-557-2703
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Falcon Electric, San Gabriel, CA 91776 818-287-6116
§ Fortron/Source Corp., Power Supplies, Livermore, CA 94550 415-373-1008

† Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
GAR Enterprises dba KGS Electronics, Pasadena, CA 91103 818-798-0785
§ GENERAL POWER CORPORATION, Anaheim, CA 92815 714-956-9321
GRIM Corporation, Medford, NJ 08055-0968 609-267-7950
§ HDR Power Systems, Inc., Hilliard, OH 43026 614-771-5500
IMC Magnetics Corp., Florida Division, Miami Lakes, FL 33014 305-822-2558
† International Power Machines, Garland, TX 75042 800-527-1208
§ ISOREG Corp., Littleton, MA 01460 508-486-9483
§ ITT PowerSystems Corp., Galion, OH 44833-0688 419-468-5200
§ Kalglo Elctrns. Co., Inc., Bethlehem, PA 18017-9359 215-837-0700
† Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
§ La Marche Mfg., Des Plaines, IL 60018 708-299-1188
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
§ Lortec Power Systems, Inc., Elyria, OH 44035-2214 216-327-5050
† MagneTek Defense Systems, MagneTek, Inc., Anaheim, CA 92805 714-956-9200
† Mep Controls, Bordentown, NJ 08505 609-298-7300
† Modular Devices, Shirley, NY 11967 516-345-3100
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
§† Oneac Corporation, Libertyville, IL 60048 ..... 708-816-6000;800-327-8801
§† Perma Power Elctrns., Chicago, IL 60648 312-763-0763
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
Powernetics LTD., Leics, ENG LE11 1DX 0509 214153
§† Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
† Power Systems & Controls, Inc., Richmond, VA 23230 804-355-2803
† Preferred Electronics, Inc., Westfield, MA 01086 ..... 413-568-2301;1-800-553-6374
Prime Power, A Prime Technology Co., N. Branford, CT 06471 203-481-5721
§† Pylon Elex Development Co. Ltd., Lachine, PQ, CANADA H8S 1Z3 514-637-1186
Qualidyne Systems, Inc., Lambda Group of Unitech, plc, San Diego, CA 92154 619-575-1100
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Reliance Comm/Tec, Reliance Electric, Cleveland, OH 44117 800-245-4501
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
§ S A B NIFE, Inc., Div. of Sonesson, Greenville, NC 27834 919-830-1600
§ SAFE POWER, Acme Electric Corporation, Salt Lake City, UT 84116 ..... 801-539-0227; 1-800-325-5848
Schaefer, Inc., Schaefer GmBH, Ashland, MA 01721 508-879-8658
§ Shape Electronics, Inc., Lombard, IL 60148 708-620-8394
§ Shindengen America Inc., Westlake Vl., CA 91361 800-634-3654
† Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
§ SL Waber, Inc., Mt. Laurel, NJ 08054 ..... 609-866-8888;800-257-8384
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§† Square D Co. Power Protection Systems, San Diego, CA 92123-1165 619-279-0831
§† Staco Energy Products Co., Dayton, OH 45403 513-253-1191
Stevens-Arnold Div., Computer Prods./Stevens-Arnold, So. Boston, MA 02127 617-268-1170
§† Superior Electric, Bristol, CT 06010 203-582-9561
Sutton Designs, Inc., Ithaca, NY 14850 800-326-8119
Switching Power Inc., Ronkonkoma, NY 11779 516-981-7231
†# Tauber Elctrns. Inc., San Diego, CA 92117 619-274-7242
† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221
Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
† Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
† Teledyne Inet, Teledyne, Inc., Torrance, CA 90506 213-325-5040
Tower Electronics, Inc., Fridley, MN 55432 612-571-3737
§† Transtector Systems, Inc., Hayden Lake, ID 83835 800-829-2901
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
§ Tripp-Lite, Chicago, IL 60610-4188 312-329-1777
† Tungstone Batteries, Inc., Sharon, MA 02067 617-784-2000
§ Tycor International Inc., Calgary, Alberta, CANADA T2H 1L9 403-259-3200
§ UPSystems, Inc., Subsidiary of Chloride Power Elec., Caledonia, NY 14423 716-538-4421
Urban Electronics, Dover, MA 02030 617-329-4068
§ Viteq Corp., Lanham, MD 20706 301-731-0400
Volgen America, Inc., Volgen Electric Co., Ltd., Tokyo, Fremont, CA 94538 415-498-5950
† Voltampere Corp., Lynbrook, NY 11563 516-887-9443
Wall Industries, Exeter, NH 03833 ..... 603-778-2300;800-321-WALL
Weir Elctrns. Ltd., Bognor Regis, West Sussex, ENG PO 22 9RW 0243-865991
† Xenotronix Inc., Valencia, CA 91355 805-257-4793
Xylog Corp., Hackensack, NJ 07601 201-489-4040
Yuasa Battery (America), Inc., Santa Fe Springs, CA 90670 213-949-4266
Yuasa Battery (America) Inc., Eastern Regional Office, Hasbrouck Hgts., NJ 07604 201-641-5900
Zytron, Zytronics, Bedford, NH 03102 603-623-8888

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† Abbott Electronics, Los Angeles, CA 90034, 213-202-8820 ..... D•1523
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Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
Astrosystems, Lake Success, NY 11042 516-328-1600
§ Brooks Electronics, Philadelphia, PA 19140 215-228-4433
Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Charles Inds. Ltd., Charles Center, Rolling Meadows, IL 60008 708-806-6300
Cherokee International, Inc., Core Industries, Tustin, CA 92680-7211 714-544-6665
CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ CPS, Inc., Fremont, CA 94538-6517 415-657-6363
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 408-734-2020
§ Deltron, Inc., N. Wales, PA 19454-9990 215-699-9261
† EG & G Power Systems, Inc., Covina, CA 91724 818-967-9521
§ Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
† Engineered Magnetics, Inc., Rancho Dominguez, CA 90221 213-635-9555
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
GENERAL POWER CORPORATION, Anaheim, CA 92815 714-956-9321
Green Engineering, Melrose, MA 02176 617-665-8994
HBS Equipment Corporation, Los Angeles, CA 90040 213-726-3033
Hoppecke Battery Systems, Inc., Bulter, NJ 07405 201-492-0045
Intelligence Power Technology, Camarillo, CA 93012 805-484-4441
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Keltec Florida, Inc., Microwave Pro, Ft. Walton Bch., FL 32549-2917 904-244-0043
Lambda Electronics Inc., Melville, NY 11747-3700 516-694-4200
Lorain Products, Reliance Electric, Lorain, OH 44052 216-288-1122
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
MIL Electronics, Inc., Nashua, NH 03036 603-882-3200
NJE Corporation, Dayton, NJ 08810-0669 201-329-4611
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ Perma Power Elctrns., Chicago, IL 60648 312-763-0763
† Perry Amplifier, Brookline, MA 02146 617-734-0844
† Polytron Devices, Inc., Paterson, NJ 07544 201-345-5885
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Star, Inc., Irvine, CA 92713 ..... 714-261-5377;800-854-9420
Powertech, Inc., Fairlawn, NJ 07410 201-791-5050
Powertron Corp., Sparta, NJ 07871 201-579-5599
Rogers Corp. Div. Power Distbn.Div., Mesa, AZ 85205 602-830-3370
§ SL Waber, Inc., Mt. Laurel, NJ 08054 ..... 609-866-8888;800-257-8384
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
§ Superior Electric, Bristol, CT 06010 203-582-9561
Sutton Designs, Inc., Ithaca, NY 14850 800-326-8119
Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Unitrode Corp., Watertown, MA 02172 617-926-0404
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
§ Valor Electronics, San Diego, CA 92121-2245 619-458-1471

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Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1003,1020-1021
† Analog Modules, Inc., Longwood, FL 32750, 407-339-4355 ..... D•1004
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† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
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† Amptek, Inc., Bedford, MA 01730 617-275-2242
§† ANZAC, M/A-COM, Burlington, MA 01803 617-273-3333
§† Avantek, Inc., Milpitas, CA 95035-7492 408-432-3080
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
† Locus, Kaman, State College, PA 16804 814-466-6275
James Millen Elctrns., Caywood Elec. Inc., No. Andover, MA 01845 508-475-7831
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Modular Audio Products, Modular Devices, Inc., Shirley, NY 11967 516-345-3100
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NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
§ Palomar Engineers, Escondido, CA 92033 619-747-3343
Panametrics, Waltham, MA 02154-3497 617-899-2740
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
† Perry Amplifier, Brookline, MA 02146 617-734-0844
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
† Stanton Magnetics, Inc., Plainview, NY 11803-1511 516-349-0235
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929

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§ A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
§ A E G Corporation, Telefunken Semiconductors Div., Somerville, NJ 08876-1269 201-231-8300
† California Eastern Labs. Inc., Santa Clara, CA 95056-0964 408-988-3500
§ Fujitsu Microelectronics Inc., Integrated Circuits Division, San Jose, CA 95134 408-922-9000
Hecon Corp., Eatontown, NJ 07724 908-542-9200
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405

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§† Microwave Filter Inc., East Syracuse, NY 13057-0486, 315-437-3953;800-448-1666 ..... A•1691-1693
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
† Microlab/FXR, Livingston, NJ 07039 201-992-7700
† Microphase, Norwalk, CT 06856 203-866-8000
† Premier Microwave, Port Chester, NY 10573 914-939-8900
Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† UTE Microwave, Asbury Park, NJ 07712 908-922-1009

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B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1422
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
† Allen Datagraph, Inc., Salem, NH 03079 603-893-1983
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Gulton Graphic Instruments Div., A Mark IV Company, E. Greenwich, RI 02818 ..... 800-343-7929;401-884-6800
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hitachi Denshi America Ltd., Test & Meas. Div., Woodbury, NY 11797 ... 516-921-7200
§ Kipp & Zonen, Enraf-Nonius, Bohemia, NY 11716 ..... 516-589-2885;800-645-1025
Miltope Business Products, Miltope Grp., Melville, NY 11747 ..... 516-420-0200; 516-756-7650
§† Mitsubishi Electronics, Torrance, CA 90502 213-515-3993
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
§† The Recorder Company, San Marcos, TX 78667 512-629-1400
§ Seiko Insts. USA, Inc., Graphic Devices & Systems Div., San Jose, CA 95131 408-922-5800
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Telpar, Inc., Addison, TX 75001 214-233-6631
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Printers, Bar Code Label-2000

 # Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 ..... D•1097
§ Panduit Corp., Tinley Park, IL 60477-0981, 800-777-3300 ..... C•1801
§ Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770 ..... D•1108
§ Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116
Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
§ Contact East, N. Andover, MA 01845 508-682-2000
§ CTSI International Inc., Commack, NY 11725-5703 516-864-5260
§ DH Print, Div. of DH Technology, Riverton, WY 82501 307-856-4821
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† Markem Corp., Keene, NH 03431 603-352-1130

Printers, Daisywheel-2000

Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Miltope Corp., Melville, NY 11747 516-420-0200

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B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
Data Mega Inc., Mega Data, Bensenville, IL 60106, 708-860-6501 ..... D•1087
 # Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 ..... D•1097
Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154, 617-894-8700 ..... D•1099
† Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
Omniprint, Inc., Sunnyvale, CA 94089, 408-745-6400 ..... D•1102-1104
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... D•1112-1115
§ Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116
§† Telpar, Inc., Addison, TX 75001, 214-233-6631 ..... D•1117
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1379
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
§ American Computer Hardware Corp., Santa Ana, CA 92705 714-549-2688
Anadex Inc., Camarillo, CA 93012 805-987-9660
§† Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
§ Computer Devices, Nutting Lake, MA 01865 508-663-4980
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
C-Tek Inc., Wakefield, MA 01880 617-246-1720
CTSI International Inc., Commack, NY 11725-5703 516-864-5260
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
DH Print, Div. of DH Technology, Riverton, WY 82501 307-856-4821
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§† Di/An Controls, Inc., Brockton, MA 02401 508-599-8000
† Digitec, Marion, OH 43302 614-387-3444
§ Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
† Gulton Graphic Instruments Div., A Mark IV Company, E. Greenwich, RI 02818 ..... 800-343-7929;401-884-6800
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
§ International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Lasertechnics, Inc., Albuquerque, NM 87113 505-822-1123
Miltope Business Products, Miltope Grp., Melville, NY 11747 ..... 516-420-0200; 516-756-7650
Mitronics, Rolling Hills, CA 90274 213-377-2022

§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Omega Engineering, Stamford, CT 06907 800-826-6342
Panasonic Industrial Company, Custom Peripheral Dept., Secaucus, NJ 07094 201-392-6313
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
§ Practical Automation, Inc., Shelton, CT 06484 203-929-5381
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Printers, Dot Matrix Impact-2000

§ CBM America Corp., Santa Monica, CA 90404, 213-828-8245 ..... D•1082-1083
Data Mega Inc., Mega Data, Bensenville, IL 60106, 708-860-6501 ... D•1087-1088
 # Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 ..... D•1097
§ Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154, 617-894-8700 ..... D•1099
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
§ Omniprint, Inc., Sunnyvale, CA 94089, 408-745-6400 ..... D•1102-1104
Singer Data Products, Inc., Bensenville, IL 60106, 708-860-6500 ..... D•1111
§ Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... D•1112-1115
§ Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116
§† Telpar, Inc., Addison, TX 75001, 214-233-6631 ..... D•1117
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1379
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
§ American Computer Hardware Corp., Santa Ana, CA 92705 714-549-2688
Anadex Inc., Camarillo, CA 93012 805-987-9660
§† Brady, W. H., Co., Indl. Prods. Div., Milwaukee, WI 53201 1-800-537-8791
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
CTSI International Inc., Commack, NY 11725-5703 516-864-5260
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
§ Datasouth Computer Corp., Charlotte, NC 28217 704-523-8500
§ DH Print, Div. of DH Technology, Riverton, WY 82501 307-856-4821
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
† Digitec, Marion, OH 43302 614-387-3444
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
Epson America, Inc./OEM Div., Torrance, CA 90503 213-534-4500
Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Genicom Corp., Waynesboro, VA 22980 703-949-1471
Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ IDEAssociates, Inc., Billerica, MA 01821 508-663-6878
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§ Melfess Five, Inc., Los Angeles, CA 90025 ..... 213-826-8133;800-533-2297
MFI, Los Angeles, CA 90025 ..... 213-826-8133;800-533-2297
† Miltope Corp., Melville, NY 11747 516-420-0200
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§# Penstock Engineering Labs., Penstock, Inc., Sunnyvale, CA 94086-4018 ..... 408-730-0300;800-PENSTOCK
§ Practical Automation, Inc., Shelton, CT 06484 203-929-5381
§ Printer Products, Boston, MA 02134 617-254-1200
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
Telesis Controls Corp., Chillocothe, OH 45601 614-642-3200
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Westrex Products, Boston, MA 02134 617-254-1200
§ Xerox Corporation, Rochester, NY 14644 800-832-6979

Printers, Event-3000

Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1416
 # Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 ..... D•1097
§ Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154, 617-894-8700 ..... D•1099
Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1379
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
AES Corp., Peabody, MA 01960 508-535-7310
§† Basic Measuring Instruments, Foster City, CA 94404 415-570-5355
B-G Instruments, Inc., Vashon, WA 98070 206-567-5000
§ CTSI International Inc., Commack, NY 11725-5703 516-864-5260
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§† Di/An Controls, Inc., Brockton, MA 02401 508-599-8000
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hecon Corp., Eatontown, NJ 07724 908-542-9200
Miltope Business Products, Miltope Grp., Melville, NY 11747 ..... 516-420-0200; 516-756-7650
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
PPM, Inc., Cleveland, OH 44139 216-349-2300
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

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 # Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 ..... D•1097
Omniprint, Inc., Sunnyvale, CA 94089, 408-745-6400 ..... D•1102-1104
Singer Data Products, Inc., Bensenville, IL 60106, 708-860-6500 ..... D•1111
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
California Micro Devices, Inc., Milpitas, CA 95035 408-263-3214
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
CTSI International Inc., Commack, NY 11725-5703 516-864-5260
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
Epson America, Inc./OEM Div., Torrance, CA 90503 213-534-4500
Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Markem Corp., Keene, NH 03431 603-352-1130
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Telesis Controls Corp., Chillocothe, OH 45601 614-642-3200
§ Xerox Corporation, Rochester, NY 14644 800-832-6979

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§ Anacom, Anaheim, CA 92805-6235 714-774-8080
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
Eastern Marking Machines, Hempstead, NY 11550 516-483-7070
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Lasertechnics, Inc., Albuquerque, NM 87113 505-822-1123
Ophir Technology Inc., Long Beach, CA 90810 213-834-0202
§ Xerox Corporation, Rochester, NY 14644 800-832-6979

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§ American Computer Hardware Corp., Santa Ana, CA 92705 714-549-2688
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Miltope Business Products, Miltope Grp., Melville, NY 11747 ..... 516-420-0200; 516-756-7650
† Miltope Corp., Melville, NY 11747 516-420-0200
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
Ophir Technology Inc., Long Beach, CA 90810 213-834-0202
§ Seiko Insts. USA, Inc., Graphic Devices & Systems Div., San Jose, CA 95131 408-922-5800

Printers, Screen, Stencil-4100

† Aremco Products, Inc., Ossining, NY 10562 914-762-0685
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
† Autoroll Machine Corporation, Middleton, MA 01949 508-777-2160
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
Micro Electronic Systems, Inc., Bridgewater, CT 06752 203-350-5004
§ NAZ-DAR/K.C., Thrall Enterprises, Chicago, IL 60622 312-943-8338
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
§ Zevatech, Inc., Morrisville, NC 27560 919-460-0111

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B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
Keltron Corp., Miniprinter/Security Systems Div., Waltham, MA 02154, 617-894-8700 ..... D•1099
† Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
§ Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770 ..... D•1108
Star Micronics, Inc., OEM Division, Piscataway, NJ 08854, 908-572-9512 ..... D•1112-1115
§ Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1379
Acculex Corporation, Taunton, MA 02780 508-880-3660
§ American Computer Hardware Corp., Santa Ana, CA 92705 714-549-2688
Anadex Inc., Camarillo, CA 93012 805-987-9660
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
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DH Print, Div. of DH Technology, Riverton, WY 82501 307-856-4821
Hecon Corp., Eatontown, NJ 07724 908-542-9200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Markem Corp., Keene, NH 03431 603-352-1130
§ Melfess Five, Inc., Los Angeles, CA 90025 ..... 213-826-8133;800-533-2297
MFI, Los Angeles, CA 90025 ..... 213-826-8133;800-533-2297
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Practical Automation, Inc., Shelton, CT 06484 203-929-5381
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
§† Telpar, Inc., Addison, TX 75001 214-233-6631

Printers, Solder, Paste, Surface Mount-4100

Alpha Metals, Jersey City, NJ 07304 201-434-6778
† Autoroll Machine Corporation, Middleton, MA 01949 508-777-2160
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
§† Multicore Solders, Richardson, TX 75081 214-238-1214
§ Zevatech, Inc., Morrisville, NC 27560 919-460-0111

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General Scanning Recorder Products Division, Arlington, MA 02174, 617-641-2702 ..... D•1419
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† Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
MFE Instruments, Stocker & Yale, Inc., Beverly, MA 01915-0490, 508-921-9104;800-472-4633 ..... D•1421
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
§ Omniprint, Inc., Sunnyvale, CA 94089, 408-745-6400 ..... D•1102-1104
§ Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770 ..... D•1108
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§ Syntest Corp., Marlboro, MA 01752-9973, 508-481-7827 ..... D•1116
§† Telpar, Inc., Addison, TX 75001, 214-233-6631 ..... D•1117
Acculex Corporation, Taunton, MA 02780 508-880-3660
§ Adcour, Inc., Sharon, MA 02067 617-784-8123
§ Advanz Technologies, Inc., Warwick, RI 02887 ..... 800-669-9987/401-737-1050
† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
§† Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
California Micro Devices, Inc., Milpitas, CA 95035 408-263-3214
Computer Devices, Nutting Lake, MA 01865 508-663-4980
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Control Module, Enfield, CT 06082 203-745-2433
Copal (USA), Inc., Torrance, CA 90501 213-618-0225
† Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ DH Print, Div. of DH Technology, Riverton, WY 82501 307-856-4821
† Digitec, Marion, OH 43302 614-387-3444
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
Epson America, Inc./OEM Div., Torrance, CA 90503 213-534-4500
Epson America Inc., Component Sales Dept., Torrance, CA 90503 213-787-6300
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ Fujitsu Component of America, Inc., Subsidiary of Fujitsu Microelectronics, Inc., San Jose, CA 95135 408-922-9000
† Gulton Graphic Instruments Div., A Mark IV Company, E. Greenwich, RI 02818 ..... 800-343-7929;401-884-6800
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Markem Corp., Keene, NH 03431 603-352-1130
Miltope Business Products, Miltope Grp., Melville, NY 11747 ..... 516-420-0200; 516-756-7650
† Miltope Corp., Melville, NY 11747 516-420-0200
§† Mitsubishi Electronics, Torrance, CA 90502 213-515-3993
Novatek Corporation, Coral Springs, FL 33065 305-341-7700
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
Panasonic Industrial Company, Custom Peripheral Dept., Secaucus, NJ 07094 201-392-6313
Practical Automation, Inc., Shelton, CT 06484 203-929-5381
§† The Recorder Company, San Marcos, TX 78667 512-629-1400
Submarine Signal Division, Raytheon Company, Portsmouth, RI 02871 .. 401-847-8000
§ Tamura Corporation of America, Carson, CA 90746-3518 213-638-1790
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Toyo Spectrum Corp., Santa Clara, CA 95051 ..... 408-720-8877;800-338-1981
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
§ Zebra Technologies Corporation, Vernon Hills, IL 60061-3109 708-634-6700

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Advanz Technologies, Inc., Warwick, RI 02887 ..... 800-669-9987/401-737-1050
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Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
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§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
§ Seiko Insts. USA, Inc., Graphic Devices & Systems Div., San Jose, CA 95131 408-922-5800
§ Toyo Spectrum Corp., Santa Clara, CA 95051 ..... 408-720-8877;800-338-1981
Zeta Graphics Corp., Martinez, CA 94553 415-372-7568

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Probe Cards, Semiconductor Testing-4100

† Accuprobe, Inc., Salem, MA 01970 508-745-7878
GGB Industries, Inc., Picoprobe Division, Naples, FL 33941 813-643-4400
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Probes, Hall-4800 – *See Vol. A*

Probes, High Voltage (1,000 Volts & Over)-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .. D•1763
§ Richard Hirschmann of America Inc., Riverdale, NJ 07457, 201-835-5002 ..... C•1398
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
† Ross Engineering Corp., Campbell, CA 95008, 408-377-4621 ..... D•1319
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Alden Products Co., Brockton, MA 02403 508-583-0160
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Concord Electronics Corporation, New York, NY 10012 1-212-777-6571
§† Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412 708-455-8830
† Contact East, N. Andover, MA 01845 508-682-2000
§† CPS, Inc., Fremont, CA 94538-6517 415-657-6363
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
Dymec Inc., Winchester, MA 01890 617-729-7870
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
Ion Physics Co., Atkinson, NH 03811 603-893-6687
Keithley Instrs., Cleveland, OH 44139 800-552-1115
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
† Pearson Electronics, Inc., Palo Alto, CA 94303 415-494-6444
† Physics International Co., Olin Defense Systems Grp., San Leandro, CA 94577 415-577-7236
§ Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
Rosemount Analytical Inc., Cedar Grove, NJ 07009 800-367-7242
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Test Probes, Inc., San Diego, CA 92121 619-552-2090
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Probes, IC-2900

Concord Electronics Corporation, New York, NY 10012, 1-212-777-6571 ..... C•1325
Emulation Technology, Inc., Santa Clara, CA 95051, 408-982-0660 ..... C•1358
E-Z Hook, Tektest Inc., Arcadia, CA 91006, 818-446-6175 ..... C•1364
§ Richard Hirschmann of America Inc., Riverdale, NJ 07457, 201-835-5002 ..... C•1398
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
GGB Industries, Inc., Picoprobe Division, Naples, FL 33941 813-643-4400
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Probes, Logic Test-2900

Concord Electronics Corporation, New York, NY 10012, 1-212-777-6571 ..... C•1325
§ Richard Hirschmann of America Inc., Riverdale, NJ 07457, 201-835-5002 ..... C•1398
3M-Electronic Products Division, Austin, TX 78769-2963, 1-800-225-5373 Sls. & Prod. Info. ..... C•1464
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307
Alden Products Co., Brockton, MA 02403 508-583-0160
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
Augat Inc., Attleboro, MA 02703 617-222-2202
† Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-1295
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Contact East, N. Andover, MA 01845 508-682-2000
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ E & L Instruments, Interplex Electronics, Inc., New Haven, CT 06512 800-368-0880
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900

HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800
§ Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
§ Shattuck Industries, Ben Lomond, CA 95005 408-336-5145
§ Superior Electric, Bristol, CT 06010 203-582-9561
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Probes, Microwave-3450 — *See Vol. A*

Probes, Oscilloscopes-2975

Avtech Electrosystems Ltd., Ottawa, Ontario, CANADA K2C 3H4, 613-226-5772 ..... D•1222
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1407
§ Concord Electronics Corporation, New York, NY 10012, 1-212-777-6571 ..... C•1325,1595
3M-Electronic Products Division, Austin, TX 78769-2963, 1-800-225-5373 Sls. & Prod. Info. ..... C•1464
~~**Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307**~~
§ Pomona Electronics, Pomona, CA 91766, 714-623-3463 ..... C•1494
Alden Products Co., Brockton, MA 02403 508-583-0160
† Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-1295
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
† Contact East, N. Andover, MA 01845 508-682-2000
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ..... 617-275-0850; 800-937-4688
§ CUI Stack Inc., Beaverton, OR 97005 503-643-4899
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Dumont/E & R Electronics, Inc., W. Caldwell, NJ 07006 201-575-8666
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
E-Z Hook, Tektest Inc., Arcadia, CA 91006 818-446-6175
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
GGB Industries, Inc., Picoprobe Division, Naples, FL 33941 813-643-4400
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
Ion Physics Co., Atkinson, NH 03811 603-893-6687
§† Keystone Electronics Corp., Astoria, NY 11105-2017 718-956-8900
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
† Kikusui International Corp., Torrance, CA 90503 ..... 213-371-4662;800-545-8784
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
Picosecond Pulse Labs, Inc., Boulder, CO 80306 303-443-1249
§ Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ H H Smith, NT-T Inc., Meadville, PA 16335 814-724-6440
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Test Probes, Inc., San Diego, CA 92121 619-552-2090
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Probes, RF-2900

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 ..... D•1020-1021
Concord Electronics Corporation, New York, NY 10012, 1-212-777-6571 ..... C•1325
E-Z Hook, Tektest Inc., Arcadia, CA 91006, 818-446-6175 ..... C•1364
† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 ..... D•1251
† Millivac Instruments, Inc., Schenectady, NY 12301, 518-355-8300 ..... D•1294
Alden Products Co., Brockton, MA 02403 508-583-0160
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Delta Controls Corp., Shreveport, LA 71107 318-424-8471
† Dielectric Communications, General Signal, Raymond, ME 04071 ..... 207-655-4555; 800-341-9678
§† Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Genisco Technology Corp., La Mirada, CA 90638 714-523-7001
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Ion Physics Co., Atkinson, NH 03811 603-893-6687
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Keithley Instrs., Cleveland, OH 44139 800-552-1115
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Telephonics Corporation/PRD Instruments, Huntington, NY 11743 ..... 516-549-6415/6428
Teleplex, Inc., Alford Division, Woburn, MA 01801 617-935-8610
§ Test Probes, Inc., San Diego, CA 92121 619-552-2090
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Probes, Temperature-2900

§† Fenwal Electronics, Inc./APD, Milford, MA 01757, 508-478-6000 ..... B•1845
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
§ Ketema/Rodan Division, Anaheim, CA 92806, 714-630-0081 ..... B•1846-1848
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. B•1850
Omega Engineering, Stamford, CT 06907, 800-826-6342 ... B•1854,1945, C•1799
Quality Thermistor, Boise, ID 83709, 208-377-3373 ..... B•1858
§† RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
† Sensor Scientific, Inc., Fairfield, NJ 07006, 201-227-7790;800-524-1610 ..... B•1862-1863
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1375
§ Therm-O-Disc, Inc., Midwest Components Product Grp., Mansfield, OH ~~**44907-0538, 419-525-8450 ..... B•1866-1869**~~
U.S. Sensor Corp., Orange, CA 92667, 714-639-1000 ..... B•1871
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Advanced Thermal Products, Inc., St. Marys, PA 15857 814-834-1541
Alfa Electronics, Inc., Princeton, NJ 08543-8089 609-275-0220
§ Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
§ Atkins Technical Inc., Gainesville, FL 32608 904-378-5555
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
§ Bayley Instrument Company, Kenwood, CA 95452 707-833-6014
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cambridge Aerofio, Inc., Shirley, MA 01464 508-45-2346
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
† Climatronics, Bohemia, NY 11716 516-567-7300
Conax Buffalo Corporation, Buffalo, NY 14225 716-684-4500
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Dale Electronics, Inc., El Paso Div., El Paso, TX 79926-6728 915-592-3253
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 ..... 800 368-2516
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
Degussa Corp., Temperature Sensing Products, So. Plainfield, NJ 07080
† Digitec, Marion, OH 43302 614-387-3444
§ Dill Instruments Inc., Kalamazoo, MI 49005 616-388-5708
§ Dowty Custom Elctrns., Inc., Thermocontrol Div., Brandon, VT 05733 ... 802-247-6811
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
§ E-Squared Technology Corp., Ventura, CA 93003 805-644-9544
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
† GIC Thermodynamics, Royal Oak, MI 48073 313-280-1648
§† Gordon Co.:Watlow, Richmond, IL 60071 815-678-2211
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Meissner Industries, Dover, NJ 07801 201-366-1700
§ Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Minco Products, Minneapolis, MN 55432 612-571-3121
† Oven Industries, Mechanicsburg, PA 17055 717-766-0721
§ Pacific Transducer Corp., Los Angeles, CA 90064-1482 213-478-1134
† Piezo Electric Products, Inc., Metuchen, NJ 08840 908-548-2800
Princo Instruments, Inc., Southampton, PA 18966
§ Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
† Relco Products, Denver, CO 80237 303-756-1143
§ RFL Inds., Inc., (DBA) Dowty Elctrns. Co., Brandon, VT 05733 802-247-6811
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
† Simmonds Precision Engine Systems, BF Goodrich Aerospace, Norwich, NY 13815 607-335-5000
§ Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Superior Electric, Bristol, CT 06010 203-582-9561
† Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Thermo Electric, Saddle Brook, NJ 07662 201-843-5800
† Thermometrics, Inc., Edison, NJ 08817-4695 908-287-2870
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vibro-Meter Corp., Billerica, MA 01822-5058 508-663-7322
§† Victory Engineering Corp., Springfield, NJ 07081 201-379-5900
† VirTis Co., Gardiner, NY 12525 ..... 914-255-5000; 800-431-8232

§† Weed Instrument Co., Inc., Round Rock, TX 78680-0300 512-255-7043
§ Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Probes, Test Lead-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
§ Concord Electronics Corporation, New York, NY 10012, 1-212-777-6571 ..... C•1324-1325,1595
§ E-Z Hook, Tektest Inc., Arcadia, CA 91006, 818-446-6175 ..... C•1364
§ Richard Hirschmann of America Inc., Riverdale, NJ 07457, 201-835-5002 ..... C•1398
3M-Electronic Products Division, Austin, TX 78769-2963, 1-800-225-5373 Sls. & Prod. Info. ..... C•1464
Multi-Contact USA, Santa Rosa, CA 95401, 707-575-7575 ..... C•1475-1477
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307
§ Pomona Electronics, Pomona, CA 91766, 714-623-3463 ..... C•1494,1499
† Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1050
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ Schurter, Inc., Petaluma, CA 94952, 707-778-6311 ..... C•1520
§† Superior Electric, Bristol, CT 06010, 203-582-9561 ..... C•1537
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
Alden Products Co., Brockton, MA 02403 508-583-0160
§ Augat/Pylon Co., Inc., Attleboro Falls, MA 02763 508-699-9800
† Avex Electronics, Bensalem, PA 19020 ..... 215-638-1515;800-345-1295
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
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§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§† Brim Electronics, Fair Lawn, NJ 07410 201-796-2886
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
§† Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412 708-455-8830
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Cooper Industries/Belden Div., Richmond, IN 47375 ..... 317-983-5200;800-BELDEN-1
§† Daburn Electronics & Cable Corp., Northvale, NJ 07647 201-768-5400
§ EBY Company, Philadelphia, PA 19124 215-537-4700
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Hameg, Inc., Port Washington, NY 11050 516-883-3837
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HP Direct, Hewlett-Packard, Sunnyvale, CA 94086 800-538-8787
§ Interconnect Devices, Inc., Kansas City, KS 66106 913-342-5544
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
§† Keystone Electronics Corp., Astoria, NY 11105-2017 718-956-8900
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§ Ostby-Barton Test Probes, Warwick, RI 02886 401-739-7310
§ Probe Master, Inc., San Diego, CA 92111 ..... 619-560-9676; 800-772-1519
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
§ Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
§ H H Smith, NT-T Inc., Meadville, PA 16335 814-724-6440
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Test Probes, Inc., San Diego, CA 92121 619-552-2090
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Western Elctrn. Comps. Corp., Camarillo, CA 93010 805-482-8002
§ "World" Test Systems, Inc., Waynesboro, VA 22980 703-949-6753

Process Control Systems-2200

Advanced Control Sys., Hingham, MA 02043, 617-740-0223 ..... D•1127
Chromalox Instrs. & Controls, La Vergne, TN 37086-3536, 615-793-3900 ..... D•1131
Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•1140, 2243
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1142
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ... D•1203
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1401
§ Acrosystems Corp., Beverly, MA 01915 508-927-8880
§ Adatek, Inc., Sandpoint, ID 83864 ..... 208-263-1471;800-323-3343
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
AMP-AKZO Corporation, Melville, NY 11747 516-454-4400
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
§ Analogic Corp., Peabody, MA 01960 508-977-3000
† Applied Data Communications, Tustin, CA 92680 714-731-9000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Athena Controls, Inc., Plymouth Meeting, PA 19462 215-828-2490
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Bambeck Systems Inc., Santa Ana, CA 92705 ..... 714-250-3100;800 334-3101
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
BLH Electronics, Inc., Canton, MA 02021-9111 617-821-2000
California Automation Inc., San Diego, CA 92121 619-452-1341
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Cross Electronics, Warrendale, PA 15086 412-776-1591
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Delta Controls Corp., Shreveport, LA 71107 318-424-8471
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
DSP Technology, Fremont, CA 94538-7338 415-657-7555
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Dynapar, Gurnee, IL 60031 312-662-2666
Electronic Innovations Corp., Englewood, CO 80110 303-789-0424
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Gimix, Inc., Northbrook, IL 60062-2406 708-559-0909
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
§ International Data Aquistion & Control, Inc., Amherst, NH 03031 603-673-0765
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
Matrix Corp., Raleigh, NC 27610 919-231-8000
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
§† Mikron Instr., Wyckoff, NJ 07481 201-891-7330
Octagon Systems, Westminster, CO 80030 303-430-1500
Optimum Applied Systems, Dobbs Ferry, NY 10522-1696 914-693-9001
Princo Instruments, Inc., Southampton, PA 18966
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Square D Co., Palatine, IL 60067 708-397-2600
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Techmation, Inc., Tempe, AZ 85282 602-968-9946
TL Inds. Inc., Northwood, OH 43619 419-666-8144
Tridyne Process Systems, DBI Industries, So. Burlington, VT 05403 802-863-6873
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
Versalogic Corp., Eugene, OR 97402 800-824-3163
Viable Systems Inc., Sherborn, MA 01770 508-653-7665
§ Weed Fiber Optics Inc., Weed Instrument Co., College Station, TX 77845 409-693-5397

Processors, Array – See Array Processors (Vol. D)

Processors, Communications, Front End-1900

§ Action Instruments, San Diego, CA 92123 619-279-5726
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
§ Electronic Tele-Communications, Inc., Atlanta, GA 30340-2178 404-455-4890
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010

Processors, Communications, Message Switching-1900

† Aydin Corp., Horsham, PA 19044 215-657-7510
§ Electronic Tele-Communications, Inc., Atlanta, GA 30340-2178 404-455-4890
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010

Processors, Communications, Network Node-1900

§ Action Instruments, San Diego, CA 92123 619-279-5726
† Aydin Corp., Horsham, PA 19044 215-657-7510
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
§ Computrol:An AEG Co., Ridgefield, CT 06877 203-431-2000
§ EDA Instruments, Inc., Toronto, ON, CANADA M4H1H1 416-425-7800
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
§ Western Digital Corp., Irvine, CA 92718 714-932-6000

Processors, Communications, Standalone-1900

§ Action Instruments, San Diego, CA 92123 619-279-5726
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777

SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM

Processors, Display-2450 — *See Vol. B*

Processors, Image-2000

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1146
Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Avelem, Gargilesse, FRANCE 36190 33-54478672
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456
# Biomation Instruments, Almonte K0A1A0 613-256-2821
§ CCD Imaging, Fairchild Weston Systems, Inc., Milpitas, CA 95035 408-433-2500
§ Datacube, Inc., Peabody, MA 01960 508-535-6644
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
† DBA Systems, Inc., Melbourne, FL 32902-0550 305-727-0660
Eastman Kodak Company, Motion Analysis Systems Division, San Diego, CA 92121-1095 619-535-2908
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
Image Graphics, Inc., Shelton, CT 06484 203-926-0100
Imaging Technology Inc., Woburn, MA 01801-6343 617-938-8444
Lixi, Inc., Downers Grove, IL 60515 708-620-4646
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
§ Matrox Electronic Systems, Ltd., Dorval, QU, CANADA H9P 2T4 514-685-2630
§ Perceptics Corp., Knoxville, TN 37922 615-966-9200
PERX,Inc., Corte Madera, CA 94925 415-927-0155
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473
# Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
Signum, Inc., Woburn, MA 01801 617-933-4780
Synoptics, Ltd., Paragon Towers, Newton, MA 02164 617-527-4461
Telesis Controls Corp., Chillocothe, OH 45601 614-642-3200
Third Domain, Inc., Tucson, AZ 85731-7568 602-290-1820
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
§ TRW LSI Products INC., La Jolla, CA 92038 619-457-1000
Vicom Systems, Inc., Fremont, CA 94538 415-498-3200
§ Vidco, Inc., Beaverton, OR 97005 503-641-1804
Vista Systems, Inc., Peabody, MA 01960 508-532-1971
Visual Information Technologies, Inc.(UITEC), Plano, TX 75075 ..... 214-596-5600; 800-325-6467
§ Weitek Corp., Sunnyvale, CA 94086 408-738-8400

Processors, Remittance-2000

Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1725
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600

Processors, Video Signal-1900

Analogic Corp., Data Conversion Prods. Grp., Wakefield, MA 01880, 508-977-3000 ..... D•1146
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Covid, Inc., Tempe, AZ 85281 602-966-2221
§ Datacube, Inc., Peabody, MA 01960 508-535-6644
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300
§ Perceptics Corp., Knoxville, TN 37922 615-966-9200
# Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
Signatec, Inc., Corona, CA 91720 714-734-3001
ST Research Corporation, Newington, VA 22122 703-550-7000
§ Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Program Board Connectors — See Connectors, Plug-in, Program Board (Vol. C)

Programmers, Cam & Drum-2200

American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
† Cole Instrument Corp., Santa Ana, CA 92704 714-556-3100
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
PPM, Inc., Cleveland, OH 44139 216-349-2300
Techniques, Inc., Englewood, NJ 07631 201-569-5900
§ Tenor Company, New Berlin, WI 53151 414-782-3800
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

Programmers, Matrix Boards — See Boards, Programming (Vol. C)

Programmers, Power-2200

Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Energy Systems, Vancouver, WA 98682 206-896-8310
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 708-543-6200

Programmers, Power Supply-4000

Electronic Measurements, Neptune, NJ 07753, 908-922-9300 ..... D•1721,1727
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728-1729,2191
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1873,2211
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2218
American Magnetics, Oak Ridge, TN 37831-2509 615-482-1056
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Energy Systems, Vancouver, WA 98682 206-896-8310
ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254

Programmers, PROM & Logic Array-3130 — *See Vol. A*

Programmers, Punched Card-2000

Signal Research Inc., Titusville, NJ 08560, 609-737-1917 ..... D•1109
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245

Programmers, Tape-2000

Amilon Corp., Woodside, NY 11377 718-274-1794
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002

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Protectors, Surge — See Suppressors, Transient Voltage (Vol. B)

Protocol Converters-1900

Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803, 516-694-6700 ..... A•1721
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124
Andrew/KMW Systems, Austin, TX 78730 ..... 800-531-5167;512-338-3082
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Digital Products, Inc., Watertown, MA 02172 ..... 617-924-1680;800-243-2333
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Instrumentation Services, Inc., Minneapolis, MN 55427 612-544-8916
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
Tamura Corporation of America, Carson, CA 90746-3518 213-638-1790
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Vetra Systems Corp., Plainview, NY 11803 516-454-6469

Prototyping Equipment, Circuit Board-4200 — *See Vol. C*

Proximity Transducers — See Current Sensors (Vol. D), Transducers, Volt, etc. (Vol. B)

Public Address Systems-1300

§† Aiphone, Bellevue, WA 98005 206-455-0510
§ Argos Prods., Genoa, IL 60135 815-784-5118
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
Cableform Inc., Troy, VA 22974 804-589-8224
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
§ Furman Sound, Inc., Greenbrae, CA 94904 415-927-1225
† Infinetics Inc., Friskem Div., Wilmington, DE 19802 302-658-2471
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830 908-283-4925
MG Electronics, Hauppauge, NY 11788 516-582-3400
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Perma Power Elctrns., Chicago, IL 60648 312-763-0763
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Spectra Sonics, Ogden, UT 84405 801-392-7531
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

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Pullers, Tube-5400 — *See Vol. C*

Pulleys-2500 — *See Vol. C*

Pulsers, Diode — See Power Supplies, AC Input, Greater than 1,000 VDC Output (Vol. D)

Pulsers, Logic Test-2900

§ Contact East, N. Andover, MA 01845 508-682-2000
§ Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ OK Industries, Inc., Yonkers, NY 10701 914-969-6800

Pumps, Vacuum-4100

§† Air-Vac Engrg., Milford, CT 06460 203-874-2541
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Brailsford & Co., Rye, NY 10580 914-967-1820
Brinkmann Instruments, Inc., Westbury, NY 11590-9974 516-334-7500
Cole-Parmer Instrument Company, Chicago, IL 60648 ..... 708/647-7600
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
† Edcliffe Div., BEI Electronics Co., Sylmar, CA 91342 818-362-7151
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
§ Hull Corp., Hatboro, PA 19040 215-672-7800
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300

Punches, Chassis-5400 — ***See Vol. C***

Pyrometers, Infrared-2900

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1368
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
§ Epic, Inc., New York, NY 10038 212-349-2470
§ E-Squared Technology Corp., Ventura, CA 93003 805-644-9544
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
§ Land Infrared, Land Instruments Intl. Inc., Bristol, PA 19007 ..... 215-781-0700; 800-523-8989
§† Mikron Instr., Wyckoff, NJ 07481 201-891-7330
§ Raytek, Inc., Santa Cruz, CA 95060-1820 408-458-1110
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
† Williamson Corporation, Concord, MA 01742 508-369-9607

Pyrometers, Optical, Noninfrared-5300 — ***See Vol. B***

Pyrometers, Recording-2900

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1368
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
Burling Instruments, Inc., Chatham, NJ 07928-0298 201-635-9481
§ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
§† Gordon Co.:Watlow, Richmond, IL 60071 815-678-2211
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
§ Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
† Williamson Corporation, Concord, MA 01742 508-369-9607

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Radiographic Equip. — See X-ray Inspection Equip. (Vol. D)

Radiometers-2900

† AIL Systems, Inc., Eaton Corp., Deer Park, NY 11729 516-595-3094
§ American Ultraviolet, Murray Hill, NJ 07974 908-665-2211
§ BEA electro-optics, inc., Des Plaines, IL 60016 708-298-1420
§ Efos Inc., Mississauga, Ont., CAN L4Z 2E8 416-568-4268
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
International Light, Newburyport, MA 01950-4092 508-465-5923
† KLC/Karl Lambrecht Corp., Chicago, IL 60618 312-472-5442
§ Laser Precision Corp., Utica, NY 13502 315-797-4449
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
§† Mikron Instr., Wyckoff, NJ 07481 201-891-7330
Oriel Corp., Stratford, CT 06497-0872 203-377-8282
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
Swan Associates, New Haven, CT 06534 203-387-3917

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Reactors, Charging-5600 — ***See Vol. A***

Reactors, Epitaxial — See Machines & Accessories, Semiconductor Manufacturing (Vol. D)

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Reactors, Loading-5600 — ***See Vol. A***

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Readers, Badge-2000

Signal Research Inc., Titusville, NJ 08560, 609-737-1917 ..... D•1109
§ Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
American Magnetics Corporation, Group 4, Carson, CA 90745 213-775-8651
Control Module, Enfield, CT 06082 203-745-2433
§ Corby Industries, Inc., Allentown, PA 18103 215-433-1412
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
Hickok Electrical Instrument Company, Cleveland, OH 44108 216-541-8060
§† PERCON, Inc., Eugene, OR 97402-9153 ..... 1-800-8-PERCON;503-344-1189
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945

Readers, Bar Code-2000

Accu Data, Inc., Springville, UT 84663-0963 801-377-9156
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 708-662-9200
Computerwise, Olathe, KS 66062 913-829-0600
Control Module, Enfield, CT 06082 203-745-2433
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
Fiberoptic Systems, Inc., Simi Valley, CA 93063 805-583-2088
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
General Digital Corp., Enfield, CT 06082 203-741-7171
† Hand Held Products, Inc., Charlotte, NC 28226 704-541-1380
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Interactive Computer Products, Inc., Laguna Hills, CA 92653 714-770-5332
§ Lazer Data, Electro Corporation, Orlando, FL 32804 1-800-843-2700
Melfess Five, Inc., Los Angeles, CA 90025 ..... 213-826-8133;800-533-2297
§ Neuron Electronics, Inc., Torrance, CA 90503 ..... 213-793-1300;1-800-FON-4-NEI
§ Opto Technology, Inc., Wheeling, IL 60090 708-537-4277
§† PERCON, Inc., Eugene, OR 97402-9153 ..... 1-800-8-PERCON;503-344-1189
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
SMK Electronics Corporation, U.S.A., Placentia, CA 92670 714-996-0960
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
Voice Connexion, Irvine, CA 92714 714-261-2366
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945

Readers, Character-2000

† Cognitronics, Stamford, CT 06906 203-327-5307
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
Dalsa Inc., Waterloo, Ont., CANADA N2V 2E9 519-886-6000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900

Readers, Key-2000

† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221

Readers, Magnetic Card-2000

§ **Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118**
Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 708-662-9200
Control Module, Enfield, CT 06082 203-745-2433
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
§ Neuron Electronics, Inc., Torrance, CA 90503 ..... 213-793-1300;1-800-FON-4-NEI
Omega Engineering, Stamford, CT 06907 800-826-6342
Thomson Passive Components Corp., Woodland Hills, CA 91367 818-887-1010
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331

Readers, Magnetic Stripe Card-2000

§ **Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118**
§ American Magnetics Corporation, Group 4, Carson, CA 90745 213-775-8651
Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 708-662-9200
Computerwise, Olathe, KS 66062 913-829-0600
Creative Micro Systems, Los Alamitos, CA 90720 213-493-2484
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
§ Mag-Tek, Carson, CA 90746 213-631-8602
Melfess Five, Inc., Los Angeles, CA 90025 ..... 213-826-8133;800-533-2297
§ PERCON, Inc., Eugene, OR 97402-9153 ..... 1-800-8-PERCON;503-344-1189
Q-Card, Inc., Owings Mills, MD 21117-1634 410-581-0112
THORN Automated Systems, Inc, THORN EMI, Westlake, OHIO 44145 216-871-9900
§ Tokin America, Inc., San Jose, CA 95134 408-432-8020
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945

Readers, Punched Card-2000

Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
Signal Research Inc., Titusville, NJ 08560, 609-737-1917 ..... D•1109
Digital Equip., Marlborough, MA 01752
Fiberoptic Systems, Inc., Simi Valley, CA 93063 805-583-2088
HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500
§ Neuron Electronics, Inc., Torrance, CA 90503 ..... 213-793-1300;1-800-FON-4-NEI
Opto Technology, Inc., Wheeling, IL 60090 708-537-4277
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331

Readers, Punched Tape-2000

Signal Research Inc., Titusville, NJ 08560, 609-737-1917 ..... D•1109
† Chalco Engrg. Corp., Chalco Industries, Inc., Gardena, CA 90248-1898 ... 213-321-0121; 213-323-5525
Digital Equip., Marlborough, MA 01752
Fiberoptic Systems, Inc., Simi Valley, CA 93063 805-583-2088
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Opto Technology, Inc., Wheeling, IL 60090 708-537-4277
Teleterminal Corp., Greenland, NH 03840 603-431-1200

Readers, Static Card-2000

Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 708-662-9200
† Vertex Industries, Inc., Clifton, NJ 07014 201-472-1331

Readers, Time Code-2000

§ **Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084**
† **Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167**
§ **ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135**
FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ..... A•1371
† **TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194-1195**
Datachron Inc., Anaheim, CA 92805 714-385-1705
Fiberoptic Systems, Inc., Simi Valley, CA 93063 805-583-2088
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
† K-Systems of Texas, Inc., El Paso, TX 79936 915-598-9769

Readouts — See Tubes, Readout (Vol. A)

Reamers-5400 — ***See Vol. C***

Receivers, AM/FM (Incl. Precision Test)-2900

Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
§† Aiphone, Bellevue, WA 98005 206-455-0510
Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
CP Technology, Inc., Cupertino, CA 95014 408-996-8069
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
§ University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

Receivers, Communication-1900

§† **Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225**
Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... D•1077
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† AEROCOM, Miami, FL 33133 305-448-6503
† Allied-Signal Aerospace Co., Bendix Communications Div., Towson, MD 21204 410-583-4000
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
BT & D Technologies, Wilmington, DE 19803 302-479-0300
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
† Colorado Video, Inc., Boulder, CO 80306 303-530-9580
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
EVI, Inc., Columbia, MD 21046 301-290-9550
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
Loral TerraCom, Sub. of Loral Corp., San Diego, CA 92123 619-278-4100
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
M/A-COM Government Products, Inc., Hunt Valley, MD 21030 301-771-0077
Marconi Instruments, Allendale, NJ 07401 201-934-9050
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§† Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Receivers, Fiber Optic-2475 — ***See Vol. B***

Receivers, Field Intensity, Microwave — See Receivers, Microwave (Vol. D)

Receivers, Fixed Frequency-2900

† **Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077**
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† AEROCOM, Miami, FL 33133 305-448-6503
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
VIZ Meteorological Instruments, Philadelphia, PA 19144-5782 215-844-2626
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Receivers, Frequency Shift-1900

Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 .. D•1077
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† AEROCOM, Miami, FL 33133 305-448-6503
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
Dantel, Fresno, CA 93727 209-292-1111
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† Electrocom Industries, S. Bend, IN 46615 219-232-2743
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
VIZ Meteorological Instruments, Philadelphia, PA 19144-5782 215-844-2626

Receivers, Global Positioning Satellite (GPS)-1900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1165-1167
Ball Corp., Efratom Division, Irvine, CA 92718-1605 714-770-5000
Datachron Inc., Anaheim, CA 92805 714-385-1705

Receivers, Headphone — See Handsets, etc. (Vol. D)

Receivers, Laser-1900

Analog Modules, Inc., Longwood, FL 32750 407-339-4355
EG&G Optoelectronics, EG&G Canada Ltd., Vaudreuil, Quebec, CANADA J7V 8P7 514-424-3300

Receivers, Loran & Omega-1900

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
LocUS Inc., Madison, WI 53704 608-244-0500
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
† Tremetrics Inc., Baker Hughes Incorporated, Austin, TX 78725-2100 512-929-2051
VIZ Meteorological Instruments, Philadelphia, PA 19144-5782 215-844-2626

Receivers, Microwave-3450 — ***See Vol. A***

Receivers, Monitoring, Communications-1900

Digitran Division, Xcel Corporation, Ontario, CA 91761, 714-391-4321 ... B•1805
† AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† AEROCOM, Miami, FL 33133 305-448-6503
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computron Display Systems, Xcel Corporation, Elk Grove Village, IL 60007 708-952-8800
† Condor Systems, Inc., San Jose, CA 95124 408-371-9580
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Avionics, Arcadia, CA 91006 818-445-5955
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
† Glatzer Industries Corp., New Rochelle, NY 10801 914-576-2700
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Lorch Electronics:Div. of Vernitron Corp., St. Petersburg, FL 33710 813-347-2181
† Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
Marconi Instruments, Allendale, NJ 07401 201-934-9050
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
ST Research Corporation, Newington, VA 22122 703-550-7000
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Receivers, NBS-2900

Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000 ..... A•1307
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
BT & D Technologies, Wilmington, DE 19803 302-479-0300
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Receivers, Telemetry-1900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1067,1164
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .. B•1058-1064
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† RHG Electronics Laboratory, Inc., Deer Park, NY 11729 516-242-1100
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
† TRAK Microwave Corp., Tampa, FL 33634 813-884-1411
§ TransKinetic Sys., Canton, MA 02021 617-828-3000
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300
VIZ Meteorological Instruments, Philadelphia, PA 19144-5782 215-844-2626

Receivers, Tone-1900

Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Aptek Technologies, Inc., Aptek Microsystems, Deerfield Beach, FL 33442 305-421-8450
§† A.R.F. Prods., Boulder, CO 80301 303-443-4844
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
Dantel, Fresno, CA 93727 209-292-1111
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
Electrocom Industries, S. Bend, IN 46615 219-232-2743
† Gorman-Redlich Mfg. Co., Athens, OH 45701 614-593-3150
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
NAVAN Corporation, Media, PA 19063 215-543-8066
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Sonicall, Inc., Signal Hill, CA 90806 213-490-2143
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Receivers, TV — See Monitors, Video (Vol. D)

Receivers (MIL)-2440 — ***See Vol. B***

Receivers (MIL), Elint-2440 — ***See Vol. B***

Receivers (MIL), ESM-2440 — ***See Vol. B***

Receivers (MIL), Fiber Optic-2440 — ***See Vol. B***

Receivers (MIL), Radio-2440 — ***See Vol. B***

Receivers (MIL), Surveillance-2440 — ***See Vol. B***

Receptacles — See Connectors (Vol. C), Jacks (Vol.), Sockets

Receptacles, Power — See Sockets, Power (Vol. C)

Recognition & Response Equipment, Speech-2000

Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
§ Antex Electronics Corp., Gardena, CA 90248 213-532-3092
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Covox, Inc., Eugene, OR 97402 503-342-1271
† Mimic, Inc., Islington, MA 02090-0705 617-329-9593
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Rhetorex, Inc., Campbell, CA 95008 408-370-0881
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Voice Connexion, Irvine, CA 92714 714-261-2366
Voicé Processing Corp., Cambridge, MA 02142 617-494-0100

Recorders, Cartridge, Bubble Memory-2000

Projector Recorder Belt Corp., Whitewater, WI 53190, 1-800-533-9654 ... C•1597
† Miltope Corp., Melville, NY 11747 516-420-0200

Recorders, Computer Data-2000

Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415-1418
B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
General Scanning Recorder Products Division, Arlington, MA 02174, 617-641-2702 ..... D•1419
 # Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Projector Recorder Belt Corp., Whitewater, WI 53190, 1-800-533-9654 ... C•1597
§ Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
§ ACR Systems Inc., Surrey,B.C., CANADA V3W 4N8 604-591-1128
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Amilon Corp., Woodside, NY 11377 718-274-1794
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Bascom-Turner Instruments, Norwood, MA 02062 617-769-9660
§ Braemar Corp., Burnsville, MN 55337 612-890-5135
† CELCO, Mahwah, NJ 07430 201-327-1123
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ Digi-Data Corp., Jessup, MD 20794 301-498-0200
Flex-Core Div., Morlan & Assocs., Inc., Worthington, OH 43235 614-889-6152
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Houston Instrument, AMETEK, Inc., Austin, TX 78753 512-835-0900
Image Graphics, Inc., Shelton, CT 06484 203-926-0100
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
† Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
§† Stemco Instruments, Colt Industries, Longview, TX 75607 214-643-3236
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464

Recorders, Electrostatic-3000

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1422
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
§ Chessell Corp., Newtown, PA 18940 215-968-0660
§ Geophysical Survey Systems, Inc., North Salem, NH 03073-0097 603-893-1109
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464

Recorders, Event/Multievent-3000

Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415-1418
General Scanning Recorder Products Division, Arlington, MA 02174, 617-641-2702 ..... D•1419
 # Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1307,1422
PPM, inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
† Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
§ Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
AES Corp., Peabody, MA 01960 508-535-7310
Altek Co., Torrington, CT 06790 203-482-7626

† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Data, Inc., Ft. Collins, CO 80525 303-493-1222
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
DSP Technology, Fremont, CA 94538-7338 415-657-7555
Electric Tachometer, Philadelphia, PA 19142 215-726-7723
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Geophysical Survey Systems, Inc., North Salem, NH 03073-0097 603-893-1109
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
§Φ Instrumented Sensor Technology, Inc., Lansing, MI 48910 517-371-1980
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
KineticSystems, Lockport, IL 60441 815-838-0005
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
Larson Instrument, Orangeburg, NY 10962 914-359-3800
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Linear Instruments, Spectra Physics Analytical, Reno, NV 89523 702-746-2200
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Mauell Corp., Dillsburg, PA 17019-0339 717-432-8686
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Pacer Systems, Inc., Billercia, MA 01821 508-667-8800
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 818-365-0101
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311
Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

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Recorders, Graphic – See Recorders, Specific Types (Vol. D)

Recorders, Magnetic Tape-2000

International Electro Magnetics, Inc., Palatine, IL 60067, 708-358-4622 ... D•1036
† Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... D•1310
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Projector Recorder Belt Corp., Whitewater, WI 53190, 1-800-533-9654 ... C•1597
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
Amilon Corp., Woodside, NY 11377 718-274-1794
§ Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
§ Audiotronics Corp., N. Hollywood, CA 91605 818-765-2645
§ Braemar Corp., Burnsville, MN 55337 612-890-5135
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Cipher Data Products, Inc., an Archive Co., San Diego, CA 92131 619-578-9100
§ Comspec Digital Products Inc., Houston, TX 77043 713-461-4487
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
Data, Inc., Ft. Collins, CO 80525 303-493-1222
§ Digi-Data Corp., Jessup, MD 20794 301-498-0200
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Geophysical Survey Systems, Inc., North Salem, NH 03073-0097 603-893-1109
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
† Memtec Corp., Salem, NH 03079 603-893-8080
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
Pacer Systems, Inc., Billercia, MA 01821 508-667-8800
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473
† Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233
§† Saylor Electronics Int'l, Inc., Carson City, NV 89706 702-883-4184
†# Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
TCA, Montebello, CA 90640 213-726-0303
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Recorders, Polar-3000

Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415,1417
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
§ Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030

Recorders, Program Loading-2000

Amilon Corp., Woodside, NY 11377 718-274-1794
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
† Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811

Recorders, Pyrometer – See Pyrometers, Recording (Vol. D)

Recorders, Sound Level-1300

† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
† Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
Metrosonics, Inc., Rochester, NY 14692-3075 716-334-7300
† Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Toshiba Instrumentation Div., Toshiba Intl. Corp., Tulsa, OK 74134 918-252-3548
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311

Recorders, Strip Chart-3000

Φ Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415-1418
B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
General Scanning Recorder Products Division, Arlington, MA 02174, 617-641-2702 ..... D•1419
 # Linseis, Inc., Princeton Junction, NJ 08550, 609-799-6282;800-RECORDER ..... D•1420
MFE Instruments, Stocker & Yale, Inc., Beverly, MA 01915-0490, 508-921-9104;800-472-4633 ..... D•1421
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... C•1799, D•1101,1191,1307
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... D•1310
† Rustrak Instruments, Mark IV Company, E. Greenwich, RI 02818, 401-884-6800;800-332-3202 ..... D•1423
§ Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
† Allen Datagraph, Inc., Salem, NH 03079 603-893-1983
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
§† Bailey Controls Co., Wickliffe, OH 44092 216-585-8500
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
Bascom-Turner Instruments, Norwood, MA 02062 617-769-9660
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Climatronics, Bohemia, NY 11716 516-567-7300
Cole-Parmer Instrument Company, Chicago, IL 60648 ..... 708/647-7600
§ Contact East, N. Andover, MA 01845 508-682-2000
Controlex, Inc., New Boston, NH 03070 603-487-5512
Dataq Instruments, Inc., Akron, OH 44311 ..... 216-434-4284 ; 800-553-9006
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ DEVAR, Inc., Bridgeport, CT 06605 203-368-6751
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ Dieterich Standard, A Dover Industries Company, Boulder, CO 80301 ... 303-530-9600
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
Electric Tachometer, Philadelphia, PA 19142 215-726-7723
§ Electronic Associates, Inc., W. Long Branch, NJ 07764 201-229-1100
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Geophysical Survey Systems, Inc., North Salem, NH 03073-0097 603-893-1109
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Houston Instrument, AMETEK, Inc., Austin, TX 78753 512-835-0900
† IPM, Inc., Elnik Systems, Fairfield, NJ 07004 201-882-8033
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
§ Kipp & Zonen, Enraf-Nonius, Bohemia, NY 11716 ..... 516-589-2885;800-645-1025
§ Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
Larson Instrument, Orangeburg, NY 10962 914-359-3800
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Linear Instruments, Spectra Physics Analytical, Reno, NV 89523 702-746-2200
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
# Meylan Corporation, Upper Montclair, NJ 07043-1844 201-744-6400
Moore Products Co., Spring House, PA 19477 215-646-7400
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 818-365-0101

§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
§† The Recorder Company, San Marcos, TX 78667 512-629-1400
Rosemount Analytical Inc., Cedar Grove, NJ 07009 800-367-7242
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
§ Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tegal Scientific, Inc., Concord, CA 94524 415-827-1054
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Vector-VIZ Instrument Div. of The Vector Grp., Inc., Newburgh, NY 12550 800-627-0943
† VirTis Co., Gardiner, NY 12525 ..... 914-255-5000; 800-431-8232
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311

Recorders, Transient-3000

§† Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415-1418
Penny & Giles Data Systems, Inc., Roswell, GA 30076, 404-740-0415 .... D•1310
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
ABB Metrawatt, Broomfield, CO 80020 ..... 303-469-5231;800-821-6327
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§Φ Instrumented Sensor Technology, Inc., Lansing, MI 48910 517-371-1980
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
Kelmet, Inc., San Dimas, CA 91773 714-599-0954
KineticSystems, Lockport, IL 60441 815-838-0005
§ Kipp & Zonen, Enraf-Nonius, Bohemia, NY 11716 ..... 516-589-2885;800-645-1025
§ Kontron Elektronik-US Kontron Elektronik GMBH-Sub. BM, Beverly, MA 01915 508-927-6575
§ Krenz Electronic, Inc., San Clemente, CA 92672 714-361-2433
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
§ Macrodyne Inc., Clifton Pk., NY 12065 518-383-3800
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
§ PrimeLine, Soltec Corporation, San Fernando, CA 91341-0670 818-365-0101
§ Rapid Systems Inc., Seattle, WA 98103 206-547-8311
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
Signatec, Inc., Corona, CA 91720 714-734-3001
Soltec Corp., San Fernando, CA 91340-1597 ..... 818-365-0800;800-423-2344
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311

Recorders, Vibration-3000

Astro-Med, Inc., W. Warwick, RI 02893, 401-828-4000 ..... D•1415-1418
Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Western Graphtec, Irvine, CA 92718-2067, 714-770-6010;800-854-8385 .. D•1425
§ Acurex Corp./Autodata Div., Mountain View, CA 94039 415-967-9100
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Chessell Corp., Newtown, PA 18940 215-968-0660
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Epic, Inc., New York, NY 10038 212-349-2470
§Φ Instrumented Sensor Technology, Inc., Lansing, MI 48910 517-371-1980
Kelmet, Inc., San Dimas, CA 91773 714-599-0954
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
† Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
M-Tek, Pittsburgh, PA 15222 ..... 800-245-5101 ; 412-261-9030
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
§ Westronics Inc. of Texas, A Baker Hughes Co., Ft. Worth, TX 76161 817-625-2311

Recorders, Video-1900

§ Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
† Loral Data Systems, Data Recorders, Sarasota, FL 34230 813-371-0811
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
† Miltope Corp., Melville, NY 11747 516-420-0200
† Sekai Electronics of America, Inc., La Mirada, CA 90638 714-670-1854
Signatec, Inc., Corona, CA 91720 714-734-3001
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
† Video Automation Systems, Pound Ridge, NY 10576 914-764-4613

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Rectifiers, Ultrafast-4800 — *See Vol. A*

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Reels, Tape — See Tape Recording Accessories (Vol. D)

Reference Books — See Technical Books (Vol. D)

References, DC Voltage-2900

† Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242-1243
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
Julie Research Labs., New York, NY 10001, 212-633-6625 .... D•1270-1271,1273
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
§ Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012 ..... 605-296-3462/3487
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Hycomp, Inc., Marlborough, MA 01752 508-485-6300
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
§† Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Thaler Corp., Tucson, AZ 85737 602-742-5572
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
ZI-TECH Instrument Corp., Mountain View, CA 94039-1567 415-966-8484

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Refrigerators, Environmental Test-2550

† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
§† Associated Environmental Systems, Eastern Technologies, Amesbury, MA 01913-4848 508-388-7241
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
† Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
§ Forma Scientific, Inc., Marietta, OH 45750 614-373-4763
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
Hotpack Corp., Philadelphia, PA 19154 ..... 215-824-1700;800-523-3608
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Ransco Industries, Inc., Sub. Despatch Ind., Inc., Oxnard, CA 93033 805-487-7777
Rush Enterprises Inc:A Heico Company, Hudson, NH 03051 603-886-9460
§ Tegal Scientific, Inc., Concord, CA 94524 415-827-1054
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
§† VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555

Regulators, Current-4000

§† Amperite Co., Inc., Union City, NJ 07087, 201-864-9503 ..... B•1414
† Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•2200-2201
Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•2203
§ Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1978-1979
Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ... D•2038
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
† Autronics Corp., Arcadia, CA 91006 818-445-5470

§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
† CELCO, Mahwah, NJ 07430 201-327-1123
§ Codi Semiconductor, Kenilworth, NJ 07033 201-298-0400
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
Cross Electronics, Warrendale, PA 15086 412-776-1591
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
Energy Systems, Vancouver, WA 98682 206-896-8310
High Voltage Technology Inc., Yonkers, NY 10701 914-423-6636
MACROAMP Inc., Ukiah, CA 95482 707-462-2222
Mag-Con, St. Paul, MN 55113 612-633-8820
Melcher, Inc., Ashland, MA 01721 800-828-9712
† Mep Controls, Bordentown, NJ 08505 609-298-7300
† Micropac Inds., Inc., Garland, TX 75040 214-272-3571
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† NWL Transformers, Bordentown, NJ 08505 609-298-7300
Phenix Technologies, Accident, MD 21520 301-746-8118
Renard Manufacturing Company, Inc., Miami, FL 33122-1015 305-592-1500
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
Sharp Electronics Corp., Microelectronics Grp., Camas, WA 98706 206-834-2500
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§† Solitron Devices, Inc., Semiconductor Group, Riviera Beach, FL 33404-9978 ..... 407-848-4311;800-888-8763
§† Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Superior Electric, Bristol, CT 06010 203-582-9561
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Regulators, Frequency-4050

Abacus Controls Inc., Somerville, NJ 08876, 908-526-6010 ..... D•2149-2150
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2191-2192
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•2201
Nova Electric Corp., Technology Dynamics, Inc., Bergenfield, NJ 07652, 201-385-0500 ..... D•2214-2215
Abbott Technologies, Inc, Transformer Division, Sun Valley, CA 91352 ... 818-504-0644; 1-800-367-8200;818-841-3630
Basler Elec., Electronic Product Group, Highland, IL 62249 ..... 618-654-2341; 800-645-2074
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
† Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Sharp Electronics Corp., Microelectronics Grp., Camas, WA 98706 206-834-2500
Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Regulators & References, Silicon-Also See Diodes, Zener & Stabistors-4800 — *See Vol. A*

Regulators & Stabilizers, Voltage-Also See Transformers, Voltage Regulating-4000

§† Amperite Co., Inc., Union City, NJ 07087, 201-864-9503 ..... B•1414
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
Arnold Magnetics, Camarillo, CA 93012, 805-484-4221 ..... D•1599
Avel-Lindberg Inc., New Milford, CT 06776, 203-355-4711 ..... D•1625
† Controlled Power Co., Troy, MI 48083, 313-528-3700;1-800-521-4792 ..... D•2185,2188-2189
Dale Electronics, Inc., Yankton Div., Yankton, SD 57078-0180, 605-665-9301 ..... A•2198
Dynapower Corporation, S. Burlington, VT 05407, 802-860-7200 ... D•1712-1713
§ Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•2191-2192
† EMCO High Voltage Co., Sutter Creek, CA 95685, 209-223-3626 ... D•1732,1735
† Georator Corp., Manassas, VA 22110-0070, 800-523-9938 .... D•2195,2197-2198
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•2200-2201
Hitran Corporation, Flemington, NJ 08822-9943, 908-782-5525 ..... D•2203
† Interpoint Corporation, Redmond, WA 98073-9705, 206-882-3100 ..... D•1810
Kaiser Systems, Inc., Beverly, MA 01915, 508-922-9300 ..... D•1834-1835
§ Kepco, Inc., Flushing, NY 11352, 718-461-7000 ..... D•1837-1839
Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212
Melcher, Inc., Ashland, MA 01721, 800-828-9712 ..... D•1892-1895
ModuPower, Inc., Santa Clara, CA 95050, 408-496-5796 ..... D•1908-1910
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
Power-One, Inc., Camarillo, CA 93012, 805-987-8741 ..... D•1988
Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
† Sorensen Company, Chicago, IL 60630, 312-775-0843;1-800-525-2024 ... D•2038
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2138-2139
Zenith Magnetics, Zenith Electronics Corp., Glenview, IL 60025-2493, 708-391-7733 ..... D•2145
ACD-Elcor Products, Bethel, CT 06801 203-743-3510
Acme Electric Corporation, Cuba, NY 14727 716-968-2400
Acme Transformer, Acme Electric Corporation, Lumberton, NC 28358 ... 919-738-1121
§ Adtech Power Inc., Anaheim, CA 92806 714-634-9211
Albar, Inc., Lynnwood, WA 98036 ..... 206-771-4006;800-822-5227
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Applied Power Conversion, Technology Dynamics, Inc., Bergenfield, NJ 07621 201-385-0500
† A.S.I. Microsystems, Inc., (Formerly Andrich Systems, Inc.), Bohemia, NY 11716 516-589-5656
§ Aspen Power, Inc., Phoenix, AZ 85031 602-937-4784
§ AT&T Microelectronics, Allentown, PA 18103 ..... 1-800-372-2447;In Can.: 1-800-553-2448
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§† Bendix Electric Power Division, Allied Signal Aerospace, Eatontown, NJ 07724 201-542-2000
Berkshire Transformer Corp., Kent, CT 06757 203-927-3541
Bikor, Microsemi Corporation, Torrance, CA 90501 213-539-6320
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
§† Control Concepts Corp., Liebert Corp., Binghamton, NY 13902-1380 607-724-2484
§† Current Technology, Inc., Richardson, TX 75081-4802 214-238-5300
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
§† Dynamic Power Systems, Div. Onset International Corp., Nesconset, NY 11767-2611 516-361-6771
Dynapower Corporation, Farmington Hills, MI 48333 313-553-4300
§ Electronic Specialists, Natick, MA 01760 ..... 508-655-1532;800-225-4876
§ Exar Corp., San Jose, CA 95161-9007 408-732-7970
§ Furman Sound, Inc., Greenbrae, CA 94904 415-927-1225
GBC, Inc., Lamp Division, Ocean, NJ 07712 908-774-8502
§ Hammond Manufacturing Co., Buffalo, NY 14225 716-894-5710
Hycomp, Inc., Marlborough, MA 01752 508-485-6300
Intepro Systems Inc., Billerica, MA 01821 508-663-7555
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ ISOREG Corp., Littleton, MA 01460 508-486-9483
Mag-Con, St. Paul, MN 55113 612-633-8820
§ Magnetek Triad, Huntington, IN 46750 219-356-7100
† Magnetico Inc., Holtsville, NY 11742 516-654-1166
† Marconi Circuit Technology Corp., Farmingdale, NY 11735 516-293-8636
† Mep Controls, Bordentown, NJ 08505 609-298-7300
§† Micron Industries, Hillside, IL 60162 708-547-0900
† Micropac Inds., Inc., Garland, TX 75040 214-272-3571
§† Microsemi Corp. - Scottsdale, Microsemi Corporation, Scottsdale, AZ 85252 602-941-6300
Mid-Eastern Industries, Technology Dynamics Inc., Bergenfield, NJ 07621-2915 201-385-0500
† Modular Devices, Shirley, NY 11967 516-345-3100
§† Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
§† North Hills Electronics Inc., Power Products Div., Glen Cove, NY 11542-3796 516-671-5700
† Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
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Oeco Corp., Milwaukie, OR 97222 503-659-7932
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Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
Pico Electronics, Inc., Mt. Vernon, NY 10552 ..... 914-699-5514;800-431-1064
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
Power Conversion Products, Crystal Lake, IL 60014 815-459-9100
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Trends, Inc., Batavia, IL 60510 708-406-0900
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§† Silicon General, Garden Grove, CA 92641 714-898-8121
§ Sola, A Unit of General Sign., Elk Grove Village, IL 60007-5666 708-439-2800
§† Solitron Devices, Inc., Semiconductor Group, Riviera Beach, FL 33404-9978 ..... 407-848-4311;800-888-8763
§† Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Superior Electric, Bristol, CT 06010 203-582-9561
§† Technipower, A Penril Co., Danbury, CT 06813 203-748-7001
Technology Dynamics Inc., Bergenfield, NJ 07621 201-385-0500
† Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Thordarson Meissner, Components Corp. of Amer., Mt. Carmel, IL 62863 618-262-5121
Todd Systems, Inc., Yonkers, NY 10701 914-963-3400
† Trio Laboratories, Inc., Plainview, NY 11803 516-349-0400
§ Tripp-Lite, Chicago, IL 60610-4188 312-329-1777
§† Tycor International Inc., Calgary, Alberta, CANADA T2H 1L9 403-259-3200
Unitrode Corp., Watertown, MA 02172 617-926-0404
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Victoreen, Inc., Solon, OH 44139-3395 ..... 216-248-9300;216-248-9043
Voltex, Amityville, NY 11701 516-842-2772
† Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668
† Xentek, Inc., Taiyo Yuden USA, Inc., Vista, CA 92083 619-727-0940

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Rental & Lease Equipment-2900

ΦContinental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
ΦGenstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
†Hayes Instrument Service Inc., Billercia, MA 01821 508-663-4800
†ΦLaser Concepts, Omega Organization Intl., Seattle, WA 98133 206-364-7881
†ΦMicrowave Filter Inc., East Syracuse, NY 13057-0486 .... 315-437-3953;800-448-1666
ΦTucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
†ΦU.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
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§†Edsyn, Inc., Van Nuys, CA 91406 ..... 818-989-2324;213-873-5115
EI & S, Prime Technology Inc., North Branford, CT 06471 203-481-5721
Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
§Nu-Concept Systems, Colmar, PA 18915 215-822-8400
Pace Inc., Laurel, MD 20723-1990 301-490-9860
§†Plato Products, Inc., Glendora, CA 91740 818-967-3821
§Pomona Electronics, Pomona, CA 91766 714-623-3463
†Ungar, Div. Eldon Inds., Inc., Buena Park, CA 90621 714-994-2510

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†Laser Concepts, Omega Organization Intl., Seattle, WA 98133 206-364-7881
Micro Industries, Westerville, OH 43081 614-895-0404
§Nu-Concept Systems, Colmar, PA 18915 215-822-8400
SMT East Corporation, Stoughton, MA 02072-1141 ..... 800-888-SMT1
†Zevatech, Inc., Morrisville, NC 27560 919-460-0111

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†Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
†GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
†Industrial Control Co., Rockledge, FL 32955 407-259-7105
†Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
§†Precision Monolithics Inc. Subsidiary of Bourns Inc., Santa Clara, CA 95052-8020 ..... 408-727-1500;800-843-1515
†Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
†Transmagnetics, Farmingdale, NY 11735 516-293-3100

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† **Computer Conversions Corp., E. Northport, NY 11731, 516-261-3300** .... **D•1151**
Fasco Industries, Inc., Hawker Siddelem No. 200, Chesterfield, MO 63017, 314-532-3505 .... **C•1623**
ILC Data Device Corp., Bohemia, NY 11716-2482, 516-567-5600 .... **D•1177**
North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 .... **D•1306**
† **Transmagnetics, Farmingdale, NY 11735, 516-293-3100** .... **D•1196-1198**
† Clifton Precision, Litton Systems, Inc., Clifton Hgts., PA 19018 215-622-1000
§† Harowe Servo Controls, Inc.:A Fasco Co., West Chester, PA 19380 215-692-2700
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
§ Namco Controls, An Acme-Cleveland Co., Mentor, OH 44060 216-946-9900
Sharp Electronics Corp., Microelectronics Grp., Camas, WA 98706 206-834-2500
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400

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RFI Measuring Equipment-2900

Amplifier Research, Souderton, PA 18964-9990, 215-723-8181 .... **D•1020-1021**
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... **D•1012**
Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
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† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
Compliance Design Inc., Boxboro, MA 01719 508-264-4668
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Rheostats, Motorized-4750 — *See Vol. A*

Ribbons for Printers-2000

 # Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 .... **D•1097**
Aspen Imaging, International, Inc., Lafayette, CO 80026-9300 .... 303-666-5750; 1-800-955-5555
§† Brady, W. H., Co., Indl. Prods. Div., Milwaukee, WI 53201 1-800-537-8791
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
§ Panduit Corp., Tinley Park, IL 60477-0981 800-777-3300
§ Zebra Technologies Corporation, Vernon Hills, IL 60061-3109 708-634-6700

Rings, Retaining-2500 — *See Vol. C*

Rings, Slip — See Slip Rings (Vol. B)

Rivets-2500 — *See Vol. C*

Robotic Pick & Place — See Arms & Manipulators, Robotic (Vol. D)

Robotics — See Arms & Manipulators, Robotic (Vol. D), Control Systems, Robotic (Vol. D)

Robots, Machine Vision-4900

Mercotac Inc., Carlsbad, CA 92009, 619-431-7723 .... **B•1295**
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§† Seiko Instruments U.S.A., Inc., Robotics/Automation Div., Torrance, CA 90505 213-517-7850
§ Sony Component Products Co, Semiconductor Division, Cypress, CA 90630 714-229-4197

Robots, Pick and Place-4900

Mercotac Inc., Carlsbad, CA 92009, 619-431-7723 .... **B•1295**
MOLEX, Inc., Lisle, IL 60532, 708-969-4550 .... **C•1474**
† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Datacube, Inc., Peabody, MA 01960 508-535-6644
Dover Electronics Manufacturing, Binghamton, NY 13902-5212 .... 607-772-7563; 1-800-PWB-ASSY
Hitachi America, Ltd., Tarrytown, NY 10591 914-631-0600
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§ Parker Hannifin Corp., Rotary Actuator Division, Wadsworth, OH 44281-0450 216-336-3511
§† Seiko Instruments U.S.A., Inc., Robotics/Automation Div., Torrance, CA 90505 213-517-7850
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040 .... 516-328-0200;328-3300
† Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970

Robots, X-Y-Z-4900

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Microvision Corp., Campbell, CA 95008 408-374-3158
§ Parker Hannifin Corp., Rotary Actuator Division, Wadsworth, OH 44281-0450 216-336-3511
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970

Rods, Ground-2500 — *See Vol. C*

Rotators — See Antenna Rotators (Vol. D)

Rotors, Motor & Generator — See Motor & Generator Armatures, Rotors, Stators (Vol. B)

Rubber, Conductive-1600 — *See Vol. C*

Rubber Guards (For Equipment) — See Bumpers (Vol. C)

Rubber, Silicone-1600 — *See Vol. C*

Satellite Antennas — See Antennas, Satellite (Vol. D)

Satellite Earth Stations, Transmit & Receive-1900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 .... **D•1067,1120,1165-1167**
† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
Andrew Corp., Orland Pk., IL 60462 800-255-1479
† Aydin Corp., Horsham, PA 19044 215-657-7510
California Microwave, Sunnyvale, CA 94086 408-732-4000
Computron Display Systems, Xcel Corporation, Elk Grove Village, IL 60007 708-952-8800
† Comtech Microwave Corp., Comtech Corp., Hauppauge, NY 11788 516-435-4646

§ Electronic Specialists, Natick, MA 01760 ..... 508-655-1532;800-225-4876
† LogiMetrics, Plainview, NY 11803 516-349-1700
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
† TIW Systems, Inc., Sunnyvale, CA 94089 408-734-3900
Varian Microwave Equip. Div., Varian Assocs., Inc., Santa Clara, CA 95054 408-496-6273

Scale Expanders, Meter — See Multipliers, Meter (Vol. D)

Scalers, Binary, Decade-2325

† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152,1156
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Dynapar, Gurnee, IL 60031 312-662-2666
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
† Nuclear Research Corp., Warrington, PA 18976 215-343-5900
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405

Scales, Dial-2400 — ***See Vol. C***

Scales, Electronic (Counting/Weighing)-2900

BLH Electronics, Inc., Canton, MA 02021-9111 617-821-2000
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
† Fairbanks Scales:Fairbanks Inc., St. Johnsbury, VT 05819 ..... 800-451-4107; 802-748-5111
General Electric Materials Technology, Buena Park, CA 90620 714-761-5684
§ Scientech, Inc., Boulder, CO 80303 ..... 303-444-1361;800-525-0522
Tridyne Process Systems, DBI Industries, So. Burlington, VT 05403 802-863-6873

Scanners, Bar Code — See Readers, Bar Code (Vol. D)

Scanners, Crossbar-1900

§ Computer Peripherals Inc., Newbury Pk., CA 91320 ..... 805-499-5751;800-854-7600
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
Matrix Corp., Indianapolis, IN 46241 317-248-2036
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301

Scanners, Fiber Optic-2475 — ***See Vol. B***

Scanners, Flying Spot-1900

† CELCO, Mahwah, NJ 07430 201-327-1123
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
Lincoln Laser Co., Phoenix, AZ 85004 602-257-0407
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151

Scanners, Infrared-2900

† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Banner Engineering Corp., Minneapolis, MN 55441 612-544-3164
† Barnes Engineering Div., EDO Corporation, Shelton, CT 06484 203-926-1777
Burleigh Instruments, Fishers, NY 14453 716-924-9355
§Φ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
Control Module, Enfield, CT 06082 203-745-2433
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500
† Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 619-931-3000
§ ING. F. P. KOGL, Steyregg, AUSTRIA 732-640-591-0
§ Land Infrared, Land Instruments Intl. Inc., Bristol, PA 19007 ..... 215-781-0700; 800-523-8989
§ Lazer Data, Electro Corporation, Orlando, FL 32804 1-800-843-2700
§† Mikron Instr., Wyckoff, NJ 07481 201-891-7330
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 415-471-9717
§ Xedar Corp., Boulder, CO 80301 303-443-6441

Scanners, Instrument, Input/Output-2900

Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1272
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
Matrix Corp., Indianapolis, IN 46241, 317-248-2036 ..... D•1185
MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... D•1295,1412-1413
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1142,1191
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1192-1193
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Acurex Corp./Autodata Div., Mountain View, CA 94039 415-967-9100
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
† Atec, Inc., Houston, TX 77055 713-468-7971
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
HBM, Inc., Marlboro, MA 01752 508-624-4500
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
IPAC Grp., Bethel Pk, PA 15102 412-831-9200
§ Lazer Data, Electro Corporation, Orlando, FL 32804 1-800-843-2700
Lincoln Laser Co., Phoenix, AZ 85004 602-257-0407
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
§ Syscon Intl., Inc., So. Bend, IN 46601-3796 219-232-3900
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Scanners, Optical-2900

† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Audre, Inc., San Diego, CA 92127 619-451-2260
§ Automatic Timing & Controls Co., King of Prussia, PA 19406 ..... 215-337-5500; 800-441-8245
§ Banner Engineering Corp., Minneapolis, MN 55441 612-544-3164
Burleigh Instruments, Fishers, NY 14453 716-924-9355
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
† CELCO, Mahwah, NJ 07430 201-327-1123
† Cognitronics, Stamford, CT 06906 203-327-5307
Control Module, Enfield, CT 06082 203-745-2433
† DBA Systems, Inc., Melbourne, FL 32902-0550 305-727-0660
§ Dolan-Jenner Inds., Woburn, MA 01801 617-935-7444
§ Efector, Inc., Exton, PA 19341 ..... 215-524-2000;800-441-8246
† Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134 ... 408-432-1300
HEI, Inc., Optoelectronics Div., Victoria, MN 55386 612-443-2500
Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
§ Houston Instrument, AMETEK, Inc., Austin, TX 78753 512-835-0900
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
§ ING. F. P. KOGL, Steyregg, AUSTRIA 732-640-591-0
§ Lazer Data, Electro Corporation, Orlando, FL 32804 1-800-843-2700
Lincoln Laser Co., Phoenix, AZ 85004 602-257-0407
† Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
Murata Erie North America, Inc., Smyrna, GA 30080 404-436-1300
§† Optek Technology Inc., Carrollton, TX 75006 214-323-2200
Photon, Inc., Santa Clara, CA 95054-3432 408-492-9449
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
§ Scientific Technologies Inc., Optical Sensor Div., Hayward, CA 94544 ... 415-471-9717
Telesis Controls Corp., Chillocothe, OH 45601 614-642-3200
§ Xerox Imaging Systems, Inc., Xerox Corp., Sunnyvale, CA 94086 ..... 408-245-7900; 800-248-6550

Scanners, Optical, Page-2000

§ ING. F. P. KOGL, Steyregg, AUSTRIA 732-640-591-0

Scanners, Reed-2900

CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
Matrix Corp., Indianapolis, IN 46241 317-248-2036
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Omega Engineering, Stamford, CT 06907 800-826-6342
PPM, Inc., Cleveland, OH 44139 216-349-2300
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Scissors-5400 — ***See Vol. C***

Scope Dollies — See Carts & Dollies, Instrument & Equipment (Vol. C)

SCRs — See Thyristors (Vol. A)

SCR Firing Controls — See Controls, SCR (Vol. D)

Scramblers, Data-2325

Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
New Wave Instruments, Provo, UT 84604 801-373-4909
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175

Scramblers/Descramblers, Video-1900

HDS Inc., Reston, VA 22091 703-620-6200

Scramblers, Speech-1900

Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049

Screening, Mesh, Conductive (Incl. Copper)-4525 — ***See Vol. C***

Screens, Printed Circuit-1700 — ***See Vol. C***

Screwdrivers-5400 — ***See Vol. C***

Screws, Lead, Feed & Translatory — See Drives & Drives Mechanisms (Dial) (Vol. C)

Screws, Fastening-2500 — *See Vol. C*

Scribers-5400 — *See Vol. C*

Scribers, Wafer-Also See Machines & Accessories, Semiconductor Manufacturing-4100

† Control Laser Corp., Orlando, FL 32809 407-438-2500
U. S. Laser Corp., Wyckoff, NJ 07481 201-848-9200

Sealers — See Coatings (Vol. C)

Sealing Equipment, Metal to Glass/Ceramic-4100

Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100

Seals & Feedthrus, Environmental — See Feedthrus & Seals, Environmental (Vol. C)

Seals, Ceramic To Metal-2500 — *See Vol. C*

Seals, Glass To Metal-2500 — *See Vol. C*

Seals, Hermetic-Also See Services, Hermetic Sealing-2500 — *See Vol. C*

Seals, Microwave — See Gaskets, Shielding, RF (Vol. C), Seals, Waveguide (Vol. A)

Seals, Pressure Sensitive-2500 — *See Vol. C*

Seals, Waveguide-3450 — *See Vol. A*

Search Unit, Magnetic Tape — See Tape Search Equipment (Vol. D)

Security Systems, Access Control-2000

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
§ Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
AES Corp., Peabody, MA 01960 508-535-7310
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
† American Electronics, Fullerton, CA 92631 714-871-3020
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Corby Industries, Inc., Allentown, PA 18103 215-433-1412
Datakey, Inc., Burnsville, MN 55337 612-890-6850
Davidge Corporation, Buellton, CA 93427 805-688-9598
Domino, Inc., Fort Wayne, IN 46899 219-456-5512
Elcom Industries, Inc., St. Louis, MO 63132 314-429-3100
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Honeywell Inc., Commercial Bldgs. Grp., MN 27-4231, Minneapolis, MN 55408 612-870-2294
Identatronics, Inc., Elk Grove, IL 60007 ..... 708-437-2654;1-800-323-5403
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100 ..... 800-336-5917;703-953-4751
Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
NAVAN Corporation, Media, PA 19063 215-543-8066
§† Racal-Guardata, Inc., Herndon, VA 22070 703-471-0892
Rodann Electronics Mfg. Co., Brea, CA 92621 ..... 714-529-1301;800-366-7010
† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221
§ THORN Automated Systems, Inc, THORN EMI, Westlake, OHIO 44145 216-871-9900

Security Systems, Data-2325

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
AES Corp., Peabody, MA 01960 508-535-7310
§† Aiphone, Bellevue, WA 98005 206-455-0510
† American Electronics, Fullerton, CA 92631 714-871-3020
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301
Datakey, Inc., Burnsville, MN 55337 612-890-6850
§ Ergotron, Inc., Eagan, MN 55122 612-452-8135
HDS Inc., Reston, VA 22091 703-620-6200
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
§† Racal-Guardata, Inc., Herndon, VA 22070 703-471-0892
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
§ Symbicon Assoc. Inc., Amherst, NH 03031 603-673-8898
§† Terminal Data Corp., Rockville, MD 20855 301-921-8282
§ Time Lock, Inc., Great Neck, NY 11021 516-487-0690
§ Via West Interface, Inc., Tucson, AZ 85705 ..... 602-623-5716;1-800-266-5716

Seismographs-2900

§ Dova Controls, Redmond, WA 98052-5165 206-881-7414
§ EG&G Geometrics, Div. of EG&G Inc., Sunnyvale, CA 94089 408-734-4616
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
Terra Technlg. Corp., Redmond, WA 98052 206-883-7300

Seizers-5400 — *See Vol. C*

Selsyns — See Motors, Synchronous (Vol. B)

Semiconductor Material — See Crystals, Semiconductor (Vol. A)

Semiconductor Wafer Fabrication, Assembling (Packaging)-4100

† Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
§ Continental Device India Limited, New Delhi, INDIA 110028 ..... 536150-53 (4 lines)
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Gould Inc., Semiconductor Division, Pocatello, ID 83201 208-233-4690
Hughes Semiconductor Products Center, Newport Beach, CA 92663 714-759-2665
§† LSI Logic Corp., Milpitas, CA 95035 408-433-8000
LTI, Inc., Carol Stream, IL 60188 708-668-8886
§† Micrel Semiconductor, Sunnyvale, CA 94086 408-245-2500
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Solitron Devices, Inc., Semiconductor Group, Riviera Beach, FL 33404-9978 ..... 407-848-4311;800-888-8763
† Standard Microsystems, Hauppauge, NY 11788 516-273-3100
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
Zetex, Inc., Zetex plc., Commack, NY 11725 516-543-7100

Semiconductor Wafer Fabrication, Designing (Topological)-4100

† Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Gould Inc., Semiconductor Division, Pocatello, ID 83201 208-233-4690
† Holt Inc., Irvine, CA 92718 714-859-8800
Hughes Semiconductor Products Center, Newport Beach, CA 92663 714-759-2665
§† LSI Logic Corp., Milpitas, CA 95035 408-433-8000
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Standard Microsystems, Hauppauge, NY 11788 516-273-3100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
Zetex, Inc., Zetex plc., Commack, NY 11725 516-543-7100

Semiconductor Wafer Fabrication, Maskmaking (Tooling)-4100

Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Hughes Semiconductor Products Center, Newport Beach, CA 92663 714-759-2665
Quantronix, Smithtown, NY 11788 516-273-6900
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
† Standard Microsystems, Hauppauge, NY 11788 516-273-3100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
Zetex, Inc., Zetex plc., Commack, NY 11725 516-543-7100

Semiconductor Wafer Fabrication, Processing-4100

† Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
† The Carborundum Company, Electric Products, Niagara Falls, NY 14302 716-278-2521
† Dionics, Westbury, NY 11590 516-997-7474
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Gould Inc., Semiconductor Division, Pocatello, ID 83201 208-233-4690
Headway Research, Inc., Garland, TX 75042 214-272-5431
Hughes Semiconductor Products Center, Newport Beach, CA 92663 714-759-2665
§ Laser Diode, Inc., Morgan Crucible, New Brunswick, NJ 08901 201-249-7000
§† Linear Technology Corp., Milpitas, CA 95035 408-432-1900
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
§† Micrel Semiconductor, Sunnyvale, CA 94086 408-245-2500
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
§† MKS Instruments, Inc., Andover, MA 01810 508-975-2350
MSI Electronics, Inc., Woodside, NY 11377 718-672-6500
† Standard Microsystems, Hauppauge, NY 11788 516-273-3100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Components, Mountain View, CA 94039-7267 415-968-9241
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
† Union Carbide Chemicals & Plastics Company Inc., Industrial Chemicals Div., Crystal, San Diego, CA 92123 619-279-4500
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
Zetex, Inc., Zetex plc., Commack, NY 11725 516-543-7100

Semiconductor Wafer Fabrication, Testing/Trimming-4100

Silicon Detector Corp., Camarillo, CA 93012, 805-484-2884 ..... B•1342-1343
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
Bermar Corp., Research Triangle Park, NC 27709 919-489-4316
† Control Laser Corp., Orlando, FL 32809 407-438-2500
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
Gennum Corporation, Linear Technology Inc., Burlington, ON, CANADA L7R 3Y3 ..... 800-263-9353;416-632-2996
Hughes Semiconductor Products Center, Newport Beach, CA 92663 714-759-2665
LTI, Inc., Carol Stream, IL 60188 708-668-8886
§† Micrel Semiconductor, Sunnyvale, CA 94086 408-245-2500
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
MSI Electronics, Inc., Woodside, NY 11377 718-672-6500

Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
SGS-THOMSON Microelectronics, Inc., Carrollton, TX 75006 214-466-6000
§† Spectronics Corp., Westbury, NY 11590 ..... 516-333-4840/1-800-274-8888
† Standard Microsystems, Hauppauge, NY 11788 516-273-3100
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
§ Toko America, Inc., Mt. Prospect, IL 60056 708-297-0070
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
Zetex, Inc., Zetex plc., Commack, NY 11725 516-543-7100

Semiconductors — See Diodes (Vol. A), Rectifiers (Vol. A), Transistors (Vol. A)

Sensors — See Transducer Listings (Vol. B)

Sensors, Acoustic-2200

Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 .. B•1323,1922
† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... B•1924
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† International Transducer Corp., Channel Technologies, Inc., Santa Barbara, CA 93111 805-683-2575
Optimum Applied Systems, Dobbs Ferry, NY 10522-1696 914-693-9001
Projects Unlimited, Dayton, OH 45414 513-890-1918
Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
Submarine Signal Division, Raytheon Company, Portsmouth, RI 02871 .. 401-847-8000
†Φ U. E. Systems, Inc., Elmsford, NY 10523 ..... 914-592-1220;800-223-1325

Sensors, Air Flow-5500 — ***See Vol. B***

Sensors, Angle Measuring-5500 — ***See Vol. B***

Sensors, CCD Image-3700 — ***See Vol. B***

Sensors, Chemical-2200

† Andersen Laboratories, Bloomfield, CT 06002 203-286-9090
G.C. Industries, Inc., Chatsworth, CA 91311 818-882-7852
High Technology Sensors, Inc., Longwood, FL 32779 407-884-7722
§† Weed Fiber Optics Inc., Weed Instrument Co., College Station, TX 77845 409-693-5397

Sensors, Fiber Optic-2475 — ***See Vol. B***

Sensors, Hall Effect-2200

† American Aerospace Controls, Farmingdale, NY 11735, 516-694-5100 ..... B•1876-1877
† Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... B•1882, D•1226,1228
Durakool, Inc., American Electronic Components, Elkhart, IN 46514, 219-264-1116 ..... B•1683
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... B•1323
§ Allegro MicroSystems, Inc., formerly Sprague Semiconductor Grp., Worcester, MA 01605 508-795-1300
§ Go Switch, Louisville, KY 40233 502-969-2386
† Lake Shore Cryotronics, Inc., Westerville, OH 43081 614-891-2243
Micro Switch, A Honeywell Div., Freeport, IL 61032 815-235-6600
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
§† Optek Technology Inc., Carrollton, TX 75006 214-323-2200
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
Wabash Magnetics, Kearney-National Inc., Huntington, IN 46750 219-356-8300
Wabash Magnetics, Wabash, IN 46992 219-563-2191
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638

Sensors, Light-3700 — ***See Vol. B***

Sensors, Liquid Flow-5500 — ***See Vol. B***

Sensors, Liquid Level-Also See Transducers, Liquid Level-5500 — ***See Vol. B***

Sensors, Moisture-5500 — ***See Vol. B***

Sensors, Presence Sensing (Optical)-3700 — ***See Vol. B***

Sensors, Proximity — See Transducers, Proximity (Vol. B)

Sensors, Temperature-Also See Bolometers; Thermistors Transducers-5500 — ***See Vol. B***

Sequence Controllers — See Controllers, Programmable (Vol. D)

Services, Acoustical, Consulting-4100

Elite Electronic Engineering Co., Downers Grove, IL 60515 708-495-9770
† Laser Concepts, Omega Organization Intl, Seattle, WA 98133 206-364-7881

Services, Assembly & Fabrication (Incl. R&D) - Also see Services, Metal Parts Fabrication; Services, Printed Circuit Products-4100

† Alden Products Co., Brockton, MA 02403, 508-583-0160 ..... C•1163
† Amuneal Manufacturing Corp., Philadelphia, PA 19124, 215-535-3000 ... C•1687
Andon Elctrns. Corp., Lincoln, RI 02865, 401-333-0388 ..... C•1278
Aries Electronics, Frenchtown, NJ 08825, 908-996-6841 ..... C•1288
Blatek, Inc., State College, PA 16801, 814-231-2085;814-231-2086 ..... B•1885
† Cabtron Systems, Inc., Northbrook, IL 60062, 708-498-6090 ..... C•1018
Dialight Corporation, Manasquan, NJ 08736, 908-223-9400 ..... B•1150
Die-Tech Inc., York Haven, PA 17370, 717-938-6771 ..... C•1347
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350
† EG & G Birtcher, EG & G, Inc., El Monte, CA 91734-1268, 818-442-2572 ..... C•1028-1029
Electromech, Inc., Kearny, NJ 07032, 201-997-0950 ..... A•2208-2209, D•1717
Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 .. C•1034,1036
EWC, Inc., Englishtown, NJ 07726, 908-446-3110 ..... A•2224,2226
§† George Risk Industries, Inc., Kimball, NE 69145, 308-235-4645 ..... B•1809
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1071-1072
† International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ..... A•1730-1731
Low Key Corporation, Strong Group, Gloucester, MA 01930, 508-281-0448 ..... B•1820
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•2243
† Modular Devices, Shirley, NY 11967, 516-345-3100 ..... D•1901
MOLEX, Inc., Lisle, IL 60532, 708-969-4550 ..... C•1474
MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Power Systems, Inc., Bloomfield, CT 06002, 203-726-1300 ..... D•2012
Rodale Technical Sales Inc., Islip, NY 11751, 516-277-5454 ..... C•1816
Rowe Industries, Inc., Toledo, OH 43612, 419-729-9761 ..... C•1513
Shelly Associates, Inc., Tustin, CA 92680, 714-669-9850 ..... B•1123
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•2239
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
† Advanced Hardware Manufacturing, Inc., Fenton, MO 63026 314-343-3850
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
† Alexandria Extrusion Co., Alexandria, MN 56308 612-736-6537
Alpha Metals, Jersey City, NJ 07304 201-434-6778
† Altek Co., Torrington, CT 06790 203-482-7626
† Altron, Inc., Anoka, MN 55303 612-427-7735
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
† Amco Engineering, Schiller Pk., IL 60176 ..... 708-671-6670;800-833-3156
American Assembly Inc., Florida, NY 10921 914-651-3433
American Microwave Technology, Inc., Brea, CA 92621 714-993-0802
AMP-AKZO Corporation, Melville, NY 11747 516-454-4400
Apollo Magnetics Corp., Los Angeles, CA 90057 213-381-2500
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
† Apsco, Inc., Mentor, OH 44060 216-352-8961
Argo Electronics, Inc., Baldwin Park, CA 91706 818-962-8422
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
† Associated Spring, Barnes Grp., Bristol, CT 06010 203-583-1331
Astro-Geo-Marine, Inc., Ventura, CA 93003 805-654-8300
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§ Atlantic Magnetics, Inc., Pompano Beach, FL 33069 305-979-7920
† Automatic Coil Corp., A DSG Company, Miami, FL 33147 305-696-6660
Automatic Systems Developers, Poughkeepsie, NY 12603 914-473-5530
Autosplice, Inc., San Diego, CA 92121 619-535-0077
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
§† Bud Industries, Inc., Willoughby, OH 44094-0431 216-946-3200
Burbank Sheet Metal Works Inc., Burbank, CA 91502 818-846-0316
† Cabletest Products Co., Malden, MA 02148 617-665-2932
† Cardinal Control Co., Kensington, CT 06037 203-828-6379
Caribbean Assemblies, Inc., Winterspring, FL 32708 407-327-0602
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
† Colt Technology Corp., Lenexa, KS 66219 913-888-1673
§ Communication Devices, Inc., Scarborough, Ont., CAN M1B3R6 416-292-4463
Compas, Ogdensburg, NY 13669 315-393-3573
†# Component Mfg. Svc., Inc., W. Bridgewater, MA 02379 508-580-0111
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Com-2, Inc., Saline, MI 48176 313-429-9027
Connectronics Corp., Toledo, OH 43607 419-537-0020
† Contours Inc., Meriden, CT 06450 203-237-8331
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Corby Industries, Inc., Allentown, PA 18103 215-433-1412
Corlund Electronics Corp., Newbury Park, CA 91320 805-499-6877
§ Custom Connector, Cleveland, OH 44114 216-241-1679
CVDS Inc., Pte. Claire,Que., CANADA H9R 1C2 514-694-9320
D & P MFG. Inc., Chalfont, PA 18914 215-997-1200
† Danmar Inds., Moorpark, CA 93021 1-805-529-3788,1-800-666-6268
† Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Da-Tech Corp., Ivyland, PA 18974 215-322-9410
DCI Inc., Olathe, KS 66062 913-782-5672
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 408-734-2020
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
† Detoronics Corporation, S. El Monte, CA 91733 818-579-7130
† Diagostic Instrument Corp., Ayer, MA 01432 508-772-4572
Digital Data Systems, Ft. Lauderdale, FL 33313 305-792-3290
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
† Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
Dowty Avionics, Arcadia, CA 91006 818-445-5955
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 203-528-9821

Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
The Electronics Group, Inc., Charlotte, NC 28208 704-391-9500
Electronics Systems, Inc., Sioux Falls, SD 57117 605-338-6868
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 714-669-9473
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
EOG, INC., OMX, INC., Hunt Valley, MD 21030 301-785-3000
Epsilon-Lambda Elctrns. Corp., Geneva, IL 60134 708-232-9611
§† Excel Specialty Corp., Chicago, IL 60660 312-262-4781
Federal Electronics, Cranston, RI 02921 401-944-6200
§† FISHERTECH, Fisher Gauge Limited, Peterborough, Ontario, CANADA K9J 6Y9 705-748-9522
The Five Star Co., Plantsville, CT 06479 203-628-5561
Flextronics International, Fremont, CA 94538 510-226-3539
† Force, Inc., Christiansburg, VA 24073 703-382-0462
† Galileo Electro-Optics Corp., Sturbridge, MA 01566 508-347-9181
GECO, Millheim, PA 16854 814-349-5555
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
General Digital Corp., Enfield, CT 06082 203-741-7171
† General Elec. Co., Electromaterials Dept., Coshocton, OH 43812 614-622-5310
GFC Power Ltd., Guelph, CAN N1K 1E1 519-763-3051
§ Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
W. L. Gore & Assocs., Phoenix, AZ 85044 602-438-2017
Grand Transformers, Inc., Grand Haven, MI 49417 616-842-5430
Green Engineering, Melrose, MA 02176 617-665-8994
† GSI Corp., Timonium, MD 21093 410-252-1768
§ GTE Electronic Repair Services, GTE Supply, W. Airport, TX 75261 214-615-7505
HDS Inc., Reston, VA 22091 703-620-6200
§ Hobson Bros., Chicago, IL 60630-3884 312-283-3600
Howard Industries, Inc., Milford, IL 60953 815-889-4105
Hughes Electronics Products Corp., Livonia, MI 48150 313-427-8310
† Hybrid Designs, Inc., Costa Mesa, CA 92626 714-557-9933
§† IEC Electronics Corp., Newark, NY 14513 315-331-7742
IM/D Corp., Manchester, NH 03101 603-669-5224
IMEC Corp., San Diego, CA 92154 619-690-2622
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
§ Inserve, Inc., LaGrange, OH 44050 1-216-355-5102
§† Instrument Specialties Co. Headquarters, Delaware Water Gap, PA 18327-0136 717-424-8510
§ International Resistive Company, Boone, NC 28607 704-264-8861
ISL Products Int'l. Ltd., Syosset, NY 11791-6093 516-937-3475
† Jettron Products Inc., E. Hanover, NJ 07936 201-887-0571
Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
Kalmus & Assocs., Inc., Broadview, IL 60153 708-343-7004
KelTech Inc., Roanoke, VA 24019 703-362-8466
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
Kentron, Inc., Cedarburg, WI 53012-0142 414-377-3733
Ken-Tron Mfg., Inc., Owensboro, KY 42301 502-684-0431
§† Lamtech Electronics, Garland, TX 75042 214-272-3504
Leecraft Mfg., Long Island City, NY 11101 718-392-8800
† Line Electric Products, Hartford, CT 06141 ..... 203-659-3573;1-800-331-1137
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 414-358-4000
§† Magnetic Technologies Corp., Rochester, NY 14625 716-385-9010
Meissner Industries, Dover, NJ 07801 201-366-1700
Micro Industries, Westerville, OH 43081 614-895-0404
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
† MOLDCON Div. of Contex Electronics, W. Springfield, MA 01089 413-736-0371
Monolithic Sys. Corp., Englewood, CO 80112 303-790-7400
Morris Enterprises, Sepulveda, CA 91343 818-894-9103
MRL, Missouri Research Labs., St. Charles, MO 63301 .. 314-946-6900;1-800-325-0223
† Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
† National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666
New England Keyboard Inc., Fitchburg, MA 01420 508-345-8332
† NKR Precision Manufacturing, Harriman, NY 10926 914-782-8562
NWL Transformers, Bordentown, NJ 08505 609-298-7300
† P C Express, Inc., Hudson, FL 34667 813-863-6114
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
§† Polygenex International Inc., Cary, NC 27513 919-380-8100
Power Pac, Shelton, CT 06484 203-925-0123
§ Powertron Corp., Sparta, NJ 07871 201-579-5599
Presco, Inc., Woodbridge, CT 06525 203-397-8722
† Product Technology, Inc., Irvine, CA 92714 714-474-8998
Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000
Ramcom Systems, Marina Del Rey, CA 90292 213-827-4432
RCD Components, Inc., Manchester, NH 03109 603-669-0054
† Reactel, Inc., Rockville, MD 20850 301-279-5535
Ren Electronics Corporation, C.C.G., An Insico Co., S. Hadley, MA 01075 413-536-1800
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO 519-696-2616
† RMS Techn., Newport News, VA 23606 804-873-0100
Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505 213-517-7770
SFE Technologies, San Fernando, CA 91340 818-365-9411
Siltronics Ltd., Dover, MA 02030 617-329-4068
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
SMT East Corporation, Stoughton, MA 02072-1141 ..... 800-888-SMT1
† Solid State Testing, Inc., Burlington, MA 01803 617-272-0972
Southtronics, Inc., Marietta, GA 30066-6029 404-429-1000
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
† Star-Tron Corporation, Providence, RI 02909 401-274-5090
Stetron International, Inc., Buffalo, NY 14203 716-854-3443
Storm Products Co., Hinsdale, IL 60521 708-323-9121
Suckle Corp., Scranton, PA 18505 717-346-3871
Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
Symtron Corp. Div. Diceon Elctrns., Mountain View, CA 94043 415-965-4500
† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221
† Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 904-243-3722
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tekworks, Inc., Morristown, NJ 07960 201-540-1096
† Teledyne Aerospace Sys., Fairmont, MN 56031 507-235-3355
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
TL Inds. Inc., Northwood, OH 43619 419-666-8144
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
†# Tratec of California, Inc., Chula Vista, CA 91911 619-476-1155
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330
Trionics, Inc., St. Charles, IL 60174 312-232-9117
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
Varian Tempe Elctrns. Div., Varian Assocs., Tempe, AZ 82581 602-968-6790
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
Veetronix, Inc., Lexington, NE 68850 308-324-4600
Vern Kiebler Electronics, Inc., Wheaton, IL 60187 708-668-5407
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
† Video Automation Systems, Pound Ridge, NY 10576 914-764-4613
† Western Reserve Electronics, Twinsburg, OH 44087 216-425-4951
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501
Zercom Corporation, Merrifield, MN 56465-0084 218-765-3151
† Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825

Services, Assembly, Surface Mount Technology-4100

† AMITRON, American Micro-Tronix, Inc., North Andover, MA 01845, 508-686-1882 ..... A•1843
CAC Microcircuits Inc., Bel Fuse, Mt. Carmel, IL 62863, 618-263-4343 ... A•1723
Die-Tech Inc., York Haven, PA 17370, 717-938-6771 ..... C•1347
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350
HEI, Inc., Hybrid Electronics Div., Victoria, MN 55386, 612-443-2500 ..... A•1726
† International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ..... A•1730-1731
† Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... C•1684
Rodale Technical Sales Inc., Islip, NY 11751, 516-277-5454 ..... C•1816
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
Advanced Electronic Packaging, Huntington Beach, CA 92646 714-969-1150
§ ALTEK Corporation, Silver Springs, MD 20904-7802 301-572-2555
† Altron, Inc., Anoka, MN 55303 612-427-7735
Apsco, Inc., Mentor, OH 44060 216-352-8961
Argo Transdata Corp., Clinton, CT 06413-0554 203-669-2233
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
Caribbean Assemblies, Inc., Winterspring, FL 32708 407-327-0602
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
Circom Inc., Bensenville, IL 60106 708-595-4460
Clover Elctrns., Inc., Newnan, GA 30264 404-251-5323
Colt Technology Corp., Lenexa, KS 66219 913-888-1673
Compas, Ogdensburg, NY 13669 315-393-3573
§ Com-2, Inc., Saline, MI 48176 313-429-9027
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
† Corlund Electronics Corp., Newbury Park, CA 91320 805-499-6877
† Da-Tech Corp., Ivyland, PA 18974 215-322-9410
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 203-528-9821
§ EI Microcircuits, Inc., Mankato, MN 56001 507-345-5786
Electra-ssembly, Lancer Chemical, Warren, RI 02885 401-245-5493
† Electro-Mech Components, Inc., South El Monte, CA 91733-3689 818-442-7180
Electronic Components & Matls. Div., GTE Products Corp., Warren, PA 16365 814-723-2000
Electronics Research Associates Inc., Winsted, CT 06098 203-379-2731
Electronics Systems, Inc., Sioux Falls, SD 57117 605-338-6868
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Entra Corporation, Indianapolis, IN 46256 317-849-8270
EOG, INC., OMX, INC., Hunt Valley, MD 21030 301-785-3000
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
Flextronics International, Fremont, CA 94538 510-226-3539
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
§ GTE Electronic Repair Services, GTE Supply, W. Airport, TX 75261 214-615-7505

† Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
Hy-Tec Industries, Div. of Topo Industries, Inc., Shoreham, NY 11786 ... 516-924-8686
§† IEC Electronics Corp., Newark, NY 14513 315-331-7742
IM/D Corp., Manchester, NH 03101 603-669-5224
§ Inservo, Inc., LaGrange, OH 44050 1-216-355-5102
International Resistive Company, Boone, NC 28607 704-264-8861
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
§ Manu-Tronics, Inc., Kenosha, WI 53142-9508 ..... 414-947-7700 ;414-947-7302
Micro Industries, Westerville, OH 43081 614-895-0404
MOLEX, Inc., Lisle, IL 60532 708-969-4550
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
† P C Express, Inc., Hudson, FL 34667 813-863-6114
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
Presco, Inc., Woodbridge, CT 06525 203-397-8722
RCD Components, Inc., Manchester, NH 03109 603-669-0054
Ren Electronics Corporation, C.C.G., An Insico Co., S. Hadley, MA 01075 413-536-1800
† Resistance Technology Inc., St. Paul, MN 55112 612-636-9770
† SCOPE Incorporated, Reston, VA 22090 703-471-5600
SMT East Corporation, Stoughton, MA 02072-1141 ..... 800-888-SMT1
† Solid State Testing, Inc., Burlington, MA 01803 617-272-0972
Stetron International, Inc., Buffalo, NY 14203 716-854-3443
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
TL Inds. Inc., Northwood, OH 43619 419-666-8144
Trionics, Inc., St. Charles, IL 60174 312-232-9117
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
Varian Tempe Elctrns. Div., Varian Assocs., Tempe, AZ 82581 602-968-6790
Vermont Semiconductor, Inc., Williston, VT 05495 802-865-3000
Vern Kiebler Electronics, Inc., Wheaton, IL 60187 708-668-5407
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
Xetel Corporation, Austin, TX 78753 512-834-2266
Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Services, Backplane Wiring - Also see Services, Wire Wrapping; Services, Cable Assembly - Also see Services, Crimping; Services, Wire Cutting & Stripping-4100

Andon Elctrns. Corp., Lincoln, RI 02865, 401-333-0388 ..... C•1278
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473 .... C•1682
† Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... C•1684
Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224
Altek Co., Torrington, CT 06790 203-482-7626
American Assembly Inc., Florida, NY 10921 914-651-3433
† Apsco, Inc., Mentor, OH 44060 216-352-8961
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
Augat Inc., Attleboro, MA 02703 617-222-2202
† Augat, Inc., Interconnection Products Group, Attleboro, MA 02703 508-222-2202
Augat/RDI, Carol Stream, IL 60188 708-682-4100
Automatic Systems Developers, Poughkeepsie, NY 12603 914-473-5530
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
† Cardinal Control Co., Kensington, CT 06037 203-828-6379
Caribbean Assemblies, Inc., Winterspring, FL 32708 407-327-0602
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
§ Com-2, Inc., Saline, MI 48176 313-429-9027
§† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
† Datawrap, Inc., Wakefield, MA 01880 617-246-5757
† Da-Tech Corp., Ivyland, PA 18974 215-322-9410
† Diagostic Instrument Corp., Ayer, MA 01432 508-772-4572
Dowty Interconnect, Dowty Electronic Components LTD, High Wycombe, Bucks, ENGLAND HP10 9UT 0-628-810810
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 203-528-9821
† Electro Prep Inc. & N-E-D Cable, Wareham, MA, MA 02571 508-291-2880
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
W. L. Gore & Assocs., Inc., Phoenix, AZ 85044 602-438-2017
† GSI Corp., Timonium, MD 21093 410-252-1768
† Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
Hybricon Corporation, Ayer, MA 01432 508-772-5422
† Interlogic Industries, Melville, NY 11747-4294 516-420-8111
# KelTech Inc., Roanoke, VA 24019 703-362-8466
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
§† Lamtech Electronics, Garland, TX 75042 214-272-3504
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
† Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 508-588-6110
New England Keyboard Inc., Fitchburg, MA 01420 508-345-8332
§ Panduit Corp., Tinley Park, IL 60477-0981 800-777-3300
Power Pac, Shelton, CT 06484 203-925-0123
Project Resources Inc., Wareham, MA 02571 508-295-7444
† Reactel, Inc., Rockville, MD 20850 301-279-5535
† Star-Tron Corporation, Providence, RI 02909 401-274-5090
Symtron Corp. Div. Diceon Elctrns., Mountain View, CA 94043 415-965-4500
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
† Teradyne Connection Sys., Teradyne, Inc., Nashua, NH 03060 603-889-5156
Trionics, Inc., St. Charles, IL 60174 312-232-9117
Unitrek Corporation, Vancouver, WA 98661 206-699-7277
Urban Electronics, Dover, MA 02030 617-329-4068
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
† Western Reserve Electronics, Twinsburg, OH 44087 216-425-4951
§ Zercom Corporation, Merrifield, MN 56465-0084 218-765-3151

Services, Board Assembly-4100

Andon Elctrns. Corp., Lincoln, RI 02865, 401-333-0388 ..... C•1278
† Fema Elctrns. Corp., E. Brunswick, NJ 08816, 908-238-1223 ..... B•1073
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 .... A•1730
Magnos, Hudson, MA 01749, 508-562-1173 ..... D•1291
Pan International (USA), Inc., Rancho Cucamonga, CA 91730, 714-945-1365 ..... C•1811
Rodale Technical Sales Inc., Islip, NY 11751, 516-277-5454 ..... C•1816
† S & S Associates, Inc., San Luis Obispo, CA 93401, 805-544-2500 .. C•1094-1096
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Altek Co., Torrington, CT 06790 203-482-7626
Alternative Manufacturing, Inc., Winthrop, ME 04364-200 207-377-9377
† Altron, Inc., Anoka, MN 55303 612-427-7735
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
American Assembly Inc., Florida, NY 10921 914-651-3433
Apsco, Inc., Mentor, OH 44060 216-352-8961
Argo Electronics, Inc., Baldwin Park, CA 91706 818-962-8422
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
Automatic Systems Developers, Poughkeepsie, NY 12603 914-473-5530
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
Cardinal Control Co., Kensington, CT 06037 203-828-6379
Caribbean Assemblies, Inc., Winterspring, FL 32708 407-327-0602
Chloride El Paso, Chloride Power Elctrns., El Paso, TX 79935 915-592-9985
Circom Inc., Bensenville, IL 60106 708-595-4460
Clover Elctrns., Inc., Newnan, GA 30264 404-251-5323
† Colt Technology Corp., Lenexa, KS 66219 913-888-1673
§ Communication Devices, Inc., Scarborough, Ont., CAN M1B3R6 416-292-4463
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Com-2, Inc., Saline, MI 48176 313-429-9027
† Corlund Electronics Corp., Newbury Park, CA 91320 805-499-6877
D & P MFG. Inc., Chalfont, PA 18914 215-997-1200
Dexter Scientific, Palatka, FL 32177 904-328-2450
† Diagostic Instrument Corp., Ayer, MA 01432 508-772-4572
† Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
Doran Manufacturing Co., Cincinnati, OH 45225 513-681-5424
El Microcircuits, Inc., Mankato, MN 56001 507-345-5786
Electro-Mech Co., Colorado Springs, CO 80915 719-597-1620
Electronic Components & Matls. Div., GTE Products Corp., Warren, PA 16365 814-723-2000
The Electronics Group, Inc., Charlotte, NC 28208 704-391-9500
Electronics Systems, Inc., Sioux Falls, SD 57117 605-338-6868
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
Entra Corporation, Indianapolis, IN 46256 317-849-8270
EOG, INC., OMX, INC., Hunt Valley, MD 21030 301-785-3000
The Five Star Co., Plantsville, CT 06479 203-628-5561
Flextronics International, Fremont, CA 94538 510-226-3539
† Force, Inc., Christiansburg, VA 24073 703-382-0462
GECO, Millheim, PA 16854 814-349-5555
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
§ Globtek, Inc., N. Bergen, NJ 07047 201-861-0246
§ GTE Electronic Repair Services, GTE Supply, W. Airport, TX 75261 214-615-7505
† Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
Hokuriku USA Ltd., Morton Grove, IL 60053 708-470-8440
Hughes Electronics Products Corp., Livonia, MI 48150 313-427-8310
† Hutronix, Inc., Tucson, AZ 85726 602-790-5348
IM/D Corp., Manchester, NH 03101 603-669-5224
§ Inservo, Inc., LaGrange, OH 44050 1-216-355-5102
Intaq Key Panels, GM Nameplate, Inc., Seattle, WA 98119 206-284-5475
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
KelTech Inc., Roanoke, VA 24019 703-362-8466
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
§ Manu-Tronics, Inc., Kenosha, WI 53142-9508 ..... 414-947-7700 ;414-947-7302
Micro Industries, Westerville, OH 43081 614-895-0404
† Mitech ELectronics Corp., Otsego, MI 49078 616-694-9471
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
† Modular Devices, Shirley, NY 11967 516-345-3100
MRL, Missouri Research Labs., St. Charles, MO 63301 .. 314-946-6900;1-800-325-0223
New England Keyboard Inc., Fitchburg, MA 01420 508-345-8332
† P C Express, Inc., Hudson, FL 34667 813-863-6114
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
Power Pac, Shelton, CT 06484 203-925-0123
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
Radio Television Products Corp., Douglas, AZ 85607 602-364-4438
RCD Components, Inc., Manchester, NH 03109 603-669-0054

RMS Techn., Newport News, VA 23606 ... 804-873-0100
Siltronics Ltd., Dover, MA 02030 ... 617-329-4068
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 ... 503-638-1000
SMT East Corporation, Stoughton, MA 02072-1141 ... 800-888-SMT1
Southtronics, Inc., Marietta, GA 30066-6029 ... 404-429-1000
† Star-Tron Corporation, Providence, RI 02909 ... 401-274-5090
Stetron International, Inc., Buffalo, NY 14203 ... 716-854-3443
† Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 ... 904-243-3722
Techrand Corp. of America, Muskegon, MI 49444 ... 616-798-2930
§ Time Mark Corp., Tulsa, OK 74116 ... 918-438-1220
TL Inds. Inc., Northwood, OH 43619 ... 419-666-8144
Trionics, Inc., St. Charles, IL 60174 ... 312-232-9117
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 ... 213-316-9984
Varian Tempe Elctrns. Div., Varian Assocs., Tempe, AZ 82581 ... 602-968-6790
Vern Kiebler Electronics, Inc., Wheaton, IL 60187 ... 708-668-5407
† Vertek Intl. Inc., San Diego, CA 92173 ... 619-661-6868
† Western Reserve Electronics, Twinsburg, OH 44087 ... 216-425-4951
XYZ Electronics, McCordsville, IN 46055 ... 317-335-2128
§ Zercom Corporation, Merrifield, MN 56465-0084 ... 218-765-3151
§ Zitel Corporation, Milpitas, CA 95035 ... 408-946-9600;800-622-5020

Services, Cable & Harness Assembly-4100

ABL Electronics Supply, Inc., Yorktown Hgts., NY 10598, 914-962-2253 ... C•1710-1711
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ... D•1623-1624
Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412, 708-455-8830 ... C•1742
Die-Tech inc., York Haven, PA 17370, 717-938-6771 ... C•1347
DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ... C•1350
† Fema Elctrns. Corp., E. Brunswick, NJ 08816, 908-238-1223 ... B•1073
§ Globtek, inc., N. Bergen, NJ 07047, 201-861-0246 ... C•1386
§ JH America, Inc., JI-HAW Group, Torrance, CA 90501, 213-328-0951 ... C•1406
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ... C•1767-1768
Magnos, Hudson, MA 01749, 508-562-1173 ... D•1291
§ MOLEX, Inc., Lisle, IL 60532, 708-969-4550 ... C•1474
Pan International (USA), Inc., Rancho Cucamonga, CA 91730, 714-945-1365 ... C•1811
† Product Technology, Inc., Irvine, CA 92714, 714-474-9998 ... C•1694
RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ... C•1510
† Advanced Hardware Manufacturing, Inc., Fenton, MO 63026 ... 314-343-3850
Altek Co., Torrington, CT 06790 ... 203-482-7626
† Altron, Inc., Anoka, MN 55303 ... 612-427-7735
AMBIT Associates, Santa Clara, CA 95051-2311 ... 408-241-5767
Amphenol Interconnect Products, Endicott, NY 13760 ... 607-754-4444
Apsco, Inc., Mentor, OH 44060 ... 216-352-8961
† Assembly Specialists, Chelmsford, MA 01824 ... 508-250-5900
Automatic Systems Developers, Poughkeepsie, NY 12603 ... 914-473-5530
Automation Elctrns., R.J.A. Inds., Inc., Chatsworth, CA 91311 ... 818-998-5124
† Branmag, Inc., North Tonawanda, NY 14120 ... 716-693-5994
§† Brim Electronics, Fair Lawn, NJ 07410 ... 201-796-2886
CableStar, Incorporated, Glasgow, KY 42141 ... 800-338-8223
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 ... 216-255-7744
† Cardinal Control Co., Kensington, CT 06037 ... 203-828-6379
§ Carrot Components Corporation, Camarillo, CA 93012 ... 805-484-0540
† C.E. Precision Assemblies, Inc., Chandler, AZ 85226 ... 602-940-0740
Chenango Industries, Inc., Vestal, NY 13850 ... 607-748-1572
Circom Inc., Bensenville, IL 60106 ... 708-595-4460
Clover Elctrns., Inc., Newnan, GA 30264 ... 404-251-5323
§ Communication Devices, Inc., Scarborough, Ont., CAN M1B3R6 ... 416-292-4463
†# Component Mfg. Svc., Inc., W. Bridgewater, MA 02379 ... 508-580-0111
Components Electronics Corp., Lewisberry, PA 17339 ... 717-938-4151
Computer Systems Technical Support, Anaheim, CA 92807 ... 714-632-1300
§ Com-2, Inc., Saline, MI 48176 ... 313-429-9027
§ Concord Electronics Corporation, New York, NY 10012 ... 1-212-777-6571
§ Control Cable, Inc., Baltimore, MD 21207 ... 301-298-4411
† Corlund Electronics Corp., Newbury Park, CA 91320 ... 805-499-6877
Covid, Inc., Tempe, AZ 85281 ... 602-966-2221
Cross Electronics, Warrendale, PA 15086 ... 412-776-1591
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 ... 617-273-5800
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 ... 408-734-2020
† Durakool, Inc., American Electronic Components, Elkhart, IN 46514 ... 219-264-1116
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 ... 203-528-9821
Electro Insulation Corp./Remtek Corp., Arlington Hgts., IL 60004 ... 708-632-1020
Electro-Mech Co., Colorado Springs, CO 80915 ... 719-597-1620
† Electro-Mech Components, Inc., South El Monte, CA 91733-3689 ... 818-442-7180
† Electro Prep Inc. & N-E-D Cable, Wareham, MA, MA 02571 ... 508-291-2880
† Electro-Support Systems, Temecula, CA 92390 ... 714-676-2751
†# ELMEC, Inc., Technautic Corp., Chandler, AZ 85226 ... 602-961-7100
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 ... 714-669-9473
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ... 201-288-4477; 800-447-5639
Enterprise Systems Corp., Dover, NH 03820 ... 603-742-7363
Entra Corporation, Indianapolis, IN 46256 ... 317-849-8270
Federal Electronics, Cranston, RI 02921 ... 401-944-6200
† The First Electronics Corp., Boston, MA 02125 ... 617-288-2430
GECO, Millheim, PA 16854 ... 814-349-5555
General Cable Co., Kenly, NC 27542 ... 919-284-5144
W. L. Gore & Assocs., Inc., Phoenix, AZ 85044 ... 602-438-2017
† GSI Corp., Timonium, MD 21093 ... 410-252-1768
GTE Fiberoptic Products, Williamsport, PA 17701 ... 717-326-6591;1-800-FBR-OPTICS
† Hibbing Electronics Corp., Hibbing, MN 55746 ... 218-263-8971
† Hutronix, Inc., Tucson, AZ 85726 ... 602-790-5348
§ ICC, Inc., Orange, CA 92665 ... 714-998-8310
§ Inservo, Inc., LaGrange, OH 44050 ... 1-216-355-5102
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 ... 516-937-3475
Jettron Products Inc., E. Hanover, NJ 07936 ... 201-887-0571
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 ... 612-943-5500
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 ... 919-876-6049
† Manger Electric Company, Inc., Stamford, CT 06902 ... 203-348-7761
Mitech ELectronics Corp., Otsego, MI 49078 ... 616-694-9471
† MLI Industries, Inc., Apalachin, NY 13732 ... 607-754-5800
† Modular Devices, Shirley, NY 11967 ... 516-345-3100
MRL, Missouri Research Labs., St. Charles, MO 63301 .. 314-946-6900;1-800-325-0223
Mueller Elec. Co., Cleveland, OH 44114 ... 216-771-5225
New England Keyboard Inc., Fitchburg, MA 01420 ... 508-345-8332
§ Panduit Corp., Tinley Park, IL 60477-0981 ... 800-777-3300
Philadelphia Insulated Wire Co. Inc., Moorestown, NJ 08057 ... 800-257-8357; 609-235-6700
Power Pac, Shelton, CT 06484 ... 203-925-0123
§† Radiant Communications Corp., South Plainfield, NJ 07080 ... 908-757-7444
Ragen Corp., Systems Div., N. Arlington, NJ 07032 ... 201-997-1000
Regal Aljoy Wire & Cable, Levittown, NY 11756 ... 516-735-4871
Ren Electronics Corporation, C.C.G., An Insico Co., S. Hadley, MA 01075 ... 413-536-1800
Ritz Electronics/Relco, New Dundee, Ont., CANADA N0B 2E0 ... 519-696-2616
Shogyo International Corp., Great Neck, NY 11021 ... 516-466-0911
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 ... 503-638-1000
Techdyne, Inc., Lance Wire & Cable Div., Hamden, CT 06514 ... 203-288-5571
† Tech Laboratories Inc., Palisades Pk, NJ 07650 ... 201-944-2221
† Technical Services Laboratory Inc., Ft. Walton Beach, FL 32548 ... 904-243-3722
Techrand Corp. of America, Muskegon, MI 49444 ... 616-798-2930
† Teledyne Ryan Electronics, San Diego, CA 92123 ... 619-560-6400
§ TELTEC, INC., Minneapolis, MN 55425 ... 612-854-9632
§ Time Mark Corp., Tulsa, OK 74116 ... 918-438-1220
† Transtechnology Electronics, Transtechnology Corporation, Peoria, IL 61615-1584 ... 309-693-3300
†# Tratec of California, Inc., Chula Vista, CA 91911 ... 619-476-1155
Trionics, Inc., St. Charles, IL 60174 ... 312-232-9117
Unitrek Corporation, Vancouver, WA 98661 ... 206-699-7277
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 ... 213-316-9984
† Vertek Intl. Inc., San Diego, CA 92173 ... 619-661-6868
§† Virginia Plastics Co., Roanoke, VA 24015-0577 ... 703-375-0100
# V-Tron Electronics Corp., S. Attleboro, MA 02703 ... 508-761-9100
† Western Reserve Electronics, Twinsburg, OH 44087 ... 216-425-4951
§ Zercom Corporation, Merrifield, MN 56465-0084 ... 218-765-3151

Services, Calibration & Instrument Repair-4100

Delevan Div., American Precision Inds. Inc., E. Aurora, NY 14052-0449, 716-652-3600 ... A•1205
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1323
AEL Defense Corp., Lansdale, PA 19446 ... 215-822-2929
Associated Testing Labs:Hanson PLC, Burlington, MA 01803 ... 617-272-9050
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 ... 800-523-3808
Bently Nevada Corp., Minden, NV 89423 ... 800-227-5514;702-782-3611
† Bird Electronic Corp., Cleveland, OH 44139-2794 ... 216-248-1200
BLH Electronics, Inc., Canton, MA 02021-9111 ... 617-821-2000
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 ... 508-481-7000
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 ... 216-255-7744
Columbia Resch. Labs., Woodlyn, PA 19094 ... 215-872-3900
Computer Doctors, College Park, MD 20740 ... 1-800-RAM-STAR;301-474-3095
† Crozier Metrology Lab, Wheeling, IL 60090 ... 708-520-9085
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 ... 800-368-2516
Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 ... 507-238-4461
† EG & G Flow Technology, Inc., Phoenix, AZ 85072 ... 602-437-1315
Electrical Instrument Service, Mt. Vernon, NY 10550 ... 914-699-9717
† Electrical Standards Div., E.S.R.S., Inc., N. Hollywood, CA 91605 ... 818-765-4224
Elite Electronic Engineering Co., Downers Grove, IL 60515 ... 708-495-9770
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 ... 714-493-8181
Enviroplan, Roseland, NJ 07068 ... 201-994-2300
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 ... 800-422-4342
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 ... 206-347-6100
G.C. Industries, Inc., Chatsworth, CA 91311 ... 818-882-7852
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA K0G 1J0 ... 613-724-1993
§ Greenwich Instruments USA, Charlotte, NC 28205 ... 704-376-1021
§ GTE Electronic Repair Services, GTE Supply, W. Airport, TX 75261 ... 214-615-7505
§† Guildline Instruments, Orlando, FL 32811-7335 ... 407-423-8215
† Hayes Instrument Service Inc., Billerica, MA 01821 ... 508-663-4800
Hewlett-Packard Co., Cupertino, CA 95014 ... 800-752-0900
† Hoffman Engineering Corp., Stamford, CT 06902 ... 203-325-8933
Holt Instrument, C.P.D. Engineering, Inc., Oconto, WI 54153 ... 414-834-2222
† Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 ... 612-870-5186
§† IEC Electronics Corp., Newark, NY 14513 ... 315-331-7742
Industrial Electronics Corp., Warren, MI 48089 ... 313-759-4450
Φ Industrial Service Technology, Grand Rapids, MI 49548 ... 616-247-1033
§# Instrumentation Services, Inc., Minneapolis, MN 55427 ... 612-544-8916
Julie Research Labs., New York, NY 10001 ... 212-633-6625
† Kikusui International Corp., Torrance, CA 90503 ... 213-371-4662;800-545-8784
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ... 201-757-2220/2277
† Kurz Instruments Inc., Monterey, CA 93940 ... 800-424-7356
Lake Shore Cryotronics, Inc., Westerville, OH 43081 ... 614-891-2243
† Laser Concepts, Omega Organization Intl., Seattle, WA 98133 ... 206-364-7881
† Leasametric, Inc., Foster City, CA 94404 ... 800-553-2255
Leeds & Northrup, General Signal, North Wales, PA 19454 ... 215-699-2000

† Maury Microwave Corp., Cucamonga, CA 91730 714-987-4715
† MDS Calibration Lab. Inc., Ft. Walton Beach, FL 32548 904-664-1234
§† MKS Instruments, Inc., Andover, MA 01810 508-975-2350
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
MULTISENS Inc, Laval, Que., CANADA H7S 2E8 514-629-5646
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
§ PTS Corporation, Bloomington, IN 47401 812-824-9331
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Rutherford Research, Rutherford, NJ 07070 201-933-2091
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
Stephens Analytical, Inc., Montreal, Que., CA H4S 1L1 514-332-1230
Stetron International, Inc., Buffalo, NY 14203 716-854-3443
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Veeco Instruments Inc., Plainview, NY 11803 516-349-8300
† Wilcoxon Research, Rockville, MD 20850 301-330-8811

Services, Coating-4100

MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
† Phoenix Wire, Inc., S. Hero, VT 05486, 802-372-4561 ..... C•1813
† Piconics, Incorporated, Tyngsboro, MA 01879, 508-649-7501 ..... A•1975
Alpha Metals, Jersey City, NJ 07304 201-434-6778
Altek Co., Torrington, CT 06790 203-482-7626
Arlon, Flexible Technologies Division, E. Providence, RI 02914 ..... 401-434-2340; 1-800-735-2340
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
† Barrington Plastics, Mt. Laurel, NJ 08054 609-235-5151
Burleigh Instruments, Fishers, NY 14453 716-924-9355
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Com-2, Inc., Saline, MI 48176 313-429-9027
† Diagostic Instrument Corp., Ayer, MA 01432 508-772-4572
† E/M Corporation, W. Lafayette, IN 47906 317-497-6346
† Evaporated Coatings, Inc., Willow Grove, PA 19090 215-659-3080
§ Flexible Technologies, Arlon, E. Providence, RI 02914 401-434-2340
Gasket International Inc., Bloomfield, NJ 07003 201-338-6814
† KLC/Karl Lambrecht Corp., Chicago, IL 60618 312-472-5442
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Micro-Circuits Co., Inc., New Buffalo, MI 49117 616-469-2744
Molecu-Wire, Farmingdale, NJ 07727 201-938-9473
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
New England Keyboard Inc., Fitchburg, MA 01420 508-345-8332
† Nova Tran Corporation, Union Carbide Corporation, Clear Lake, WI 54005 715-263-2333
† Oxley Inc., Branford, CT 06405 203-488-1033
† Plumer Precision Optics, Pennsburg, PA 18073 215-679-6272
† Polygenex International Inc., Cary, NC 27513 919-380-8100
Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO 519-696-2616
Rogers Corporation, Circuit Materials Div., Chandler, AZ 85244 602-963-4584
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
† Union Carbide Chemicals & Plastics Company Inc., Industrial Chemicals Div., Crystal, San Diego, CA 92123 619-279-4500
United Foam Plastics, Georgetown, MA 01833 508-352-2200
U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
§ Wescorp Antistatic Products, Mountain View, CA 94041 415-969-7717
† Western Reserve Electronics, Twinsburg, OH 44087 216-425-4951
Wontronics, Los Angeles, CA 90039 213-660-6230
† Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825

Services, Component Testing & Screening-4100

Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ..... A•1730
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
† Ark Elctrns. Corp., Southampton, PA 18966 215-322-6510
Associated Testing Labs:Hanson PLC, Burlington, MA 01803 617-272-9050
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Branmag, Inc., North Tonawanda, NY 14120 716-693-5994
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
§ Com-2, Inc., Saline, MI 48176 313-429-9027
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Detroit Testing Laboratory, Inc., Warren, MI 48090-0869 313-754-9000
† Electronics Test Centre, Alberta Research Council, Edmonton, AB, CANADA T6N 1E4 403-450-5370
Elite Electronic Engineering Co., Downers Grove, IL 60515 708-495-9770
E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 714-669-9473
Epic Resins, General Fiberglass Supply, Inc., Waukesha, WI 53186 414-521-2255
Garry Electronics an LPL Co., Langhorne, PA 19047 215-949-2300
Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
Instrument Specialties Co. Headquarters, Delaware Water Gap, PA 18327-0136 717-424-8510
Reliability, Incorporated, Houston, TX 77218 713-492-0550
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
§† Solid State Testing, Inc., Burlington, MA 01803 617-272-0972
Stetron International, Inc., Buffalo, NY 14203 716-854-3443
Systems Testing, Inc., Santa Clara, CA 95052 408-727-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868

Services, Computer-Aided Design (CAD)-Also See Computers, CAD, CAM, & CAD/CAM-4100

Dialight Corporation, Manasquan, NJ 08736, 908-223-9400 ..... B•1150
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350
Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 .. C•1034,1036
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361, 818-889-3179;800-423-3179 ..... D•1179
LXD, Inc., Cleveland, OH 44146, 216-786-8700 ..... B•1099
Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... C•1684
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 ..... D•1122-1123
Addacon Greensboro, Greensboro, NC 27407 919-852-6200
Advanced Electronic Packaging, Huntington Beach, CA 92646 714-969-1150
Alden Computer Systems, Salem, MA 01970 508-744-1314
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
Automatic Systems Developers, Poughkeepsie, NY 12603 914-473-5530
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Burbank Sheet Metal Works Inc., Burbank, CA 91502 818-846-0316
† CDRL Data, Inc., Phoenix, AZ 85027-2823 602-582-8844
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
Colt Technology Corp., Lenexa, KS 66219 913-888-1673
§ Compact Software, Inc., Paterson, NJ 07504 201-881-1200
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
† Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 203-528-9821
§ EI Microcircuits, Inc., Mankato, MN 56001 507-345-5786
The Electronics Group, Inc., Charlotte, NC 28208 704-391-9500
† EMDS, Inc., Gaithersburg, MD 20877 301-840-5710
Entra Corporation, Indianapolis, IN 46256 317-849-8270
EOG, INC., OMX, INC., Hunt Valley, MD 21030 301-785-3000
† Flex-Link Products, Inc., San Fernando, CA 91340 818-898-1451
Flextronics International, Fremont, CA 94538 510-226-3539
Garry Electronics an LPL Co., Langhorne, PA 19047 215-949-2300
GECO, Millheim, PA 16854 814-349-5555
Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
IM/D Corp., Manchester, NH 03101 603-669-5224
Industrial Electronics Corp., Warren, MI 48089 313-759-4450
§ Inservo, Inc., LaGrange, OH 44050 1-216-355-5102
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
ITW Fastex Distributor Business, Wood Dale, IL 60191-1150 708-350-8200
KelTech Inc., Roanoke, VA 24019 703-362-8466
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
§† LSI Logic Corp., Milpitas, CA 95035 408-433-8000
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Micro Industries, Westerville, OH 43081 614-895-0404
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
Power Pac, Shelton, CT 06484 203-925-0123
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
Presco, Inc., Woodbridge, CT 06525 203-397-8722
† Proto Systems, Alpharetta, GA 30201 ..... 404-475-1330;800-331-1797
Quality Research Company, Spokane, WA 99207-9632 509-924-6895
Science & Engrg. Consultants, Inc., Reston, VA 22090 703-471-1600
Smert Compter Aided Design & Prototype, Div. of SME (Monaco), Kanata, Ont., CANADA K2K 1X4 613-839-5588
SMT East Corporation, Stoughton, MA 02072-1141 ..... 800-888-SMT1
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
† SURON Maagan Michael, D.N. Menashe 37805, ISRAEL 06-394211
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
TL Inds. Inc., Northwood, OH 43619 419-666-8144
Trend Circuits, Fremont, CA 94538-6148 415-651-1150
Trionics, Inc., St. Charles, IL 60174 312-232-9117
Varian Tempe Elctrns. Div., Varian Assocs., Tempe, AZ 82581 602-968-6790
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
§† VLSI Technology, Inc., San Jose, CA 95131 408-434-7673
Xetel Corporation, Austin, TX 78753 512-834-2266
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Services, Computer Programming - Also see Services, Computer Systems, Specific Classification-2050

Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911

AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
California Automation Inc., San Diego, CA 92121 619-452-1341
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
Custom Logic, Crestline, CA 92325 714-338-4059
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Encoder Products, Sandpoint, ID 83864 208-263-8541
Energy Systems, Vancouver, WA 98682 206-896-8310
Flex-Key Corporation, Gloucester, MA 01930 508-281-2040
General Digital Corp., Enfield, CT 06082 203-741-7171
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Micro Industries, Westerville, OH 43081 614-895-0404
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
Power Pac, Shelton, CT 06484 203-925-0123
Presco, Inc., Woodbridge, CT 06525 203-397-8722
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Systems Data, Inc., Akron, OH 44321 216-666-0085
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
Tree Technologies Corporation, Buffalo, NY 14228 716-688-4640
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202

Services, Computer Systems, Builders-2050

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
California Automation Inc., San Diego, CA 92121 619-452-1341
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
† Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
Da-Tech Corp., Ivyland, PA 18974 215-322-9410
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Encoder Products, Sandpoint, ID 83864 208-263-8541
Energy Systems, Vancouver, WA 98682 206-896-8310
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
Flextronics International, Fremont, CA 94538 510-226-3539
§ GMR Co., Venice, CA 90291 213-399-1490
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
† Lamtech Electronics, Garland, TX 75042 214-272-3504
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
New England Keyboard Inc., Fitchburg, MA 01420 508-345-8332
Power Pac, Shelton, CT 06484 203-925-0123
Presco, Inc., Woodbridge, CT 06525 203-397-8722
§† Terminal Data Corp., Rockville, MD 20855 301-921-8282
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Trionics, Inc., St. Charles, IL 60174 312-232-9117

Services, Computer Systems, Consulting-2050

§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•1119
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
California Automation Inc., San Diego, CA 92121 619-452-1341
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Encoder Products, Sandpoint, ID 83864 208-263-8541
Energy Systems, Vancouver, WA 98682 206-896-8310
Entra Corporation, Indianapolis, IN 46256 317-849-8270
§ GMR Co., Venice, CA 90291 213-399-1490
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Industrial Electronics Corp., Warren, MI 48089 313-759-4450
§ Learning Tree International, Los Angeles, CA 90045-0028 213-417-8888
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Matrix Corp., Raleigh, NC 27610 919-231-8000
Micro Industries, Westerville, OH 43081 614-895-0404
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
Parsytec Inc., West Chicago, IL 60185 708-293-9500
Presco, Inc., Woodbridge, CT 06525 203-397-8722
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452
Sygenex Inc., Redmond, WA 98052 206-881-5500
Systems Data, Inc., Akron, OH 44321 216-666-0085
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Tree Technologies Corporation, Buffalo, NY 14228 716-688-4640
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202

Services, Computer Systems, Integrators-2050

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
Anacom, Anaheim, CA 92805-6235 714-774-8080
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† Aydin Corp., Horsham, PA 19044 215-657-7510
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
† Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Electronic Tele-Communications, Inc., Atlanta, GA 30340-2178 404-455-4890
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Encoder Products, Sandpoint, ID 83864 208-263-8541
EOG, INC., OMX, INC., Hunt Valley, MD 21030 301-785-3000
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
KineticSystems, Lockport, IL 60441 815-838-0005
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Matrix Corp., Raleigh, NC 27610 919-231-8000
MEXITRONIX (Woman Owned), Kingman, AZ 86401 602-757-9798
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
Parsytec Inc., West Chicago, IL 60185 708-293-9500
Presco, Inc., Woodbridge, CT 06525 203-397-8722
§† Radiant Communications Corp., South Plainfield, NJ 07080 908-757-7444
SCOPE Incorporated, Reston, VA 22090 703-471-5600
Systems Data, Inc., Akron, OH 44321 216-666-0085
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
TL Inds. Inc., Northwood, OH 43619 419-666-8144
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Services, Computer Systems, Turnkey-2050

Anacom, Anaheim, CA 92805-6235 714-774-8080
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Corp., Horsham, PA 19044 215-657-7510
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
Colt Technology Corp., Lenexa, KS 66219 913-888-1673
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
† Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 408-734-2020
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Electronic Tele-Communications, Inc., Atlanta, GA 30340-2178 404-455-4890
Encoder Products, Sandpoint, ID 83864 208-263-8541
Entra Corporation, Indianapolis, IN 46256 317-849-8270
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
KineticSystems, Lockport, IL 60441 815-838-0005
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
§ Matrix Corp., Raleigh, NC 27610 919-231-8000
MEXITRONIX (Woman Owned), Kingman, AZ 86401 602-757-9798
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Micro Industries, Westerville, OH 43081 614-895-0404
RACET Computes, Ltd., Brea, CA 92621 714-579-1725
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
SCOPE Incorporated, Reston, VA 22090 703-471-5600
Systems Data, Inc., Akron, OH 44321 216-666-0085
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
TL Inds. Inc., Northwood, OH 43619 419-666-8144
Varian Tempe Elctrns. Div., Varian Assocs., Tempe, AZ 82581 602-968-6790
§ Zitel Corporation, Milpitas, CA 95035 ..... 408-946-9600;800-622-5020

Services, Consulting, Chemical Analysis-4100

† Gardiner Solder Co., Div. of Gardiner Metal Co., Chicago, IL 60632 312-847-0100
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143

Services, Consulting, Data Processing-4100

§ CMV Software Specialists Inc., Sioux Falls, SD 57106 605-338-6645
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
§ Learning Tree International, Los Angeles, CA 90045-0028 213-417-8888
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000

Services, Consulting, Drafting-4100

Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 ..... C•1034
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Buckeye Stamping Co., Columbus, OH 43207 614-445-8433
† CDRL Data, Inc., Phoenix, AZ 85027-2823 602-582-8844
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
D & P MFG. Inc., Chalfont, PA 18914 215-997-1200
Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
Power Pac, Shelton, CT 06484 203-925-0123
Quality Research Company, Spokane, WA 99207-9632 509-924-6895
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Trend Circuits, Fremont, CA 94538-6148 415-651-1150

Services, Consulting, Engineering-4100

Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647, 402-563-6506 ..... A•1908
Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 ..... C•1034
Everest Electronic Equipment, Buford, GA 30518, 404-932-2900 ..... C•1050
EWC, Inc., Englishtown, NJ 07726, 908-446-3110 ..... A•2224,2226
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... D•1891
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
McLean Engineering, Zero Corporation, Princeton Junction, NJ 08550, 609-799-0100 ..... C•1633
Ocular Inc., Richardson, TX 75081, 214-437-2561 ..... B•1106
Pan International (USA), Inc., Rancho Cucamonga, CA 91730, 714-945-1365 ..... C•1811
Teka Interconnection Systems, Providence, RI 02907, 401-785-4110 .... C•1545
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
Wilmore Electronics Co., Inc., Hillsborough, NC 27278, 919-732-9351 ..... D•2139,2231
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 .. D•1119,2239
† Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
Amador Corporation, Taylors Falls, MN 55084-0270 612-631-2487
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
† Ark Elctrns. Corp., Southampton, PA 18966 215-322-6510
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Augat, Inc., Interconnection Products Group, Attleboro, MA 02703 508-222-2202
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
§ Beta Review, Inc., Millwood, VA 22646 703-837-1436
Buckeye Stamping Co., Columbus, OH 43207 614-445-8433
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
Cambridge Aeroflo, Inc., Shirley, MA 01464 508-45-2346
† CDRL Data, Inc., Phoenix, AZ 85027-2823 602-582-8844
† Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
Colt Technology Corp., Lenexa, KS 66219 913-888-1673
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Controls Unlimited, Inc., Perry, OH 44081 216-259-2500
Creare Inc., Hanover, NH 03755 603-643-3800
D & P MFG. Inc., Chalfont, PA 18914 215-997-1200
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dexter Scientific, Palatka, FL 32177 904-328-2450
Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
East Controls, Hanover Park, IL 60103 708-837-7709
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Electromech, Inc., Kearny, NJ 07032 201-997-0950
Electronic Development Associates, Inc., Dix Hills, NEW YORK 11746 .. 516-673-3881
Electronics Test Centre, Alberta Research Council, Edmonton, AB, CANADA T6N 1E4 403-450-5370
Electronic Testing & Consulting, Decatur, TX 76234 817-627-2929
Electrostatic Consulting Assocs., Groton, MA 01450 508-448-5583
Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elite Electronic Engineering Co., Downers Grove, IL 60515 708-495-9770
Energy Systems, Vancouver, WA 98682 206-896-8310
Entra Corporation, Indianapolis, IN 46256 317-849-8270
FJA Industries, Santa Clara, CA 95052 408-727-0100
GECO, Millheim, PA 16854 814-349-5555
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
General Digital Corp., Enfield, CT 06082 203-741-7171
W. L. Gore & Assocs., Inc., Phoenix, AZ 85044 602-438-2017
Green Engineering, Melrose, MA 02176 617-665-8994
Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
Industrial Electronics Corp., Warren, MI 48089 313-759-4450
Johnson Yokogawa Corp., Newnan, GA 30265 404-254-0400
KelTech Inc., Roanoke, VA 24019 703-362-8466
Kentron, Inc., Cedarburg, WI 53012-0142 414-377-3733
Lamtech Electronics, Garland, TX 75042 214-272-3504
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
† Lockheed Sanders, Inc., Nashua, NH 03061-2004 603-885-3602
LocUS Inc., Madison, WI 53704 608-244-0500
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
MEXITRONIX (Woman Owned), Kingman, AZ 86401 602-757-9798
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Micro Industries, Westerville, OH 43081 614-895-0404
† Microwave Design Svcs., Inc., Ft. Walton Beach, FL 32548 904-664-1234
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
MOLEX, Inc., Lisle, IL 60532 708-969-4550
Multipower, Inc., Spectrum Electronics Corp., Beaverton, OR 97006 503-646-4700
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
NWL Transformers, Bordentown, NJ 08505 609-298-7300
PC Transformer Corp., West Babylon, NY 11704 516-491-3300
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
Power Pac, Shelton, CT 06484 203-925-0123
§ Powertron Corp., Sparta, NJ 07871 201-579-5599
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
Presco, Inc., Woodbridge, CT 06525 203-397-8722
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
Science & Engrg. Consultants, Inc., Reston, VA 22090 703-471-1600
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
TL Inds. Inc., Northwood, OH 43619 419-666-8144
Tree Technologies Corporation, Buffalo, NY 14228 716-688-4640
Trend Circuits, Fremont, CA 94538-6148 415-651-1150
§† Video Automation Systems, Pound Ridge, NY 10576 914-764-4613
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202

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Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
FJA Industries, Santa Clara, CA 95052 408-727-0100
Science & Engrg. Consultants, Inc., Reston, VA 22090 703-471-1600
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202

Services, Consulting, Production-4100

Alden Products Co., Brockton, MA 02403, 508-583-0160 ..... C•1163
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647, 402-563-6506 ..... A•1908
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
Teka Interconnection Systems, Providence, RI 02907, 401-785-4110 .... C•1545
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 .. D•1119,2239
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
Dexter Scientific, Palatka, FL 32177 904-328-2450
Electro-Support Systems, Temecula, CA 92390 714-676-2751
Energy Systems, Vancouver, WA 98682 206-896-8310
Entra Corporation, Indianapolis, IN 46256 317-849-8270
FJA Industries, Santa Clara, CA 95052 408-727-0100
Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
Industrial Electronics Corp., Warren, MI 48089 313-759-4450
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 516-937-3475
Kentron, Inc., Cedarburg, WI 53012-0142 414-377-3733
Lamtech Electronics, Garland, TX 75042 214-272-3504
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Matrix Corp., Raleigh, NC 27610 919-231-8000
Micro Industries, Westerville, OH 43081 614-895-0404
† Microwave Design Svcs., Inc., Ft. Walton Beach, FL 32548 904-664-1234
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
† P C Express, Inc., Hudson, FL 34667 813-863-6114
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Trend Circuits, Fremont, CA 94538-6148 415-651-1150
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868

Services, Consulting, Research & Development-4100

Albar, Inc., Lynnwood, WA 98036, 206-771-4006;800-822-5227 ..... A•2152
Alden Products Co., Brockton, MA 02403, 508-583-0160 ..... C•1163
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647, 402-563-6506 ..... A•1908
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... **D•1267**
Magna-Power Electronics, Inc., Whippany, NJ 07981, 201-428-1197 ..... **D•1891**
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... **D•1121**
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... **D•1048-1049**
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... **D•2077**
§ **Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020** .. **D•1119,2239**
† Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
AMP-AKZO Corporation, Melville, NY 11747 516-454-4400
† Ark Elctrns. Corp., Southampton, PA 18966 215-322-6510
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† CDRL Data, Inc., Phoenix, AZ 85027-2823 602-582-8844
Colt Technology Corp., Lenexa, KS 66219 913-888-1673
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Creare Inc., Hanover, NH 03755 603-643-3800
D & P MFG. Inc., Chalfont, PA 18914 215-997-1200
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Dexter Scientific, Palatka, FL 32177 904-328-2450
Digital Dynamics, Inc., Scotts Valley, CA 95066 408-438-4444
Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
East Controls, Hanover Park, IL 60103 708-837-7709
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Electronic Development Associates, Inc., Dix Hills, NEW YORK 11746 .. 516-673-3881
Electronics Test Centre, Alberta Research Council, Edmonton, AB, CANADA T6N 1E4 403-450-5370
Electronic Testing & Consulting, Decatur, TX 76234 817-627-2929
Electrostatic Consulting Assocs., Groton, MA 01450 508-448-5583
Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elite Electronic Engineering Co., Downers Grove, IL 60515 708-495-9770
Energy Systems, Vancouver, WA 98682 206-896-8310
Entra Corporation, Indianapolis, IN 46256 317-849-8270
Epsilon-Lambda Elctrns. Corp., Geneva, IL 60134 708-232-9611
FJA Industries, Santa Clara, CA 95052 408-727-0100
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA K0G 1J0 613-724-1993
Green Engineering, Melrose, MA 02176 617-665-8994
Industrial Electronics Corp., Warren, MI 48089 313-759-4450
§ Inservo, Inc., LaGrange, OH 44050 1-216-355-5102
# KelTech Inc., Roanoke, VA 24019 703-362-8466
Kentron, Inc., Cedarburg, WI 53012-0142 414-377-3733
† Laser Concepts, Omega Organization Intl., Seattle, WA 98133 206-364-7881
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
LocUS Inc., Madison, WI 53704 608-244-0500
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
MEXITRONIX (Woman Owned), Kingman, AZ 86401 602-757-9798
Micro Industries, Westerville, OH 43081 614-895-0404
† Microwave Design Svcs., Inc., Ft. Walton Beach, FL 32548 904-664-1234
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
MOLEX, Inc., Lisle, IL 60532 708-969-4550
MULTISENS Inc, Laval, Que., CANADA H7S 2E8 514-629-5646
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
NAVAN Corporation, Media, PA 19063 215-543-8066
Parsytec Inc., West Chicago, IL 60185 708-293-9500
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
† Polygenex International Inc., Cary, NC 27513 919-380-8100
Power Pac, Shelton, CT 06484 203-925-0123
§ Powertron Corp., Sparta, NJ 07871 201-579-5599
Precision Specialties, Inc., Northridge, CA 91324 818-349-9774
Presco, Inc., Woodbridge, CT 06525 203-397-8722
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452
† Research Specialists, Cleveland, OH 44145 216-871-8909
Science & Engrg. Consultants, Inc., Reston, VA 22090 703-471-1600
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
Sierra West Power Systems, Las Cruces, NM 88001 505-522-8828
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Systems Data, Inc., Akron, OH 44321 216-666-0085
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
Tree Technologies Corporation, Buffalo, NY 14228 716-688-4640
Trend Circuits, Fremont, CA 94538-6148 415-651-1150
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
§† Video Automation Systems, Pound Ridge, NY 10576 914-764-4613
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202

Services, Crimping - Also see Services, Wire Cutting & Stripping-4100

ABL Electronics Supply, Inc., Yorktown Hgts., NY 10598, 914-962-2253 ..... **C•1711**
† **Daniels Manufacturing Corp., Orlando, FL 32824, 407-855-6161** ..... **C•1703**
DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... **C•1350**
† **E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473** .... **C•1682**
Altek Co., Torrington, CT 06790 203-482-7626
† Altron, Inc., Anoka, MN 55303 612-427-7735
American Assembly Inc., Florida, NY 10921 914-651-3433
§ American Wire & Electronics, Costa Mesa, CA 92626 714-957-5738
† Apsco, Inc., Mentor, OH 44060 216-352-8961
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
† Automation Elctrns., R.J.A. Inds., Inc., Chatsworth, CA 91311 818-998-5124
Autosplice, Inc., San Diego, CA 92121 619-535-0077
§† Brim Electronics, Fair Lawn, NJ 07410 201-796-2886
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
† Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Com-2, Inc., Saline, MI 48176 313-429-9027
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Corlund Electronics Corp., Newbury Park, CA 91320 805-499-6877
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 408-734-2020
† Diagostic Instrument Corp., Ayer, MA 01432 508-772-4572
† Electro Prep Inc. & N-E-D Cable, Wareham, MA, MA 02571 508-291-2880
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
Entra Corporation, Indianapolis, IN 46256 317-849-8270
Federal Electronics, Cranston, RI 02921 401-944-6200
General Cable Co., Kenly, NC 27542 919-284-5144
† GSI Corp., Timonium, MD 21093 410-252-1768
§† IEC Electronics Corp., Newark, NY 14513 315-331-7742
† Manger Electric Company, Inc., Stamford, CT 06902 203-348-7761
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Microdot, Interconnect Systems Division, Montgomeryville, PA 18936 ... 215-699-5373
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
§† Panduit Corp., Tinley Park, IL 60477-0981 800-777-3300
† Reactel, Inc., Rockville, MD 20850 301-279-5535
Regal Aljoy Wire & Cable, Levittown, NY 11756 516-735-4871
† Rowe Industries, Inc., Toledo, OH 43612 419-729-9761
§ Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Trionics, Inc., St. Charles, IL 60174 312-232-9117
Unitrek Corporation, Vancouver, WA 98661 206-699-7277
§ U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
# V-Tron Electronics Corp., S. Attleboro, MA 02703 508-761-9100
† Wontronics, Los Angeles, CA 90039 213-660-6230

Services, Cryogenic-4100

Creare Inc., Hanover, NH 03755 603-643-3800
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
Scientific Instruments, West Palm Beach, FL 33407 407-881-8500
TL Inds. Inc., Northwood, OH 43619 419-666-8144

Services, Custom Cable Fabrication-6000 — *See Vol. C*

Services, Custom Molding, Plastics — See Services, Plastic Fabrication & Molding (Vol. D)

Services, Data Processing, Consulting — See Services, Consulting, Data Processing (Vol. D)

Services, Decapsulation/Encapsulation-4100

† **Rowe Industries, Inc., Toledo, OH 43612, 419-729-9761** ..... **C•1513**
Altek Co., Torrington, CT 06790 203-482-7626
† Aremco Products, Inc., Ossining, NY 10562 914-762-0685
† Automation Elctrns., R.J.A. Inds., Inc., Chatsworth, CA 91311 818-998-5124
† Bacon Industries, Watertown, MA 02172-2399 617-926-2550
† Danmar Inds., Moorpark, CA 93021 ..... 1-805-529-3788;1-800-666-6268
# Electrostatic Consulting Assocs., Groton, MA 01450 508-448-5583
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
Endicott Coil Co., Inc., Binghamton, NY 13905 607-797-1263
The Fredericks Company, Huntingdon Valley, PA 19006 215-947-2500
Glenmarc Manufacturing Inc., Vernon Hills, IL 60061 708-634-6080
† Hedrich USA, Inc., Goldsboro, NC 27534 919-751-1144
Isolation Products, Inc., Sunnyvale, CA 94086 408-730-4672
Kentron, Inc., Cedarburg, WI 53012-0142 414-377-3733
K-Two Industries, Palo Alto, CA 94306 408-720-9316
Manger Electric Company, Inc., Stamford, CT 06902 203-348-7761
MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
Robison Electronics, San Luis Obispo, CA 93403-8121 805-544-8000
Techdyne, Inc., Lance Wire & Cable Div., Hamden, CT 06514 203-288-5571
† Teledyne Aerospace Sys., Fairmont, MN 56031 507-235-3355
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330
Trionics, Inc., St. Charles, IL 60174 312-232-9117
† Vermont Semiconductor, Inc., Williston, VT 05495 802-865-3000

Services, Documentation (Incl. Technical Writing)-4100

Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... **C•1684**
Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... **D•2239**
AEL Defense Corp., Lansdale, PA 19446 215-822-2929
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
† CDRL Data, Inc., Phoenix, AZ 85027-2823 602-582-8844
† Electronics Test Centre, Alberta Research Council, Edmonton, AB, CANADA T6N 1E4 403-450-5370
† Electronic Testing & Consulting, Decatur, TX 76234 817-627-2929
Futuretech, Auburndale, MA 02166 617-965-3834
§ GTE Testmark Labs, GTE Industry Sls., Irving, TX 75039 214-718-3647
Industrial Electronics Corp., Warren, MI 48089 313-759-4450
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Matrix Corp., Raleigh, NC 27610 919-231-8000
Micro Industries, Westerville, OH 43081 614-895-0404

† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452

Services, Education/Training-4100

Action Instruments, San Diego, CA 92123 619-279-5726
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
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APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
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† Amuneal Manufacturing Corp., Philadelphia, PA 19124, 215-535-3000 ... C•1687
Andon Elctrns. Corp., Lincoln, RI 02865, 401-333-0388 ..... C•1278
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
Atlee Inc., North Andover, MA 01845, 508-681-1003 ..... C•1014,1679
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1623-1624
Bopla Enclosures, Frederick, MD 21701, 301-696-9300 ..... C•1016
† Compac, Holbrook, NY 11741, 516-585-3400 ..... C•1022-1025
EG & G Birtcher, EG & G, Inc., El Monte, CA 91734-1268, 818-442-2572 ..... C•1028-1029
§† Electronic Enclosures, Div. Wyle Laboratories, El Segundo, CA 90245, 213-643-8181 ..... C•1030-1032
Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 .. C•1034,1036
ISL Products Int'l, Ltd., Syosset, NY 11791-6093, 516-937-3475 .... C•1399,1759
JMJ Technical Prods., Newark, NJ 07105, 201-589-4257 ..... C•1591
Mechatronics Inc., Mercer Island, WA 98040, 206-232-4800 ..... C•1638-1639
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•2243
The Mushield Co. Inc., Goffstown, NH 03045, 603-666-4433 ..... C•1700
MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
Rose Enclosures Sys., Inc., Frederick, MD 21701, 301-696-9800 ..... C•1093
Tracewell Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ..... C•1123-1124
U.S. Terminals Inc., Cincinnati, OH 45243, 513-561-8145 ..... C•1563
§† Abalon Precision Mfg., Bronx, NY 10459 ..... 212-589-5682;1-800-888-ABALON
† Accumet Engineering, Hudson, MA 01749 508-568-8311
Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Acme Model Engineering Co., Ridgefield, NJ 07657 201-943-7650
† Alexandria Extrusion Co., Alexandria, MN 56308 612-736-6537
† American Aluminum, Mountainside, NJ 07092 908-233-3500
† American Etching & Mfg., Pacoima, CA 91331-2796 818-896-1187
Apollo Magnetics Corp., Los Angeles, CA 90057 213-381-2500
Art Wire/Doduco, Cedar Knolls, NJ 07927 201-267-2000
† Associated Spring, Barnes Grp., Bristol, CT 06010 203-583-1331
† Astro Dynamics, Inc., Woburn, MA 01801 617-935-4944
Automatic Systems Developers, Poughkeepsie, NY 12603 914-473-5530
Autoswage Products, Shelton, CT 06484 203-929-1401
§† Berg, W. M., Inc., East Rockaway, NY 11518 516-599-5010
BICC-VERO Electronics, Inc., Hamden, CT 06514 203-288-8001
Boker's, Inc., Minneapolis, MN 55406-1937 612-729-9365
† Braxton Mfg., Watertown, CT 06795 203-274-6781
§ Brooks Electronics, Philadelphia, PA 19140 215-228-4433
§† Bud Industries, Inc., Willoughby, OH 44094-0431 216-946-3200
Burbank Sheet Metal Works Inc., Burbank, CA 91502 818-846-0316
† Cardinal Control Co., Kensington, CT 06037 203-828-6379
† Contours Inc., Meriden, CT 06450 203-237-8331
DCI Inc., Olathe, KS 66062 913-782-5672
Delbert Blinn Co., Pomona, CA 91769 714-629-3900
Deringer Mfg. Co., Mundelein, IL 60060 708-566-4100
Electronic Components & Matls. Div., GTE Products Corp., Warren, PA 16365 814-723-2000
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Extrusion Technology, Inc., Randolph, MA 02368 617-963-7200
§† FISHERCAST, Fisher Gauge Limited, Peterborough, Ontario, CANADA K9J 6Y9 705-748-9522
§† FISHERTECH, Fisher Gauge Limited, Peterborough, Ontario, CANADA K9J 6Y9 705-748-9522
Framar Metal Products Co., Inc., Kenilworth, NJ 07033 908-241-0710
Gabriel Electronics, Scarborough, ME 04074 207-883-5161
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
† GM Nameplate, Inc., Seattle, WA 98119 206-284-2200
High Voltage Systems, Inc., Chappaqua, NY 10514 914-238-9057
§ Hobson Bros., Chicago, IL 60630-3884 312-283-3600
§ Hoffman Engineering, Anoka, MN 55303 612-421-2240
§† Instrument Specialties Co. Headquarters, Delaware Water Gap, PA 18327-0136 717-424-8510
Jettron Products Inc., E. Hanover, NJ 07936 201-887-0571
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
Kam Components, Inc., Nesconset, NY 11767 516-585-0666
Ken-Tron Mfg., Inc., Owensboro, KY 42301 502-684-0431
LaFrance Corp., Philadelphia, PA 19153-3893 215-365-8000
† Magnet Sales & Mfg. Co. Inc., Culver City, CA 90230-6127 ..... 213-391-7213; 800-421-6692
§ Main Prototypes Ltd., Moldmakers/Injectors, Cambridge, Ont., CAN N1R7J2 519-622-2291
Mark Eyelet Inc., AMP, Inc., Wolcott, CT 06716 203-756-8847
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
† Meco Industries, Mechanical Engraving Co., Inc., Bronx, NY 10470 212-324-4455
† Micro-Etch Products, Inc., Stratford, CT 06497 203-378-8610
§† Miller Dial Corp., El Monte, CA 91731 818-444-4555
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
Molecu-Wire, Farmingdale, NJ 07727 201-938-9473
MRL, Missouri Research Labs., St. Charles, MO 63301 .. 314-946-6900;1-800-325-0223
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
† NKR Precision Manufacturing, Harriman, NY 10926 914-782-8562
§ Norelcom Inds., Farmingdale, NY 11735 516-249-7245
† Ohmite Manufacturing Co., Skokie, IL 60076 708-675-2600
Precision Extrusions, Inc., Bensenville, IL 60106 708-766-0340
§† PTS Corporation, Bloomington, IN 47401 812-824-9331
Quantum Scientific Inc., Toronto, ONT M4J4Y1 ..... 416-239-3363;800-268-6000
Shamrock Plastics & Rubber, Inc., Indianapolis, IN 46218 ..... 317-543-3540; 800-382-4635
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
† Sjoberg, C., & Son, Inc., Cranston, RI 02910 401-461-8220
† Sko-Die, Inc., Morton Grove, IL 60053 708-965-1130
Staver Co., Inc., Bay Shore, NY 11706 516-666-8000
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Suckle Corp., Scranton, PA 18505 717-346-3871
SURON Maagan Michael, D.N. Menashe 37805, ISRAEL 06-394211
Tech-Etch, Inc., Plymouth, MA 02360 508-747-0300
† Tech Laboratories Inc., Palisades Pk., NJ 07650 201-944-2221
Techmar Corp., Los Angeles, CA 90066 ..... 213-827-8897;1-800-TECHMAR
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172
† Titchener, E. H., & Co., Binghamton, NY 13902 607-772-1161
TL Inds. Inc., Northwood, OH 43619 419-666-8144
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
† Wilkinson, Westlake Village, CA 91359 ..... 818-889-0050;800-822-4653
York Metal Products, Inc., Long Island City, NY 11106 718-932-3660
† Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825
Zierick Manufacturing Corp., Mt. Kisco, NY 10549 ..... 914-666-2911;800-882-8020

Services, Metallizing (Incl. Electroforming)-4100

Oxley Inc., Branford, CT 06405, 203-488-1033 ..... B•1335
Alberox Corporation, New Bedford, MA 02745 508-995-1725
Ceramaseal, New Lebanon, NY 12125 518-794-7800
† Craig Systems Corp., Eastern Technologies, Ltd., Amesbury, MA 01913-4848 508-388-5662
Flexible Technologies, Arlon, E. Providence, RI 02914 401-434-2340
Frequency Electronics, Inc., Mitchel Field, NY 11553 516-794-4500
GM Nameplate, Inc., Seattle, WA 98119 206-284-2200
† Hermetic Seal Corp., Rosemead, CA 91770 213-283-0411
HiTemp Technologies, Inc., San Jose, CA 95131-1101 408-922-0740
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 407-574-0208
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† United Supertek, Inc., San Jose, CA 95131-1101 408-922-0730

Services, Microprocessor Development - Also see Services, PROM & Array Programming-4100

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 .... D•1122
Advanced Systems Concepts, Inc., Altadena, CA 91001 818-791-0983
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Anacom, Anaheim, CA 92805-6235 714-774-8080
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
Colt Technology Corp., Lenexa, KS 66219 913-888-1673
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Corby Industries, Inc., Allentown, PA 18103 215-433-1412
Custom Logic, Crestline, CA 92325 714-338-4059
Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Entra Corporation, Indianapolis, IN 46256 317-849-8270
Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179

Industrial Electronics Corp., Warren, MI 48089 313-759-4450
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
#KelTech Inc., Roanoke, VA 24019 703-362-8466
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
LocUS Inc., Madison, WI 53704 608-244-0500
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
MEXITRONIX (Woman Owned), Kingman, AZ 86401 602-757-9798
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Micro Industries, Westerville, OH 43081 614-895-0404
Monolithic Sys. Corp., Englewood, CO 80112 303-790-7400
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
Presco, Inc., Woodbridge, CT 06525 203-397-8722
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452
Ramcom Systems, Marina Del Rey, CA 90292 213-827-4432
RMS Techn., Newport News, VA 23606 804-873-0100
Sensor Corp., Scottdale, PA 15683 412-887-4080
Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§† Solid State Testing, Inc., Burlington, MA 01803 617-272-0972
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Tree Technologies Corporation, Buffalo, NY 14228 716-688-4640
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 602-833-5202
Wilmington Research & Development, Topsfield, MA 01983 508-887-2501

Services, Molding/Casting - Also see Services, Plastic Fabrication & Molding-4100

† Alden Products Co., Brockton, MA 02403, 508-583-0160 ..... C•1163
† AME Corporation, Towaco, NJ 07082-0195, 201-263-1700 ..... B•1644
§ Bopla Enclosures, Frederick, MD 21701, 301-696-9300 ..... C•1016
§ George Risk Industries, Inc., Kimball, NE 69145, 308-235-4645 ..... B•1809
† Jettron Products Inc., E. Hanover, NJ 07936, 201-887-0571 ..... C•1404
JMJ Technical Prods., Newark, NJ 07105, 201-589-4257 ..... C•1591
Kycon Cable & Connector, Inc., San Jose, CA 95125, 408-295-1110 ..... C•1423
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1448,1450-1451,1454
National Wire & Cable Corp., Los Angeles, CA 90031-1780, 213-225-5611 ..... C•1776
PacTec, LaFrance Corp., Philadelphia, PA 19153, 215-365-8400 ..... C•1071
RDI Electrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... C•1510
§† Rose Enclosures Sys., Inc., Frederick, MD 21701, 301-696-9800 ..... C•1093
† Rowe Industries, Inc., Toledo, OH 43612, 419-729-9761 ..... C•1513
Shin-Etsu Polymer America, Inc., Union City, CA 94587, 415-475-9000 .. C•1521
† Skydyne Div., AAR Mfg., Port Jervis, NY 12771, 914-856-6655;800-428-CASE ..... C•1106
Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Anacom, Anaheim, CA 92805-6235 714-774-8080
† Applied Plastics Technology, Bristol, RI 02809 401-253-0200
Arrem Plastics, Inc., Addison, IL 60101 708-628-2450
§† Atlantic Optical Moulding, Webster, MA 01570 508-943-1746
† Cable Systems, Inc., Everett, MA 02149 617-389-7080
Cardinal Prods., Inc., Santa Ana, CA 92704 714-546-1224
†# Component Mfg. Svc., Inc., W. Bridgewater, MA 02379 508-580-0111
† Danmar Inds., Moorpark, CA 93021 1-805-529-3788,1-800-666-6268
Delbert Blinn Co., Pomona, CA 91769 714-629-3900
§ Dynacast Inc., Yorktown Heights, NY 10598 914-962-6300
† ECS Composites, Grants Pass, OR 97526 503-476-8871
Electronic Components & Matls. Div., GTE Products Corp., Warren, PA 16365 814-723-2000
† Electro-Tec Corporation A Kaydon Company, Blackburg, VA 24060 703-552-2111
§† FISHERTECH, Fisher Gauge Limited, Peterborough, Ontario, CANADA K9J 6Y9 705-748-9522
Gasket International Inc., Bloomfield, NJ 07003 201-338-6814
§ Johnson, E. F., Co., Minneapolis, MN 55459-0089 612-943-5500
Kentron, Inc., Cedarburg, WI 53012-0142 414-377-3733
LaFrance Corp., Philadelphia, PA 19153-3893 215-365-8000
§† Main Prototypes Ltd., Moldmakers/Injectors, Cambridge, Ont., CAN N1R7J2 519-622-2291
Microdot, Interconnect Systems Division, Montgomeryville, PA 18936 ... 215-699-5373
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
† MOLDCON Div. of Contex Electronics, W. Springfield, MA 01089 413-736-0371
† Moldtronics, Inc., Downers Grove, IL 60515 708-968-7000
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
§ Nepenthe, Inc., Palo Alto, CA 94303 415-496-6666
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
Pan International (USA), Inc., Rancho Cucamonga, CA 91730 714-945-1365
Plasticorp, Harbor City, CA 90710 213-539-9530
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
Robison Electronics, San Luis Obispo, CA 93403-8121 805-544-8000
† SAS Industries Inc., Manorville, NY 11949 ..... 516-727-1441;1-800-544-5238
Security Plastics, Inc., Miami Lakes, FL 33014 305-823-5440
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
Star-Tron Corporation, Providence, RI 02909 401-274-5090
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
§ Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
Techdyne, Inc., Lance Wire & Cable Div., Hamden, CT 06514 203-288-5571
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Teledyne Aerospace Sys., Fairmont, MN 56031 507-235-3355
†# Tratec of California, Inc., Chula Vista, CA 91911 619-476-1155
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330
Useco Div., Litton Inds, Van Nuys, CA 91409 818-786-6381
U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
Veetronix, Inc., Lexington, NE 68850 308-324-4600
§ Wescorp Antistatic Products, Mountain View, CA 94041 415-969-7717

Services, Optical Design-4100

Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† D. O. Industries, Rochester, NY 14623 716-359-4000
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
† KLC/Karl Lambrecht Corp., Chicago, IL 60618 312-472-5442
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Noll, J. A. Co., Monroeville, PA 15146 412-856-7566
Oxley Inc., Branford, CT 06405 203-488-1033
Science & Engrg. Consultants, Inc., Reston, VA 22090 703-471-1600

Services, Packaging-4100

Die-Tech Inc., York Haven, PA 17370, 717-938-6771 ..... C•1347
Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 ..... C•1034
† Gemini Inc., Cannon Falls, MN 55009, 507-263-3957;800-533-3031 ..... C•1054
Graham Electronic Manufacturing Inc., Escondido, CA 92025, 619-747-9177;800-628-4095 ..... C•1057
§† Hardigg Inds., Inc., South Deerfield, MA 01373, 413-665-2163 ..... C•1059
† International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ..... A•1730-1731
Mini-Systems, Inc., Electronic Package Div., Plainville, MA 02762, 508-695-2000 ..... A•1735
Serco Products Division:Serco Mold, Inc., Covina, CA 91723, 818-331-0517;800-843-8172(Calif.) ..... C•1100-1101
Skydyne Div., AAR Mfg., Port Jervis, NY 12771, 914-856-6655;800-428-CASE ..... C•1106-1107
§ ADE, Inc., Chicago, IL 60633 312-646-3400
Advanced Electronic Packaging, Huntington Beach, CA 92646 714-969-1150
AMP-AKZO Corporation, Melville, NY 11747 516-454-4400
§ Augat Inc., Attleboro, MA 02703 617-222-2202
Augat/RDI, Carol Stream, IL 60188 708-682-4100
Cardinal Prods., Inc., Santa Ana, CA 92704 714-546-1224
Caristrap Internatonal, Inc., Chomedey, Lavac, QUEBEC, CANADA H7SIN8 514-667-4700
Dynacast Inc., Yorktown Heights, NY 10598 914-962-6300
† ECS Composites, Grants Pass, OR 97526 503-476-8871
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
† Gordon, L., Packaging, Baltimore, MD 21230 301-539-6537
HiTemp Technologies, Inc., San Jose, CA 95131-1101 408-922-0740
§† IEC Electronics Corp., Newark, NY 14513 315-331-7742
§† LSI Logic Corp., Milpitas, CA 95035 408-433-8000
LTI, Inc., Carol Stream, IL 60188 708-668-8886
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
† Modular Devices, Shirley, NY 11967 516-345-3100
MULTISENS Inc, Laval, Que., CANADA H7S 2E8 514-629-5646
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
Parsons Manufacturing, Menlo Park, CA 94025-1476 415-324-4726
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
§ Polygenex International Inc., Cary, NC 27513 919-380-8100
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
Project Resources Inc., Wareham, MA 02571 508-295-7444
Quantum Scientific Inc., Toronto, ONT M4J4Y1 ..... 416-239-3363;800-268-6000
§ Reliance Plastics & Packaging, Passaic, NJ 07055 201-473-7200
† Resistance Technology Inc., St. Paul, MN 55112 612-636-9770
Siltronics Ltd., Dover, MA 02030 617-329-4068
† Solid State Testing, Inc., Burlington, MA 01803 617-272-0972
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Technology Design Inc., Bellevue, WA 98006 206-455-9822
† Teledyne Microelectronics, Los Angeles, CA 90066 ..... 213-822-8229;213-870-9831
† Teradyne Connection Sys., Teradyne, Inc., Nashua, NH 03060 603-889-5156
§ Tra-Con, Inc., Medford, MA 02155 617-391-5550
United Foam Plastics, Georgetown, MA 01833 508-352-2200
Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
§ Wescorp Antistatic Products, Mountain View, CA 94041 415-969-7717
† Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825
† Zero Plastics, A Unit of Zero Corp., Chicopee, MA 01020 ..... 413-267-5561 Ext. 432

Services, PCB Test Development-4100

International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 .... A•1731
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•2239
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Diversified Systems, Inc., Indianapolis, IN 46268 317-299-9547
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
§ GTE Electronic Repair Services, GTE Supply, W. Airport, TX 75261 214-615-7505
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452
Vu-Data Corporation, San Diego, CA 92121 619-452-7670
Wieland Inc., New Rochelle, NY 10801 914-633-0222

Services, Photographic-4100

Aztec Industries, Inc., Mesa, AZ 85210 ..... 602-833-3131;800-729-3132

Circuit Images, Inc., Beaverton, OR 97006 503-629-2133
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212 ..... 607-772-7563; 1-800-PWB-ASSY
† EMDS, Inc., Gaithersburg, MD 20877 301-840-5710
Garry Electronics an LPL Co., Langhorne, PA 19047 215-949-2300
Identatronics, Inc., Elk Grove, IL 60007 ..... 708-437-2654;1-800-323-5403
Smert Compter Aided Design & Prototype, Div. of SME (Monaco), Kanata, Ont., CANADA K2K 1X4 613-839-5588
† SURON Maagan Michael, D.N. Menashe 37805, ISRAEL 06-394211
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Services, Plastics Fabrication/Molding/Foaming/Finishing-4100

Alden Products Co., Brockton, MA 02403, 508-583-0160 ..... C•1163
† AME Corporation, Towaco, NJ 07082-0195, 201-263-1700 ..... B•1644
APX-Arstan Products, Hicksville, NY 11801, 516-433-1313 ..... D•1597
Autec Power Systems, Chatsworth, CA 91311, 818-341-6123 ..... D•1623-1624
† Cut Craft, Inc., Ft. Worth, TX 76102, 817-332-6151 ..... C•1675,1688
Dialight Corporation, Manasquan, NJ 08736, 908-223-9400 ..... B•1150
† ECS Composites, Grants Pass, OR 97526, 503-476-8871 ..... C•1027
Electro Space Fabricators, Topton, PA 19562-0067, 215-682-7181 .. C•1034,1036
† Fema Elctrns. Corp., E. Brunswick, NJ 08816, 908-238-1223 ..... B•1073
† George Risk Industries, Inc., Kimball, NE 69145, 308-235-4645 ..... B•1809
Homalite, Whitco, Inc., Wilmington, DE 19804, 302-652-3686 ..... B•1085
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1454,1767
National Wire & Cable Corp., Los Angeles, CA 90031-1780, 213-225-5611 ..... C•1776,1796
PacTec, LaFrance Corp., Philadelphia, PA 19153, 215-365-8400 ..... C•1071
RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... C•1510
Rose Enclosures Sys., Inc., Frederick, MD 21701, 301-696-9800 ..... C•1093
† Rowe Industries, Inc., Toledo, OH 43612, 419-729-9761 ..... C•1513
† S & S Associates, Inc., San Luis Obispo, CA 93401, 805-544-2500 .. C•1094-1096
Serco Products Division:Serco Mold, Inc., Covina, CA 91723, 818-331-0517;800-843-8172(Calif.) ..... C•1100-1101
† Skydyne Div., AAR Mfg., Port Jervis, NY 12771, 914-856-6655;800-428-CASE ..... C•1106-1107
U.S. Terminals Inc., Cincinnati, OH 45243, 513-561-8145 ..... C•1563
Accurate Electronics Corp., Elyria, OH 44036 ..... 216-366-6330;1-800-325-8979
Anacom, Anaheim, CA 92805-6235 714-774-8080
† Applied Plastics Technology, Bristol, RI 02809 401-253-0200
Arrem Plastics, Inc., Addison, IL 60101 708-628-2450
† Barrington Plastics, Mt. Laurel, NJ 08054 609-235-5151
Cable Systems, Inc., Everett, MA 02149 617-389-7080
† Cadillac Plastic & Chem. Co. Div. of M.A. Hanna, Troy, MI 48083 313-583-1200
Cardinal Prods., Inc., Santa Ana, CA 92704 714-546-1224
†# Component Mfg. Svc., Inc., W. Bridgewater, MA 02379 508-580-0111
§ Custom Connector, Cleveland, OH 44114 216-241-1679
† Danmar Inds., Moorpark, CA 93021 1-805-529-3788,1-800-666-6268
DEK, Inc., St. Charles, IL 60174 708-377-2575
Delbert Blinn Co., Pomona, CA 91769 714-629-3900
Dimco-Gray, Dayton, OH 45458 513-433-7600
§ Durakool, Inc., American Electronic Components, Elkhart, IN 46514 219-264-1116
§ Dynacast Inc., Yorktown Heights, NY 10598 914-962-6300
§ E-A-R Specialty Composites, Cabot Safety Corp., Indianapolis, IN 46268 317-872-1111
EBY Company, Philadelphia, PA 19124 215-537-4700
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Electronic Components & Matls. Div., GTE Products Corp., Warren, PA 16365 814-723-2000
† Electro-Tec Corporation A Kaydon Company, Blackburg, VA 24060 703-552-2111
Enerco, Inc., Seattle, WA 98108 206-762-1422
Fastex, Illinois Tool Works, Des Plaines, IL 60016 312-299-2222
Ferro Corporation, Filled & Reinforced Plastics Div., Evansville, IN 47711 812-423-5218
Ferro Corporation, Plastic Colorants & Dispersions, Stryker, OH 43557 .. 419-682-3311
Gasket International Inc., Bloomfield, NJ 07003 201-338-6814
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
General Cable Co., Kenly, NC 27542 919-284-5144
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GM Nameplate, Inc., Seattle, WA 98119 206-284-2200
§† Hardigg Inds., Inc., South Deerfield, MA 01373 413-665-2163
§ Hobson Bros., Chicago, IL 60630-3884 312-283-3600
§ Hoffman Engineering, Anoka, MN 55303 612-421-2240
§ ICC, Inc., Orange, CA 92665 714-998-8310
Integrity Technology Corp., Santa Clara, CA 95050 408-262-8640
ITW Fastex Distributor Business, Wood Dale, IL 60191-1150 708-350-8200
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
Kam Components, Inc., Nesconset, NY 11767 516-585-0666
§† Keystone Electronics Corp., Astoria, NY 11105-2017 718-956-8900
LaFrance Corp., Philadelphia, PA 19153-3893 215-365-8000
Liberty Polyglas, Inc., West Mifflin, PA 15122 412-466-8611
§ Main Prototypes Ltd., Moldmakers/Injectors, Cambridge, Ont., CAN N1R7J2 519-622-2291
Manger Electric Company, Inc., Stamford, CT 06902 203-348-7761
§ Mantex Corp., Oxford, MI 48371 313-628-8210
§† Meco Industries, Mechanical Engraving Co., Inc., Bronx, NY 10470 212-324-4455
† MFG, Parabam Div., Carson, CA 90745 213-549-5044
Microdot, Interconnect Systems Division, Montgomeryville, PA 18936 ... 215-699-5373
Minnesota Wire & Cable, St. Paul, MN 55108-2721 ..... 612-642-1800 ; 1-800-258-6922(MWCC)
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
† Moldtronics, Inc., Downers Grove, IL 60515 708-968-7000
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
§ Norelcom Inds., Farmingdale, NY 11735 516-249-7245
† NY Glass Plastics, Calnetics Corp., Paramount, CA 90723 213-636-1035
§ Pan International (USA), Inc., Rancho Cucamonga, CA 91730 714-945-1365
§† Parker Seal Group, Irvine, CALIFORNIA 92715 714-851-3763
Parsons Manufacturing, Menlo Park, CA 94025-1476 415-324-4726
The Pedro Companies, St. Paul, MN 55101 612-224-9491
Plastic Forming, Woodridge, CT 06525 203-397-1338
Plasticorp, Harbor City, CA 90710 213-539-9530
§† Plastimatic, Inc., Glynwed Int'L, Fairfield, NJ 07004 201-575-0038
† Polygenex International Inc., Cary, NC 27513 919-380-8100
§† PTS Corporation, Bloomington, IN 47401 812-824-9331
Quantum Scientific Inc., Toronto, ONT M4J4Y1 ..... 416-239-3363;800-268-6000
† Quartzite Processing, Inc., Malden, MA 02148 617-322-3611
† Resistance Technology Inc., St. Paul, MN 55112 612-636-9770
§ Richco Plastic Co., Chicago, IL 60680 312-539-4060
Rutherford Research, Rutherford, NJ 07070 201-933-2091
§ Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
Sanlar, Inc. T/A, Harbison Industrial Products, Levittown, PA 19057 215-943-9000
Security Plastics, Inc., Miami Lakes, FL 33014 305-823-5440
Shamrock Plastics & Rubber, Inc., Indianapolis, IN 46218 ..... 317-543-3540; 800-382-4635
† Shogyo International Corp., Great Neck, NY 11021 516-466-0911
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
Sjoberg, C., & Son, Inc., Cranston, RI 02910 401-461-8220
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
Stratos Product Development Group, Seattle, WA 98121 206-448-1388
Techdyne, Inc., Lance Wire & Cable Div., Hamden, CT 06514 203-288-5571
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Thermoset Plastics Inc., Indianapolis, IN 46220 317-259-4161
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330
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† Unit Industries, Fullerton, CA 92631 714-871-4161
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§ Wescorp Antistatic Products, Mountain View, CA 94041 415-969-7717
§† Whitso, Schiller Pk, IL 60176 708-678-5200
Zero Enclosures, Zero Corp., Burbank, CA 91503 ..... 818-846-4191;818-841-1825
† Zero Plastics, A Unit of Zero Corp., Chicopee, MA 01020 ..... 413-267-5561 Ext. 432

Services, Plating-4100

Heritage Metal Finishing Inc., Elizabethtown, PA 17022, 717-367-1561 ... D•2235
AMP-AKZO Corporation, Melville, NY 11747 516-454-4400
† Autoswage Products, Shelton, CT 06484 203-929-1401
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Dynacast Inc., Yorktown Heights, NY 10598 914-962-6300
† Finishers, Inc., Santa Clara, CA 94054 408-988-0222
Garry Electronics an LPL Co., Langhorne, PA 19047 215-949-2300
† Handy & Harman Elctrn. Matls. Corp., N. Attleboro, MA 02760 508-695-1401
HiTemp Technologies, Inc., San Jose, CA 95131-1101 408-922-0740
§† Instrument Specialties Co. Headquarters, Delaware Water Gap, PA 18327-0136 717-424-8510
LaFrance Corp., Philadelphia, PA 19153-3893 215-365-8000
McCoy Electronics Co., A Sub. of Oak Industries, Mt. Holly Springs, PA 17065 717-486-3411
MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
PacTec, LaFrance Corp., Philadelphia, PA 19153 215-365-8400
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330

Services, Precious Metal Refining-4100

The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
† Technic, Inc., Providence, RI 02940-9650 401-781-6100

Services, Precious Metal Resmelting, Recovery, Recycling-4100

The J. M. Ney Company, Bloomfield, CT 06002 203-242-2281
† Technic, Inc., Providence, RI 02940-9650 401-781-6100

Services, PC Design/Preparation/Production-4100

Advanced Electronic Packaging, Huntington Beach, CA 92646, 714-969-1150 ..... A•1719
Andon Elctrns. Corp., Lincoln, RI 02865, 401-333-0388 ..... C•1278
† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
ESC Electronics Corp., Palisades Pk., NJ 07650, 201-947-0400 ..... A•1671
HEI, Inc., Hybrid Electronics Div., Victoria, MN 55386, 612-443-2500 ..... A•1726
Hybridyne, Inc., Tucson, AZ 85745, 602-629-0001 ..... A•1729
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 .... A•1731
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Murata Erie North America, Inc., Smyrna, GA 30080, 404-436-1300 ..... A•1698
MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... C•1684
State of the Art, Inc., State College, PA 16803-1797, 814-355-8004 ..... A•1986
ACC Electronics Company, Echlin Inc., Independence, KS 67301 316-331-1000
Advanced Hardware Manufacturing, Inc., Fenton, MO 63026 314-343-3850
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
AMBIT Associates, Santa Clara, CA 95051-2311 408-241-5767
Apollo Magnetics Corp., Los Angeles, CA 90057 213-381-2500
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900

A-Systems Inc., Charlottesville, VA 22901 ... 804-295-7200
† Branmag, Inc., North Tonawanda, NY 14120 ... 716-693-5994
Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 ... 708-662-9200
Circom Inc., Bensenville, IL 60106 ... 708-595-4460
Colt Technology Corp., Lenexa, KS 66219 ... 913-888-1673
Computer System Assocs., San Diego, CA 92121 ... 619-566-3911
Computer Systems Technical Support, Anaheim, CA 92807 ... 714-632-1300
Corlund Electronics Corp., Newbury Park, CA 91320 ... 805-499-6877
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 ... 617-273-5800
† Da-Tech Corp., Ivyland, PA 18974 ... 215-322-9410
DCI Inc., Olathe, KS 66062 ... 913-782-5672
† Diversified Systems, Inc., Indianapolis, IN 46268 ... 317-299-9547
† Electro-Mech Components, Inc., South El Monte, CA 91733-3689 ... 818-442-7180
The Electronics Group, Inc., Charlotte, NC 28208 ... 704-391-9500
EOG, INC., OMX, INC., Hunt Valley, MD 21030 ... 301-785-3000
FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 ... 408-432-8331
† Flex-Link Products, Inc., San Fernando, CA 91340 ... 818-898-1451
Garry Electronics an LPL Co., Langhorne, PA 19047 ... 215-949-2300
GECO, Millheim, PA 16854 ... 814-349-5555
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO ... 613-724-1993
General Digital Corp., Enfield, CT 06082 ... 203-741-7171
General Numeric Corporation, Elk Grove Village, IL 60007 ... 708-640-1535
W. L. Gore & Assocs., Inc., Phoenix, AZ 85044 ... 602-438-2017
HiTech Equipment Corp., San Diego, CA 92126 ... 619-566-1892
Hughes Electronics Products Corp., Livonia, MI 48150 ... 313-427-8310
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 ... 914-373-9003
§ Inservo, Inc., LaGrange, OH 44050 ... 1-216-355-5102
§ Instant Board Circuits Grp., Novato, CA 94949 ... 415-883-1717
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 ... 516-937-3475
† Lamtech Electronics, Garland, TX 75042 ... 214-272-3504
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
§ Manu-Tronics, Inc., Kenosha, WI 53142-9508 ... 414-947-7700 ;414-947-7302
Marsh Products, Inc., Spectrum Companies, Intl., Batavia, IL 60510 ... 708-879-8008
Memory X, Inc., San Diego, CA 92123 ... 619-292-1151
Micro Industries, Westerville, OH 43081 ... 614-895-0404
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 ... 219-489-2511
National Telephone & Electronics Inc., Miami, FL 33172 ... 305-592-0551
Philips Circuit Assemblies, Tampa, FL 33614-2797 ... 813-933-5113
† Precision Graphics Inc., Raritan, NJ 08869 ... 908-707-8880
Professional Engineering Systems, Erie, PA 16511-1051 ... 814-453-5452
Quality Research Company, Spokane, WA 99207-9632 ... 509-924-6895
Ragen Corp., Systems Div., N. Arlington, NJ 07032 ... 201-997-1000
Smert Compter Aided Design & Prototype, Div. of SME (Monaco), Kanata, Ont., CANADA K2K 1X4 ... 613-839-5588
SMT East Corporation, Stoughton, MA 02072-1141 ... 800-888-SMT1
Stratos Product Development Group, Seattle, WA 98121 ... 206-448-1388
Techrand Corp. of America, Muskegon, MI 49444 ... 616-798-2930
Tektronix, Inc., Beaverton, OR 97077 ... 800-835-9433
Tree Technologies Corporation, Buffalo, NY 14228 ... 716-688-4640
Triac Electronic Systems, Inc., Glendale, NY 11385 ... 718-441-4759
Trionics, Inc., St. Charles, IL 60174 ... 312-232-9117
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 ... 213-316-9984
† Vertek Intl. Inc., San Diego, CA 92173 ... 619-661-6868
W.L. Williamson & Assoc., Ltd., Mesa, AZ 85210 ... 602-833-5202

Services, PROM & Array Programming - Also see Services, Microprocessor Development-4100

Altron, Inc., Anoka, MN 55303 ... 612-427-7735
ASC Systems, St. Clair Shores, MI 48080 ... 313-882-1133
Colt Technology Corp., Lenexa, KS 66219 ... 913-888-1673
Computer Doctors, College Park, MD 20740 ... 1-800-RAM-STAR;301-474-3095
§ Com-2, Inc., Saline, MI 48176 ... 313-429-9027
Design Automation, Inc., Lexington, MA 02173-3992 ... 617-862-8998
† Eastern Electronics Mfg. Corp., National Patent Dev. Corp., East Hartford, CT 06108 ... 203-528-9821
Enterprise Systems Corp., Dover, NH 03820 ... 603-742-7363
Hibbing Electronics Corp., Hibbing, MN 55746 ... 218-263-8971
KelTech Inc., Roanoke, VA 24019 ... 703-362-8466
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 ... 803-578-2143
MicroDimensions, Inc., Mentor, OH 44060 ... 216-974-8070
National Telephone & Electronics Inc., Miami, FL 33172 ... 305-592-0551
Presco, Inc., Woodbridge, CT 06525 ... 203-397-8722
Professional Engineering Systems, Erie, PA 16511-1051 ... 814-453-5452
† Programmable Devices, Inc., Woburn, MA 01801 ... 617-935-9530
§ Prologic Systems, Broomfield, CO 80020 ... 303-460-0103
§† Solid State Testing, Inc., Burlington, MA 01803 ... 617-272-0972
Sunrise Electronics, Inc., Glendora, CA 91740 ... 818-914-1926
Techrand Corp. of America, Muskegon, MI 49444 ... 616-798-2930
† The Test Grp., Inc., San Diego, CA 92121 ... 619-450-1722

Services, Profile Extruders-4100

† Alexandria Extrusion Co., Alexandria, MN 56308 ... 612-736-6537
† Minor Rubber Co., Inc., Bloomfield, NJ 07003 ... 201-338-6800;800-433-6886
# REDCO, Carson City, NV 89706 ... 702-882-3100
Richco Plastic Co., Chicago, IL 60680 ... 312-539-4060

Services, Qualification Testing — See Services, Environmental Testing (Vol. D)

Services, Reliability-4100

§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ... D•2239
† CDRL Data, Inc., Phoenix, AZ 85027-2823 ... 602-582-8844
Connectronics Corp., Toledo, OH 43607 ... 419-537-0020
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 ... 617-273-5800
Design Automation, Inc., Lexington, MA 02173-3992 ... 617-862-8998
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 ... 708-574-5400
Electronics Test Centre, Alberta Research Council, Edmonton, AB, CANADA T6N 1E4 ... 403-450-5370
Garry Electronics an LPL Co., Langhorne, PA 19047 ... 215-949-2300
Green Engineering, Melrose, MA 02176 ... 617-665-8994
§ GTE Testmark Labs, GTE Industry Sls., Irving, TX 75039 ... 214-718-3647
Kentron, Inc., Cedarburg, WI 53012-0142 ... 414-377-3733
MOLEX, Inc., Lisle, IL 60532 ... 708-969-4550
Pace Inc., Laurel, MD 20723-1990 ... 301-490-9860
Philips Circuit Assemblies, Tampa, FL 33614-2797 ... 813-933-5113
† Solid State Testing, Inc., Burlington, MA 01803 ... 617-272-0972
Systems Testing, Inc., Santa Clara, CA 95052 ... 408-727-0100
† The Test Grp., Inc., San Diego, CA 92121 ... 619-450-1722
† Trio-Tech International, San Fernando, CA 91340 ... 818-365-9200

Services, Rental, Instruments & Equipment — See Test Equipment, Rental & Lease (Vol. D)

Services, Repair, Maintenance — See Services, Calibration & Repair Instrument (Vol. D)

Services, RFI Measuring — See Services, Electrical Measurement & Test (Vol. D)

Services, Silicon Foundry — See Silicon Foundry Services (Vol. D)

Services, Silk Screening-4100

§ Bopla Enclosures, Frederick, MD 21701, 301-696-9300 ... C•1016
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ... D•2234
EG & G Birtcher, EG & G, Inc., El Monte, CA 91734-1268, 818-442-2572 ... C•1029
† International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ... A•1730
† JMJ Technical Prods., Newark, NJ 07105, 201-589-4257 ... C•1591
PacTec, LaFrance Corp., Philadelphia, PA 19153, 215-365-8400 ... C•1076
† S & S Associates, Inc., San Luis Obispo, CA 93401, 805-544-2500 ... C•1094-1096
† Abrams Instrument Corp., Okemos, MI 48864 ... 517-332-6405
Accurate Electronics Corp., Elyria, OH 44036 ... 216-366-6330;1-800-325-8979
† Apollo Magnetics Corp., Los Angeles, CA 90057 ... 213-381-2500
† Aremco Products, Inc., Ossining, NY 10562 ... 914-762-0685
§# Arkay Engravers, Inc., Ronkonkoma, NY 11779 ... 516-467-7795
† Autoroll Machine Corporation, Middleton, MA 01949 ... 508-777-2160
Aztec Industries, Inc., Mesa, AZ 85210 ... 602-833-3131;800-729-3132
† Barrington Plastics, Mt. Laurel, NJ 08054 ... 609-235-5151
Buckeye Stamping Co., Columbus, OH 43207 ... 614-445-8433
Component General, Inc., Odessa, FL 33556 ... 813-376-6655
Garry Electronics an LPL Co., Langhorne, PA 19047 ... 215-949-2300
GECO, Millheim, PA 16854 ... 814-349-5555
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO ... 613-724-1993
Jayco Plastics of California, Inc., Orange, CA 92665 ... 714-974-1701
KelTech Inc., Roanoke, VA 24019 ... 703-362-8466
§† Meco Industries, Mechanical Engraving Co., Inc., Bronx, NY 10470 ... 212-324-4455
§† Miller Dial Corp., El Monte, CA 91731 ... 818-444-4555
Mini-Systems, Inc., Thick/Thin Film Division, North Attleboro, MA 02761 ... 508-695-0203
Mini-Systems, Inc., Sunbelt Microelectronic Division, Deltona, FL 32725 ... 407-574-0208
† MLI Industries, Inc., Apalachin, NY 13732 ... 607-754-5800
† NAZ-DAR/K.C., Thrall Enterprises, Chicago, IL 60622 ... 312-943-8338
New England Keyboard Inc., Fitchburg, MA 01420 ... 508-345-8332
Ritz Electronics/Relco, New Dundee, Ont., CANADA NOB 2EO ... 519-696-2616
§† Rose Enclosures Sys., Inc., Frederick, MD 21701 ... 301-696-9800
† Southwestern Nameplate & Mfg. Co., Inc., Anna, TX 75003 ... 214-231-6663; 214-924-3289;1-800-331-6600
Triac Electronic Systems, Inc., Glendale, NY 11385 ... 718-441-4759
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Wontronics, Los Angeles, CA 90039 ... 213-660-6230
York Metal Products, Inc., Long Island City, NY 11106 ... 718-932-3660
† Zero Enclosures, Zero Corp., Burbank, CA 91503 ... 818-846-4191;818-841-1825

Services, Soldering-4100

§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ... D•2234
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473 ... C•1682
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 ... A•1730
Advanced Hardware Manufacturing, Inc., Fenton, MO 63026 ... 314-343-3850
Advanced Interconnections Corp., West Warwick, RI 02893 ... 401-823-5200
§† Alpha Metals, Jersey City, NJ 07304 ... 201-434-6778
Altek Co., Torrington, CT 06790 ... 203-482-7626
† Altron, Inc., Anoka, MN 55303 ... 612-427-7735
Argo Electronics, Inc., Baldwin Park, CA 91706 ... 818-962-8422
† Assembly Specialists, Chelmsford, MA 01824 ... 508-250-5900
† Automation Elctrns., R.J.A. Inds., Inc., Chatsworth, CA 91311 ... 818-998-5124
§† Brim Electronics, Fair Lawn, NJ 07410 ... 201-796-2886
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 ... 216-255-7744
Cardinal Control Co., Kensington, CT 06037 ... 203-828-6379
Caribbean Assemblies, Inc., Wintersprings, FL 32708 ... 407-327-0602
Computer Systems Technical Support, Anaheim, CA 92807 ... 714-632-1300
§ Com-2, Inc., Saline, MI 48176 ... 313-429-9027
Control Laser Corp., Orlando, FL 32809 ... 407-438-2500

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† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
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The Electronics Group, Inc., Charlotte, NC 28208 704-391-9500
Electronics Research Associates Inc., Winsted, CT 06098 203-379-2731
† Electro Prep Inc. & N-E-D Cable, Wareham, MA, MA 02571 508-291-2880
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
Elgin Electronics, Erie, PA 16509-3570 814-864-4921
The Five Star Co., Plantsville, CT 06479 203-628-5561
GECO, Millheim, PA 16854 814-349-5555
General Automation, A Div. of 769442 Ont. Ltd., Kemptville, Ont., CANADA KOG 1JO 613-724-1993
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Hughes Electronics Products Corp., Livonia, MI 48150 313-427-8310
KelTech Inc., Roanoke, VA 24019 703-362-8466
† Lamtech Electronics, Garland, TX 75042 214-272-3504
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
† Miller, L.C., Co., Monterey Pk., CA 91754 213-268-3611
Minnesota Wire & Cable, St. Paul, MN 55108-2721 ..... 612-642-1800 ; 1-800-258-6922(MWCC)
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New England Keyboard Inc., Fitchburg, MA 01420 508-345-8332
P C Express, Inc., Hudson, FL 34667 813-863-6114
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
Southtronics, Inc., Marietta, GA 30066-6029 404-429-1000
Star-Tron Corporation, Providence, RI 02909 401-274-5090
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Trionics, Inc., St. Charles, IL 60174 312-232-9117
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
Wontronics, Los Angeles, CA 90039 213-660-6230

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Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
† Microwave Filter Inc., East Syracuse, NY 13057-0486, 315-437-3953;800-448-1666 ..... A•1695
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Ballco Inc., Snellville, GA 30278-1078 404-979-5900
† B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
† Data-Design Labs., Cucamonga, CA 91730 714-987-2511
§ Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Electronics Test Centre, Alberta Research Council, Edmonton, AB, CANADA T6N 1E4 403-450-5370
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Instrument Society of America, Research Triangle Park, NC 27709 919-549-8411
§ Learning Tree International, Los Angeles, CA 90045-0028 213-417-8888
LG Systems Corp., Lockwood Greene Engineers, Inc., Spartanburg, SC 29304 803-578-2143
Moore Products Co., Spring House, PA 19477 215-646-7400
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
Pace Inc., Laurel, MD 20723-1990 301-490-9860
Philips Circuit Assemblies, Tampa, FL 33614-2797 813-933-5113
† Photo Research:Kollmorgen, Chatsworth, CA 91313-2192 818-341-5151
§ PolyPhaser Corporation, Minden, NV 89423-9000 ..... 702-782-2511;800-325-7170
Professional Engineering Systems, Erie, PA 16511-1051 814-453-5452
Pro-Log Corp., Monterey, CA 93940 408-372-4593
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787

Services, Vibration Surveys-4100

Rowe Industries, Inc., Toledo, OH 43612, 419-729-9761 ..... C•1513
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
Detroit Testing Laboratory, Inc., Warren, MI 48090-0869 313-754-9000
General Vibrations Mfg. Co., Manchester, CT 06040 203-646-0090
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
§ Reliance Electric Co., Marketing Info Center, Cleveland, OH 44117 800-245-4501
† Torwico Elctrns. Inc., Lakewood, NJ 08701 908-364-1800

Services, Welding & Brazing-4100

† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
Burbank Sheet Metal Works Inc., Burbank, CA 91502 818-846-0316
Ceramaseal, New Lebanon, NY 12125 518-794-7800
† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Contours Inc., Meriden, CT 06450 203-237-8331
Deringer Mfg. Co., Mundelein, IL 60060 708-566-4100
†# Ewald Instruments Corp., Kent, CT 06757 203-927-3278
GTI/Electronics Div., Hadley, PA 16130 412-253-3161
Jettron Products Inc., E. Hanover, NJ 07936 201-887-0571
† Miller, L.C., Co., Monterey Pk., CA 91754 213-268-3611
MRL, Missouri Research Labs., St. Charles, MO 63301 .. 314-946-6900;1-800-325-0223
Shamrock Plastics & Rubber, Inc., Indianapolis, IN 46218 ..... 317-543-3540; 800-382-4635
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330

Services, Wire Cutting & Stripping - Also see Services, Crimping-4100

ABL Electronics Supply, Inc., Yorktown Hgts., NY 10598, 914-962-2253 ..... C•1711-1712
Daniels Manufacturing Corp., Orlando, FL 32824, 407-855-6161 ..... C•1703
DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... C•1454,1767
MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
Acme Model Engineering Co., Ridgefield, NJ 07657 201-943-7650
Altek Co., Torrington, CT 06790 203-482-7626
Altron, Inc., Anoka, MN 55303 612-427-7735
American Assembly Inc., Florida, NY 10921 914-651-3433
† American Monarch, Minneapolis, MN 55421 612-788-9161
§† American Wire & Electronics, Costa Mesa, CA 92626 714-957-5738
† Apsco, Inc., Mentor, OH 44060 216-352-8961
† Art Wire/Doduco, Cedar Knolls, NJ 07927 201-267-2000
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
Automation Elctrns., R.J.A. Inds., Inc., Chatsworth, CA 91311 818-998-5124
§† Brim Electronics, Fair Lawn, NJ 07410 201-796-2886
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
† Cardinal Control Co., Kensington, CT 06037 203-828-6379
Caribbean Assemblies, Inc., Wintersprings, FL 32708 407-327-0602
† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
# Component Mfg. Svc., Inc., W. Bridgewater, MA 02379 508-580-0111
§ Com-2, Inc., Saline, MI 48176 313-429-9027
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Control Laser Corp., Orlando, FL 32809 407-438-2500
Corlund Electronics Corp., Newbury Park, CA 91320 805-499-6877
§† Daburn Electronics & Cable Corp., Northvale, NJ 07647 201-768-5400
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
De Anza Mfg. Svcs. Inc., Sunnyvale, CA 94089 408-734-2020
§† Dearborn Wire & Cable, Inc., Wheeling, IL 60090 ..... 708-459-1000; 800-323-0198
† Diagostic Instrument Corp., Ayer, MA 01432 508-772-4572
† Electro Prep Inc. & N-E-D Cable, Wareham, MA, MA 02571 508-291-2880
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
† Electroweave, Inc., Worcester, MA 01604 508-752-8932
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 714-669-9473
Eubanks Engineering, Monrovia, CA 91016 818-357-7011
§† Excel Specialty Corp., Chicago, IL 60660 312-262-4781
Federal Electronics, Cranston, RI 02921 401-944-6200
General Cable Co., Kenly, NC 27542 919-284-5144
† GSI Corp., Timonium, MD 21093 410-252-1768
† Hibbing Electronics Corp., Hibbing, MN 55746 218-263-8971
§ Hobson Bros., Chicago, IL 60630-3884 312-283-3600
§† IEC Electronics Corp., Newark, NY 14513 315-331-7742
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 516-937-3475
† Lamtech Electronics, Garland, TX 75042 214-272-3504
Leecraft Mfg., Long Island City, NY 11101 718-392-8800
† Line Electric Products, Hartford, CT 06141 ..... 203-659-3573;1-800-331-1137
† Manger Electric Company, Inc., Stamford, CT 06902 203-348-7761
Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Microdot, Interconnect Systems Division, Montgomeryville, PA 18936 ... 215-699-5373
Minnesota Wire & Cable, St. Paul, MN 55108-2721 ..... 612-642-1800 ; 1-800-258-6922(MWCC)
Mitech ELectronics Corp., Otsego, MI 49078 616-694-9471
† MLI Industries, Inc., Apalachin, NY 13732 607-754-5800
Mueller Elec. Co., Cleveland, OH 44114 216-771-5225
† National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
§ Panduit Corp., Tinley Park, IL 60477-0981 800-777-3300
† Product Technology, Inc., Irvine, CA 92714 714-474-8998
† Reactel, Inc., Rockville, MD 20850 301-279-5535
Regal Aljoy Wire & Cable, Levittown, NY 11756 516-735-4871
§ Storm Products Co., Hinsdale, IL 60521 708-323-9121
§ Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
†# Tratec of California, Inc., Chula Vista, CA 91911 619-476-1155
Tricon Industries, Inc., Electromechanical Division, Downers Grove, IL 60515-4076 708-964-2330
Trionics, Inc., St. Charles, IL 60174 312-232-9117
† United Wire & Cable Corp., Worcester, MA 01604 508-757-3872
# Unitrek Corporation, Vancouver, WA 98661 206-699-7277
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
Weico Wire & Cable, Inc., Edgewood, NY 11717 516-254-2970
† Western Reserve Electronics, Twinsburg, OH 44087 216-425-4951
§† Whitmor Wire & Cable, Valencia, CA 91355 805-257-2400

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Andon Elctrns. Corp., Lincoln, RI 02865, 401-333-0388 ..... C•1278
§† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234

† **E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473 .... C•1682**
† **Pulizzi Engineering, Inc., Santa Ana, CA 92704-6865, 714-540-4229 ..... D•2224**
† **Scanbe, Unit of Zero Corporation, El Monte, CA 91731, 619-452-9333 ... C•1098**
Altek Co., Torrington, CT 06790 203-482-7626
Altron, Inc., Anoka, MN 55303 612-427-7735
American Assembly Inc., Florida, NY 10921 914-651-3433
† Apsco, Inc., Mentor, OH 44060 216-352-8961
† Assembly Specialists, Chelmsford, MA 01824 508-250-5900
Augat Inc., Attleboro, MA 02703 617-222-2202
Caribbean Assemblies, inc., Winterspring, FL 32708 407-327-0602
Chenango Industries, Inc., Vestal, NY 13850 607-748-1572
§ Communication Devices, Inc., Scarborough, Ont., CAN M1B3R6 416-292-4463
§ Com-2, Inc., Saline, MI 48176 313-429-9027
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
† Datawrap, Inc., Wakefield, MA 01880 617-246-5757
† Electro-Support Systems, Temecula, CA 92390 714-676-2751
W. L. Gore & Assocs., Inc., Phoenix, AZ 85044 602-438-2017
† GSI Corp., Timonium, MD 21093 410-252-1768
HiTemp Technologies, Inc., San Jose, CA 95131-1101 408-922-0740
† Interlogic Industries, Melville, NY 11747-4294 516-420-8111
Jettron Products Inc., E. Hanover, NJ 07936 201-887-0571
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
Micro Industries, Westerville, OH 43081 614-895-0404
† National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
† Precision Graphics Inc., Raritan, NJ 08869 908-707-8880
† Product Technology, Inc., Irvine, CA 92714 714-474-8998
RCD Components, Inc., Manchester, NH 03109 603-669-0054
† Reactel, Inc., Rockville, MD 20850 301-279-5535
† RMS Techn., Newport News, VA 23606 804-873-0100
Trionics, Inc., St. Charles, IL 60174 312-232-9117
§† U.S. Power Converting Company/Relco, Leonard V. Snow & Assocs., Torrance, CA 90503 213-316-9984
† Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
† Vertek Intl. Inc., San Diego, CA 92173 619-661-6868
† Western Reserve Electronics, Twinsburg, OH 44087 216-425-4951

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Advanced Technology Company, Vista, CA 92083, 619-727-7430 ... B•1235-1237
† **BEI Motion Systems Company, Digital Products Div., Little Rock, AR 72203, 501-851-4000 ..... B•1879**
† **Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240-2241**
Eltrol Corporation, Canoga Park, CA 91304, 818-709-0131 ..... B•1255
§† **Industrial Drives, A Kollmorgen Div., Radford, VA 24141, 703-639-2495 ..... B•1277**
Infranor, Naugatuck, CT 06770, 203-729-8258;800-BE-SERVO ..... B•1279
† **Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182-1183**
† **Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... D•2243**
† **Modular Devices, Shirley, NY 11967, 516-345-3100 ..... B•1302**
Servo-Tek Products Co., Hawthorne, NJ 07506, 201-427-3100 ..... B•1310
† **Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312**
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1197
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., Pittsburgh, PA 15238 412-963-7470
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
† Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
§† Berg, W. M., Inc., East Rockaway, NY 11518 516-599-5010
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
Bertsch U.S., Vista, CA 92083 619-727-7420
Caribbean Assemblies, Inc., Winterspring, FL 32708 407-327-0602
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 .. 707-584-7558
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Data Technology, Inc., Woburn, MA 01811 617-935-8820
† Datron Systems, Inc., Simi Valley, CA 93065-1650 805-584-1717
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
† Electro Magnetic Processes, Inc., Chatsworth, CA 91311-4858 818-882-6333
Electronic Design Engineering, Norco, CA 91760 714-735-1761
§ Galil Motion Control, Inc., Sunnyvale, CA 94086 ..... 408 746-2300
† GAP Instrument Corp., Hauppauge, NY 11788 516-273-0909
General Numeric Corporation, Elk Grove Village, IL 60007 708-640-1595
† Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
† HH Controls Co., Inc., Arlington, MA 02174 617-646-2626
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
§ LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
† MFG, Parabam Div., Carson, CA 90745 213-549-5044
† Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
† Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Oriel Corp., Stratford, CT 06497-0872 203-377-8282
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
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Parker Hannifin Corp., Compumotor Div., Rohnert Pk., CA 94928 707-584-7558
† Perfect Gear & Instrument, Designatronics, Inc., New Hyde Park, NY 11040 516-328-3300
† Performance Controls, Inc., Horsham, PA 19044 215-675-6500
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
† Precision Mechanisms, Westbury, NY 11590 ..... 516-ED3-5955
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
§ ServoByte Inc., Millbury, MA 01527 508-865-0225
† Sterling Instruments, New Hyde Pk., NY 11040 516-328-3300
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
§ TS Products, Inc., Arleta, CA 91331-3429 818-896-6676
Unico, Franksville, WI 53126-0505 414-886-5678
Vasak Inds., Inc., El Segundo, CA 90245 ..... 1-800-67-VASAK
Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
§† Westamp, Santa Monica, CA 90404 213-393-0401
§† Wide Range Elctrns. Corp., Chesterfield, MISSOURI 63005 314-532-5887

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Shift Registers-2325

§ Centent Co., Santa Ana, CA 92707 714-979-6491
Meissner Industries, Dover, NJ 07801 201-366-1700
§† TRW LSI Products INC., La Jolla, CA 92038 619-457-1000
Verdure Industries Inc., Omaha, NE 68124 402-691-8300

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§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207**
Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
KGS Electronics, Inc., Pasadena, CA 91103 818-798-0786
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
Phase Control Electronics, Glendale, NY 11385 718-441-4278
Ryan International Corp., Columbus, OH 43229-6207 614-885-3303
Triac Electronic Systems, Inc., Glendale, NY 11385 718-441-4759

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Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1130
Caddock Electronics, Inc., Riverside, CA 92507, 714-788-1700 ..... A•1853
† Empro Manufacturing Company, Inc., Indianapolis, IN 46226, 317-823-4478 ..... D•1246
† Janco Corp., Burbank, CA 91508, 818-846-1800 ..... B•1726-1727
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270,1272
Mills Resistor Co., Los Alamitos, CA 90720, 213-598-2454 ..... A•1949
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ... D•1322
Ultronix, Inc., A Company of Vishay, Grand Junction, CO 81502, 303-242-0810 ..... A•1995
Vishay Resistive Systems, Malvern, PA 19355, 215-644-1300 ..... D•1335
§ Weston Instruments, Electrical Instrument Service, Inc., Mt. Vernon, NY 10550, 914-699-9717 ..... D•1338-1339
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
† Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† Deltec Co., Norwalk, CA 90650 213-926-2304
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
† Electronic Precision Components Corporation, Mt. Vernon, NY 10550-4430 914-664-2333
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Holt Instrument, C.P.D. Engineering, Inc., Oconto, WI 54153 414-834-2222
KRL/Bantry Components, Inc., Manchester, NH 03103 603-668-3210
§ Larson Instrument, Orangeburg, NY 10962 914-359-3800
Meissner Industries, Dover, NJ 07801 201-366-1700
† Precision Resistor Co., Inc., Largo, FL 34647-1421 813-541-5771
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tepro of Florida, Clearwater, FL 33575 813-796-1044
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

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Signal Averagers-2900

Active Control Instrumentation, Key Largo, FL 33037 305-451-1000
DSP Technology, Fremont, CA 94538-7338 415-657-7555
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929

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Calex Mfg. Co., Inc., Pleasant Hill, CA 94523, 510-932-3911 ..... D•1008
Dymec Inc., Winchester, MA 01890, 617-729-7870 ..... D•1241
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
Frequency Devices, Inc., Haverhill, MA 01832, 508-374-0761 ..... A•1674
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
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Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1013,1101,1191, 1422
† PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Precision Filters, Ithaca, NY 14850, 607-277-3550 ... A•1706-1707, D•1015,1193
Transducers & Systems, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... B•1947
Wilcoxon Research, Rockville, MD 20850, 301-330-8811 ..... B•1959
Acculex Corporation, Taunton, MA 02780 508-880-3660
Acromag Inc., Wixom, MI 48393-7037 ..... 313 624-1541
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
A. P. Circuit, Brooklyn, NY 11237 718-456-2717
A.P.C.S. America, Grand Rapids, MI 49548 616-247-1453
† Applied Controls Co., inc., Fairfield, NJ 07004 201-227-5454
§ ARGA Controls, Pasadena, CA 91105 213-682-3314
Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
Astrosystems, Lake Success, NY 11042 516-328-1600
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
Avens Corp., Brooklyn, NY 11208 ..... 718-827-5991;800-452-1966
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
BLH Electronics, Inc., Canton, MA 02021-9111 617-821-2000
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† CEC Instruments, Imo Industries Inc., San Dimas, CA 91773 714-394-4410
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Controlex, Inc., New Boston, NH 03070 603-487-5512
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
DGH Corporation, Manchester, NH 03108 603-622-0452
DSP Technology, Fremont, CA 94538-7338 415-657-7555
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
Elcon Instruments, Inc., Annapolis, MD 21401 301-280-6686
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
Gould Inc., Test and Measurement Group, Valley View, OH 44125 216-328-7000
† Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
HBM, Inc., Marlboro, MA 01752 508-624-4500
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
Instrum, MDH Industries, Inc., Monrovia, CA 91016 818-303-4210
Intelligent Instrumentation/Burr-Brown, Tucson, AZ 85705 602-624-2434
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
ITHACO, Inc., Meas. & Control Instrs. Div., Ithaca, NY 14851-6437 607-272-7640
Kinemetrics/Systems, Kinemetrics, Inc., Pasadena, CA 91107 818-795-2220
KineticSystems, Lockport, IL 60441 815-838-0005
§ Kistler Instruments Corp., Amherst, NY 14221-2171 716-691-5100
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
† Marel Instr. Co., Cape Coral, FL 33990 813-574-8788
Mathematical Systems Design, Inc., Los Angeles, CA 90064 310-479-7180
Measurements Group, Inc., Raleigh, NC 27611 919-365-3800
Metrum Information Storage, Denver, CO 80217-5227 303-773-4581
M. System Technology, Inc., Dallas, TX 75244 800-544-3181
MTS Systems, Minneapolis, MN 55424 612-937-4000
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
NMB Technologies, Chatsworth, CA 91311 818-341-3355
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Pacific Instruments Inc., Concord, CA 94520 415-827-9010
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Precise Sensors, Inc., Monrovia, CA 91016 818-358-4578
Sensotec, Inc., Columbus, OH 43212 614-486-7723
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§† Teledyne Taber, Teledyne Inc., N. Ton., NY 14120 ..... 716-694-4000;800-333-5300
Trans-Tek, Ellington, CT 06029 203-872-8351
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057

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Signal Systems, Fiber Optic-2325

§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300

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Silicon Foundry Services-4100

§† Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
Semtech, Newbury Park, CA 91320 805-498-2111
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† VLSI Technology, Inc., San Jose, CA 95131 408-434-7673
Zetex, Inc., Zetex plc, Commack, NY 11725 516-543-7100

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Simulation Systems, Electromagnetic Pulse-1100

Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Cober Electronics, Stamford, CT 06902 203-327-0003
† Maxwell Laboratories, Inc., San Diego, CA 92123-1506 619-279-5100
† Velonex, Santa Clara, CA 95050 408-727-7370

Simulators, Data-2900

† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Loral Data Systems, Sarasota, FL 34230 813-371-0811
New Wave Instruments, Provo, UT 84604 801-373-4909
§ Southern Computer Corp., Atlanta, GA 30342 404-252-3340
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
† Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Simulators, Digital Satellite-1900

§ Aldec, Inc., Newbury Park, CA 91320 805-499-6867
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010

Simulators, Motion-2550

† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183
North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196-1199
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
Carco Electronics, Menlo Pk., CA 94025-1106 415-321-8174

§ Centent Co., Santa Ana, CA 92707 714-979-6491
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† McFadden Systems, Inc., Santa Fe Springs, CA 90670 213-948-4414
MTS Systems, Minneapolis, MN 55424 612-937-4000
PIC Design, Remington Technologies, Inc., Middlebury, CT 06762 203-758-8272
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
§ TS Products, Inc., Arleta, CA 91331-3429 818-896-6676
Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

Simulators, Optics-3700 — *See Vol. B*

Simulators, Power Failure-2900

Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Bermar Corp., Research Triangle Park, NC 27709 919-489-4316
California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
§ Powertrend, Inc., Newbury Pk., CA 91320-1415 805-496-2945
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770

Simulators, Powerline Disturbance-2900

California Instruments Corp., San Diego, CA 92111-1216, 619-279-8620;800-356-2244 ..... D•2179
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•2211
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216,2218,2221
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Compact Power Company, Yorba Linda, CA 92686 714-996-5826
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
§ Powertrend, Inc., Newbury Pk., CA 91320-1415 805-496-2945
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Velonex, Santa Clara, CA 95050 408-727-7370

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† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152
† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1183
Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1187
† North Atlantic Industries, Hauppauge, NY 11788, 516-582-6500 ..... D•1306
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196-1199
§ Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Magnecomp, Inc., Pickens, SC 29671 803-878-4700
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581

Simulators, Solar-2900

Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600

Simulators, Thermocouple-2900

Ectron Corp., San Diego, CA 92111-1960, 619-278-0600 ..... D•1010
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252-1253
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1854
Cole-Parmer Instrument Company, Chicago, IL 60648 ..... 708/647-7600
Xitron Technologies, San Diego, CA 92121 619-450-9852

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Slides, Linear-4900

§† Accuride, Santa Fe Springs, CA 90670 213-903-0373
§ Daedal, Harrison City, PA 15636 412-744-4451
§ Del-Tron Precision, Bethel, CT 06801 800-245-5013
§ NMC Fastening Systems, Nylon Molding Corp., Monrovia, CA 91016 818-357-0901
§ PIC Design, Remington Technologies, Inc., Middlebury, CT 06762 203-758-8272
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970

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Sockets, SIMM-2100 — *See Vol. C*

Sockets, SIP-2100 — *See Vol. C*

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§ Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1422
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 ..... D•1122-1123
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Acrosystems Corp., Beverly, MA 01915 508-927-8880
Action Instruments, San Diego, CA 92123 619-279-5726
Alden Computer Systems, Salem, MA 01970 508-744-1314
Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
Automatix Inc., Billerica, MA 01821 506-667-7900
Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† Aydin Corp., Horsham, PA 19044 215-657-7510
California Automation Inc., San Diego, CA 92121 619-452-1341
Celadon Corporation, Waltham, MA 02154 617-290-5775
§ CMV Software Specialists Inc., Sioux Falls, SD 57106 605-338-6645
§ Compact Software, Inc., Paterson, NJ 07504 201-881-1200
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
† Datacom, Inc., Ft. Walton Beach, FL 32549 904-244-6121
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Datag Instruments, Inc., Akron, OH 44311 ..... 216-434-4284 ; 800-553-9006
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
DEPAC Corp., Rome, NY 13440 315-339-1265
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ Elite Software Development, Inc., Bryan, TX 77806 409-846-2340
Eyring, Inc., Provo, UT 84601 801-375-2434
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
General Digital Corp., Enfield, CT 06082 203-741-7171
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
HBM, Inc., Marlboro, MA 01752 508-624-4500
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HyperLogic Corporation, Escondido, CA 92027 619-746-2765
§ ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
§ Infometrix, Seattle, WA 98121 206-441-4696
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
Intec Controls Corp., Walpole, MA 02081 508-660-1221
§Φ Integrated Engineering Software, Winnipeg, Man., CANADA R3B 1Y6 ... 204-942-5636
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
KineticSystems, Lockport, IL 60441 815-838-0005
Kistler-Morse, Redmond, WA 98073 206-881-8000
§ Laboratory Technologies Corp., Wilmington, MA 01887 508-657-5400
Laboratory Technologies Corp., Wilmington, MA 01887 508-657-5400
§ Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581

The MathWorks, Inc., So. Natick, MA 01760 508-653-1415
MicroMath, Inc., Salt Lake City, UT 84121 801-943-0290
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
Mitronics, Rolling Hills, CA 90274 213-377-2022
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
National Telephone & Electronics Inc., Miami, FL 33172 305-592-0551
§† Omation Inc., Richardson, TX 75081 ..... 214-231-5167;800-553-9119
§ Opto 22, Huntington Bch., CA 92649 714-891-5861
§ PERCON, Inc., Eugene, OR 97402-9153 ..... 1-800-8-PERCON;503-344-1189
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
§† SPS Software Products & Services, Inc., New York, NY 10016 212-686-3790
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
Sygenex Inc., Redmond, WA 98052 206-881-5500
Systems Data, Inc., Akron, OH 44321 216-666-0085
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
Taurus Computer Products, DY-4 Systems Inc., Nepean, Ont., CANADA K2H 9J4 613-596-9911
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
† Teledyne Ryan Electronics, San Diego, CA 92123 619-560-6400
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
TSSI, Beaverton, OR 97005 503-643-9281
Validyne Engineering Corporation, Northridge, CA 91324 818-886-2057
§ Versacad Computervision Personal CAD/CAM, Huntington Bch., CA 92648 714-960-7720
§ West Instrument, A Mark IV Company, Des Plaines, IL 60018-1919 708-390-7711
§ Wolfram Research, Inc., Champaign, IL 61820-7237 217-398-0700

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§ OrCAD, Hillsboro, OR 97124, 503-690-9881 ..... D•1125
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 ..... D•1122-1123
Applied Software Tech., Inc., Atlanta, GA 30329 404-663-8660
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Audre, Inc., San Diego, CA 92127 619-451-2260
§ Bishop Graphics, Inc., Agoura, CA 91304 818-991-2600
CAD Utility CO., Chatsworth, CA 91311 805-527-8630
Calmos Semiconductor, Inc., Kanata, Ontario, CANADA K2L 1V8 ..... 613-836-1014; 800-267-7231
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
§ Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
Douglas Electronics, Inc., San Leandro, CA 94577 510-483-8770
§ Elite Software Development, Inc., Bryan, TX 77806 409-846-2340
General Digital Corp., Enfield, CT 06082 203-741-7171
§ GraphiCode, Inc., Lynnwood, WA 98036 206-672-1980
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† Kepro Circuit Systems, Fenton, MO 63026-2992 314-343-1630
§† LSI Logic Corp., Milpitas, CA 95035 408-433-8000
§ Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
Minc Incorporated, Colorado Springs, CO 80918 719-590-1155
Moore Products Co., Spring House, PA 19477 215-646-7400
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§† Omation Inc., Richardson, TX 75081 ..... 214-231-5167;800-553-9119
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
§† SPS Software Products & Services, Inc., New York, NY 10016 212-686-3790
§ Stag Microsystems Inc., Santa Clara, CA 95054 ..... 408-988-1118;1-800-227-8836
§ Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Versacad Computervision Personal CAD/CAM, Huntington Bch., CA 92648 714-960-7720
Visionics Corporation, Santa Clara, CA 95054 408-492-1440
† VLSI Technology, Inc., San Jose, CA 95131 408-434-7673

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§ Advanced Video Products, Littleton, MA 01460 508-486-0024
§ Applied Information Systems, Inc., Chapel Hill, NC 27514 .. 919-942-7801;800-334-5510
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Corp., Horsham, PA 19044 215-657-7510
Chemical Abstracts Service, American Chemical Society, Columbus, OH 43202-1505 614-447-3600
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
CTSI International Inc., Commack, NY 11725-5703 516-864-5260
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
§ Direct Aid, Westlake Vl., CA 91362 ..... 818-889-1013;800-443-8080
Drumlin, Micro/Sys, Inc., Glendale, CA 91201-3010 818-244-4600
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ GMR Co., Venice, CA 90291 213-399-1490
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ IDEAssociates, Inc., Billerica, MA 01821 508-663-6878
§ Infometrix, Seattle, WA 98121 206-441-4696
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
† Labtronics Inc., Guelph, Ont., CANADA N1G 3B6 519-767-1061
Locus Computing Corp., Inglewood, CA 90301-4440 213-670-6500
3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
Network Software Associates, Inc., Laguna Hills, CA 92656 714-768-4013
§ PERCON, Inc., Eugene, OR 97402-9153 ..... 1-800-8-PERCON;503-344-1189
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
The Software Link, Inc., Norcross, GA 30092 404-448-5465
Systems Data, Inc., Akron, OH 44321 216-666-0085
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Compilers/Languages-2050

American Arium, Formerly American Automation & Arium, Tustin, CA 92680-7207, 714-731-1661 ..... D•1217
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 ..... D•1122
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
§ Applied Information Systems, Inc., Chapel Hill, NC 27514 .. 919-942-7801;800-334-5510
§ Applied Microsystems Corp., Redmond, WA 98052 206-882-2000
§ Byte Craft Limited, Waterloo, Ont., CAN N2J 4E4 519-888-6911
California Automation Inc., San Diego, CA 92121 619-452-1341
Data I/O Corp., Redmond, WA 98073-9746 206-881-6444
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Ecosoft, Inc., Indianapolis, IN 46214 317-271-5551
§ Eyring, Inc., Provo, UT 84601 801-375-2434
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
General Digital Corp., Enfield, CT 06082 203-741-7171
§ GMR Co., Venice, CA 90291 213-399-1490
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† Inmos Corp., Colorado Springs, CO 80935 ..... 719-630-4000 (ext 4357)
§† Intermetrics Microsystems Software, Inc., Cambridge, MA 02138 ..... 617-661-1840; 800-356-3594
The MathWorks, Inc., So. Natick, MA 01760 508-653-1415
§ Microtec Research, Inc., Santa Clara, CA 95054 408-980-1300
Microtek International/Dev. Sys. Div., Hillsboro, OR 97124 503-645-7333
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Octagon Systems, Westminster, CO 80030 303-430-1500
Parsytec Inc., West Chicago, IL 60185 708-293-9500
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ Prologic Systems, Broomfield, CO 80020 303-460-0103
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
§† SPS Software Products & Services, Inc., New York, NY 10016 212-686-3790
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Wolfram Research, Inc., Champaign, IL 61820-7237 217-398-0700

Software, Computer Performance Measurement-2050

Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
§ Compact Software, Inc., Paterson, NJ 07504 201-881-1200
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Northwest Analytical Inc., Portland, OR 97209 503-224-7727
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366

Software, Data Base Management-2050

§ Advanced Video Products, Littleton, MA 01460 508-486-0024
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Audre, Inc., San Diego, CA 92127 619-451-2260
Biosoft, Ferguson, MO 63135 314-524-8029
Celadon Corporation, Waltham, MA 02154 617-290-5775
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Control Module, Enfield, CT 06082 203-745-2433
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Eyring, Inc., Provo, UT 84601 801-375-2434
§ GMR Co., Venice, CA 90291 213-399-1490
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
MicroMath, Inc., Salt Lake City, UT 84121 801-943-0290
Mitronics, Rolling Hills, CA 90274 213-377-2022
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800

§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Software, Data Base Management Dictionaries-2050

DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Data Base Query Language-2050

Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Data Communications Control-2050

§ Advanced Video Products, Littleton, MA 01460 508-486-0024
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Comspec Digital Products Inc., Houston, TX 77043 713-461-4487
CTSI International Inc., Commack, NY 11725-5703 516-864-5260
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
† NCR Comten, Inc., NCR Corp., St. Paul, MN 55113 612-638-7777
SBE, Concord, CA 94520 ..... 501-680-7722;800-347-COMM
§ Stag Microsystems Inc., Santa Clara, CA 95054 ..... 408-988-1118;1-800-227-8836
Systems Data, Inc., Akron, OH 44321 216-666-0085
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, DC Motor Control-2050

Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140,2243
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1422
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500

Software, Disk/Tape File Utilities-2050

§ Comspec Digital Products Inc., Houston, TX 77043 713-461-4487
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
GEN/COMP Inc., Canton, MA 02021 617-828-2008
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Emulation/Simulation-2050

American Arium, Formerly American Automation & Arium, Tustin, CA 92680-7207, 714-731-1661 ..... D•1217
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
§ OrCAD, Hillsboro, OR 97124, 503-690-9881 ..... D•1125
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
§ Applied Microsystems Corp., Redmond, WA 98052 206-882-2000
Biosoft, Ferguson, MO 63135 314-524-8029
§ Compact Software, Inc., Paterson, NJ 07504 201-881-1200
Data I/O Corp., Redmond, WA 98073-9746 206-881-6444
§ Design Automation, Inc., Lexington, MA 02173-3992 617-862-8998
§ Direct Aid, Westlake VI, CA 91362 ..... 818-889-1013;800-443-8080
§ GW Instruments, Inc., Somerville, MA 02143 617-625-4096
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
HEI Corporation, Carol Stream, IL 60188 708-665-5500
HILEVEL Technology, Irvine, CA 92718 714-727-2100
HiTech Equipment Corp., San Diego, CA 92126 619-566-1892
§† Inmos Corp., Colorado Springs, CO 80935 ..... 719-630-4000 (ext 4357)
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§Φ Integrated Engineering Software, Winnipeg, Man., CANADA R3B 1Y6 ... 204-942-5636
§ Intermetrics Microsystems Software, Inc., Cambridge, MA 02138 ..... 617-661-1840; 800-356-3594
§† LSI Logic Corp., Milpitas, CA 95035 408-433-8000
The MathWorks, Inc., So. Natick, MA 01760 508-653-1415
§Φ MetaLink Corporation, Chandler, AZ 85244 602-926-0797
Microcompatibles Inc., Silver Springs, MD 20901 301-593-0683
MicroMath, Inc., Salt Lake City, UT 84121 801-943-0290
MicroPlot Systems, Columbus, OH 43229 614-882-4786
Microtek International/Dev. Sys. Div., Hillsboro, OR 97124 503-645-7333
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
MTS Systems, Minneapolis, MN 55424 612-937-4000
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
Network Software Associates, Inc., Laguna Hills, CA 92656 714-768-4013
§ Omation Inc., Richardson, TX 75081 ..... 214-231-5167;800-553-9119
Omicron electronic, Hohenems, AUSTRIA A-6845 ..... + /5576/4010-0
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
† Signatron, A Subsidiary of Meteor Communications Corp., Lexington, MA 02173 617-861-1500
SL Corporation, Corte Madera, CA 94925 415-927-1724
Softaid, Inc., Columbia, MD 21045 301-964-8455
The Software Link, Inc., Norcross, GA 30092 404-448-5465
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Systems Data, Inc., Akron, OH 44321 216-666-0085
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Software, Graphics-2050

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1422
§ AFE Displays Inc., Charlottesville, VA 22901 804-974-7801
# Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Audre, Inc., San Diego, CA 92127 619-451-2260
† Aydin Corp., Horsham, PA 19044 215-657-7510
Biosoft, Ferguson, MO 63135 314-524-8029
Chromatics, Tucker, GA 30084 404-493-7000
Cogent Software, Menlo Park, CA 94025-3405 415-324-4360
Comspec Digital Products Inc., Houston, TX 77043 713-461-4487
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Creare Inc., Hanover, NH 03755 603-643-3800
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ Graphic Strategies, Inc., Sunnyvale, CA 94089 408-745-6500
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
§ International Microsystems, Milpitas, CA 95035 408-942-1001
† Labtronics Inc., Guelph, Ont., CANADA N1G 3B6 519-767-1061
The MathWorks, Inc., So. Natick, MA 01760 508-653-1415
Microcompatibles Inc., Silver Springs, MD 20901 301-593-0683
MicroMath, Inc., Salt Lake City, UT 84121 801-943-0290
MicroPlot Systems, Columbus, OH 43229 614-882-4786
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
Modular Mining Systems, Inc., Tuscon, AZ 85706 602-746-9127
MTS Systems, Minneapolis, MN 55424 612-937-4000
Northwest Analytical Inc., Portland, OR 97209 503-224-7727
PERX,Inc., Corte Madera, CA 94925 415-927-0155
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Signum, Inc., Woburn, MA 01801 617-933-4780
SL Corporation, Corte Madera, CA 94925 415-927-1724
3-D Visions, Redondo Beach, CA 90277 ..... 213-540-8818;800-SAY-GRAF
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
§# V.I. Corporation, Northampton, MA 01060 413-586-4144
Visionics Corporation, Santa Clara, CA 95054 408-492-1440
§ Wolfram Research, Inc., Champaign, IL 61820-7237 217-398-0700
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Software, Image Processing-2050

Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Celadon Corporation, Waltham, MA 02154 617-290-5775
Eyring, Inc., Provo, UT 84601 801-375-2434
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473
§ Regulus Systems, Foster City, CA 94404 415-593-4197
SL Corporation, Corte Madera, CA 94925 415-927-1724
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
Synoptics, Ltd., Paragon Towers, Newton, MA 02164 617-527-4461
Ultran Laboratories, State College, PA 16801 814-238-9083
§ Vicom Systems, Inc., Fremont, CA 94538 415-498-3200
Vista Systems, Inc., Peabody, MA 01960 508-532-1971

Software, Information Storage & Retrieval-2050

Electronic Controls Design, Milwaukie, OR 97222, 503-659-6100 ..... D•1169
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•1119
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Audre, Inc., San Diego, CA 92127 619-451-2260
§ Beta Review, Inc., Millwood, VA 22646 703-837-1436
Biosoft, Ferguson, MO 63135 314-524-8029
† CAD Engrg. & Assembly Inc., Mentor, OH 44060 216-255-7744
Celadon Corporation, Waltham, MA 02154 617-290-5775
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Environmental Telesis & Controls, Austin, TX 78718 512-835-0330
Eyring, Inc., Provo, UT 84601 801-375-2434
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
ICS Electronics Corp., Milpitas, CA 95035-5545 408-263-5500
Intec Controls Corp., Walpole, MA 02081 508-660-1221
§ Intellution, Inc., Norwood, MA 02062 617-769-8878

Kistler-Morse, Redmond, WA 98073 206-881-8000
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
PERX,Inc., Corte Madera, CA 94925 415-927-0155
† Recognition Concepts,Inc., Incline Village, NV 89450 702-831-0473
† Samatic Winding Machine, Jenlor Ltd., Fayetteville, NY 13066 315-637-9080
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§† ZyLAB Corporation, Buffalo Grove, IL 60089 708-459-8000

Software, Job Scheduling/Accounting-2050

Accu Data, Inc., Springville, UT 84663-0963 801-377-9156
§ CMV Software Specialists Inc., Sioux Falls, SD 57106 605-338-6645
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Elite Software Development, Inc., Bryan, TX 77806 409-846-2340
§ GMR Co., Venice, CA 90291 213-399-1490
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Mitronics, Rolling Hills, CA 90274 213-377-2022
† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
§ Stolzberg Research, Inc., Stony Brook, NY 11790 516-751-4277
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Label Printing-2050

§ Panduit Corp., Tinley Park, IL 60477-0981, 800-777-3300 ..... C•1801
§ Seiko Instruments U.S.A., Inc. Electronic Components, Torrance, CA 90505, 213-517-7770 ..... D•1108
§ Brady, W. H., Co., Indl. Prods. Div., Milwaukee, WI 53201 1-800-537-8791
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625

Software, Librarians-2050

Biosoft, Ferguson, MO 63135 314-524-8029
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
§† ZyLAB Corporation, Buffalo Grove, IL 60089 708-459-8000

Software, Motion Control-2050

Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•1140,2243
§ TS Products, Inc., Arleta, CA 91331-3429, 818-896-6676 ..... D•2245
ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Berkeley Process Control, Inc., Richmond, CA 94804 415-526-3333
§ Compumotor Division, Parker Hannifin Corp., Rohnert Park, CA 94928 707-584-7558
Cyberpak Co., Burr Ridge, IL 60521 708-654-3999
† GME Systems, Inc., Pittsburgh, PA 15090 412-935-0440
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
§ Industrial Indexing Systems, Inc., Victor, NY 14564 716-924-9181
Intec Controls Corp., Walpole, MA 02081 508-660-1221
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
Ormec Systems Corp., Rochester, NY 14625 716-385-3520
SL Corporation, Corte Madera, CA 94925 415-927-1724
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040 ..... 516-328-0200;328-3300
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
Ultran Laboratories, State College, PA 16801 814-238-9083

Software, Neural Networks-2050

HyperLogic Corporation, Escondido, CA 92027 619-746-2765
Neural Systems Inc., Vancouver, BC, CANADA V6N 3H9 604-263-3667

Software, Operating Systems-2050

Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 .... D•1122
Acme Electric Corporation, Cuba, NY 14727 716-968-2400
§ Action Instruments, San Diego, CA 92123 619-279-5726
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
California Automation Inc., San Diego, CA 92121 619-452-1341
Charles River Data Systems, Inc., Framingham, MA 01701 508-626-1000
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Drumlin, Micro/Sys, Inc., Glendale, CA 91201-3010 818-244-4600
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
§ Eyring, Inc., Provo, UT 84601 801-375-2434
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
Inmos Corp., Colorado Springs, CO 80935 ..... 719-630-4000 (ext 4357)
International Digital Electronics, San Jose, CA 95113 ..... 408-283-1010 (ext 107)
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Locus Computing Corp., Inglewood, CA 90301-4440 213-670-6500
MicroSignals Inc., L.I.C., NY 11101 ..... 718-937-7955;718-937-0391;800-648-2252
§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
Parsytec Inc., West Chicago, IL 60185 708-293-9500
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
Software Components Group, San Jose, CA 95110 408-437-0700
The Software Link, Inc., Norcross, GA 30092 404-448-5465
§† SPS Software Products & Services, Inc., New York, NY 10016 212-686-3790
Systems Data, Inc., Akron, OH 44321 216-666-0085
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Operating Systems Enhancement-2050

Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Drumlin, Micro/Sys, Inc., Glendale, CA 91201-3010 818-244-4600
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Locus Computing Corp., Inglewood, CA 90301-4440 213-670-6500
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
Reade Advanced Materials, Riverside, RI 02915-0039 401-433-7000
Systems Data, Inc., Akron, OH 44321 216-666-0085
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Software, Programming/Systems Development Aids-2050

American Arium, Formerly American Automation & Arium, Tustin, CA 92680-7207, 714-731-1661 ..... D•1217
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 .. D•1124,1189
Nohau Corporation, Campbell, CA 95008, 408-866-1820;408-866-4493 ..... D•1300-1303
Wintek Corp., Lafayette, IN 47904-2993, 317-448-1903;800-742-6809 ..... D•1122-1123
Accel Technologies, Inc., San Diego, CA 92121 619-554-1000
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Allen Systems, Columbus, OH 43221 614-488-7122
Anritsu, Oakland, NJ 07436 ..... 201-337-1111;800-255-7234
§ Applied Information Systems, Inc., Chapel Hill, NC 27514 .. 919-942-7801;800-334-5510
§ Applied Microsystems Corp., Redmond, WA 98052 206-882-2000
Atlanta Signal Processors, Inc., Atlanta, GA 30308 404-892-7265
§† BYTEK Corp., Instrument Systems Div., Boca Raton, FL 33487-1323 407-994-3520
California Automation Inc., San Diego, CA 92121 619-452-1341
§ Covox, Inc., Eugene, OR 97402 503-342-1271
dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Data I/O Corp., Redmond, WA 98073-9746 206-881-6444
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
Drumlin, Micro/Sys, Inc., Glendale, CA 91201-3010 818-244-4600
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
§ Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Elite Software Development, Inc., Bryan, TX 77806 409-846-2340
† Eyring, Inc., Provo, UT 84601 801-375-2434
General Digital Corp., Enfield, CT 06082 203-741-7171
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
HyperLogic Corporation, Escondido, CA 92027 619-746-2765
§† Inmos Corp., Colorado Springs, CO 80935 ..... 719-630-4000 (ext 4357)
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
§ Intermetrics Microsystems Software, Inc., Cambridge, MA 02138 ..... 617-661-1840; 800-356-3594
KnowledgeWare, Inc., Atlanta, GA 30326 404-231-8575
Matrix Corp., Raleigh, NC 27610 919-231-8000
§Φ MetaLink Corporation, Chandler, AZ 85244 602-926-0797
Micro Industries, Westerville, OH 43081 614-895-0404
Microtek International/Dev. Sys. Div., Hillsboro, OR 97124 503-645-7333
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
§ Point 4 Data Corp., Tustin, CA 92680 714-259-0777
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
§† SPS Software Products & Services, Inc., New York, NY 10016 212-686-3790
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
Sunrise Electronics, Inc.; Glendora, CA 91740 818-914-1926
Systronix Inc., Salt Lake City, UT 84152-6398 801-487-7412
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
TL Inds. Inc., Northwood, OH 43619 419-666-8144
TSSI, Beaverton, OR 97005 503-643-9281
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900
Ziatech, San Luis Obispo, CA 93401 805-541-0488

Software, Program Translators-2050

§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
CAD Utility CO., Chatsworth, CA 91311 805-527-8630
Data I/O Corp., Redmond, WA 98073-9746 206-881-6444

§ Intermetrics Microsystems Software, Inc., Cambridge, MA 02138 ..... 617-661-1840; 800-356-3594
Lewis Systems, Inc., Dallas, TX 75247 214-630-3884
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
TSSI, Beaverton, OR 97005 503-643-9281

Software, Project Management-2050

§† CDRL Data, Inc., Phoenix, AZ 85027-2823 602-582-8844
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547

Software, Quality Control-2050

Electronic Controls Design, Milwaukie, OR 97222, 503-659-6100 ..... D•1169
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
Intec Controls Corp., Walpole, MA 02081 508-660-1221
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
Northwest Analytical Inc., Portland, OR 97209 503-224-7727
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
SL Corporation, Corte Madera, CA 94925 415-927-1724
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
Ultran Laboratories, State College, PA 16801 814-238-9083

Software, Report Generators-2050

Electronic Controls Design, Milwaukie, OR 97222, 503-659-6100 ..... D•1169
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
§ Eyring, Inc., Provo, UT 84601 801-375-2434
§ GMR Co., Venice, CA 90291 213-399-1490
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
Heuristics Incorporated, Sacramento, CA 95827 916-369-6606
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
PERX,Inc., Corte Madera, CA 94925 415-927-0155
§ TA Engineering Co., Inc., Morago, CA 94556 415-376-8500
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
§ Tele-Denken Resources, Inc., Humble, TX 77346 713-852-5366
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Security-2050

Alpha Omega Computer Systems, Corvallis, OR 97333 503-754-1911
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
DATATRONIC SYSTEMS CORP., Computer Sciences Div., Panorama City, CA 91412-0128 818-988-5290
Eyring, Inc., Provo, UT 84601 801-375-2434
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Sort/Merge-2050

Biosoft, Ferguson, MO 63135 314-524-8029
Ecosoft, Inc., Indianapolis, IN 46214 317-271-5551
§ GMR Co., Venice, CA 90291 213-399-1490
Haverly Systems, Inc., Denville, NJ 07834 201-627-1424
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Spoolers-2050

§ Advanced Video Products, Littleton, MA 01460 508-486-0024
Elite Software Development, Inc., Bryan, TX 77806 409-846-2340
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Software, Utilities-2050

Alligator Technologies, Fountain Valley, CA 92708 714-850-9984
Ampro Computers,Inc., Sunnyvale, CA 94086 408-522-2100
Continental Resources, Computer & Peripherals Div., Bedford, MA 01730-1469 ..... 617-275-0850;800-937-4688
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
§ Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Eyring, Inc., Provo, UT 84601 801-375-2434
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
GEN/COMP Inc., Canton, MA 02021 617-828-2008
§ GMR Co., Venice, CA 90291 213-399-1490
HILEVEL Technology, Irvine, CA 92718 714-727-2100
§ IDEAssociates, Inc., Billerica, MA 01821 508-663-6878
§ Intellution, Inc., Norwood, MA 02062 617-769-8878
KineticSystems, Lockport, IL 60441 815-838-0005
KMS Advanced Products, Inc., Ann Arbor, MI 48106-1868 313-769-1780
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
Matrix Corp., Raleigh, NC 27610 919-231-8000
Microtek International/Dev. Sys. Div., Hillsboro, OR 97124 503-645-7333
§ MicroWay Inc. Research Park, Kingston, MA 02364 508-746-7341
H. Wm. Myers & Assocs., Crystal Lake, IL 60014 815-459-0100
§† National Information Systems, Inc., San Jose, CA 95117-1852 ..... 408-985-7100; 800-441-5758
§ Ontrack Data Recovery, Inc., Ontrack Computer Systems, Inc., Eden Prairie, MN 55346 800-872-2599
Sector Systems Co., Inc., Marblehead, MA 01945 617-639-2625
Taylor Industrial Software, Edmonton, Alberta, CANADA T5K 2M5 403-482-7547
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
§† ZyLAB Corporation, Buffalo Grove, IL 60089 708-459-8000

Solar Cells — See Cells, Photovoltaic (Vol. B)

Solder (All Types)-4600 — ***See Vol. C***

Solder Lugs — See Terminals, Lug (All Types) (Vol. C)

Solder Pots & Baths-4600 — ***See Vol. C***

Soldering, Wave, Control/Monitoring-4600 — ***See Vol. C***

Soldering Accessories-4600 — ***See Vol. C***

Soldering Equipment, Hot Gas-4100

Air-Vac Engrg., Milford, CT 06460 203-874-2541
§ Contact East, N. Andover, MA 01845 508-682-2000
Fusion Inc., Willoughby, OH 44094 216-946-3300
Hydro-Gen Products Inc., Fort Collins, CO 80522-1517 800-779-0126
§ Nu-Concept Systems, Colmar, PA 18915 215-822-8400
OK Industries, Inc., Yonkers, NY 10701 914-969-6800
Pace Inc., Laurel, MD 20723-1990 301-490-9860
§ Brian R. White Co., Inc., Ukiah, CA 95482 707-462-9795

Soldering Equipment, Induction Heating-4100

§† Antex Division, Marblehead, MA 01945 617-631-7100
§ Contact, Inc., Hudson, NH 03051 603-883-7708
§ Contact East, N. Andover, MA 01845 508-682-2000
Fusion Inc., Willoughby, OH 44094 216-946-3300
Hexacon Electric Co., Roselle Park, NJ 07204 908-245-6200
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
† Lepel Corp., Edgewood, NY 11717 516-586-3300
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
† Miller, L.C., Co., Monterey Pk, CA 91754 213-268-3611
† Reeve Electronics, Mellish E. Murray, Chicago, IL 60612 312-670-0150
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990

Soldering Equipment, Infrared-4100

Automated Production Concepts, Wayne, NJ 07470 201-831-8300
§† BTU International, Inc.:BTU Systems Division, N. Billerica, MA 01862 508-667-4111
§† Casso-Solar, Pomona, NY 10970 914-354-2500
Electrovert USA Corp., Arlington, TX 76018 817-468-5171
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
§ Eraser Co., Syracuse, NY 13221 315-454-3237
§ Hollis Automation, Esterline Corporation, Nashua, NH 03063 603-889-1121
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§† Multicore Solders, Richardson, TX 75081 214-238-1214
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
OK Industries, Inc., Yonkers, NY 10701 914-969-6800
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
Sikama International, Inc., Santa Barbara, CA 93117 805-683-6379

Soldering Equipment, Printed Circuit-4100

† Air-Vac Engrg., Milford, CT 06460 203-874-2541
§† Analytic Technology Corp., Redmond, WA 98052 ..... 206-883-2445;800-428-2808
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
§ Beau Tech, Portland, ME 04101 207-775-6139
§† Casso-Solar, Pomona, NY 10970 914-354-2500
§† Chemtronics Inc., Hauppauge, NY 11788 ..... 516-582-3322;800-645-5244
† Contact East, N. Andover, MA 01845 508-682-2000
Creative Automation Co., Sun Valley, CA 91352 818-767-6220
† Cyclo-Tronics, Inc., Wauconda, IL 60084 708-526-0800
Electronic Controls Design, Milwaukie, OR 97222 503-659-6100
Electrovert USA Corp., Arlington, TX 76018 817-468-5171
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
E.M.S., Div. of Sandberg Industries, Tustin, CA 92680 714-669-9473
§ ESICO/TRITON, Triton Industries Inc., Deep River, CT 06417 203-526-5361
Φ# Exselect Engineering Ltd., Concord, Ont., CANADA LK42G2 416-738-4077
§ Hexacon Electric Co., Roselle Park, NJ 07204 908-245-6200
§ Hollis Automation, Esterline Corporation, Nashua, NH 03063 603-889-1121
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Nu-Concept Systems, Colmar, PA 18915 215-822-8400
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
§ Pace Inc., Laurel, MD 20723-1990 301-490-9860
§† Plato Products, Inc., Glendora, CA 91740 818-967-3821
§ Portasol, Oglesby and Botler Ltd., Charlotte, NC 28226 704-543-6239
Sikama International, Inc., Santa Barbara, CA 93117 805-683-6379
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ Technical Devices, Torrance, CA 90503 213-618-8437
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Ungar, Div. Eldon Inds., Inc., Buena Park, CA 90621 714-994-2510
† Unit Design, Orange, CA 92665 714-282-8100
Vector Electronics Co., Specialties Division, Anaheim, CA 92807 ..... 714-632-9842; 800-326-9888
§ Wilson, H. F., Engineering Co., Glen Ellyn, IL 60137 708-469-7473

Soldering Equipment, Resistance-4100

§† Antex Division, Marblehead, MA 01945 617-631-7100
§† Automated Prod. Equip. Corp., Medford, NY 11763 516-654-1197
§† Contact, Inc., Hudson, NH 03051 603-883-7708
† Contact East, N. Andover, MA 01845 508-682-2000
§ ESICO/TRITON, Triton Industries Inc., Deep River, CT 06417 203-526-5361
Ewald Instruments Corp., Kent, CT 06757 203-927-3278
Hexacon Electric Co., Roselle Park, NJ 07204 908-245-6200
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 619-931-3000
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§† M/A-COM Omni Spectra, Inc., Waltham, MA 02254-9101 617-890-4750

§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
Necoa, Inc., Nittoku Engineering Group, Baltimore, MD 21237 301-574-4960
§ Pace Inc., Laurel, MD 20723-1990 301-490-9860
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Tech Spray, Inc., Amarillo, TX 79105 806-372-8523
Trans American Transformer, E. Setauket, NY 11733 516-928-0762

Soldering Systems, Temperature Controlled-4100

† Air-Vac Engrg., Milford, CT 06460 203-874-2541
§† Analytic Technology Corp., Redmond, WA 98052 ..... 206-883-2445;800-428-2808
† Aremco Products, Inc., Ossining, NY 10562 914-762-0685
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
† Comatel USA, Inc., Danbury, CT 06810 203-797-9445
† Contact East, N. Andover, MA 01845 508-682-2000
§† Cooper Tools, Raleigh, NC 27622 919-781-7200
Creative Automation Co., Sun Valley, CA 91352 818-767-6220
§† Edsyn, Inc., Van Nuys, CA 91406 ..... 818-989-2324;213-873-5115
† ELVO:Division of Zumbach Electronics Corporation, Mt. Kisco, NY 10549-1407 914-241-1008
EPM Corporation, Baltimore, MD 21221 301-686-7800
§ ESICO/TRITON, Triton Industries Inc., Deep River, CT 06417 203-526-5361
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
Φ# Exselect Engineering Ltd., Concord, Ont., CANADA LK42G2 416-738-4077
§ Hexacon Electric Co., Roselle Park, NJ 07204 908-245-6200
§ Hollis Automation, Esterline Corporation, Nashua, NH 03063 603-889-1121
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 619-931-3000
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§† Metcal, Inc., Menlo Park, CA 94025 415-325-3291
§ Micro Electronic Systems, Inc., Bridgewater, CT 06752 203-350-5004
Necoa, Inc., Nittoku Engineering Group, Baltimore, MD 21237 301-574-4960
† Newman, M. M., Corp., Heli-Tube Div., Marblehead, MA 01945 617-631-7100
† OAL Associates, Inc., Escondido, CA 92033 619-743-7143
§† OK Industries, Inc., Yonkers, NY 10701 914-969-6800
Pace Inc., Laurel, MD 20723-1990 301-490-9860
§† Plato Products, Inc., Glendora, CA 91740 818-967-3821
§ Portasol, Oglesby and Botler Ltd., Charlotte, NC 28226 704-543-6239
Sikama International, Inc., Santa Barbara, CA 93117 805-683-6379
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ Technical Devices, Torrance, CA 90503 213-618-8437
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ Ungar, Div. Eldon Inds., Inc., Buena Park, CA 90621 714-994-2510
† Unit Design, Orange, CA 92665 714-282-8100
§† Wall Lenk Corporation, Kinston, NC 28502-3349 919-527-4186

Soldering Equipment, Ultrasonic-4100

Orientation Inc., Hudson, MA 01749 508-568-0509
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990

Soldering Equipment, Vapor Phase-4100

Centech Corporation, Minneapolis, MN 55420 612-881-8245
† Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200

Soldering Guns, Irons & Desoldering Tools-4600 — *See Vol. C*

Soldering Machines, Laser-4100

† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Control Laser Corp., Orlando, FL 32809 407-438-2500
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 619-931-3000
Raytheon Co., Laser Products, Quincy, MA 02169 617-479-5300
U. S. Laser Corp., Wyckoff, NJ 07481 201-848-9200

Soldering (MIL)-2440 — *See Vol. B*

Solenoids, Linear-4550 — *See Vol. B*

Solenoids, Proportional-4550 — *See Vol. B*

Solenoids, Rotary-4550 — *See Vol. B*

Solenoids, Stepping-4550 — *See Vol. B*

Solenoids (MIL)-2440 — *See Vol. B*

Solvents — See Cleaners & Solvents (Vol. C)

Sonar Systems-2440 — *See Vol. B*

S100 Bus — See Board Computers & Subassemblies (Vol. D)

Sound Absorbing Materials-2500 — *See Vol. C*

Sound Level Indicators — See Meters, Audio Level (Vol. D)

Sound Recording Equip. — See Microphones (Vol. D), Recorders (Vol. D), etc.

Source & Detector Assemblies (SDAs)-3700 — *See Vol. B*

Spacers-2500 — *See Vol. C*

Spaghetti — See Tubing, Spaghetti (Vol. C)

Spark Gaps-4300 — *See Vol. B*

Speakers, Explosion & Flame Proof-1300

† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
Motorola Ceramic Products, Components Division, Albuquerque, NM 87113 505-822-8801
† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Poly-Planar Inc., Warminster, PA 18974 215-675-7805
§ Quam-Nichols Co., Chicago, IL 60637 312-488-5800
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

Speakers, Horn-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
§ International Components Corp., Melville, NY 11747, 516-293-1500 .. D•1037,1039
§ MG Electronics, Hauppauge, NY 11788, 516-582-3400 ..... D•1044
§ Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1050-1051
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1059
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
AES Corp., Peabody, MA 01960 508-535-7310
§† Aiphone, Bellevue, WA 98005 206-455-0510
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
§ Fourjay Industries, Dayton, OH 45413-0617 513-890-6444
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
International Microelectronics, Arlington, TX 76003 817-561-2244
ISL Products Int'l, Ltd., Syosset, NY 11791-6093 516-937-3475
† Kolin Inds., Pound Ridge, NY 10576 914-764-5775
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
§ Motorola Ceramic Products, Components Division, Albuquerque, NM 87113 505-822-8801
Mouser Electronics, Mansfield, TX 76063 800-346-6873
Multi Products International, West Paterson, NJ 07424 201-890-1344
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Speakers, Intercom-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
§ International Components Corp., Melville, NY 11747, 516-293-1500 ..... D•1037
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1040-1041
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1042-1043
§ MG Electronics, Hauppauge, NY 11788, 516-582-3400 ..... D•1044
§ Quam-Nichols Co., Chicago, IL 60637, 312-488-5800 ..... D•1054-1055
† S & S Associates, Inc., San Luis Obispo, CA 93401, 805-544-2500 .. C•1094-1096
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1059
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† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§† Aiphone, Bellevue, WA 98005 206-455-0510
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† CML MACARR, A Marine Electric Systems Co., Clifton, NJ 07014-1135 201-471-6800
CTS Corporation, Elkhart, IN 46514 219-293-7511
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
† MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
Multi Products International, West Paterson, NJ 07424 201-890-1344
§ NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 708-824-1133
§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Poly-Planar Inc., Warminster, PA 18974 215-675-7805
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200

§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Tektone Sound & Signal, Lake Park, FL 33403 407-844-2383
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Speakers, Midrange-1300

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CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... D•1031
§ Golden Pacific Electronics, Inc, Placentia, CA 92670, 714-993-6970 ..... D•1034
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† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
CTS Corporation, Elkhart, IN 46514 219-293-7511
§† Hartley Products, Wilmington, NC 28405 919-763-7422
International Microelectronics, Arlington, TX 76003 817-561-2244
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
§ Motorola Ceramic Products, Components Division, Albuquerque, NM 87113 505-822-8801
Mouser Electronics, Mansfield, TX 76063 800-346-6873
Multi Products International, West Paterson, NJ 07424 201-890-1344
NMB Technologies, Chatsworth, CA 91311 818-341-3355
§ Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Speakers, Musical Instrument-1300

† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1059
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
CTS Corporation, Elkhart, IN 46514 219-293-7511
§ Hartley Products, Wilmington, NC 28405 919-763-7422
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ International Components Corp., Melville, NY 11747 516-293-1500
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
§ MG Electronics, Hauppauge, NY 11788 516-582-3400
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Quam-Nichols Co., Chicago, IL 60637 312-488-5800
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

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Speakers, Pillow-1300

§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300
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International Components Corp., Melville, NY 11747 516-293-1500
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§ Multi Products International, West Paterson, NJ 07424 201-890-1344
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
§ Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Speakers, Public Address-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
§ International Components Corp., Melville, NY 11747, 516-293-1500 ..... D•1037
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§† Aiphone, Bellevue, WA 98005 206-455-0510
§ Argos Prods., Genoa, IL 60135 815-784-5118
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
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§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
† Kolin Inds., Pound Ridge, NY 10576 914-764-5775
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Perma Power Elctrns., Chicago, IL 60648 312-763-0763
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Poly-Planar Inc., Warminster, PA 18974 215-675-7805
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
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§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Speakers, Replacement (Incl. Aircraft, Automotive & TV)-1300

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§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
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§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Speakers, Submergence Proof-1300

LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1043
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† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

Speakers, Subminiature-Also See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
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§ Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1050-1051
† RDI Elctrns., Inc., New Rochelle, NY 10801, 914-632-7274 ..... D•1057
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1059
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§† FDK America, Inc., Fuji Electrochemical Co., Ltd., San Jose, CA 95134 .. 408-432-8331
§ Heath Co., St. Joseph, MI 49085 616-982-3200
† Imtronics Industries, St. Petersburg, FL 33716 813-572-9010
§ International Components Corp., Melville, NY 11747 516-293-1500
§ MG Electronics, Hauppauge, NY 11788 516-582-3400
§ NTK Technical Ceramics, NGK Spark Plugs (USA), Mt. Prospect, IL 60056 708-824-1133
Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
Peter Parts & Assocs., Webster, NY 14580 716-265-2540
§ Rye Industries, Inc., Fuquay-Varina, NC 27526 919-557-0511
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Star Micronics, Inc., OEM Division, Piscataway, NJ 08854 908-572-9512
† Telectro Systems Corp., Corona, NY 11368 718-651-8900

Speakers, Tweeter-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
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§ MG Electronics, Hauppauge, NY 11788, 516-582-3400 ..... D•1044
§ Quam-Nichols Co., Chicago, IL 60637, 312-488-5800 ..... D•1055
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1059
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
CTS Corporation, Elkhart, IN 46514 219-293-7511
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 ... 708-584-2300

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§† Hartley Products, Wilmington, NC 28405 919-763-7422
§ International Components Corp., Melville, NY 11747 516-293-1500
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
NMB Technologies, Chatsworth, CA 91311 818-341-3355
§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Speakers, Weatherproof-1300

§ CUI Stack Inc., Beaverton, OR 97005, 503-643-4899 ..... D•1031
§ International Components Corp., Melville, NY 11747, 516-293-1500 ..... D•1037
LZR Electronics, Inc., Gaithersburg, MD 20879, 301-921-4600 ..... D•1043
§ Quam-Nichols Co., Chicago, IL 60637, 312-488-5800 ..... D•1054-1055
† Shogyo International Corp., Great Neck, NY 11021, 516-466-0911 ..... D•1059
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 ..... D•1060
† Accusonic Systems Corp., A DSG Company, New Hyde Park, NY 11040 516-328-3300
AES Corp., Peabody, MA 01960 508-535-7310
§ Argos Prods., Genoa, IL 60135 815-784-5118
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
CTS Corporation, Elkhart, IN 46514 219-293-7511
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
§† Hartley Products, Wilmington, NC 28405 919-763-7422
† Kolin Inds., Pound Ridge, NY 10576 914-764-5775
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
§ MG Electronics, Hauppauge, NY 11788 516-582-3400
† MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
§† Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Philmore Manufacturing, Rockford, IL 61125-1386 815-229-7773
§ Poly-Planar Inc., Warminster, PA 18974 215-675-7805
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
§ Wheelock, Inc., Long Branch, NJ 07740 201-222-6880

Speakers, Woofer-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
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§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
CTS Corporation, Elkhart, IN 46514 219-293-7511
§ Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
§† Hartley Products, Wilmington, NC 28405 919-763-7422
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ International Components Corp., Melville, NY 11747 516-293-1500
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
§ Martin Sound Prods. Inc., Cleveland, OH 44143-2297 216-442-2286
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
NMB Technologies, Chatsworth, CA 91311 818-341-3355
§ Oaktron Corporation, Mtx, Monroe, WI 53566 608-328-5560
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
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Speaker Systems-1300

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MG Electronics, Hauppauge, NY 11788, 516-582-3400 ..... D•1044
Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1051
Quam-Nichols Co., Chicago, IL 60637, 312-488-5800 ..... D•1055
§ Argos Prods., Genoa, IL 60135 815-784-5118
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§† Audiosone, Inc., Stratford, CT 06497 203-377-4475
§ Baknor Industries Inc., Mississauga, ONT., CANADA L5L 1X1 416-828-2400
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§ Celestion Industries, Inc., Holliston, MA 01746 508-429-6706
§ International Components Corp., Melville, NY 11747 516-293-1500
MISCO/Minneapolis Speaker Co., Inc., Minneapolis, MN 55409 612-825-1010
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Pyle Industries, Inc., Huntington, IN 46750 219-356-1200
§ Shure Brothers Inc., Evanston, IL 60202-3696 708-866-2200
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516

Spectrometers-2900

Bomem Inc., Quebec, CANADA G2E-5S5 ..... 418-877-2944;1-800-888-FTIR
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
§† Fisons Instruments, Valencia, CA 91355 805-295-0019
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Laser Precision Corp., Utica, NY 13502 315-797-4449
§ Micro-Now Instr. Co., Inc., Skokie, IL 60076 708-677-4700
Spiricon, Inc., Logan, UT 84321 801-753-3729
Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
§† UTI Instruments Co., San Jose, CA 95131 408-428-9400

Speech Compression & Synthesis Equipment-2325

Ariel Corporation, Highland Pk., NJ 08904 908-249-2900
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Calmos Semiconductor, Inc., Kanata, Ontario, CANADA K2L 1V8 ..... 613-836-1014; 800-267-7231
§ Covox, Inc., Eugene, OR 97402 503-342-1271
Eletech Electronics, Inc., Anaheim, CA 92805 714-385-1707
† Mimic, Inc., Islington, MA 02090-0705 617-329-9593
§ Rhetorex, Inc., Campbell, CA 95008 408-370-0881
Spectral Innovations, Santa Clara, CA 95054-1807 408-727-1314
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
§ Street Electronics Corp., Carpinteria, CA 93013 805-684-4593
§ Voice Connexion, Irvine, CA 92714 714-261-2366

Speed Drives, Motor — See Controls, Motor Speed (Vol. D)

Spiral Wrap — See Tubing, Spiral Wrap (Vol. C)

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Splicers, Fiber Optic-2475 — *See Vol. B*

Splicers, Wire (Incl. Butt & Cap Types)-5400 — *See Vol. C*

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Splices-2100 — *See Vol. C*

Splices, Fiberoptic-2475 — *See Vol. B*

Splicing Equipment, Fiber Optic-5400 — *See Vol. C*

Splicing Equipment, Magnetic Tape-1300

§† Benjamin International, Inc., Plainview, NY 11803 516-753-0700

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Spoolers, Printer Buffers-2325

Infoprint, Inc., Micro Electronic Business, Inc., Chicago, IL 60641, 312-539-6045 ..... D•1097
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§ Consolink, Longmont, CO 80501 303-651-2642
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Digital Products, Inc., Watertown, MA 02172 ..... 617-924-1680;800-243-2333
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
† Eventide, Inc., Little Ferry, NJ 07643 ..... 201-641-1200;800-446-7878
Intelligent Interfaces, Inc., Stone Mountain, GA 30086 ... 404-381-9891;1-800-842-0888
§ National Instruments Corp., Austin, TX 78730-5039 512-794-0100
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757

Spoolers, Punched Tape — See Readers, Punched Tape (Vol. D)

Springs (All Types)-2500 — *See Vol. C*

Stabilizers, Current — See Current Sources (Vol. D), Regulators, Current (Vol. D)

Stabilizers, Line Impedance-4050

Marway Prods. Inc., Santa Ana, CA 92703, 714-973-1800 ..... D•2212
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
§ Computer Power Inc., High Bridge, NJ 08829 ..... 908-638-8000;800-526-5088
Genisco Electronics Corporation, San Diego, CA 92173 619-661-5100
§† JMK, Inc., Amherst, NH 03031 603-886-4100

Stabilizers, Voltage — See Regulators & Stabilizers, Voltage (Vol. D), Transformers, Voltage Regulating (Vol. A), Voltage Sources (Vol. D)

Stabilizers, Voltage/Current, Automatic — See Power Supplies, Constant Current (Vol. D)

Stalos (Stabilized Local Oscillators) — See Oscillators, Microwave (Vol. A)

Stampings, Deep Drawn Metal-2500 — *See Vol. C*

Stampings, Precious Metal — See Preforms, Precious Metal (Vol. C)

Standards, Atomic Beam-2900

Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000 ..... A•1307
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1164
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368
† Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 818-993-0048

Standards, Capacitance-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258-1259,1262
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Boonton Electronics Corp., Randolph, NJ 07869 201-584-1077
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
International Instrumentation, Inc., Westlake Vlg., CA 91361 805-495-7673
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Standards, Current-2900

Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
† Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242-1243
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ..... D•1322,1324
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Holt Instrument, C.P.D. Engineering, Inc., Oconto, WI 54153 414-834-2222
Julie Research Labs., New York, NY 10001 212-633-6625
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Rotek Instrument Corp., Waltham, MA 02254 617-899-4611
Xitron Technologies, San Diego, CA 92121 619-458-9852

Standards, Delay Line-2350 — *See Vol. A*

Standards, Frequency-2900

§† **Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000 ..... A•1307**
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167
Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242-1243
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368-1369
Vectron Laboratories, Inc., Norwalk, CT 06850, 203-853-4433 ..... A•1488-1489
Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
CTS Corporation, Elkhart, IN 46514 219-293-7511
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
† FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
† FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
Global Specialties, Interplex Electronics, Inc., New Haven, CT 06509 203-624-3103
† Greenray Inds., Inc., Mechanicsburg, PA 17055 717-766-0223
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Julie Research Labs., New York, NY 10001 212-633-6625
Monitor Products Co., Inc., Oceanside, CA 92054 619-433-4510
§ Oscilloquartz, B & J Marketing, Northridge, CA 91325 818-993-0048
Ovenaire-Audio-Carpenter, Oak Crystal Inc., Charlottesville, VA 22901 .. 804-977-8050
† Piezo Crystal Co., Carlisle, PA 17013 717-249-2151
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Stanford Resch. Sys., Inc., Sunnyvale, CA 94089 408-744-9040
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
† Wenzel Associates, Inc., Austin, TX 78728 512-244-7741

Standards, Inductance-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258-1259,1262-1263
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Standards, Magnetic Field-2900

§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337

Standards, Noise-2900

Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Maury Microwave Corp., Cucamonga, CA 91730 714-987-4715

Standards, Phase-2900

† Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1237
Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242-1243
† Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
Ryan International Corp., Columbus, OH 43229-6207 614-885-3303
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Standards, Phase Angle-2900

† Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
† Elpaz Instruments, Inc., Pittsburgh, PA 15213 412-687-8700
Ryan International Corp., Columbus, OH 43229-6207 614-885-3303

Standards, Resistance-2900

General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258-1263
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270,1272
† PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
§ RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
† Instrulab, Dayton, OH 45404 513-223-2241
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Mills Resistor Co., Los Alamitos, CA 90720 213-598-2454
† Precision Resistor Co., Inc., Largo, FL 34647-1421 813-541-5771
Rotek Instrument Corp., Waltham, MA 02254 617-899-4611
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Vishay Resistive Systems, Malvern, PA 19355 215-644-1300

Standards, Temperature-2900

Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
§Φ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
† Electro Optical Industries Inc., Santa Barbara, CA 93111 ..... 805-964-6701 (ext. 280)
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
† Instrulab, Dayton, OH 45404 513-223-2241
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Minco Products, Minneapolis, MN 55432 612-571-3121
Omega Engineering, Stamford, CT 06907 800-826-6342
† Thermometrics, Inc., Edison, NJ 08817-4695 908-287-2870
† Thunder Scientific Corp., Albuquerque, NM 87123 ..... 505-265-8701;800-872-7728
Xitron Technologies, San Diego, CA 92121 619-458-9852
§ Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Standards, Time-2900

§† **Ball Corp., Efratom Division, Irvine, CA 92718-1605, 714-770-5000 ..... A•1307**
† Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1164
† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368
† TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1195
† Datachron Inc., Anaheim, CA 92805 714-385-1705
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
† FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Kinemetrics/Truetime, Santa Rosa, CA 95407 707-528-1230
PPM, Inc., Cleveland, OH 44139 216-349-2300
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Standards, Voltage-2900

Clarke-Hess Communications Research Corp., New York, NY 10011, 212-255-2940 ..... D•1236
Ectron Corp., San Diego, CA 92111-1980, 619-278-0600 ..... D•1010
† Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1242-1243
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1257
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270
Sensitive Research Instruments, Mt. Vernon, NY 10550, 914-699-9717 ..... D•1322-1324
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
§ Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Dynage/Power & Magnetics, Division Of Oakleaf, Inc., Canistota, SD 57012 ..... 605-296-3462/3487
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Greenray Inds., Inc., Mechanicsburg, PA 17055 717-766-0223
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Holt Instrument, C.P.D. Engineering, Inc., Oconto, WI 54153 414-834-2222
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Rotek Instrument Corp., Waltham, MA 02254 617-899-4611

Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Xitron Technologies, San Diego, CA 92121 619-458-9852

Standards, Voltage Ratio-2900

General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
DJ Instruments, Inc., N. Billerca, MA 01862 508-667-5301
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Ryan International Corp., Columbus, OH 43229-6207 614-885-3303
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Third Wave Instruments, Inc., Burlington, MA 01803 617-273-0779
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

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Standoffs, PCB-2500 — *See Vol. C*

Stands, Instruments-1400 — *See Vol. C*

Stands, Instrument, Tilting-1400 — *See Vol. C*

Stands, Printer/Terminal-1400 — *See Vol. C*

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STD Bus — See Board Computers & Subassemblies (Vol. D)

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Steppers, Indexing, Switch-5100 — *See Vol. B*

Stiffeners, PCB, Glass Epoxy-1700 — *See Vol. C*

Storage Equipment, Cartridge/Cassette-1400 — *See Vol. C*

Storage Equipment, Disk-1400 — *See Vol. C*

Storage Equipment, Flexible Disk-1400 — *See Vol. C*

Storage Equipment, Magnetic Card-1400 — *See Vol. C*

Storage Equipment, Multifunctional-1400 — *See Vol. C*

Storage Equipment, Printout-1400 — *See Vol. C*

Storage Equipment, Reel-to-Reel Tape-1400 — *See Vol. C*

Storage Racks, Circuit Board-1400 — *See Vol. C*

Strain Reliefs, Cable & Wire-2500 — *See Vol. C*

Strip-Line Components, Microwave-3450 — *See Vol. A*

Strips, Ground-1900

† Cut Craft, Inc., Ft. Worth, TX 76102, 817-332-6151 ..... C•1688
§ Bussco Inc., El Segundo, CA 90245 213-322-6580
§ Chomerics, Inc.:W.R. Grace & Co., Woburn, MA 01888 617-935-4850
§† Daburn Electronics & Cable Corp., Northvale, NJ 07647 201-768-5400
§ Excel Specialty Corp., Chicago, IL 60660 312-262-4781
Instrument Specialties Co. Headquarters, Delaware Water Gap, PA 18327-0136 717-424-8510
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
† Sjoberg, C., & Son, Inc., Cranston, RI 02910 401-461-8220
Tech-Etch, Inc., Plymouth, MA 02360 508-747-0300
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ WECO Electrical Connectors, Inc., Kirkland, Quebec, CANADA H9H 3L4 514-694-9136
† Zippertubing Co., Los Angeles, CA 90061 213-321-3901

Strips, Marker & Fanning-6000 — *See Vol. C*

Stroboscopes — See Lamps, Stroboscopic Source (Vol. B)

Substrates, Ceramic-2500 — *See Vol. C*

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Switched Filter Banks-3450 — *See Vol. A*

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Switches, Cam-5100 — *See Vol. B*

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Switches, Coded-5100 — *See Vol. B*

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Switches, Data, Manual-2325

† ADC Telecommunications, Inc., Minneapolis, MN 55435, 612-835-6800 ..... C•1157,1159
† Advanced Systems Concepts, Inc., Altadena, CA 91001, 818-791-0983 .. D•1144
† Capitol Switch Inc., Bethel, CT 06801, 203-744-3300 ..... B•1656
§ Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087, 708-662-9200 ..... B•1662
Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412, 708-455-8830 ..... C•1743
Crosspoint, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ... B•1673
CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... B•1676
Electronic Components Groupe, Stein Industries, Inc., Minneapolis, MN 55403, 612-375-9639;800-677-8719 ..... B•1689-1691
§ JH America, Inc., JI-HAW Group, Torrance, CA 90501, 213-328-0051 .... C•1407
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§ T-Bar Data Switch Corp., Shelton, CT 06484, 203-926-1801 ..... B•1788
Augat Alcoswitch, Augat Inc., N. Andover, MA 01845 508-685-4371
Bytex Corp., Southborough, MA 01772 508-480-0840
CableStar, Incorporated, Glasgow, KY 42141 800-338-8223
Cole Instrument Corp., Santa Ana, CA 92704 714-556-3100
§ COMCAB, Nashport, OH 43830 614-828-2468
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ CSD Industries, Inc., dba C Enterprises , San Marcos, CA 92069 ..... 619-744-8182; 800-334-3815;800-423-3345
§ CTS Corporation, Elkhart, IN 46514 219-293-7511
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ Dreefs Switch, Inc., Waukegan, IL 60087 ..... 708-662-7667;800-323-9605
§ EECO Incorporated, Santa Ana, CA 92702-0659 714-835-6000
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
EnTech Corporation, Simsbury, CT 06070 ..... 203-658-2740;203-651-9557
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
Grayhill Inc., La Grange, IL 60525 708-354-1040
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
International Microelectronics, Arlington, TX 76003 817-561-2244
§ IVO Industries, Inc., Eatontown, NJ 07724 ..... 908-542-5151;800-932-0489
§† Keptel/Armiger, Tinton Falls, NJ 07724 ..... 800-526-3697;201-389-8800
LZR Electronics, Inc., Gaithersburg, MD 20879 301-921-4600
MarLee Switch Co., Upland, CA 91786 714-982-8988
Mouser Electronics, Mansfield, TX 76063 800-346-6873
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
§ Oxley Inc., Branford, CT 06405 203-488-1033
Peca, Inc., Bensalem, PA 19020 215-245-1550
§ Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
Vetra Systems Corp., Plainview, NY 11803 516-454-6469
§ Via West Interface, Inc., Tucson, AZ 85705 ..... 602-623-5716;1-800-266-5716

Switches, Data, Programmable-2325

Advanced Systems Concepts, Inc., Altadena, CA 91001, 818-791-0983 .. D•1144
Consolidated Electronic Wire & Cable, Franklin Park, IL 60131-1412, 708-455-8830 ..... C•1743
Crosspoint, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ... B•1673
CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... B•1676-1677
§ IEE (Industrial Electronic Engineers), Van Nuys, CA 91405, 818-787-0311 ..... B•1088
Information Transfer Inc., Bloomfield, NY 14469, 716-657-7074 ..... D•1181
§ T-Bar Data Switch Corp., Shelton, CT 06484, 203-926-1801 ..... B•1788
Amber Inds., Inc., Dallas, TX 75379 214-490-9801

Bytex Corp., Southborough, MA 01772 508-480-0840
CableStar, Incorporated, Glasgow, KY 42141 800-338-8223
Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 708-662-9200
Cole Instrument Corp., Santa Ana, CA 92704 714-556-3100
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
§ Consolink, Longmont, CO 80501 303-651-2642
§ CSD Industries, Inc., dba C Enterprises , San Marcos, CA 92069 ..... 619-744-8182; 800-334-3815;800-423-3345
CTS Corporation, Elkhart, IN 46514 219-293-7511
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ Digital Products, Inc., Watertown, MA 02172 ..... 617-924-1680;800-243-2333
§ EDA Instruments, Inc., Toronto, ON, CANADA M4H1H1 416-425-7800
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
# Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
† Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
JAE Electronics Inc., Irvine, CA 92718 714-753-2600
§ Machine Components Corp., Plainview, NY 11803 516-694-7222
MarLee Switch Co., Upland, CA 91786 714-982-8988
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
OakGrigsby Inc., Sugar Grove, IL 60554 708-556-4200
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Support Systems Intl. Corp., Richmond, CA 94804 415-234-9090
† Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600
Vetra Systems Corp., Plainview, NY 11803 516-454-6469
§ Via West Interface, Inc., Tucson, AZ 85705 ..... 602-623-5716;1-800-266-5716

Switching Systems, Audio-1300

CTS Corp.,Electrocomponents business unit (Formerly Elkhart Div.), Elkhart, IN 46514, 219-295-3575 ..... D•1030
CYTEC Corp., Penfield, NY 14526, 716-381-4740;800-346-3117 ..... D•1240
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1070-1071,1073-1074
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1040-1041
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§ T-Bar Data Switch Corp., Shelton, CT 06484, 203-926-1801 ..... B•1788
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
§† Aiphone, Bellevue, WA 98005 206-455-0510
Amber Inds., Inc., Dallas, TX 75379 214-490-9801
§ Atlas/Soundolier, Fenton, MO 63026 314-349-3110
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
§ Industrial Computer Designs, Inc., Westlake Village, CA 91361 ..... 818-889-3179; 800-423-3179
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
MarLee Switch Co., Upland, CA 91786 714-982-8988
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Matthey Electronics, Television Equipment Associates, South Salem, NY 10590 914-763-8893
§ McCurdy Radio Industries Limited, Toronto, Ont., CAN M4A 2L4 416-751-6262
Precision Filters, Ithaca, NY 14850 607-277-3550
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ ROH, Portland Instrument, Glendale, CA 91201 818-500-0137
† RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Switching Systems, Test & Measurement-2900

† Advanced Switching Concepts, Inc., Altadena, CA 91001, 818-791-0983 .. D•1144
CYTEC Corp., Penfield, NY 14526, 716-381-4740;800-346-3117 ..... D•1240
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Information Transfer Inc., Bloomfield, NY 14469, 716-657-7074 ..... D•1181
† Jennings, San Jose, CA 95122-2696, 408-292-4025 ..... B•1519
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1101,1142,1191
§ T-Bar Data Switch Corp., Shelton, CT 06484, 203-926-1801 ..... B•1788
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
Amber Inds., Inc., Dallas, TX 75379 214-490-9801
§ Aqualarm, Marine Safety Systems, Inc., Chula Vista, CA 91911 619-575-4011
† Electrospace Systems, Inc., Richardson, TX 75083-1359 214-470-2137
E-Z Hook, Tektest Inc., Arcadia, CA 91006 818-446-6175
MarLee Switch Co., Upland, CA 91786 714-982-8988
Matrix Systems Corp., Calabasas, CA 91302 818-222-2301
Precision Filters, Ithaca, NY 14850 607-277-3550
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Synchronizers, PCM Bit-1900

Loral Data Systems, Sarasota, FL 34230 813-371-0811
§ Mitel Semiconductor Div. of Mitel Corp., Kanata, Ont., CANADA K2K 1X3 613-592-2122
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257

Synchros-4900

Control Technology Co., Inc., Long Island City, NY 11101, 718-361-2133 ..... D•2240-2241
Fasco Industries, Inc., Hawker Siddelem No. 200, Chesterfield, MO 63017, 314-532-3505 ..... C•1623
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1187
† Astro Instrument Corp., Deerfield, FL 33442-3019 305-698-6000
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
§† Harowe Servo Controls, Inc.:A Fasco Co., West Chester, PA 19380 215-692-2700
ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
J. R. Merritt Controls, Inc., Norwalk, CT 06854 ..... 203-855-9100;800-333-5762
North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
† Novatronics Inc., Stratford, Ontario, CANADA N5A 6V6 519-271-3880
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Synchro Transmitters, Solid State-4900

† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152,1155
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449, 805-581-3950 .. D•1187
† Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1196-1197
Astrosystems, Lake Success, NY 11042 516-328-1600
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
† Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
† Interface Engineering Inc., Holbrook, MA 02343 617-986-2600
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500

Synthesizers, Frequency-2900

† Frequency Electronics, Inc., Mitchel Field, NY 11553, 516-794-4500 ..... A•1368-1369
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
† Micronics Technology Inc., Glen Cove, NY 11542, 516-759-5600 ..... A•1399
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Programmed Test Sources, Littleton, MA 01460, 508-486-3008 ..... D•1312
† TRAK Microwave Corp., Tampa, FL 33634, 813-884-1411 ..... A•1829
Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
† American Trans-Coil Corporation, Richmond Hill, NY 11419-1410 718-441-5207
Anadex Inc., Camarillo, CA 93012 805-987-9660
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
California Microwave, Sunnyvale, CA 94086 408-732-4000
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Avionics, Arcadia, CA 91006 818-445-5955
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† Greenray Inds., Inc., Mechanicsburg, PA 17055 717-766-0223
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Hughes Microelectronic Circuits Division, Newport Beach, CA 92658-8903 714-759-2952
† ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
KDI/Triangle Electronics, Whippany, NJ 07981 201-887-5700
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
† Loral Microwave-Narda West, San Jose, CA 95112-4210 408-436-4400
† Lucas Zeta, Inc., Lucas Aerospace, Inc., San Jose, CA 95134 408-434-3600
Luff Research, Floral Park, NY 11001 516-358-2880
† M/A COM Ltd., Bedfordshire, ENGLAND LU5 4SX, England ..... 44(582)471200
† MITEQ Inc., Hauppauge, NY 11788 516-436-7400
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
§† QUALCOMM, Inc., San Diego, CA 92121 619-587-1121
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† SCITEQ Electronics, Inc., San Diego, CA 92123 619-292-0500
† Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Spectracom Corporation, East Rochester, NY 14445-1484 716-381-4827
† Stanford Telecommunications, Inc., Santa Clara, CA 95056 408-748-1010
§ Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
† Techtrol Cyclonetics, Inc., New Cumberland, PA 17070 717-774-2746
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Tele-Tech Corporation, Bozeman, MT 59715 406-586-0291
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000
† Z Communications, Inc., Ft. Lauderdale, FL 33309 305-735-1000

Synthesizers, Speech-2325

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Covox, Inc., Eugene, OR 97402 503-342-1271
† Mimic, Inc., Islington, MA 02090-0705 617-329-9593

NAVAN Corporation, Media, PA 19063 215-543-8066
PERX,Inc., Corte Madera, CA 94925 415-927-0155
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Voice Connexion, Irvine, CA 92714 714-261-2366

Synthesizers, Waveform-2900

Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Micronics Technology Inc., Glen Cove, NY 11542, 516-759-5600 ..... A•1399
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Analogic Corp., Peabody, MA 01960 508-977-3000
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
NF Electronic Instruments, Costa Mesa, CA 92626 714-557-1684
PERX,Inc., Corte Madera, CA 94925 415-927-0155
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
SCITEQ Electronics, Inc., San Diego, CA 92123 619-292-0500
§ Syntest Corp., Marlboro, MA 01752-9973 508-481-7827
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Wavetek San Diego, Inc. , Wavetek Corp., San Diego, CA 92123 619-279-2200

Tables, Positioning-4900

† Anorad Corp., Hauppauge, NY 11788 516-231-1995
§ Daedal, Harrison City, PA 15636 412-744-4451
§ Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
§† Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

Tables, Rotary-4900

Mercotac Inc., Carlsbad, CA 92009, 619-431-7723 ..... B•1295
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
§ Daedal, Harrison City, PA 15636 412-744-4451
§ Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† Melles Griot, Inc., Irvine, CA 92714 714-261-5600
Parker Hannifin Corp., Daedal Div., Harrison City, PA 15636 412-744-4451
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
§† Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

Tables, X-Y Axis-4900

† Anorad Corp., Hauppauge, NY 11788 516-231-1995
§ Daedal, Harrison City, PA 15636 412-744-4451
§ Design Components, Inc., Franklin, MA 02038 ..... 508-528-7300;800-341-4811
Microvision Corp., Campbell, CA 95008 408-374-3158
Parker Hannifin Corp., Daedal Div., Harrison City, PA 15636 412-744-4451
Techno-Isel USA Division, Designatronics, New Hyde Park, NY 11040 .. 516-328-3970
§† Velmex, Inc., East Bloomfield, NY 14443 ..... 716-657-6151;800-642-6446

Tablets, Digitizing-2000

§ ALTEK Corporation, Silver Springs, MD 20904-7802 301-572-2555
§ Oce' Graphics, Mountain View, CA 94039 415-964-7900
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Tachometers, Generator-4900

§† Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1298
Motor Technology, Inc., Dayton, OH 45429, 513-294-1041 ..... B•1303
Servo-Tek Products Co., Hawthorne, NJ 07506, 201-427-3100 ..... B•1310
† Vernitech:Vernitron Corp., Deer Pk., NY 11729, 516-586-5100 ..... B•1318
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Aetna Engineering, Van Nuys, CA 91409-7749 818-341-9409
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
† Ashland Elec. Prods., Inc., Rochester, NH 03867 603-335-1100
† Astro Instrument Corp., Deerfield, FL 33442-3019 305-698-6000
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ B & B Motor & Control Corp., B & B Long Island City, Edison, NJ 08817 ..... 908-819-7070; 908-572-0500
§ Beckman Industrial Corp., Affiliate of Emerson Electric Co., Fullerton, CA 92635 714-447-2300
Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
Bertsch U.S., Vista, CA 92083 619-727-7420
§ Carter Motor, Warren, IL 61087-0647 815-745-2100
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Dixson, Inc., Grand Junction, CO 81503 303-244-1241
† Eastern Air Devices, Inc., Dover, NH 03820 603-742-3330
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
† Electric Tachometer, Philadelphia, PA 19142 215-726-7723
Escap Products, Hauppauge, NY 11788 516-234-3900
Esterline Angus Instrument Corp., Indianapolis, IN 46224 317-244-7611
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
† GIC Thermodynamics, Royal Oak, MI 48073 313-280-1648
§† Globe Motors, Dayton, OH 45404 513-228-3171
§† Harowe Servo Controls, Inc.:A Fasco Co., West Chester, PA 19380 215-692-2700
Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
† IMC Magnetics Corp., Eastern Div., Westbury, NY 11590 516-334-7070
§† Industrial Drives, A Kollmorgen Div., Radford, VA 24141 703-639-2495
† Inland Motor, Kollmorgen Corp., Sierra Vista, AZ 85635 602-459-1150
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
† Maxon Precision Motors, Inc., Burlingame, CA 94010 415-697-9614
Micronel U.S., Vista, CA 92083 619-727-7400
§ Monarch Instrument, Monarch International Inc., Amherst, NH 03031 ..... 603-883-3390; 800-999-3390
† Moore Reed & Co. Ltd., Andover, HAMPSHIRE SP 105AB 0264-324155
Motor-Tronics, Inc., Vista, CA 92083 619-727-7430
† Novatronics Inc., Stratford, Ontario, CANADA N5A 6V6 519-271-3880
PMI Motion Technologies, Kollmorgen Corporation, Commack, NY 11725-5703 516-864-1000
Portescap U.S., Inc., Hauppauge, NY 11788 516-234-3900
§ Powertron, Contraves Goerz Corp., Charlotte, NC 28210 704-525-8962
Robbins & Myers/Electro-Craft, Eden Prairie, MN 55344 612-942-3600
† Sierracin/Magnedyne, Carlsbad, CA 92008 619-438-3321
§† Stemco Instruments, Colt Industries, Longview, TX 75607 214-643-3236
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
Vibrac, Amherst, NH 03031 603-882-6777
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121
§† WestCon, Marion, OH 43302 614-382-5771

Tachometers, Optical-4900

Micro Mo Electronics, Inc., St. Petersburg, FL 33701, 813-822-2529 ..... B•1920, D•2243
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
Sumtak Electronics, Daido Corporation, Somerset, NJ 08875, 908-805-0008 ..... B•1950-1951
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
§ Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Force, Inc., Christiansburg, VA 24073 703-382-0462
† Hathaway Corporation:Motion Control Div., Tulsa, OK 74116 918-438-7800
Litton Encoder Div., Chatsworth, CA 91311 818-341-6161
§ Monarch Instrument, Monarch International Inc., Amherst, NH 03031 ..... 603-883-3390; 800-999-3390
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
Teledyne Gurley, Troy, NY 12181 ..... 518-272-6300;800-759-1844

Tachometers, Pulse-4900

Airpax-Cheshire Division, A North American Philips Co., Cheshire, CT 06410, 203-271-6000 ..... B•1875
BEI Motion Systems Company, Computer Products Div., San Marcos, CA 92069, 619-471-2600 ..... B•1879
BEI Motion Systems Company, Itek Encoder Div., Needham Hgts., MA 02194, 617-455-1414 ..... B•1879-1881
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
† FOX METER INC., Elburn, IL 60119, 708-365-2422 ..... D•1347
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1907
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk., NY 11040, 516-328-0200;328-3300 ..... B•1312
† Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803 516-694-6700
Aetna Engineering, Van Nuys, CA 91409-7749 818-341-9409
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
§† Ametek, Inc., Mansfield & Green Div., Largo, FL 34643 813-536-7831
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Autronics Corp., Arcadia, CA 91006 818-445-5470
§ Baldor Electric Company, Fort Smith, AR 72902 501-646-4711
§ Beede Electrical Instrument Co., Inc., Penacook, NH 03303 603-753-6362
BEI Motion Systems Company, Corporate Off., Carlsbad, CA 92009 619-931-1500
† BEI Motion Systems Company, Digital Products Div., Little Rock, AR 72203 501-851-4000
BEI Motion Systems Company, Industrial Encoder Div., Goleta, CA 93117 805-968-0782
BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311 818-341-6161
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Dynapar, Gurnee, IL 60031 312-662-2666
† Eastern Air Devices, Inc., Dover, NH 03820 603-742-3330
† Electric Tachometer, Philadelphia, PA 19142 215-726-7723
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
Elm Systems, Wauconda, IL 60084 708-526-5003
† Faria, Thomas G., Corp., Uncasville, CT 06382-0983 203-848-9271
§ JMR Electronics, Bronx, NY 10461 212-597-6050
† Micro Mo Electronics, Inc., St. Petersburg, FL 33701 813-822-2529
§ Monarch Instrument, Monarch International Inc., Amherst, NH 03031 ..... 603-883-3390; 800-999-3390
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§† Renco Encoders Inc., Goleta, CA 93117-3094 805-968-1525
§ Richard-Lee Co., Cranford, NJ 07016 201-276-0710
§† Stemco Instruments, Colt Industries, Longview, TX 75607 214-643-3236
† Teledyne Gurley, Troy, NY 12181 ..... 518-272-6300;800-759-1844
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
† Transicoil, Inc., Eagle-Picher, Valley Forge, PA 19485 215-539-4400
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Vernitech:Vernitron Corp., Deer Pk., NY 11729 516-586-5100
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121

Tachometers, Stroboscopic-4900

Alpha-M Corp., Dallas, TX 75229 214-406-0424
§† Ametek, Inc., Mansfield & Green Div., Largo, FL 34643 813-536-7831
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
§ Monarch Instrument, Monarch International Inc., Amherst, NH 03031 ..... 603-883-3390; 800-999-3390
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ SKF Condition Monitoring, San Diego, CA 92123-1841 619-496-3400
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Xenon Corp., Woburn, MA 01801 617-938-3594

Tape and Reel Packaging-4100

† Dover Electronics Manufacturing, Binghamton, NY 13902-5212, 607-772-7563;1-800-PWB-ASSY ..... D•2234
MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
Panduit Corp., Tinley Park, IL 60477-0981, 800-777-3300 ..... C•1802
ADE, Inc., Chicago, IL 60633 312-646-3400
Altron, Inc., Anoka, MN 55303 612-427-7735
§ Clarostat Mfg. Co., Inc., Hawker Siddeley, PLC., Dover, NH 03820-1507 603-742-1120,800-872-0042
Eastern Marking Machines, Hempstead, NY 11550 516-483-7070
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
§ 3M-Electronic Products Division, Austin, TX 78769-2963 ..... 1-800-225-5373 Sls. & Prod. Info.

Tape Recording Accessories-1300

† International Electro Magnetics, Inc., Palatine, IL 60067, 708-358-4622 ... D•1036
Japan Electronic Manufacturers Agency, Inc., Wilmette, IL 60091, 708-251-3600 ..... D•1040-1041
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† Memtec Corp., Salem, NH 03079 603-893-8080
§ Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
§† Prof. A/V & Specialty Prod. Div., St. Paul, MN 55144-1000 612-733-7644
§ Recoton Corp., Long Island City, NY 11101 718-392-6442
† Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233
§ RTS Systems, Telex Communications, Inc., Burbank, CA 91506 818-566-6700
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893

Tape Search Equipment-2000

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167
Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
† TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
Datachron Inc., Anaheim, CA 92805 714-385-1705
FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893
Voice Identification, Somerville, NJ 08876 908-526-3408

Tape Winders-2000

† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
§ GC-Thorsen, Rockford, IL 61105-1209 815-968-9661
Ghielmetti, Inc., Westlake Village, CA 91361 800-228-1097
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Infranor, Naugatuck, CT 06770 ..... 203-729-8258;800-BE-SERVO
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893

Tapes, Magnetic, Digital Cassette-2000

Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
Herstal Automation Ltd., Berkley, MI 48072 313-548-2001
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900

Tapes, Magnetic, Cartridge-2000

§ Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 ..... D•1091
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Algo, Inc., ODENTON, MD 21113 301-672-1544
§† Analog & Digital Peripherals, Inc.(ADPI), Troy, OH 45373 513-339-2241
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200

Tapes, Magnetic, Reel-2000

§ Ampex Corp., Redwood City, CA 94063-3199 ..... 1-800-25AMPEX
§ Computerware, Inc., Vienna, VA 22182-2266 703-821-8200

Tapes, Numerical Control-2000

Caristrap Internatonal, Inc., Chomedey, Lavac, QUEBEC, CANADA H7SIN8 514-667-4700
§ Flexible Technologies, Arlon, E. Providence, RI 02914 401-434-2340

Telephone Sets, Exclusion Key-1900

§ Dataprobe, Englewood, NJ 07631 201-569-6464
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ R-Columbia Prods. Co., Inc., Highland Park, IL 60035 708-432-7915
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516

Teleprinters, Auto Send/Receive-1900

Computer Devices, Nutting Lake, MA 01865 508-663-4980
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Teleprinters, Keyboard Send/Receive-1900

Computer Devices, Nutting Lake, MA 01865 508-663-4980
§† Dataproducts New England, Inc., Wallingford, CT 06492 203-265-7151
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Teleprinters, Receive Only-1900

Singer Data Products, Inc., Bensenville, IL 60106, 708-860-6500 ..... D•1111
Computer Devices, Nutting Lake, MA 01865 508-663-4980
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Teletypewriters & Equipment-1900

Digital Equip., Marlborough, MA 01752
Electrocom Industries, S. Bend, IN 46615 219-232-2743
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765

Television Systems & Equipment Closed Circuit-1900

§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ ATV Research, Inc., Dakota City, NE 68731 402-987-3771
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
† Colorado Video, Inc., Boulder, CO 80306 303-530-9580
Components Corp., Denville, NJ 07834 201-627-0290
§ Dage-MTI, Michigan City, IN 46360 219-872-5514
§ Dotronix, New Brighton, MN 55112 612-633-1742
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
§Φ Gordon Instruments, Inc., Orchard Park, NY 14127 ..... 716-662-5353;1-800-333-2672
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Hamamatsu Photonic Systems Corp., Industrial Video, Wakefield, MA 01880 617-245-8100
HDS Inc., Reston, VA 22091 703-620-6200
Imaging & Sensing Technology Corp., Horseheads, NY 14845 607-796-3372
† LCT Electronic Corporation, Anaheim, CA 92801 714-991-7317
† Math Assocs., Westbury, NY 11590 516-334-6800
§† Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
† Stenning Instrments, Inc., Pacific Palisades, CA 90272 213-459-2930
§ Tektone Sound & Signal, Lake Park, FL 33403 407-844-2383
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893
§ Video Automation Systems, Pound Ridge, NY 10576 914-764-4613
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361
Volpi-MFG-USA, Auburn, NY 13021-1289 315-255-1737

Terminal Equipment, Digital-2000

† ADC Telecommunications, Inc., Minneapolis, MN 55435, 612-835-6800 ..... C•1157-1159
Memodyne, Newton, MA 02164, 617-964-6556 (in MA);800-255-1510 .... D•1100
§ SAMTRON DISPLAYS, INC., SAMSUNG Electron Devices, La Mirada, CA 90638, 213-802-8425 ..... B•1114-1115
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Computerwise, Olathe, KS 66062 913-829-0600
§† Di/An Controls, Inc., Brockton, MA 02401 508-599-8000
Electrocom Industries, S. Bend, IN 46615 219-232-2743
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Genicom Corp., Waynesboro, VA 22980 703-949-1471
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600

§ NEC Technologies, INc., Boxborough, MA 01719 508-264-8000
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
Ramcom Systems, Marina Del Rey, CA 90292 213-827-4432
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Terminal Data Corp., Rockville, MD 20855 301-921-8282
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500

Terminals, Communications-2000

Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Computerware, Inc., Vienna, VA 22182-2266 703-821-8200
† Enterprise Systems Corp., Dover, NH 03820 603-742-7363
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ IDEAssociates, Inc., Billerica, MA 01821 508-663-6878
Librascope Corp., Glendale, CA 91201 818-244-6541
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765

Terminals, Credit Authorization-2000

Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
ASC Systems, St. Clair Shores, MI 48080 313-882-1133

Terminals, Data Display (Incl. Alphanumeric & Graphic)-2000

Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
Densitron Corporation, Densitron International, Torrance, CA 90505, 213-530-3530 ..... B•1055
Excel Technology Intl. Corp., Belle Mead, NJ 08502, 908-874-4747 .. B•1069-1072
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1380
§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Analogic Corp., Peabody, MA 01960 508-977-3000
Apollo Display Technologies, Inc., Holtsville, NY 11742 516-654-1143
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Cherry Electrical Products, Cherry Corporation, Waukegan, IL 60087 708-662-9200
Chromatics, Tucker, GA 30084 404-493-7000
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
§ Colorgraphic Communications Corp., Atlanta, GA 30366 404-455-3921
§ Computer Devices, Nutting Lake, MA 01865 508-663-4980
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Computerwise, Olathe, KS 66062 913-829-0600
Control Module, Enfield, CT 06082 203-745-2433
Coreco, Inc., St. Laurent, Que., CANADA H4T 1V8 ..... 800-361-4914;514-333-1301
Daytronic Corp., Hawker Siddeley, Miamisburg, OH 45342 513-866-3300
DCI Inc., Olathe, KS 66062 913-782-5672
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
§ Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
Endicott Research Group, Endicott, NY 13760 607-754-9187
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
General Digital Corp., Enfield, CT 06082 203-741-7171
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Honeywell Inc., Aerospace & Defense Grp., Minneapolis, MN 55408 612-870-5186
Honeywell Information Systems, Waltham, MA 02154 617-895-6000
† IEE (Industrial Electronic Engineers), Van Nuys, CA 91405 818-787-0311
§ Lucas Deeco Corp., Hayward, CA 94544-7831 415-471-4700
† Miltope Corp., Melville, NY 11747 516-420-0200
Mitronics, Rolling Hills, CA 90274 213-377-2022
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100
Ramcom Systems, Marina Del Rey, CA 90292 213-827-4432
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tektronix, Inc., Display Products, Beaverton, OR 97077 503-627-5000
Terminal Data Corp., Rockville, MD 20855 301-921-8282
§ Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Two Technologies,Inc., Horsham, PA 19044 215-441-5305
VL Electronics, Inc., Los Angeles, CA 90010-1603 213-738-8700

Terminals, Data Entry, Multimedia-2000

§ Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
Accu Data, Inc., Springville, UT 84663-0963 801-377-9156
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
Computerwise, Olathe, KS 66062 913-829-0600
Control Module, Enfield, CT 06082 203-745-2433
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Genicom Corp., Waynesboro, VA 22980 703-949-1471
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
§ Two Technologies,Inc., Horsham, PA 19044 215-441-5305
§ Welch Allyn, Inc., Data Collection Div., Skaneateles Falls, NY 13153-0187 315-685-8945
§ Zebra Technologies Corporation, Vernon Hills, IL 60061-3109 708-634-6700

Terminals, Display-2000

Densitron Corporation, Densitron International, Torrance, CA 90505, 213-530-3530 ..... B•1055
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Aydin Corp., Horsham, PA 19044 215-657-7510
§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
Chromatics, Tucker, GA 30084 404-493-7000
Computer Maintenance Corp., East Rutherford, NJ 07073 201-896-0707
Control Module, Enfield, CT 06082 203-745-2433
§ Craft Data, Inc., Mission Viejo, CA 92691 714-582-8284
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Enterprise Systems Corp., Dover, NH 03820 603-742-7363
† FOX METER INC., Elburn, IL 60119 708-365-2422
General Digital Corp., Enfield, CT 06082 203-741-7171
§ GMR Co., Venice, CA 90291 213-399-1490
§ Graphic Strategies, Inc., Sunnyvale, CA 94089 408-745-6500
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§ Lucas Deeco Corp., Hayward, CA 94544-7831 415-471-4700
† Miltope Corp., Melville, NY 11747 516-420-0200
Omnicomp Graphics Corp., Houston, TX 77043 713-464-2990
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100
QSI Corporation, Salt Lake City, UT 84115 801-466-8770
Quantum Electronics, Inc., Lewistown, PA 17044 717-242-1132
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tektronix, Inc., Display Products, Beaverton, OR 97077 503-627-5000
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
† UCE, Inc., Norwalk, CT 06854 203-838-7509
§ Zebra Technologies Corporation, Vernon Hills, IL 60061-3109 708-634-6700

Terminals, Financial-2000

Computer Devices, Nutting Lake, MA 01865 508-663-4980

Terminals, Intelligent/Programmable, Batch-2000

ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
§ Action Instruments, San Diego, CA 92123 619-279-5726
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
General Digital Corp., Enfield, CT 06082 203-741-7171
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Terminals, Intelligent/Programmable, Interactive-2000

§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
Analogic Corp., Peabody, MA 01960 508-977-3000
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Craft Data, Inc., Mission Viejo, CA 92691 714-582-8284
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
General Digital Corp., Enfield, CT 06082 203-741-7171
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
§ Qwint Data, Inc., Vernon Hills, IL 60061 708-913-8765
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Terminal Data Corp., Rockville, MD 20855 301-921-8282
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Two Technologies,Inc., Horsham, PA 19044 215-441-5305
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Terminals, Intelligent/Programmable, Multiprogramming-2000

Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803, 516-694-6700 ..... A•1721
§ Action Instruments, San Diego, CA 92123 619-279-5726
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Control Module, Enfield, CT 06082 203-745-2433
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
General Digital Corp., Enfield, CT 06082 203-741-7171
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Terminals, Intelligent/Programmable, Multiuser-2000

Aydin Corp., Horsham, PA 19044 215-657-7510
Control Module, Enfield, CT 06082 203-745-2433
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
General Digital Corp., Enfield, CT 06082 203-741-7171
GTE SUPPLY, GTE SUPPLY, DFW Airport, TX 75261 800-433-4837
LJ Technical Systems, Hauppauge, NY 11788 516-234-2100
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Two Technologies,Inc., Horsham, PA 19044 215-441-5305
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Terminals, Intelligent/Programmable, Real Time-2000

§ Action Instruments, San Diego, CA 92123 619-279-5726
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
Control Module, Enfield, CT 06082 203-745-2433
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
Editron Systems Inc., Teaneck, NJ 07666 201-837-0051
Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
General Digital Corp., Enfield, CT 06082 203-741-7171
† Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Two Technologies,Inc., Horsham, PA 19044 215-441-5305
Xcel Controls Inc., Mishawaka, IN 46544 219-259-7804

Terminals, Intelligent/Programmable, Transaction Processing-2000

§ Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Divelbiss Corp., Fredericktown, OH 43019 614-694-9015
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Two Technologies,Inc., Horsham, PA 19044 215-441-5305

Terminals, Point-of-Sale-2000

§ Xico, Inc., Chatsworth, CA 91311, 818-709-4403 ..... D•1118
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Autosplice, Inc., San Diego, CA 92121 619-535-0077
§ Cole Hersee Co., Boston, MA 02127-2467 617-268-2100
§† Di/An Controls, Inc., Brockton, MA 02401 508-599-8000
General Digital Corp., Enfield, CT 06082 203-741-7171
Printer Products, Boston, MA 02134 617-254-1200
Westrex Products, Boston, MA 02134 617-254-1200

Terminations, VHF, Video, Pulse-1900

† Elcom Systems, Inc., Boca Raton, FL 33487, 407-994-1774 ..... A•1747
† Bird Electronic Corp., Cleveland, OH 44139-2794 216-248-1200
Compac, Holbrook, NY 11741 516-585-3400
† Dielectric Communications, General Signal, Raymond, ME 04071 ..... 207-655-4555; 800-341-9678
† Electro Impulse, Neptune, NJ 07754-0278 908-776-5800
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† JFW Industries, Inc., Indianapolis, IN 46237 317-887-1340
Manger Electric Company, Inc., Stamford, CT 06902 203-348-7761
† North Hills Electronics, Glen Cove, NY 11542 516-671-5700
§ Pomona Electronics, Pomona, CA 91766 714-623-3463
† Servo Corporation of America, Hicksville, NY 11802-9907 516-938-9700
§† Systron-Donner Microwave Div., Sylmar, CA 91342 818-362-9900
† Trompeter Electronics, Inc., Westlake Village, CA 91362-4047 818-707-2020
Wide Band Engineering Co., Inc., Phoenix, AZ 85036 602-254-1570

Test Equipment, Closed Circuit TV-Also See Television Systems & Equipment, Closed-Circuit-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
Anritsu, Oakland, NJ 07436 ..... 201-337-1111;800-255-7234
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
Dotronix, New Brighton, MN 55112 612-633-1742
ElectroPhysics Corp., Nutley, NJ 07110 201-667-0170
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Microvision Corp., Campbell, CA 95008 408-374-3158
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
§ Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361
§ Wavetek RF Products, Inc., (Formerly Wavetek Indiana, Inc.), Indianapolis, IN 46203-6109 317-788-9351

Test Equipment, Color TV-2900

§ Leader Instruments Corp., Hauppauge, NY 11788-3694, 516-231-6900;1-800-645-5104 ..... D•1287
§† Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... D•1315
Anritsu, Oakland, NJ 07436 ..... 201-337-1111;800-255-7234
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
† Cohu, Inc., Elctrns. Div., San Diego, CA 92123 619-277-6700
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Microvision Corp., Campbell, CA 95008 408-374-3158
Network Technologies Inc., Chagrin Falls, OH 44022 216-543-1646
§ Philips ECG, North American Philips Co., Williamsport, PA 17701 717-323-4691
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
§ Telemet, Geotel, Inc., Hauppauge, NY 11788 516-436-7260
Television Equipment Assocs., So. Salem, NY 10590-0393 914-763-8893
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361

Test Equipment, Data Communications, Monitors & Recorders-2900

† Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218-1219
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1198
§ ACR Systems Inc., Surrey,B.C., CANADA V3W 4N8 604-591-1128
Anacom, Anaheim, CA 92805-6235 714-774-8080
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astro-Med, Inc., W. Warwick, RI 02893 401-828-4000
Ballard Technology, Seattle, WA 98117 206-782-8704
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
§ Contact East, N. Andover, MA 01845 508-682-2000
† Data Check Corporation, San Diego, CA 92126 619-578-0101
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
Electro Rent Corp., Van Nuys, CA 91411 818-787-2100
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
3M Dynatel Systems Division, Austin, TX 78769-2963 ... 512-984-3412;800-426-8688
3M Photodyne Products. Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Microvision Corp., Campbell, CA 95008 408-374-3158
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
§ Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787

Test Equipment, Mechanical Impedance-2900

† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
† PCB Piezotronics, Depew, NY 14043-2495 716-684-0001
Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
† Wilcoxon Research, Rockville, MD 20850 301-330-8811

Test Equipment, Memory Systems, Disk-2900

† Sunrise Electronics, Inc., Glendora, CA 91740, 818-914-1926 ..... D•1329
§ Adaptec, Inc., Milpitas, CA 95035 408-945-8600
§ Applied Data Communications, Tustin, CA 92680 714-731-9000
† AVA Instrumentation, Inc., Ben Lomond, CA 95005 408-336-2281
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Peer Protocols, Costa Mesa, CA 92626 714-662-1929
Peripherals, Costa Mesa, CA 92626 ..... 714-540-4925;800-468-6888
Pioneer Magnetics, Santa Monica, CA 90404 213-829-6751
Pioneer Research, Inc., Santa Monica, CA 90404 213-829-6751
Simulex Corporation, Tustin, CA 92680 714-730-1500
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Test Equipment, Motor-2900

Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216,2221
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Electric Device, Canfield, OH 44406 216-533-1111
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
Motortest, Inc., Columbus, OH 43229 614-882-7821
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
Third Wave Instruments, Inc., Burlington, MA 01803 617-273-0779
Vibrac, Amherst, NH 03031 603-882-6777

Test Equipment, Rental & Lease - Also See Services, Electrical Measurement & Test-2900

Cirris Systems Corp., Salt Lake City, UT 84119, 801-973-4600;800-441-9910 ..... D•1235
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Cal-Scope, Exceltron Inc., Sunnyvale, CA 94086 ..... 408-730-4573; 1-800-828-3547
Continental Resources, Inc, Test Instruments Div., Bedford, MA 01730 ... 617-275-0850; 800-937-4688
Φ# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
Φ Fastek Test Systems, Div. of International Fastek Corp., Vista, CA 92083 619-598-9990
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409

† Hayes Instrument Service Inc., Billercia, MA 01821 508-663-4800
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Φ Julie Research Labs., New York, NY 10001 212-633-6625
† Leasametric, Inc., Foster City, CA 94404 800-553-2255
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
Φ Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
§ Prologic Systems, Broomfield, CO 80020 303-460-0103
†Φ Quantum Data Inc., Elgin, IL 60123 708-888-0450
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
† Step Engineering, Sunnyvale, CA 94088 408-733-7837
Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311 305-587-5577
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123

Test Equipment, RFI Susceptibility-2900

† Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1219
Instruments for Industry, Inc., Ronkonkoma, NY 11779, 516-467-8400 ... D•1012
† Jennings, San Jose, CA 95122-2696, 408-292-4025 ..... D•1274
Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Compliance Design Inc., Boxboro, MA 01719 508-264-4668
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
§ Electro-Metrics, Incorporated, A Penril Corp., Amsterdam, NY 12010 518-843-2600
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
† E-Systems, Melpar Div., Falls Church, VA 22046 703-560-5000
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Lake Shore Cryotronics, Inc., Westerville, OH 43081 614-891-2243
Lectronic Research Labs., Inc., Camden, NJ 08104 609-541-4200
† LogiMetrics, Plainview, NY 11803 516-349-1700
† Loral Microwave Narda, Hauppauge, NY 11788 516-231-1700
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
Solar Electronics Co., A. T. Parker, Inc., Hollywood, CA 90038 213-462-0806
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412

Test Fixtures, ATE-2900

Elastomeric Technologies, Inc., Hatboro, PA 19040, 215-672-0787;215-672-4741 ..... C•1357
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1728
† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473 .... C•1682
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Sunrise Electronics, Inc., Glendora, CA 91740, 818-914-1926 ..... D•1329
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§ Augat/Pylon Co., Inc., Attleboro Falls, MA 02763 508-699-9800
Axis Corporation, San Diego, CA 92123 619-560-7737
Cablescan, Inc., Subsidiary of Eubanks Engrg. Co., Orange, CA 92665 ... 714-998-1961
Cabletest International Inc., Markham, Ont., CANADA L39 3W9 416-475-2607
† Cabletest Products Co., Malden, MA 02148 617-665-2932
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Emulation Technology, Inc., Santa Clara, CA 95051 408-982-0660
§ Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Fastek Test Systems, Div. of International Fastek Corp., Vista, CA 92083 619-598-9990
Green Engineering, Melrose, MA 02176 617-665-8994
§ In.Circuit Test, Clifton Park, NY 12065 518-877-7042
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
LTX Corporation, Westwood, MA 02090 617-461-1000
Markenrich Corp., Duarte, CA 91010 818-359-9190
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
† Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
† The Test Grp., Inc., San Diego, CA 92121 619-450-1722
Tidewater Technological, Inc., Newport News, VA 23602 804-874-2800
§ T T I Testron Inc., Woonsocket, RI 02895 401-762-9100
† Virgina Panel Corporation, Waynesboro, VA 22980 703-949-8376
§ "World" Test Systems, Inc., Waynesboro, VA 22980 703-949-6753
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Sets, Communications-1900

† ADC Telecommunications, Inc., Minneapolis, MN 55435, 612-835-6800 ..... C•1157,1159
Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1218-1219
GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1072
Amber Electric Design, St. Laurent, PQ., CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
§ Anacom, Anaheim, CA 92805-6235 714-774-8080
§ AT&T Network Systems,Network Cable Sys. Div., Morristown, NJ 07962 ..... 1-800-344-0223, Ext. 1027
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
† Aydin Corp., Horsham, PA 19044 215-657-7510
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§† Canoga-Perkins Corp., Chatsworth, CA 91311 818-718-6300
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ E.I.L. Instruments, Inc., Sparks, MD 21152 301-771-4800
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
Φ Genstar Rental Electronics, Inc., Woodland Hills, CA 91367 ..... 800-331-3440 (in CA); 800-227-8409
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
† INTELCO, Acton, MA 01720 508-264-4485
§ Jensen Tools, Inc., Axia, Inc., Phoenix, AZ 85044 602-968-6241
3M Dynatel Systems Division, Austin, TX 78769-2963 ... 512-984-3412;800-426-8688
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
New Wave Instruments, Provo, UT 84604 801-373-4909
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Test Systems, Automatic DC-2900

Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1231
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•2211
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
† Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
Axis Corporation, San Diego, CA 92123 619-560-7737
Carco Electronics, Menlo Pk, CA 94025-1106 415-321-8174
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Green Engineering, Melrose, MA 02176 617-665-8994
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Julie Research Labs., New York, NY 10001 212-633-6625
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
§† Lorlin Test Systems, Wakefield, MA 01867 617-245-9044
LTX Corporation, Westwood, MA 02090 617-461-1000
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
Meissner Industries, Dover, NJ 07801 201-366-1700
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Rapid Systems Inc., Seattle, WA 98103 206-547-8311
Swan Associates, New Haven, CT 06534 203-387-3917
System General Corporation, Milpitas, CA 95035 408-263-6667
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ U. E. Systems, Inc., Elmsford, NY 10523 ..... 914-592-1220;800-223-1325
Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Systems, Board-2900

† E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473 .... C•1682
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•2211
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ McKenzie Technology, Fremont, CA 94538, 415-651-2700 ..... C•1467
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
† Sunrise Electronics, Inc., Glendora, CA 91740, 818-914-1926 ..... D•1329
Applied Data Systems, Baltimore, MD 21202 ..... 800-541-2003;410-576-0335
Axis Corporation, San Diego, CA 92123 619-560-7737
B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
Cabletest Products Co., Malden, MA 02148 617-665-2932
C & C Technology Inc., West Chicago, IL 60185 708-231-0015
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§† Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Fastek Test Systems, Div. of International Fastek Corp., Vista, CA 92083 619-598-9990
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555

Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
Swan Associates, New Haven, CT 06534 203-387-3917
Tekworks, Inc., Morristown, NJ 07960 201-540-1096
Testronics, Richardson, TX 75081 214-238-8378
Total Power International, Inc., Lowell, MA 01850 508-453-7272
Trio-Tech International, San Fernando, CA 91340 818-365-9200
§ Vu-Data Corporation, San Diego, CA 92121 619-452-7670
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Systems, Component-2900

† Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1215
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1225
Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1231
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275,1277
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•2211
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216
Panel Components Corp., Santa Rosa, CA 95406, 707-523-0600 ..... C•1492, D•2222
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Torotron Corp., Mt. Vernon, NY 10550, 914-664-2050 ..... D•1330
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
Axis Corporation, San Diego, CA 92123 619-560-7737
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Exatron Automatic Test Equip., San Jose, CA 95111 ..... 408-629-7600;800-EXA-TRON
Fastek Test Systems, Div. of International Fastek Corp., Vista, CA 92083 619-598-9990
Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ In.Circuit Test, Clifton Park, NY 12065 518-877-7042
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
§† Lorlin Test Systems, Wakefield, MA 01867 617-245-9044
LTX Corporation, Westwood, MA 02090 617-461-1000
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
§ Phenix Technologies, Accident, MD 21520 301-746-8118
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
§ H H Smith, NT-T Inc., Meadville, PA 16335 814-724-6440
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Swan Associates, New Haven, CT 06534 203-387-3917
System General Corporation, Milpitas, CA 95035 408-263-6667
Testronics, Richardson, TX 75081 214-238-8378
† VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Systems, Computer Controlled (Automatic)-2900

Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1232
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
† Hopper Electronics, Phoenix, AZ 85021, 602-870-3093 ..... D•1175
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1270
§ Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1278,1873,2211
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
MiNT Systems Corporation, Milpitas, CA 95035-6262, 408-262-7171 ..... D•1295,1412-1413
NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Orion Instruments, Inc., Menlo Park, CA 94025, 415-327-8800;800-767-4666 ..... D•1309
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§† Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... D•1315
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
† Sunrise Electronics, Inc., Glendora, CA 91740, 818-914-1926 ..... D•1329
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1198
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Anacom, Anaheim, CA 92805-6235 714-774-8080
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
§ Applied Data Communications, Tustin, CA 92680 714-731-9000
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Astrosystems, Lake Success, NY 11042 516-328-1600
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
† Atec, Inc., Houston, TX 77055 713-468-7971
§ Audio Precision, Inc., Beaverton, OR 97075 503-627-0832
# Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
Axis Corporation, San Diego, CA 92123 619-560-7737
§† Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
† Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456
Carco Electronics, Menlo Pk, CA 94025-1106 415-321-8174
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
Data Engineering, Inc., Margate, FL 33063-3206 305-971-0400
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Dynage/Controls, Inc., Canistota, SD 57012 605-296-3487
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
† Electronic Systems Division, Boeing Defense & Space Grp., Seattle, WA 98124-2499 206-657-7474
Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Green Engineering, Melrose, MA 02176 617-665-8994
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
† Hoffman Engineering Corp., Stamford, CT 06902 203-325-8933
† Howell Instruments, Ft. Worth, TX 76107 817-336-7411
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
† Infrared Industries, Inc., Orlando, FL 32826 407-282-7700
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§# Instrumentation Services, Inc., Minneapolis, MN 55427 612-544-8916
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Keithley MetraByte, Taunton, MA 02780 508-880-3000
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
KineticSystems, Lockport, IL 60441 815-838-0005
† LogiMetrics, Plainview, NY 11803 516-349-1700
§† Lorlin Test Systems, Wakefield, MA 01867 617-245-9044
LTX Corporation, Westwood, MA 02090 617-461-1000
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
Maxus Electronic Corp., Boulder, CO 80301 303-447-1226
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Meissner Industries, Dover, NJ 07801 201-366-1700
Microvision Corp., Campbell, CA 95008 408-374-3158
† Microwave Design Svcs., Inc., Ft. Walton Beach, FL 32548 904-664-1234
MTS Systems, Minneapolis, MN 55424 612-937-4000
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
† Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
§ Pulse Instruments Co., Torrance, CA 90502 213-515-5330
§ Quality Automation, Inc., Anaheim, CA 92805 714-491-8535
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
Sensor Corp., Scottdale, PA 15683 412-887-4080
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
System General Corporation, Milpitas, CA 95035 408-263-6667
Techrand Corp. of America, Muskegon, MI 49444 616-798-2930
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Texas Instrs., Information Technlg. Grp., Dallas, TX 75380-9063 1-800-527-3500
Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
Vektrex Electronic Systems, Inc., San Diego, CA 92126 619-578-6787
Vu-Data Corporation, San Diego, CA 92121 619-452-7670
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000
§ "World" Test Systems, Inc., Waynesboro, VA 22980 703-949-6753
Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Systems, Functional-2900

† Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1215
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Analytic Instruments Corporation, Dallas, TX 75354 214-357-3882
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
Axis Corporation, San Diego, CA 92123 619-560-7737

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
† Hancock Electronics Corp., Hingham, MA 02043 617-740-4190
HILEVEL Technology, Irvine, CA 92718 714-727-2100
† Hoffman Engineering Corp., Stamford, CT 06902 203-325-8933
§ In.Circuit Test, Clifton Park, NY 12065 518-877-7042
Innovatek Microsystems, Inc., Millerton, NY 12546-9720 914-373-9003
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Interface Technology, Dynatech Corp., Glendora, CA 91740 818-914-2741
Kenmar Manufacturing Services, Kenmar Business Groups, Inc., Raleigh, NC 27604 919-876-6049
LTX Corporation, Westwood, MA 02090 617-461-1000
Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449 805-581-3950
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
Reliability, Incorporated, Houston, TX 77218 713-492-0550
† Russtech Engineering Company, Inc., Mission Viejo, CA 92691 714-472-0880
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
System General Corporation, Milpitas, CA 95035 408-263-6667
Vu-Data Corporation, San Diego, CA 92121 619-452-7670
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Systems, Hall Effect-2900

Keithley Instrs., Cleveland, OH 44139 800-552-1115
Midamerica Design Service, Spirit of America Corp., Fort Wayne, IN 46818 219-489-2511
§ Walker Scientific, Worcester, MA 01606 ... 508-852-3674;508-853-3232;800-962-4638

Test Systems, IC-2900

† Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1215
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1225
Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Axis Corporation, San Diego, CA 92123 619-560-7737
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Exatron Automatic Test Equip., San Jose, CA 95111 .... 408-629-7600;800-EXA-TRON
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
LTX Corporation, Westwood, MA 02090 617-461-1000
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
§ Quality Automation, Inc., Anaheim, CA 92805 714-491-8535
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
System General Corporation, Milpitas, CA 95035 408-263-6667
Tekworks, Inc., Morristown, NJ 07960 201-540-1096
Testronics, Richardson, TX 75081 214-238-8378
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Test Systems, Thermal Stress-2550

Sun Electronic Systems, Inc., Ft. Lauderdale, FL 33311, 305-587-5577 ... D•1202
Axis Corporation, San Diego, CA 92123 619-560-7737
§ Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071

Test Systems, Ultrasonic, Computer Controlled-2900

§ Contaq Technologies Corp., Bristol, VT 05443, 802-453-3332 ..... B•1889
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Matec Instruments, Inc., Hopkinton, MA 01748 508-435-9039
Systems Research Laborotories, Arvin/Calspan, Dayton, OH 45440 513-426-6000
Ultran Laboratories, State College, PA 16801 814-238-9083

Test Systems, VLSI & Memory-2900

† Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
# Equipment Remarketing Company, Boston Financial & Equity Corporation, Boston, MA 02215 617-267-8600
HILEVEL Technology, Irvine, CA 92718 714-727-2100
LTX Corporation, Westwood, MA 02090 617-461-1000
§ Prologic Systems, Broomfield, CO 80020 303-460-0103
Reliability, Incorporated, Houston, TX 77218 713-492-0550
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
System General Corporation, Milpitas, CA 95035 408-263-6667
† Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Testers, Armature-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Phenix Technologies, Accident, MD 21520 301-746-8118

Testers, Battery-2900

Alexander Manufacturing Company, Mason City, IA 50401, 800-247-1821;515-423-8955 ..... D•1430
Energy Systems, Vancouver, WA 98682, 206-896-8310 ..... D•1247
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ Shurite Meters, A Prime Technology Co., North Branford, CT 06471, 203-481-5721 ..... D•1373
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
Alexander Batteries, New Product/OEM Divison, San Diego, CA 92198 619-480-4445
† American Monarch, Minneapolis, MN 55421 612-788-9161
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
† Christie Electric Corp., Gardena, CA 90248 213-715-1402
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
EMICO Inc., Dublin, PA 18917 215-249-9330
Exide Corporation, Reading, PA 19601 215-378-0500
§ GN National Electric Inc., Walnut, CA 91789 ..... 714-598-1919;714-598-1337; 800-321-1266
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Maccor, Inc., Tulsa, OK 74107 918-446-1874
† NCE:National Custom Enterprises, Inc., Burnsville, MN 55337-2559 612-890-1360
Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
† Q.V.S., Inc., East Orange, NJ 07017 201-673-3996
§ Schauer Manufacturing, Cincinnati, OH 45242 513-791-3030
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Xenotronix Inc., Valencia, CA 91355 805-257-4793

Testers, Bit Rate-2900

† Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
Loral Data Systems, Sarasota, FL 34230 813-371-0811
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Testers, Burn-in, Aging-2550

Elastomeric Technologies, Inc., Hatboro, PA 19040, 215-672-0787;215-672-4741 ..... C•1357
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1278,2211
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2218
Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
† Artronics Corporation, Portsmouth, NH 03801 603-433-3111
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
Axis Corporation, San Diego, CA 92123 619-560-7737
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Delta Design, San Diego, CA 92123-1111 619-292-5000
§† Despatch Industries, Minneapolis, MN 55418 612-781-5363
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714 714-474-3900
§ Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
§ Reliability, Incorporated, Houston, TX 77218 713-492-0550
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
† Trio-Tech International, San Fernando, CA 91340 818-365-9200

Testers, Cable-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1230-1233
Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Cirris Systems Corp., Salt Lake City, UT 84119, 801-973-4600;800-441-9910 ..... D•1235

† **E.M.S., Div. of Sandberg Industries, Tustin, CA 92680, 714-669-9473 .... C•1682**
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1254,1256
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§ **Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313**
§ **ROD-L Electronics, Inc., Menlo Park, CA 94025, 415-322-0711;1-800-548-6305 ..... D•1316-1317**
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
Allen Technology, Sutton, NE 68979 402-773-5285
§ Alpha Wire Corp., Elizabeth, NJ 07207-0711 908-925-8000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
A-Systems Inc., Charlottesville, VA 22901 804-295-7200
§ AT&T Network Systems,Network Cable Sys. Div., Morristown, NJ 07962 ..... 1-800-344-0223, Ext. 1027
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Beta Automation, Inc., Newbury Park, CA 91320 805-499-5785
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cablescan, Inc., Subsidiary of Eubanks Engrg. Co., Orange, CA 92665 ... 714-998-1961
Cabletest Products Co., Malden, MA 02148 617-665-2932
§ Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
§ Datatran Corp., Denver, CO 80223 303-778-0870
Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Fastek Test Systems, Div. of International Fastek Corp., Vista, CA 92083 619-598-9990
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
† Glenair Inc., Glendale, CA 91201-2497 818-247-6000
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
§ Harris Corp., Dracon Div., Camarillo, CA 93012 805-987-9511
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
§ Paladin Corp., Newbury Park, CA 91320 805-499-0318
Phenix Technologies, Accident, MD 21520 301-746-8118
Ren Electronics Corporation, C.C.G., An Insico Co., S. Hadley, MA 01075 413-536-1800
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Testronics, Richardson, TX 75081 214-238-8378
Texscan Instruments, Texscan Corporation, Indianapolis, IN 46226 317-545-4196
§ Thomas & Betts Corporation, Electronics Div., Greenville, SC 29616-2401 803-676-2900
Torotron Corp., Mt. Vernon, NY 10550 914-664-2050
Trilithic, Inc., Indianapolis, IN 46236 800-344-2412
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
Universal Voltronics Corp, Thermedics Inc./ThermoEletron Corp., Mt. Kisco, NY 10549 914-241-1300
Vann Instruments, Albuquerque, NM 87106 505-265-2498

Testers, Capacitor-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ **Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313**
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hilton Industries, Inc., Subsidiary of Core Industries, Sarasota, FL 34232 813-371-2600
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
§ Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
§ Phenix Technologies, Accident, MD 21520 301-746-8118
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
§ PROTEK Inc., Norwood, NJ 07648 201-767-7242
RE Instruments Corp., Westlake, OH 44145 216-871-7617
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Telepacific Electronics Co., Inc., Pacific Vista Sys., Vista, CA 92083 619-598-6729
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811

Testers, Coil & Transformer-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... A•2230, D•1254-1255
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ **Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2207**
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Magnos, Hudson, MA 01749, 508-562-1173 ..... D•1291
§ **Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313**
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
Torotron Corp., Mt. Vernon, NY 10550, 914-664-2050 ..... D•1330
† **Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333**
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Atlantic Magnetics, Inc., Pompano Beach, FL 33069 305-979-7920
A/Z-Tech, Inc. R&D Lab, Indiana Institute of Technlg., Fort Wayne, IN 46803 219-422-5561
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ International Electro Magnetics, Inc., Palatine, IL 60067 708-358-4622
† Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
Pacific Power Source Corp., Huntington Bch., CA 92649 .. 714-898-2691;800-854-2433
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
Third Wave Instruments, Inc., Burlington, MA 01803 617-273-0779
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Wabash Magnetics, Wabash, IN 46992 219-563-2191

Testers, Communication Equipment (Automatic)-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1214-1215
Cabletest International Inc., Markham, Ont., CANADA L3G 3W9, 416-475-2607 ..... D•1233
§ **Marconi Instruments, Allendale, NJ 07401, 201-934-9050 ..... D•1292**
§ **Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313**
Amber Electric Design, St. Laurent, PQ,, CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Contact East, N. Andover, MA 01845 508-682-2000
CYTEC Corp., Penfield, NY 14526 ..... 716-381-4740;800-346-3117
§ Dataprobe, Englewood, NJ 07631 201-569-6464
† Dataproducts Corporation, Woodland Hills, CA 91367-2499 818-888-4014
Gandalf Data Inc., Gandalf Technologies Inc., Wheeling, IL 60090 ..... 708-541-6060; 800-GANDALF
Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† INTELCO, Acton, MA 01720 508-264-4485
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
3M Dynatel Systems Division, Austin, TX 78769-2963 ... 512-984-3412;800-426-8688
New Wave Instruments, Provo, UT 84604 801-373-4909
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Racal-Milgo, Sunrise, FL 33323-2899 ..... 305-846-1601;800-327-4440
† Rohde & Schwarz, Inc., Lanham, MD 20706 301-459-8800
† Schlumberger Instruments, Schlumberger Technologies, Burlington, MA 01803 617-229-4825
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
§ Team Systems, Div. of Toyo Spectrum, Santa Clara, CA 95051 408-720-8877
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550
Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Testers, Component Linearity-2900

Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1219
§ Contact East, N. Andover, MA 01845 508-682-2000
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Solatron Enterprises, Inglewood, CA 90302 213-678-4981
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Testronics, Richardson, TX 75081 214-238-8378
Venable Industries, Inc., Torrance, CA 90505 213-539-2522

Testers, Corona-2900

Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1254
§ **Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313**

§† Ansonics, Inc., Halfway, OR 97834 503-742-7475
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
†ΦU. E. Systems, Inc., Elmsford, NY 10523 ..... 914-592-1220;800-223-1325

Testers, CRT-2900

Del Elctrns. Corp., Mt. Vernon, NY 10550, 914-699-2000 ..... D•1701
Glassman High Voltage Inc., Whitehouse Sta., NJ 08889, 908-534-9007 .. D•1763
Quantum Data Inc., Elgin, IL 60123, 708-888-0450 ..... D•1315
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
† Hoffman Engineering Corp., Stamford, CT 06902 203-325-8933
Microvision Corp., Campbell, CA 95008 408-374-3158
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Visual Information Institute, Xenia, OH 45385-0033 513-376-4361

Testers, Diode-2900

Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1231
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Bermar Corp., Research Triangle Park, NC 27709 919-489-4316
§ Contact East, N. Andover, MA 01845 508-682-2000
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
§† Lorlin Test Systems, Wakefield, MA 01867 617-245-9044
Markenrich Corp., Duarte, CA 91010 818-359-9190
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
Meissner Industries, Dover, NJ 07801 201-366-1700
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Testronics, Richardson, TX 75081 214-238-8378
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Testers, Electron Beam-2900

Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808

Testers, Electrical Parameter-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264-1265
LEM U.S.A., Inc., Milwaukee, WI 53218, 414-353-0711 ..... B•1912-1913
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
Dranetz Technologies, Inc., Edison, NJ 08818-4019 908-287-3680
Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
Ohio Semitronics, Inc., Columbus, OH 43212 614-486-9561
Phenix Technologies, Accident, MD 21520 301-746-8118
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
† Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
System General Corporation, Milpitas, CA 95035 408-263-6667
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Testers, Encoder-2900

Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1198
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800
Teledyne Gurley, Troy, NY 12181 ..... 518-272-6300;800-759-1844

Testers, Fiber Optic-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1214
§ AT&T Network Systems,Network Cable Sys. Div., Morristown, NJ 07962 ..... 1-800-344-0223, Ext. 1027
Atlantic Scientific Corporation, Melbourne, FL 32901 1-800-544-4737
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cambridge Instruments, Inc., Optical Systems Division, Buffalo, NY 14240 716-891-3000
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
§ EXFO E.O. Engineering, Quebec City, Quebec, CANADA G1N 3Y2 418-683-0211
GTE Fiberoptic Products, Williamsport, PA 17701 ... 717-326-6591;1-800-FBR-OPTICS
† INTELCO, Acton, MA 01720 508-264-4485
§ Laser Precision Corp., Utica, NY 13502 315-797-4449
Litton Poly-Scientific, Div. of Litton Industries, Blacksburg, VA 24060-3100 ..... 800-336-5917;703-953-4751
§ Macrodyne Inc., Clifton Pk., NY 12065 518-383-3800
† Math Assocs., Westbury, NY 11590 516-334-6800
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
† 3M Private Network Products, 3M, Austin, TX 78769-2963 ..... 512-984-1800; 800-745-7459
Omega Engineering, Stamford, CT 06907 800-826-6342
Photon, Inc., Santa Clara, CA 95054-3432 408-492-9449
§† Radiant Communications Corp., South Plainfield, NJ 07080 908-757-7444
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550
† York Technology, Inc., Burbank, CA 91502 818-955-8927

Testers, Heat, Manual-2550

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
† Thermonics, Inc., Santa Clara, CA 95054 408-496-6838

Testers, Insulation Breakdown-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1230-1233
Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Cirris Systems Corp., Salt Lake City, UT 84119, 801-973-4600;800-441-9910 ..... D•1235
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 ..... D•1238-1239
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1254-1256
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1278
† Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1917
§ PolyPhaser Corporation, Minden, NV 89423-9000, 702-782-2511;800-325-7170 ..... B•1385
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ ROD-L Electronics, Inc., Menlo Park, CA 94025, 415-322-0711;1-800-548-6305 ..... D•1317
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
† Torotron Corp., Mt. Vernon, NY 10550, 914-664-2050 ..... D•1330
Allen Technology, Sutton, NE 68979 402-773-5285
A/Z-Tech, Inc. R&D Lab, Indiana Institute of Technlg., Fort Wayne, IN 46803 219-422-5561
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cabletest Products Co., Malden, MA 02148 617-665-2932
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
† Jennings, San Jose, CA 95122-2696 408-292-4025
Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
† Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
Phenix Technologies, Accident, MD 21520 301-746-8118
† Plastic Capacitors, Inc., Chicago, IL 60639 312-489-2229
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Systems Testing, Inc., Santa Clara, CA 95052 408-727-0100
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811

Testers, Insulation Resistance-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Cabletest International Inc., Markham, Ont., CANADA L39 3W9, 416-475-2607 ..... D•1230-1233
Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Cirris Systems Corp., Salt Lake City, UT 84119, 801-973-4600;800-441-9910 ..... D•1235
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 ..... D•1238-1239
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1254-1256
Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-8784 ..... D•1278
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ ROD-L Electronics, Inc., Menlo Park, CA 94025, 415-322-0711;1-800-548-6305 ..... D•1316-1317
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ C.G. Instruments Corp., Electromatic Controls Corp., Hoffman Estates, IL 60195 708-882-5757
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434

† dataCon, Inc., Interconnect Sub-Systems, Burlington, MA 01803 617-273-5800
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
§ Kistler Instruments Corp., Amherst, NY 14221-2171 716-691-5100
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
Phenix Technologies, Accident, MD 21520 301-746-8118
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Systems Testing, Inc., Santa Clara, CA 95052 408-727-0100
Tettex Instruments, Inc., Fairview Village, PA 19409-0281 215-539-6050

Testers, Integrated Circuit (Automatic)-2900

† Advantest America, Inc., Lincolnshire, IL 60069 708-634-2552
Advantest Corporation, Tokyo 163, JAPAN 03-3342-7500
† Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Exatron Automatic Test Equip., San Jose, CA 95111 .... 408-629-7600;800-EXA-TRON
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Reliability, Incorporated, Houston, TX 77218 713-492-0550
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
System General Corporation, Milpitas, CA 95035 408-263-6667
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Testronics, Richardson, TX 75081 214-238-8378
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141
Xitron Technologies, San Diego, CA 92121 619-458-9852

Testers, Integrated Circuit (Manual)-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635, 312-889-1448 ..... D•1225
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Contact East, N. Andover, MA 01845 508-682-2000
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Exatron Automatic Test Equip., San Jose, CA 95111 .... 408-629-7600;800-EXA-TRON
§† E-Z Hook, Tektest Inc., Arcadia, CA 91006 818-446-6175
GGB Industries, Inc., Picoprobe Division, Naples, FL 33941 813-643-4400
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Telectro Systems Corp., Corona, NY 11368 718-651-8900
Testronics, Richardson, TX 75081 214-238-8378
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
Xitron Technologies, San Diego, CA 92121 619-458-9852

Testers, Interface-2900

L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124
§ Anacom, Anaheim, CA 92805-6235 714-774-8080
Cablescan, Inc., Subsidiary of Eubanks Engrg. Co., Orange, CA 92665 ... 714-998-1961
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
§ Datatran Corp., Denver, CO 80223 303-778-0870
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
§ Electro Standards Lab., Inc., Data Communications Products Div., Cranston, RI 02921 401-943-1164
Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
§ Multi-Tech Systems, Inc., Mounds View, MN 55112 ..... 612-785-3500;800-328-9717
Nu Data, Inc., Little Silver, NJ 07739 908-842-5757
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Simulex Corporation, Tustin, CA 92680 714-730-1500
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Testers, LED & LED Arrays-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1215
EG&G Gamma Scientific, Div. of EG&G Inc., San Diego, CA 92123 619-279-8034
Hoffman Engineering Corp., Stamford, CT 06902 203-325-8933
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
Microvision Corp., Campbell, CA 95008 408-374-3158
Photon, Inc., Santa Clara, CA 95054-3432 408-492-9449
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Testronics, Richardson, TX 75081 214-238-8378
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811

Testers, Life, Component-2550

Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
† Tenney Engineering, Union, NJ 07083, 908-686-7870 ..... D•1205
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Solatron Enterprises, Inglewood, CA 90302 213-678-4981

Testers, Logic Card-2900

§† Augat Alcoswitch, Augat Inc., N. Andover, MA 01845 508-685-4371
Data Environment, Inc., Beaverton, OR 97291 503-643-4292
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
HILEVEL Technology, Irvine, CA 92718 714-727-2100
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Zehntel Systems, Div.of Teradyne Inc., Walnut Creek, CA 94598 415-932-6900

Testers, Loopback-2900

Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
§ Telebyte Technology, Inc., Greenlawn, NY 11740 ..... 516-423-3232;800-835-3298
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Testers, Magnetic Core-2900

Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Magnetic Instrumentation, Indianapolis, IN 46226, 317-545-2102 ..... D•1290
Magnos, Hudson, MA 01749, 508-562-1173 ..... D•1291
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202

Testers, Magnetic Head Media-2900

§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313

Testers, Magnetic Medium-2900

Bell, F. W., Inc., Orlando, FL 32807, 407-678-6900 ..... D•1226
Magnetic Instrumentation, Indianapolis, IN 46226, 317-545-2102 ..... D•1290
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
§ Applied Data Communications, Tustin, CA 92680 714-731-9000
§ MBD International, Dallas, TX 75287-0577 214-788-5277
Q-Card, Inc., Owings Mills, MD 21117-1634 410-581-0112
Third Wave Instruments, Inc., Burlington, MA 01803 617-273-0779

Testers, Magnetron-2900

Cober Electronics, Stamford, CT 06902 203-327-0003
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808

Testers, Material-2550

Magnos, Hudson, MA 01749, 508-562-1173 ..... D•1291
§ Walker Scientific, Worcester, MA 01606, 508-852-3674;508-853-3232;800-962-4638 ..... D•1337
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
§ Dillon, Weigh-Tronix, Inc., Fairmont, MN 56031 507-238-4461
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
LDJ Incorporated, Troy, MI 48099-0219 313-528-2202
Magnetic Instrumentation, Indianapolis, IN 46226 317-545-2102
MTS Systems, Minneapolis, MN 55424 612-937-4000
§ Pacific Transducer Corp., Los Angeles, CA 90064-1482 213-478-1134
Panametrics, Waltham, MA 02154-3497 617-899-2740
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000

Testers, Memory Board-2900

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
Reliability, Incorporated, Houston, TX 77218 713-492-0550
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
Tekworks, Inc., Morristown, NJ 07960 201-540-1096

Testers, Meter-2900

Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1243
Gralex Industries, Norwood, NJ 07648, 800-486-4499 ..... D•1348
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264-1265
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2205
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
† EG & G Flow Technology, Inc., Phoenix, AZ 85072 602-437-1315
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700

Julie Research Labs., New York, NY 10001 212-633-6625
3M Photodyne Products, Dynatel Systerms Division, Camarillo, CA 93010 ..... 805-388-8378;800-426-8688
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
Rotek Instrument Corp., Waltham, MA 02254 617-899-4611
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Testers, Microwave-2900

Anritsu, Oakland, NJ 07436, 201-337-1111;800-255-7234 ..... D•1219
† General Microwave Corporation, Amityville, NY 11701, 516-226-8900 .... D•1251
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Carco Electronics, Menlo Pk, CA 94025-1106 415-321-8174
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ Eaton Corp., Electronic Instrument Div., Los Angeles, CA 90066 213-822-3061
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Lucas Weinschel, Gaithersburg, MD 20884-6001 301-948-3434
§ Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Mitec Electronics, Pointe Claire, QUEBEC, CANADA H9R 3X3 514-694-6666
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
† Republic Electronics Co., Hauppauge, NY 11788 516-273-9800
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
Teleplex, Inc., Alford Division, Woburn, MA 01801 617-935-8610
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300
§ Wiltron, Morgan Hill, CA 95037-2809 408-778-2000

Testers, Modem-2900

Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
§ Dataprobe, Englewood, NJ 07631 201-569-6464
§ Electrodata, Inc., Bedford Heights, OH 44128 216-663-3333
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
§ Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
Northeast Innovations, Inc., Concord, NH 03302 603-736-8260
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Testers, Motor-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2221
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
Torotron Corp., Mt. Vernon, NY 10550, 914-664-2050 ..... D•1330
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Hipotronics Inc., Brewster, NY 10509 914-279-8091
Motortest, Inc., Columbus, OH 43229 614-882-7821
Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
Phenix Technologies, Accident, MD 21520 301-746-8118
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
§† Staco Energy Products Co., Dayton, OH 45403 513-253-1191
§ Vaco Products, Chicago, IL 44139-3395 708-677-9500
Vibrac, Amherst, NH 03031 603-882-6777

Testers, Multibus-2025

Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 .. D•1238

Testers, PIND-2900

† Pind Testers Inc., Irvine, CA 92718 714-380-1551

Testers, Potentiometer-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Julie Research Labs., New York, NY 10001 212-633-6625
† Litton Potentiometer Div., Mt. Vernon, NY 10551 914-664-7733
Omega Engineering, Stamford, CT 06907 800-826-6342
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Solatron Enterprises, Inglewood, CA 90302 213-678-4981

Testers, Power Supply-2900

Astec America, Oceanside, CA 92054, 619-439-4200 ..... D•1606
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1243
Elgar Electronics Corporation, San Diego, CA 92121, 619-450-0085;800-733-5427 ..... D•1729,2191
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-6784 ..... D•1278,1873,2211
† NH Research, Incorporated Instrumentation Products Division, Irvine, CA 92714, 714-474-3900 ..... D•1299
† Pacific Power Source Corp., Huntington Bch., CA 92649, 714-898-2691;800-854-2433 ..... D•2216,2218,2221
Prodigit Electronics, Chatsworth, CA 91311, 818-341-6987 ..... D•2003
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Rantec Microwave & Elctrns., Inc., Los Osos, CA 93402, 805-528-5858 .. D•2021
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
† Transistor Devices, Inc., Randolph, NJ 07869, 201-361-6622 ..... D•1331
Acme Electric Corporation, Cuba, NY 14727 716-968-2400
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Astrosystems, Lake Success, NY 11042 516-328-1600
Axis Corporation, San Diego, CA 92123 619-560-7737
Bermar Corp., Research Triangle Park, NC 27709 919-489-4316
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
† Elgar/Intepro Systems, San Diego, CA 92121 ..... 619-458-0261;1-800-733-5427
Energy Systems, Vancouver, WA 98682 206-896-8310
† ETM Electromatic Inc, Newark, CA 94560 415-797-1100
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Green Engineering, Melrose, MA 02176 617-665-8994
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
§† Intepro Systems Inc., Billerica, MA 01821 508-663-7555
Julie Research Labs., New York, NY 10001 212-633-6625
NH Research, Irvine, CA 92714 714-474-3900
Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
† Pacific Electro Dynamics, Inc., Redmond, WA 98073-9745 206-881-1700
§ Pass & Seymour/Legrand, Pass & Seymour/Inc., Syracuse, NY 13221 315-468-6211
§ Power/Mate Corporation, San Diego, CA 92110 ..... 800-843-8544;619-299-3800
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Reliability, Incorporated, Houston, TX 77218 713-492-0550
Universal Voltronics Corp, Thermedics Inc./ThermoElctron Corp., Mt. Kisco, NY 10549 914-241-1300
Venable Industries, Inc., Torrance, CA 90505 213-539-2522
Xitron Technologies, San Diego, CA 92121 619-458-9852

Testers, Pulse Jitter-2900

† Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Testers, Relay-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Cabletest International Inc., Markham, Ont., CANADA L3S 3W9, 416-475-2607 ..... D•1231
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2205
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
Axis Corporation, San Diego, CA 92123 619-560-7737
† Babcock, Inc., Orange, CA 92667 714-633-3700
Coto Wabash, Kearney National Corporation, Providence, RI 02907 401-943-2686
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8 416-299-6666
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
† Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
Itronic-Fuchs Corp., Buford, GA 30518 404-945-3844
§ Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
† Markenrich Corp., Duarte, CA 91010 818-359-9190
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
† Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083 ..... 908-851-0644;800-367-5566
Solatron Enterprises, Inglewood, CA 90302 213-678-4981
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
Testronics, Richardson, TX 75081 214-238-8378
§ Tidewater Technological, Inc., Newport News, VA 23602 804-874-2800
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Testers, Resistivity-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1255-1256
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Shalltronix Corp., Selma, NC 27576, 919-965-6346 ..... D•1325
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
Alpha Metals, Jersey City, NJ 07304 201-434-6778
Andeen-Hagerling, Inc., Chagrin Falls, OH 44022 216-349-0370
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
Chauvin Arnoux, Chauvin Arnoux-France, Dover, NH 03820 603-749-6434
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
† Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
Julie Research Labs., New York, NY 10001 212-633-6625
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254

§ NRD Inc., Subsidiary of Mark IV Inds., Inc., Grand Island, NY 14072 716-773-7634
Omega Engineering, Stamford, CT 06907 800-826-6342
Rutherford Research, Rutherford, NJ 07070 201-933-2091
§ Spectrascan, Inc., Colorado Springs, CO 80907 719-599-9254
Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300

Testers, Resistor-2900

IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1272
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
§ Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Shalltronix Corp., Selma, NC 27576, 919-965-6346 ..... D•1325
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
Automated Production Concepts, Wayne, NJ 07470 201-831-8300
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cambridge Technology, Inc., Watertown, MA 02172 617-923-1181
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
Electro Scientific Industries, Inc. (ESI), Portland, OR 97229 503-641-4141
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
Meissner Industries, Dover, NJ 07801 201-366-1700
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
† Optimized Devices, Inc., Pleasantville, NY 10570 914-769-6100
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
RE Instruments Corp., Westlake, OH 44145 216-871-7617
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Transicoil Inc., Penn Airborne Products, Southampton, PA 18966 215-355-3400

Testers, ROM Devices-2900

§ Contact East, N. Andover, MA 01845 508-682-2000
§ Prologic Systems, Broomfield, CO 80020 303-460-0103
† Sunrise Electronics, Inc., Glendora, CA 91740 818-914-1926
System General Corporation, Milpitas, CA 95035 408-263-6667

Testers, Servo — See Analyzers, Servo (Vol. D)

Testers, Shock-2550

Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Blue M, A Unit of General Signal, Blue Island, IL 60406 708-385-9000
Cincinnati Sub-Zero Prods., Cincinnati, OH 45241 513-772-8810
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
Media Recovery Inc., Graham, TX 76046 ..... 800-527-9497;214-630-9625 (Texas)
MTS Systems, Minneapolis, MN 55424 612-937-4000
† Pind Testers Inc., Irvine, CA 92718 714-380-1551
R. C. Electronics Inc., Goleta, CA 93116 805-685-7770
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580

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Testers, Signal Tracing-2900

Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
L-Com Inc., N. Andover, MA 01845, 508-682-6936 ..... C•1424
§† Projects Unlimited, Dayton, OH 45414, 513-890-1918 ..... D•1050
Singer Data Products, Inc., Bensenville, IL 60106, 708-860-6500 ..... D•1111
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Computer Doctors, College Park, MD 20740 ..... 1-800-RAM-STAR;301-474-3095
Eclypse International Corp., Ontario, CA 91761-9925 714-947-8839
Everett/Charles Test Equipment, Inc., Pomona, CA 91767 714-621-9511
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Information Transfer Inc., Bloomfield, NY 14469 716-657-7074
§ MBD International, Dallas, TX 75287-0577 214-788-5277
Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
Probe-Rite, Inc., Santa Clara, CA 95052 408-727-0100
§ PTS Corporation, Bloomington, IN 47401 812-824-9331
§ Shattuck Industries, Ben Lomond, CA 95005 408-336-5145
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Systems Testing, Inc., Santa Clara, CA 95052 408-727-0100
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tekworks, Inc., Morristown, NJ 07960 201-540-1096
† Virgina Panel Corporation, Waynesboro, VA 22980 703-949-8376

Testers, Solderability-4100

§† Kester Solder Div., Litton Sys., Inc., Des Plaines, IL 60018, 708-297-1600 ..... C•1701
MWS Wire Industries, Westlake Village, CA 91362, 818-991-8553 ..... C•1772
† Caig Labs., Escondido, CA 92029-1431 619-743-7143
† Express Test Corp., Mountain View, CA 94043 415-968-8818
Hexacon Electric Co., Roselle Park, NJ 07204 908-245-6200
§ Hollis Automation, Esterline Corporation, Nashua, NH 03063 603-889-1121

Testers, Synchro/Resolver-2900

† Control Sciences, Inc., Chatsworth, CA 91311, 818-709-5510 ..... D•1152,1157
† Natel Engineering Co., Inc., Simi Valley, CA 93063-3449. 805-581-3950 .. D•1187
Transmagnetics, Farmingdale, NY 11735, 516-293-3100 ..... D•1198-1199
Astrosystems, Lake Success, NY 11042 516-328-1600
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
† Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
† Industrial Control Co., Rockledge, FL 32955 407-259-7105
International Machine & Tool Corp., Warwick, RI 02888 401-467-6905
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Northern Precision Labs., Fairfield, NJ 07006 201-227-4800

Testers, Thickness (all types)-2900

† Ocean Motions Co., Barrington, RI 02806, 401-246-1394 ..... B•1924
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
† Custom Sci. Instrs., Cedar Knolls, NJ 07927 201-538-8500
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§† Jonard Industries Corp., Tuckahoe, NY 10707 914-793-0700
Lucas Schaevitz, Pennsauken, NJ 08110-1489 609-662-8000
Moody Tools, Inc., E. Greenwich, RI 02818 401-885-0911
Nuclear Research Corp., Warrington, PA 18976 215-343-5900
Panametrics, Waltham, MA 02154-3497 617-899-2740
§ Sloan Technology Corporation, Veeco Instruments Inc., Santa Barbara, CA 93103 805-963-4431
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990

Testers, Thyristor-2900

LEM U.S.A., Inc., Milwaukee, WI 53218 414-353-0711
Lorlin Test Systems, Wakefield, MA 01867 617-245-9044
Markenrich Corp., Duarte, CA 91010 818-359-9190
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
Testronics, Richardson, TX 75081 214-238-8378

Testers, Tracking & Erosion Resistance (Insulation)-2900

Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
§ Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§† Guildline Instruments, Orlando, FL 32811-7335 407-423-8215
Hipotronics Inc., Brewster, NY 10509 914-279-8091

Testers, Transistor-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
Bermar Corp., Research Triangle Park, NC 27709 919-489-4316
§ Contact East, N. Andover, MA 01845 508-682-2000
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
Direct Conversion Technique, Inc., Des Plaines, IL 60016 708-827-2282
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§† Lorlin Test Systems, Wakefield, MA 01867 617-245-9044
Mastech, Inc., Lorlin Test Systems, Danbury, CT 06810 203-744-0096
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
QUAN-TECH, Stansbury Industries Inc., Flanders, NJ 07836 201-927-1766
† Sencore, Sioux Falls, SD 57107 ..... 1-800-736-2673; 605-339-0100
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Testronics, Richardson, TX 75081 214-238-8378
† Trio-Tech International, San Fernando, CA 91340 818-365-9200
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015

Testers, Transmission & Delay-2900

Advantest America, Inc., Lincolnshire, IL 60069, 708-634-2552 ..... D•1214-1215
Amber Electric Design, St. Laurent, PQ,, CANADA H4T 1V8 ..... 514-333-8748; 800-361-3697
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
Comstron A Div. of Aeroflex, Plainview, NY 11803 516-752-2351
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Marconi Instruments, Allendale, NJ 07401 201-934-9050
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
S Squared Electronics, formerly ComTech Systems, Inc., Valley Stream, NY 11581-2813 516-791-1175
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
† Telecommunications Techniques Corp., Germantown, MD 20876 301-353-1550

Testers, Tube-2900

§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808

Testers, Vibration-Also See Services, Environmental Test-2900

Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
Compact Power Company, Yorba Linda, CA 92686, 714-996-5826 ..... D•2183
§ Vibra-Metrics, Inc., Hamden, CT 06514, 203-288-6158;1-800-8-SENS-IT .. B•1957
Alpha-M Corp., Dallas, TX 75229 214-406-0424
American Hofmann Corp., Lynchburg, VA 24506 804-522-0300
APS Dynamics, Inc., Carlsbad, CA 92008 619-438-4848

ASC Systems, St. Clair Shores, MI 48080 313-882-1133
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Bently Nevada Corp., Minden, NV 89423 ..... 800-227-5514;702-782-3611
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
† Columbia Resch. Labs., Woodlyn, PA 19094 215-872-3900
§ Cyber Sys., Inc., Anaheim, CA 92806 ..... 714-722-2051;714-634-2800
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
§ Epic, Inc., New York, NY 10038 212-349-2470
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† Kistler Instruments Corp., Amherst, NY 14221-2171 716-691-5100
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
Metrix Instrument Co., Houston, TX 77043 713-461-2131
MTS Systems, Minneapolis, MN 55424 612-937-4000
Nicolet Instrument Corp., Test Instrument Division, Madison, WI 53711 .. 608-271-3333
† Pind Testers Inc., Irvine, CA 92718 714-380-1551
PMC/BETA Ltd. Partnership, Natick, MA 01760 617-237-6920
Schenck Pegasus Corp., Troy, MI 48083 313-689-9000
TEKTRONIX-Signal Analysis Unit, Campbell, CA 95008 408-374-6464
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929
Wilcoxon Research, Rockville, MD 20850 301-330-8811

Testers, Voltage-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Cabletest International Inc., Markham, Ont., CANADA L3Q 3W9, 416-475-2607 ..... D•1231
Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 ..... D•1238-1239
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1256
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1264
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
Ross Engineering Corp., Campbell, CA 95008, 408-377-4621 ..... D•1319
Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Torotron Corp., Mt. Vernon, NY 10550, 914-664-2050 ..... D•1330
§ AEMC Corporation, Boston, MA 02111 ..... 617-451-0227;800-343-1391
† Amprobe Instrument, Core Industries, Inc, Lynbrook, NY 11563 516-593-5600
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ B & K Precision, Maxtec International Corp, Chicago, IL 60635 312-889-1448
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
§† Calibron Instruments, Burton-Rogers Co., Waltham, MA 02154 617-894-6440
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
§ Contact East, N. Andover, MA 01845 508-682-2000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Ealing Electro-Optics, Holliston, MA 01746 ..... 508-429-8370;1-800-343-4912
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
Electrical Insulation Suppliers, Inc., Hillside, IL 60162 708-574-5400
Electro-Tech Systems, Inc., Glenside, PA 19038 215-887-2196
§ Emco Electronics, Lindenhurst, NY 11803 516-845-7080
EMICO Inc., Dublin, PA 18917 215-249-9330
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
† GreenLee Textron Inc.:Subsidiary of Textron Inc., Rockford, IL 61109 ... 815-397-7070
§ Ideal Industries, Sycamore, IL 60178 815-895-5181
† Jennings, San Jose, CA 95122-2696 408-292-4025
Jewell Electrical Instruments, Manchester, NH 03103 603-669-6400
Julie Research Labs., New York, NY 10001 212-633-6625
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
Lark Electronics, Inc., New York, NY 10040 212-569-0430
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ MBD International, Dallas, TX 75287-0577 214-788-5277
Mercer Electronics, Simpson Electric Co., Elgin, IL 60120 708-697-2260
† Micro Instrument Company, Escondido, CA 92029 619-746-2010
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
§ Phenix Technologies, Accident, MD 21520 301-746-8118
§ Simpson Electric Co., Elgin, IL 60120 708-697-2260
§ Speco Div., Components Specialties, Inc., Lindenhurst, NY 11757 ..... 516-957-8700; 800-645-5516
§ Sperry, A. W. Instruments, Smithtown, NY 11787 ..... 516-231-7050;800-645-5398
§ Square D Co., Palatine, IL 60067 708-397-2600
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
§ TIF Instruments, Inc., Miami, FL 33150 305-757-8811
§ Triplett Corporation, Bluffton, OH 45817-9987 419-358-5015
§ Vaco Products, Chicago, IL 44139-3395 708-677-9500
§ Western Electro-Mechanical Co., Inc., Oakland, CA 94607 415-452-1936

Testers, Voltage Breakdown-2900

Associated Research, Inc., Lake Bluff, IL 60044, 708-295-3312 ..... D•1220-1221
Bertan Assocs., Hicksville, NY 11801, 516-433-3110 ..... D•1631
Cabletest International Inc., Markham, Ont., CANADA L3Q 3W9, 416-475-2607 ..... D•1230-1233
Chatsworth Data Corporation, Chatsworth, CA 91311, 818-341-9200 .... D•1234
§ Criterion Instrs., Ltd., Scarborough, Ont., CAN M1P4W8, 416-299-6666 ..... D•1238-1239
Hipotronics Inc., Brewster, NY 10509, 914-279-8091 ..... D•1254,1256
† Kikusui International Corp., Torrance, CA 90503, 213-371-4662;800-545-6784 ..... D•1278,2211
Oram High Voltage, Dayton, TX 77535, 409-258-5553 ..... D•1917
§ PolyPhaser Corporation, Minden, NV 89423-9000, 702-782-2511;800-325-7170 ..... B•1385
§† Qualitec Technologies, Inc., Fremont, CA 94538, 415-498-1046 ..... D•1313
§ ROD-L Electronics, Inc., Menlo Park, CA 94025, 415-322-0711;1-800-548-6305 ..... D•1316-1317
Rosemount Analytical Inc., Cedar Grove, NJ 07009, 800-367-7242 ..... D•1318
§ Schaffner EMC, Inc. Instr. Div., Union, NJ 07083, 908-851-0644;800-367-5566 ..... D•1321
Slaughter Co., Ardmore, OK 73402, 405-223-4773 ..... D•1327
† Torotron Corp., Mt. Vernon, NY 10550, 914-664-2050 ..... D•1330
Allen Technology, Sutton, NE 68979 402-773-5285
§† Aydin Corporation (West), San Jose, CA 95119-1371 408-629-1100
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Biddle Instruments, Blue Bell, PA 19422 215-646-9200
Cabletest Products Co., Malden, MA 02148 617-665-2932
Computer Systems Technical Support, Anaheim, CA 92807 714-632-1300
Crompton Modutec, Manchester, NH 03103 ..... 603-669-5121;800-METERS-1
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
† Del Elctrns. Corp., Mt. Vernon, NY 10550 914-699-2000
Electrical Instrument Service, Mt. Vernon, NY 10550 914-699-9717
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
Glassman Europe Limited, Basingstoke, Hampshire RG24 0NE ..... (0256) 810808
Haefely Test Systems, E. Haefely & Co. LTD., Woodbridge, VA 22192 ... 703-494-1900
Hughes Aircraft Co., Industrial Products Division, Carlsbad, CA 92009 ... 619-931-3000
† Jennings, San Jose, CA 95122-2696 408-292-4025
Joslyn Electronic Systems, Goleta, CA 93116 ..... 800-752-8068; 805-968-3551
KeyTek Instrument Corp., Wilmington, MA 01887 508-658-0880
Methode Electronics, Inc., Chicago, IL 60656 708-867-9600
Phenix Technologies, Accident, MD 21520 301-746-8118
† Production Automation, Inc., Santa Clara, CA 95054 408-980-9880
Ross Engineering Corp., Campbell, CA 95008 408-377-4621
Rutherford Research, Rutherford, NJ 07070 201-933-2091
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ Vaco Products, Chicago, IL 44139-3395 708-677-9500

Thermal Platforms-2900

† AAVID Engineering, Inc., Laconia, NH 03247-0400, 603-528-3400 ..... C•1604
EG & G Wakefield Engineering, Wakefield, MA 01880, 617-245-5900 ..... C•1614
Environmental Stress Systems, Inc., Sonora, CA 95370, 209-928-4900 ... D•1200
Fujipoly, Inc., Cranford, NJ 07016, 908-272-3850 ..... C•1676,1690
Sigma Systems Corp., San Diego, CA 92116, 619-283-3193 ..... D•1201
† Thermacore Inc., Lancaster, PA 17601, 717-569-6551 ..... C•1666
† FTS Systems, Inc., Stone Ridge, NY 12484 914-687-0071
† Langley:Fleet Aerospace, Inc., San Diego, CA 92112 619-264-3181
† Lytron Incorporated, Woburn, MA 01801 617-933-7300
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Noren Products Inc., Menlo Pk, CA 94025 415-322-9500
Power Devices Inc., Laguna Hills, CA 92653 714-582-6712
† Rush Enterprises Inc.:A Heico Company, Hudson, NH 03051 603-886-9460
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Temptronic Corporation, Newton, MA 02158 617-969-2501
VA-Tran Systems Inc., Chula Vista, CA 91911 619-423-4555

Thermocouple Interfaces for Personal Computers-2000

Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... B•1945, D•1101,1191,1422
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1399
Action Instruments, San Diego, CA 92123 619-279-5726
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
§ Beckman Industrial Corp., An Affiliate of Emerson Elec. Co., San Diego, CA 92123-1898 619-495-3200
# Biomation Instruments, Almonte K0A1A0 613-256-2821
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
§ Columbus Instruments, Columbus, OH 43204 614-488-6176
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Dianachart Inc., Rockaway, NJ 07866 201-625-2299
§ duTec, Inc., Jackson, MI 49204-0964 800-248-1632
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
§Φ Logic Beach Inc., La Mesa, CA 91941 619-698-3300
§ Sensoray Corp., Fremont, CA 94538 415-657-7290
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
Strawberry Tree, Inc., Sunnyvale, CA 94086 408-736-8800
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Thermographs-2900

B-G Instruments, Inc., Vashon, WA 98070, 206-567-5000 ..... D•1081
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§† Onset Computer Corp., N. Falmouth, MA 02556 508-563-9000
§ Pacific Transducer Corp., Los Angeles, CA 90064-1482 213-478-1134
§ S. F. Products Corporation, Chester, NJ 07930 201-271-4009
§† UTI Instruments Co., San Jose, CA 95131 408-428-9400

Thermometers, Microscopic, Infrared-2900

§Φ Capintec Instruments, Ramsey, NJ 07446 201-825-9500
§ Elan Technical Corp., Fairfield, CT 06430 203-335-2115
† Everest Interscience, Inc., Fullerton, CA 92634-3640 800-422-4342
§ Land Infrared, Land Instruments Intl. Inc., Bristol, PA 19007 ..... 215-781-0700; 800-523-8989
Omega Engineering, Stamford, CT 06907 800-826-6342
§† Plato Products, Inc., Glendora, CA 91740 818-967-3821
§ Raytek, Inc., Santa Cruz, CA 95060-1820 408-458-1110
Swan Associates, New Haven, CT 06534 203-387-3917

Thermometers, Resistance-2900

Fenwal Electronics, Inc./APD, Milford, MA 01757, 508-478-6000 ..... B•1845
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1252
Gossen/Texmate, Vista, CA 92083-8397, 619-598-9899 ..... D•1382
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1260,1265
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 ..... B•1850-1851
Omega Engineering, Stamford, CT 06907, 800-826-6342 ..... D•1368-1369
§† RCD Components, Inc., Manchester, NH 03109, 603-669-0054 ..... A•1982
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1382
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1399
ABB Kent-Taylor Inc., ASea Brown Boveri, Rochester, NY 14692 716-235-5000
Advanced Thermal Products, Inc., St. Marys, PA 15857 814-834-1541
Analog Devices, Inc., Norwood, MA 02062-9106 617-329-4700
ARi Industries, Inc., Addison, IL 60101 ..... 708-953-9100;800-237-6725
§ Atkins Technical Inc., Gainesville, FL 32608 904-378-5555
Barber-Colman Co., Indl. Instrs. Div., Rockford, IL 61125-7040 815-877-0241
§ Bayley Instrument Company, Kenwood, CA 95452 707-833-6014
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Degussa Corp., Temperature Sensing Products, So. Plainfield, NJ 07080 908-561-1000
† Digitec, Marion, OH 43302 614-387-3444
§ EDL, Inc., Danville, VA 24540 ..... 804-799-0807;1-800-DIAL EDL
§ FENWAL Inc., Ashland, MA 01721 508-881-2000
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† GIC Thermodynamics, Royal Oak, MI 48073 313-280-1648
§† Gordon Co.:Watlow, Richmond, IL 60071 815-678-2211
§ Hades Manufacturing Corp., Farmingdale, NY 11735 516-249-4244
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§† Hy-Cal Engineering, El Monte, CA 91731 818-444-4000
Instrulab, Dayton, OH 45404 513-223-2241
§ Jumo Process Control, Inc., Coatsville, PA 19320 215-380-8002
† KRL/Bantry Components, Inc., Manchester, NH 03103 603-668-3210
† Lake Shore Cryotronics, Inc., Westerville, OH 43081 614-891-2243
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
§ Love Controls Corp., Wheeling, IL 60090 708-541-3232
Meissner Industries, Dover, NJ 07801 201-366-1700
Micro Technical Industries, Laguna Hills, CA 92653 714-855-4326
† Minco Products, Minneapolis, MN 55432 612-571-3121
§ Newport Electronics, Santa Ana, CA 92704-4426 ..... 714-540-4914;800-NEWPORT
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
§ Pacer Industries, Inc., Chippewa Falls, WI 54729 715-723-1141
† Relco Products, Denver, CO 80237 303-756-1143
§ Science/Electronics, Dayton, OH 45401-0986 513-859-5555
Solder Absorbing Technology (SAT), A Spirig Co., Springfield, MA 01108 800-628-8862
§ S-Products Inc., Fairfield, CT 06430 203-331-9546
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§ TEGAM, Inc., Madison, OH 44057 800-666-1010
† Thermo Electric, Saddle Brook, NJ 07662 201-843-5800
† Thermometrics, Inc., Edison, NJ 08817-4695 908-287-2870
§ United Electric Controls, Watertown, MA 02272-9143 617-926-1000
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§† Weed Instrument Co., Inc., Round Rock, TX 78680-0300 512-255-7043
§ Yellow Springs Instrument Co., Yellow Springs, OH 45387 800-343-4357

Time Delays, Precision-2900

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1538,1540
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
§ Action Instruments, San Diego, CA 92123 619-279-5726
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
Andersen Laboratories, Bloomfield, CT 06002 203-286-9090
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Cramer Co., Old Saybrook, CT 06475 800-247-6784
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
EG&G Reticon, Div. of EG&G, Sunnyvale, CA 94086-4197 408-738-4266
† Frequency & Time Systems, Inc., Datum, Inc., Beverly, MA 01915 508-927-8220
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101 708-543-6200
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
Nolatron, Harrisburg, PA 17111 717-564-3398
PPM, Inc., Cleveland, OH 44139 216-349-2300
SACO Controls Inc., Montreal,Qc., CANADA H4S 1V9 514-745-0310
† Scientific Technologies Inc., Control Components Div., Hayward, CA 94544-7831 ..... 415-471-9717;800-221-7060
Sokol Crystal Products, Inc., Mineral Point, WI 53565 608-987-3363
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
† Teledyne Microwave, Mountain View, CA 94043 415-968-2211
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220

Time Dispenser, Microprocessor based-2200

§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341
Stoelting Co., Wood Dale, IL 60191 708-860-9700

Time Management Systems-2200

FTS/AUSTRON, Austin, TX 78761-4766, 512-251-2341 ..... A•1371
TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194-1195
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336

Timers, Counting-2200

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447-1448
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ..... B•1058,1060-1064
EDI, Wood Dale, IL 60191, 708-860-5838 ..... B•1065
† Electrodynamics, Inc., A Talley Inds. Co., Rolling Meadows, IL 60008, 708-259-0740 ..... D•1134
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504-1505
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ Aromat Corp., Matsushita Electrical Works Ltd., New Providence, NJ 07974 908-464-3550
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 ... 201-984-1900
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Canyon Elctrns., Phoenix, AZ 85021 602-944-4421
† Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Cramer Co., Old Saybrook, CT 06475 800-247-6784
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp, Durant Products, Watertown, WI 53094 ..... 414-261-4070;800-289-3866
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electric Switches, Inc., Los Angeles, CA 90039 213-660-1310
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
ENM Company, Chicago, IL 60646 312-775-8400
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† FOX METER INC., Elburn, IL 60119 708-365-2422
Frequency Control Products, Inc., American Time Products Div., Deer Pk, NY 11729 516-243-5730
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 . 201-825-9696
Hecon Corp., Eatontown, NJ 07724 908-542-9200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
KineticSystems, Lockport, IL 60441 815-838-0005
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Redington Counters, Windsor, CT 06095 203-688-6205
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
§ Square D Co., Palatine, IL 60067 708-397-2600
§† Statek Corp., Orange, CA 92668 714-639-7810
Stoelting Co., Wood Dale, IL 60191 708-860-9700
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Verdure Industries Inc., Omaha, NE 68124 402-691-8300
Vorne Industries, Inc., Chicago, IL 60631 312-775-9440
Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Timers, Cycle & Reset-2200

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447-1448
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ..... B•1058,1060-1064

§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504-1505
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1540
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Midtex Relays, Inc., El Paso, TX 79906, 915-772-1061;1-800-MIDTEX1 ..... B•1547-1548
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§ Aromat Corp., Matsushita Electrical Works Ltd., New Providence, NJ 07974 908-464-3550
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
Canfield Connector, Canfield Industries, Youngstown, OH 44514 216-758-8299
Canyon Elctrns., Phoenix, AZ 85021 602-944-4421
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§† Cramer Co., Old Saybrook, CT 06475 800-247-6784
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
§ Deltrol Controls, Milwaukee, WI 53215 414-671-6800
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
ENM Company, Chicago, IL 60646 312-775-8400
† FOX METER INC., Elburn, IL 60119 708-365-2422
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
Hecon Corp., Eatontown, NJ 07724 908-542-9200
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716 516-563-3388
§ Intermatic, Spring Grove, IL 60081 815-675-2321
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ JMR Electronics, Bronx, NY 10461 212-597-6050
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
Mallory Controls, Emerson Electric, Indianapolis, IN 46214 317-328-4010
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ MKC Electronics Corp., Overland Park, KS 66215 913-894-9711
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
PPM, Inc., Cleveland, OH 44139 216-349-2300
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Square D Co., Palatine, IL 60067 708-397-2600
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Statek Corp., Orange, CA 92668 714-639-7810
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Switches Unlimited, Inc., Woodside, NY 11377 ..... 718-478-5000;800-221-0487
Techniques, Inc., Englewood, NJ 07631 201-569-5900
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tennelec/Nucleus Inc., Oak Ridge, TN 37830 615-483-8405
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
Vanguard Relay Corp., Warwick, RI 02886 401-732-0700
Verdure Industries Inc., Omaha, NE 68124 402-691-8300
Wilmar Electronics, Inc., Torrance, CA 90505 213-326-6668

Timers, Delay-2200

§† Amperite Co., Inc., Union City, NJ 07087, 201-864-9503 ..... B•1414
§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1446-1448
Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 ..... A•1540
Hold-Heet Products Corp., Chicago, IL 60640, 312-728-4454;312-728-4455 ..... B•1501
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504-1505
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1540
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Midtex Relays, Inc., El Paso, TX 79906, 915-772-1061;1-800-MIDTEX1 ... B•1548
Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
AES Corp., Peabody, MA 01960 508-535-7310
§ Air-O-Tronics, Trush, Inc., Cazenovia, NY 13035 315-655-2387
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
Bel Fuse, Jersey City, NJ 07302 201-432-0463
§ Buchanan, Amerace Corporation, Livingston, NJ 07039 201-992-8400
Canfield Connector, Canfield Industries, Youngstown, OH 44514 216-758-8299
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Corby Industries, Inc., Allentown, PA 18103 215-433-1412
§ Cramer Co., Old Saybrook, CT 06475 800-247-6784
§ C-Tek Inc., Wakefield, MA 01880 617-246-1720
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Deltrol Controls, Milwaukee, WI 53215 414-671-6800
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
ENM Company, Chicago, IL 60646 312-775-8400
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
§ Furnas Elec., Batavia, IL 60510 708-879-6000
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
LeCroy Corp., Chestnut Ridge, NY 10977 914-425-2000
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
Mallory Controls, Emerson Electric, Indianapolis, IN 46214 317-328-4010
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
§ Pass & Seymour/Legrand, Pass & Seymour/Inc., Syracuse, NY 13221 315-468-6211
Power Sys. Grp., Rantec Div., Emerson Elec. Co., Chatsworth, CA 91311 818-885-8223
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
† Relay Specialties, Oakland, NJ 07436 201-337-1000
Republic Electronics Co., Hauppauge, NY 11788 516-273-9800
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Square D Co., Palatine, IL 60067 708-397-2600
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Statek Corp., Orange, CA 92668 714-639-7810
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Switches Unlimited, Inc., Woodside, NY 11377 ..... 718-478-5000;800-221-0487
Sylvania GTE Control Devices, Standish, ME 04084 207-642-4535
† Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tenor Company, New Berlin, WI 53151 414-782-3800
§ Therm-O-Disc, Inc., Midwest Components Product Grp., Mansfield, OH 44907-0538 419-525-8450
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
§ Vanguard Relay Corp., Warwick, RI 02886 401-732-0700

Timers, Electrolytic Cell-2200

§ Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
† The Fredericks Company, Huntingdon Valley, PA 19006 215-947-2500
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336

Timers, Interval-2200

§† Amperite Co., Inc., Union City, NJ 07087, 201-864-9503 ..... B•1414
§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447-1448
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1165-1167
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ..... B•1058,1060-1064
EDI, Wood Dale, IL 60191, 708-860-5838 ..... B•1065
† Electrodynamics, Inc., A Talley Inds. Co., Rolling Meadows, IL 60008, 708-259-0740 ..... D•1134
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504-1505
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1540
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Midtex Relays, Inc., El Paso, TX 79906, 915-772-1061;1-800-MIDTEX1 ... B•1547
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
§ Air-O-Tronics, Trush, Inc., Cazenovia, NY 13035 315-655-2387
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122

§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
Canfield Connector, Canfield Industries, Youngstown, OH 44514 216-758-8299
Canyon Elctrns., Phoenix, AZ 85021 602-944-4421
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§† Cramer Co., Old Saybrook, CT 06475 800-247-6784
C-Tek Inc., Wakefield, MA 01880 617-246-1720
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Deltrol Controls, Milwaukee, WI 53215 414-671-6800
† Digitec, Marion, OH 43302 614-387-3444
§ Dimco-Gray, Dayton, OH 45458 513-433-7600
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
DSP Technology, Fremont, CA 94538-7338 415-657-7555
Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
† Electro Physics Co., Inc., Waukegan, IL 60085 708-249-5801
ENM Company, Chicago, IL 60646 312-775-8400
§ John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† FOX METER INC., Elburn, IL 60119 708-365-2422
Frequency Control Products, Inc., American Time Products Div., Deer Pk, NY 11729 516-243-5730
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ I.M.C., (International Microtronics Corp.), Tuscon, AZ 85714 602-748-7900
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716 516-563-3388
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
KineticSystems, Lockport, IL 60441 815-838-0005
§ Lektra Service Corp., Bronx, NY 10474 212-617-7786
Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 414-358-4000
Mallory Controls, Emerson Electric, Indianapolis, IN 46214 317-328-4010
Marconi Instruments, Allendale, NJ 07401 201-934-9050
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
Meylan Corporation, Upper Montclair, NJ 07043-1844 201-744-6400
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
Microvision Corp., Campbell, CA 95008 408-374-3158
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
Omega Engineering, Stamford, CT 06907 800-826-6342
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
PPM, Inc., Cleveland, OH 44139 216-349-2300
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
† Republic Electronics Co., Hauppauge, NY 11788 516-273-9800
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Square D Co., Palatine, IL 60067 708-397-2600
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
† Stock Drive Products, Div. of Designatronics, Inc., New Hyde Pk, NY 11040 ..... 516-328-0200;328-3300
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Switches Unlimited, Inc., Woodside, NY 11377 ..... 718-478-5000;800-221-0487
§ Technic, Inc., Providence, RI 02940-9650 401-781-6100
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ Time Mark Corp., Tulsa, OK 74116 918-438-1220
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
Verdure Industries Inc., Omaha, NE 68124 402-691-8300

Timers, Programmed-2200

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447-1448
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ..... B•1058,1060-1064
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716, 516-563-3388 ..... C•1147
Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504-1505
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1540
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
Acculex Corporation, Taunton, MA 02780 508-880-3660
AES Corp., Peabody, MA 01960 508-535-7310
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ Aromat Corp., Matsushita Electrical Works Ltd., New Providence, NJ 07974 908-464-3550
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Autronics Corp., Arcadia, CA 91006 818-445-5470
Canyon Elctrns., Phoenix, AZ 85021 602-944-4421
Cardinal Control Co., Kensington, CT 06037 203-828-6379
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Centent Co., Santa Ana, CA 92707 714-979-6491
Codar Technology, Inc., Longmont, CO 80503 303-776-0472
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Cramer Co., Old Saybrook, CT 06475 800-247-6784
C-Tek Inc., Wakefield, MA 01880 617-246-1720
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
† Digitec, Marion, OH 43302 614-387-3444
Dimco-Gray, Dayton, OH 45458 513-433-7600
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
Eitel Mfg., San Juan Capistrano, CA 92675 714-240-3933
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
§ EliWell-USA Ltd., EliWell, S.P.A., NYC, NY 10022 212-832-9393
ENM Company, Chicago, IL 60646 312-775-8400
Extech Instruments Corp., Waltham, MA 02154 617-890-7440
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Frequency Control Products, Inc., American Time Products Div., Deer Pk, NY 11729 516-243-5730
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 201-825-9696
§ Heath Co., St. Joseph, MI 49085 616-982-3200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
§ Intermatic, Spring Grove, IL 60081 815-675-2321
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
KineticSystems, Lockport, IL 60441 815-838-0005
§ Lab-Line Instruments, Melrose Park, IL 60160 708-450-2600
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 414-358-4000
Mallory Controls, Emerson Electric, Indianapolis, IN 46214 317-328-4010
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
§ Pass & Seymour/Legrand, Pass & Seymour/Inc., Syracuse, NY 13221 315-468-6211
† Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
Scanning Devices, Inc., Waltham, MA 02154 617-891-8991
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Square D Co., Palatine, IL 60067 708-397-2600
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Switches Unlimited, Inc., Woodside, NY 11377 ..... 718-478-5000;800-221-0487
Techniques, Inc., Englewood, NJ 07631 201-569-5900
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Timeco, Inc., Huntington, WV 25705 304-523-5149
Trumeter Company, Inc., New York, NY 10001 ..... 212-564-0666;800-537-2261
Vanguard Relay Corp., Warwick, RI 02886 401-732-0700
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Timers, Sequence-2200

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447-1448
† Electrodynamics, Inc., A Talley Inds. Co., Rolling Meadows, IL 60008, 708-259-0740 ..... D•1134
§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504-1505
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1540
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
§ Midtex Relays, Inc., El Paso, TX 79906, 915-772-1061;1-800-MIDTEX1 ..... B•1547-1548
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
§ ROD-L Electronics, Inc., Menlo Park, CA 94025, 415-322-0711;1-800-548-6305 ..... D•1317
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
§ Altech Corp., Somerville, NJ 08876 908-707-8484

§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Canfield Connector, Canfield Industries, Youngstown, OH 44514 216-758-8299
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Cramer Co., Old Saybrook, CT 06475 800-247-6784
C-Tek Inc., Wakefield, MA 01880 617-246-1720
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
§ Electronic Counters & Controls, Inc., LFE Corp., Libertyville, IL 60048 ..... 708-362-8910; 800-422-3224
ENM Company, Chicago, IL 60646 312-775-8400
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
§ Furnas Elec., Batavia, IL 60510 708-879-6000
§ Industrial Timer Co., Centerbrook, CT 06705 203-767-7130
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
KineticSystems, Lockport, IL 60441 815-838-0005
† Lucas Ledex Inc., Vandalia, OH 45377-0427 513-898-3621
Mallory Controls, Emerson Electric, Indianapolis, IN 46214 317-328-4010
Master Electronic Controls, Los Angeles, CA 90025 213-452-1336
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
PPM, Inc., Cleveland, OH 44139 216-349-2300
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Square D Co., Palatine, IL 60067 708-397-2600
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
Stoelting Co., Wood Dale, IL 60191 708-860-9700
§ Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Switches Unlimited, Inc., Woodside, NY 11377 ..... 718-478-5000;800-221-0487
Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Timeco, Inc., Huntington, WV 25705 304-523-5149
Vanguard Relay Corp., Warwick, RI 02886 401-732-0700
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Timers, Solid State-2200

§ Automatic Timing & Controls Co., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ..... D•1129
§ Crouzet Corporation, Carrollton, TX 75006-2503, 214-250-1647;1-800-527-5311 ..... B•1447
Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1164
DCI Inc., Olathe, KS 66062, 913-782-5672 ..... D•1342
§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
§ Instrumentation & Control Sys., ICS.Inc., Addison, IL 60101, 708-543-6200 ..... B•1504
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
† Logitek, Inc., Ronkonkoma, NY 11779, 516-467-4200 ..... B•1540
Magnum Opus Custom Elctrn. Engrg., Iselin, NJ 08830, 908-283-4925 ... D•1121
Master Electronic Controls, Los Angeles, CA 90025, 213-452-1336 .. B•1541,1544
§ Midtex Relays, Inc., El Paso, TX 79906, 915-772-1061;1-800-MIDTEX1 ... B•1549
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1049-1049
§ Potter & Brumfield, A Siemens Co., Princeton, IN 47671-0001, 812-386-1000 ..... B•1565
PPM, Inc., Cleveland, OH 44139, 216-349-2300 ..... D•1311
† Abrams Instrument Corp., Okemos, MI 48864 517-332-6405
§† Advanced Linear Devices, Inc., Sunnyvale, CA 94086-4606 408-720-8737
AES Corp., Peabody, MA 01960 508-535-7310
§ Air-O-Tronics, Trush, Inc., Cazenovia, NY 13035 315-655-2387
† Alarm Controls Corporation, Deer Park, NY 11729 516-586-4220
§ Allen- Bradley Co., Div. of Industrial Control Grp., Milwaukee, WI 53201 414-382-2000
§ Altech Corp., Somerville, NJ 08876 908-707-8484
§ Amerace Corporation, Hackettstown, NJ 07840 201-852-1122
§ American Control Products, Div. of Precision Timer Co., Inc., Westbrook, CT 06498 203-399-6253
Analog Systems, Tucson, AZ 85731-7389 602-290-1818
§† Antex Electronics Corp., Gardena, CA 90248 213-532-3092
§ Artisan Controls Corp., Parsippany, NJ 07054 201-428-1770
† Autronics Corp., Arcadia, CA 91006 818-445-5470
§ Brentek International, Inc., Hallam, PA 17406 717-755-8000
§ Buchanan, Amerace Corporation, Livingston, NJ 07039 201-992-8400
Canfield Connector, Canfield Industries, Youngstown, OH 44514 216-758-8299
Cardinal Control Co., Kensington, CT 06037 203-828-6379
§ Centent Co., Santa Ana, CA 92707 714-979-6491
§ Cramer Co., Old Saybrook, CT 06475 800-247-6784
C-Tek Inc., Wakefield, MA 01880 617-246-1720
§† Curtis Instruments, Inc., Mt. Kisco, NY 10549 914-666-2971
Dantronics, Inc., St. Paul, MN 55126 612-484-2108
† DARE Electronics, Inc., Troy, OH 45373 513-335-0031
§ Diversified Electronics, Inc., Evansville, IN 47706-1140 812-426-2806
Douglas Randall, Pawcatuck, CT 06379 203-599-2075
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
§ Eaton Corp./Cutler-Hammer Prods, Aerospace & Commercial Controls Div., Milwaukee, WI 53216 414-449-7487
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
† Electro Physics Co., Inc., Waukegan, IL 60085 708-249-5801
ENM Company, Chicago, IL 60646 312-775-8400
§ Exar Corp., San Jose, CA 95161-9007 408-732-7970
Frequency Control Products, Inc., American Time Products Div., Deer Pk., NY 11729 516-243-5730
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
§ Furnas Elec., Batavia, IL 60510 708-879-6000
Gralex Industries, Norwood, NJ 07648 800-486-4499
§ Grasslin Controls Corp.:Grasslin Gmbh & Co., K.G., Ramsey, NJ 07446 201-825-9696
Harrel, Inc., E. Norwalk, CT 06855 203-866-2573
† Holt Inc., Irvine, CA 92718 714-859-8800
§ IDEC Corporation, Sunnyvale, CA 94089-2211 408-747-0550
§ Injectorall Electronics (Woman Owned), Bohemia, NY 11716 516-563-3388
† International Sensor Systems, Inc., Aurora, NE 68818 402-694-6111
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
§ Klockner Moeller, Franklin, MA 02038 508-520-7080
§ Lektra Service Corp., Bronx, NY 10474 212-617-7786
Macromatic Division, Milwaukee Elctrns. Corp., Milwaukee, WI 53223 ... 414-358-4000
Mallory Controls, Emerson Electric, Indianapolis, IN 46214 317-328-4010
§ Maxmar Controls Inc., Pleasantville, NY 10570 914-747-3540
Microavionics Corp., Costa Mesa, CA 92626 714-957-6904
§ MKC Electronics Corp., Overland Park, KS 66215 913-894-9711
Multi-Amp Corp., TBG, Dallas, TX 75237 214-333-3201
§ National Controls Corp., W. Chicago, IL 60185 312-231-5900
NEC Electronics, Inc., Mountain View, CA 94039 415-960-6000
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Northwest Microcircuits, Inc., Philomath, OR 97370 503-929-6424
§ Omron Electronics, Inc., F A Systems Div., Schaumburg, IL 60173 708-843-7900
§ Paragon Electric Co., Inc., Two Rivers, WI 54241 414-793-1161
§ Pass & Seymour/Legrand, Pass & Seymour/Inc., Syracuse, NY 13221 315-468-6211
Phase Control Electronics, Glendale, NY 11385 718-441-4278
§ Ragen Data Systems, Inc., Subsidiary of Meggit U.S.A., Central Islip, NY 11722 516-234-3800
§ Regent Controls, Inc., Shelton, CT 06484-0767 203-924-2924
§ Relay Specialties, Oakland, NJ 07436 201-337-1000
§ Roean Industries, Inc., Pacoima, CA 91331 818-767-7047
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Square D Co., Palatine, IL 60067 708-397-2600
§ SSAC Incorporated, Baldwinsville, NY 13027 315-638-1300
§† Statek Corp., Orange, CA 92668 714-639-7810
§† Struthers-Dunn, Inc. and Hi-G Co., Inc., Pitman, NJ 08071-0901 609-589-7500
§ Switches Unlimited, Inc., Woodside, NY 11377 ..... 718-478-5000;800-221-0487
§† Tempo Instrument, Inc., Commack, NY 11725 516-864-3700
§ Tenor Company, New Berlin, WI 53151 414-782-3800
Timeco, Inc., Huntington, WV 25705 304-523-5149
§ TURCK Inc., Minneapolis, MN 55441-2656 ..... 612-553-9224;1-800-328-0580; 1-800-544-PROX
Vanguard Relay Corp., Warwick, RI 02886 401-732-0700
§ Veeder-Root, Simsbury, CT 06070-2003 203-651-2700
Verdure Industries Inc., Omaha, NE 68124 402-691-8300

Totalizers, Digital-2200

EDI, Wood Dale, IL 60191, 708-860-5838 ..... B•1065
§ Electro-Numerics, Inc., Irvine, CA 92714, 714-250-1501 ..... D•1344
§ IVO Industries, Inc., Eatontown, NJ 07724, 908-542-5151;800-932-0489 ..... B•1723,1906-1907
§ Newport Electronics, Santa Ana, CA 92704-4426, 714-540-4914;800-NEWPORT ..... D•1365
Texmate, Inc., Vista, CA 92083-8397, 619-598-9899 ..... D•1380
Airpax Sensor Div., A North American Philips Co., Cheshire, CT 06410 .. 203-271-6000
Applied Controls Co., Inc., Fairfield, NJ 07004 201-227-5454
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Ballantine Laboratories, Noise Unlimited Inc., Cedar Knolls, NJ 07927 201-984-1900
§ Bristol Babcock Inc., Watertown, CT 06795 ..... 203-575-3000;800-243-3576
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATE1
§ Crouzet Corporation, Carrollton, TX 75006-2503 ..... 214-250-1647;1-800-527-5311
C-Tek Inc., Wakefield, MA 01880 617-246-1720
§ Dynamics, Div. of Waugh Controls Corp., Chatsworth, CA 91311 818-998-8281
§ Dynapar, Gurnee, IL 60031 312-662-2666
§ Eagle Signal Controls:A Mark IV Inds. Co., Austin, TX 78753 512-837-8300
† EG & G Flow Technology, Inc., Phoenix, AZ 85072 602-437-1315
§ Electromatic Controls Corp., Hoffman Estates, IL 60195-2010 708-882-5757
Flex-Core Div., Morlan & Assocs., Inc., Worthington, OH 43235 614-889-6152
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
† FOX METER INC., Elburn, IL 60119 708-365-2422
FSI/Fork Standards, Inc., Lombard, IL 60148-2097 ..... 708-932-9380;800-468-6009
§ Hecon Corp., Eatontown, NJ 07724 908-542-9200
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
§ Kessler-Ellis Prods., Atlantic Highlands, NJ 07716 ..... 201-291-0500;800-631-2165
Kistler-Morse, Redmond, WA 98073 206-881-8000
§ Non-Linear Systems/Div. of Kaypro Corp., San Diego, CA 92121 619-535-2155
Racal-Dana Instrs. Inc., Irvine, CA 92718 714-859-8999
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
§† Veeder-Root, Simsbury, CT 06070-2003 203-651-2700

Touch Monitors-2000

CTI Electronics, Stratford, CT 06497, 203-386-9779 ..... D•1085
IEE (Industrial Electronic Engineers), Van Nuys, CA 91405, 818-787-0311 ..... B•1814
§† Interaction Systems Inc., Watertown, MA 02172, 617-923-6001 ..... D•1098
Wells-Gardner Elctrns. Corp., Chicago, IL 60639, 312-252-8220 ..... B•1133
Apollo Display Technologies, Inc., Holtsville, NY 11742 516-654-1143
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Aydin Corp., Horsham, PA 19044 215-657-7510
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121

† Carroll Touch, Inc., Round Rock, TX 78680 512-244-3500
§ Conrac Display Products, Inc., Duarte, CA 91010 818-303-0095
§ Craft Data, Inc., Mission Viejo, CA 92691 714-582-8284
Electro Mechanical Systems, Inc., Champaign, IL 61820 217-359-7125
§ Electronics Research Associates Inc., Winsted, CT 06098 203-379-2731
Elographics Inc., Oak Ridge, TN 37830 615-482-4100
General Digital Corp., Enfield, CT 06082 203-741-7171
The Graphics Technology Co., Austin, TX 78746 512-328-9284
Greenspring Computers, Inc., Menlo Park, CA 94025 415-327-1200
† Hallmark Technologies, Mt. Dora, FL 32757 800-874-9063
HMW Enterprises, Inc., Etters, PA 17319 717-938-4691
§ Lucas Deeco Corp., Hayward, CA 94544-7831 415-471-4700
MicroTouch Systems, Inc., Wilmington, MA 01887 508-694-9900
† Orbit Instrument Corp., Hauppauge, NY 11788 516-435-8300
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100

Touch Panels-2000

Dale Electronics, Inc., Columbus Div., Columbus, NE 68601-3647, 402-563-6506 ..... B•1048
† IEE (Industrial Electronic Engineers), Van Nuys, CA 91405, 818-787-0311 ..... B•1089,1814
§† Interaction Systems Inc., Watertown, MA 02172, 617-923-6001 ..... D•1098
Jayco Plastics of California, Inc., Orange, CA 92665, 714-974-1701 ..... B•1818-1819
Lucas Duralith Corporation, Millville, NJ 08332, 609-825-6900 ..... B•1822
Shin-Etsu Polymer America, Inc., Union City, CA 94587, 415-475-9000 .. C•1521
Wells-Gardner Elctrns. Corp., Chicago, IL 60639, 312-252-8220 ..... B•1133
Apollo Display Technologies, Inc., Holtsville, NY 11742 516-654-1143
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Automation Displays Inc., Eau Claire, WI 54703 715-834-9595
Aztec Industries, Inc., Mesa, AZ 85210 ..... 602-833-3131;800-729-3132
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
† Carroll Touch, Inc., Round Rock, TX 78680 512-244-3500
§ Craft Data, Inc., Mission Viejo, CA 92691 714-582-8284
† Electro Mechanical Systems, Inc., Champaign, IL 61820 217-359-7125
§ Electronics Research Associates Inc., Winsted, CT 06098 203-379-2731
Elographics Inc., Oak Ridge, TN 37830 615-482-4100
General Digital Corp., Enfield, CT 06082 203-741-7171
GM Nameplate, Inc., Seattle, WA 98119 206-284-2200
† The Graphics Technology Co., Austin, TX 78746 512-328-9284
† Hallmark Technologies, Mt. Dora, FL 32757 800-874-9063
Intaq Key Panels, GM Nameplate, Inc., Seattle, WA 98119 206-284-5475
§ Lucas Deeco Corp., Hayward, CA 94544-7831 415-471-4700
§ Mantex Corp., Oxford, MI 48371 313-628-8210
Membrane Switch & Panel Co., Inc., Santa Ana, CA 92705 714-541-5775
MicroTouch Systems, Inc., Wilmington, MA 01887 508-694-9900
† Orbit Instrument Corp., Hauppauge, NY 11788 516-435-8300
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100
Southwestern Nameplate & Mfg. Co., Inc., Anna, TX 75003 ..... 214-231-6663; 214-924-3289;1-800-331-6600
Taliq Corp., Sunnyvale, CA 94089 408-745-0750
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
§ Topflight, York, PA 17404 ..... 717-843-9901;800-233-9386

Touch Terminals-2000

† IEE (Industrial Electronic Engineers), Van Nuys, CA 91405, 818-787-0311 ..... B•1089,1814
§† Interaction Systems Inc., Watertown, MA 02172, 617-923-6001 ..... D•1098
Apollo Display Technologies, Inc., Holtsville, NY 11742 516-654-1143
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Bowmar Instrument Corp., Aerospace Div., Ft. Wayne, IN 46809 219-747-3121
† Carroll Touch, Inc., Round Rock, TX 78680 512-244-3500
§ Cincinnati Electrosystems, Loveland, OH 45140 513-831-6800
Electro Mechanical Systems, Inc., Champaign, IL 61820 217-359-7125
§ Electronics Research Associates Inc., Winsted, CT 06098 203-379-2731
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
General Digital Corp., Enfield, CT 06082 203-741-7171
† Hallmark Technologies, Mt. Dora, FL 32757 800-874-9063
HMW Enterprises, Inc., Etters, PA 17319 717-938-4691
§ Lucas Deeco Corp., Hayward, CA 94544-7831 415-471-4700
Lucas Duralith Corporation, Millville, NJ 08332 609-825-6900
§ MicroTouch Systems, Inc., Wilmington, MA 01887 508-694-9900
† Orbit Instrument Corp., Hauppauge, NY 11788 516-435-8300
Planar Systems, Inc., Beaverton, OR 97006-1992 503-690-1100
Vetra Systems Corp., Plainview, NY 11803 516-454-6469

Tracers, Curve-2900

§ Heath Co., St. Joseph, MI 49085 616-982-3200
§ Leader Instruments Corp., Hauppauge, NY 11788-3694 ..... 516-231-6900; 1-800-645-5104
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642

Trackballs, XY Positioning-2200

BEI Motion Systems Company, Chatsworth Encoder Div., Chatsworth, CA 91311, 818-341-6161 ..... B•1879
CTI Electronics, Stratford, CT 06497, 203-386-9779 ..... D•1085
† Measurement Systems, Inc., Norwalk, CT 06854, 203-838-5561 ..... D•1138
† Orbit Instrument of Cal., Orbit Instrument Corp., Cypress, CA 90630, 714-527-0561 ..... B•1826, D•1143
† Amkey, Methuen, MA 01844 508-975-5445
Disc Instruments, Honeywell, Costa Mesa, CA 92626 714-433-0343
Flex-Key Corporation, Gloucester, MA 01930 508-281-2040
† Litton Encoder Div., Chatsworth, CA 91311 818-341-6161
† Orbit Instrument Corp., Hauppauge, NY 11788 516-435-8300
† Penny & Giles, Santa Monica, CA 90401 213-393-1497

Transceivers-1900

† ADC Telecommunications, Inc., Minneapolis, MN 55435, 612-835-6800 ..... C•1157-1159
Aeroflex Laboratories Inc., ARX, Inc., Plainview, NY 11803, 516-694-6700 ..... A•1720-1721
GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ..... D•1072
International Sensor Systems, Inc., Aurora, NE 68818, 402-694-6111 .... A•1731
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 ... D•1048-1049
† Aydin Corp., Horsham, PA 19044 215-657-7510
Cabletron Systems, Inc., Rochester, NH 03867 603-332-9400
† Corvus Microwave Inc., Syracuse, NY 13211-2100 315-437-4400
§ Dupont Electro-Optic Products, Dupont Electronics, Research Triangle Park, NC 27709 ..... 1-800-888-LAN1;919-481-5100
# Glasgal Communications, Inc., Northvale, NJ 07647 201-768-8082
Hughes Microelectronic Circuits Division, Newport Beach, CA 92658-8903 714-759-2952
§ Longshine Technlg. Inc., San Jose, CA 95132 408-942-1746
Motorola Semiconductor Prods. Sector, Tempe, AZ 85284 602-244-6900
SEEQ Technology, San Jose, CA 95131 ..... 408-432-7400;1-800-333-7706
§ Ten-Tec, Inc., Sevierville, TN 37862 615-453-7172

Translators, Data-2325

† Interface Engineering Inc., Holbrook, MA 02343, 617-986-2600 ..... D•1182-1183
Keithley MetraByte, Taunton, MA 02780, 508-880-3000 ..... D•1184
Precision Filters, Ithaca, NY 14850, 607-277-3550 ..... D•1192-1193
§† Superior Electric, Bristol, CT 06010, 203-582-9561 ..... B•1315
TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194
Weschler Instruments, Hughes Corp., Cleveland, OH 44136, 216-238-2550 ..... D•1402
† Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
Data Translation, Inc., Marlboro, MA 01752 508-481-3700
† ILC Data Device Corp., Bohemia, NY 11716-2482 516-567-5600
ISC Datacom, ISC Defense & Space, Sunnyvale, CA 94089 408-747-0300
† Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600

Translators, Time Code-2000

§ Chrono-log Corp., Havertown, PA 19083, 215-853-1130 ..... D•1084
† Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1120,1164-1167
§ ESE, El Segundo, CA 90245, 213-322-2136 ..... D•1135
† TRAK Systems, Div. TRAK Microwave Corp., Tampa, FL 33634-6391, 813-884-1411 ..... D•1078,1194-1195
Datachron Inc., Anaheim, CA 92805 714-385-1705
FTS/AUSTRON, Austin, TX 78761-4766 512-251-2341

Transmission Systems, Data-2000

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1067,1120,1165-1167
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 ..... B•1058,1060-1064
† GRIM Corporation, Medford, NJ 08055-0968, 609-267-7950 ... D•1070,1072-1074
§† Meret Optical Communications, Inc., An Amoco Co., Santa Monica, CA 90404-4998, 213-828-7496 ..... B•1225
† Optelecom, Inc., Gaithersburg, MD 20877, 301-840-2121 ..... B•1227
† Alden Electronics, Inc., Westboro, MA 01581 508-366-8851
§ American Laser Systems, Inc., Goleta, CA 93117 805-967-0423
§† Applied Data Communications, Tustin, CA 92680 714-731-9000
§ Artel Communications Corp., Hudson, MA 01749 508-562-2100
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
† Aydin Corp., Horsham, PA 19044 215-657-7510
BT & D Technologies, Wilmington, DE 19803 302-479-0300
§ Coastcom, Concord, CA 94527 510-825-7500
§ Comspec Digital Products Inc., Houston, TX 77043 713-461-4487
Control Technology Co., Inc., Long Island City, NY 11101 718-361-2133
† Digital Radio Corp., Redondo Beach, CA 90277 213-316-4114
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
Dowty RFL Inds. Inc./Instrumentation Div., The Dowty Grp. PLC, Boonton, NJ 07005-0239 201-334-3100
§# Fibronics International Inc., Communications Way, Hyannis, MA 02601-1892 508-778-0700
† Foundation Instruments Inc., Nepean, ON, CANADA K2E 7J6 613-226-4000
IPAC Grp., Bethel Pk., PA 15102 412-831-9200
† ISC Cardion Electronics, Inc., Woodbury, NY 11797 516-921-7300
† LNR Communications, Inc., Hauppauge, NY 11788 516-273-7111
MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
Metric Systems, Ft. Walton Beach, FL 32548-9990 904-244-9600
† Phoenix Microsystems, Huntsville, AL 35806 205-922-1200
† Potter Instrument, (PSI-Peripheral Support), El Segundo, CA 90245 213-322-9370
Richard-Lee Co., Cranford, NJ 07016 201-276-0710
† Timeplex, Inc., Woodcliff Lake, NJ 07675 201-930-4600

Transmitters, Fixed Frequency-1900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 ..... D•1067,1120,1165-1167
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 ..... A•1827, D•1077
§ Action Instruments, San Diego, CA 92123 619-279-5726
† AEROCOM, Miami, FL 33133 305-448-6503
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271

† Collins Commercial Avionics, Rockwell Intl., Cedar Rapids, IA 52498 319-395-1000
Continental Electronics Corporation, Dallas, TX 75227 214-381-7161
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Electrocom Industries, S. Bend, IN 46615 219-232-2743
† EVI, Inc., Columbia, MD 21046 301-290-9550
† Glatzer Industries Corp., New Rochelle, NY 10801 914-576-2700
HDS Inc., Reston, VA 22091 703-620-6200
LF Engineering Company Inc., East Haven, CT 06512 203-467-3590
† MCL, Inc., Bolingbrook, IL 60440-4999 708-759-9500
§† Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
Verdure Industries Inc., Omaha, NE 68124 402-691-8300

Transmitters, Infrared remote control transmitters for satellite T.V. receivers-1900

A E G Corporation, Telefunken Semiconductors Div., Somerville, NJ 08876-1269 201-231-8300
§ Preh Electronic Industries, Inc., Lake Zurich, IL 60047-2578 708-438-4000

Transmitters, Position-1900

§ Action Instruments, San Diego, CA 92123 619-279-5726
† Celesco Transducer Prods., Inc., Canoga Pk, CA 91304-5005 818-884-6860
§ Computer Conversions Corp., E. Northport, NY 11731 516-261-3300
§ Data Instruments, Inc., Acton, MA 01720 508-264-9550
MagneTek, Transducer Products, Simi Valley, CA 93065 805-581-3985
† Magtech Controls, Vernitron Corporation, San Diego, CA 92073 619-428-5581
Metrix Instrument Co., Houston, TX 77043 713-461-2131
† Teledyne Gurley, Troy, NY 12181 .... 518-272-6300;800-759-1844
§† Weed Fiber Optics Inc., Weed Instrument Co., College Station, TX 77845 409-693-5397

Transmitters, Telemetry-1900

Datum Timing, Datum Inc., Anaheim, CA 92806-5790, 714-533-6333 .... D•1120,1165-1167
Dio-Rey, Div. of Info-Lite Corp., Fairview, NJ 07022, 201-941-4455 .... B•1058,1060-1064
† Servo Corporation of America, Hicksville, NY 11802-9907, 516-938-9700 .... A•1827, D•1077
AES Corp., Peabody, MA 01960 508-535-7310
† Aydin Corp., Horsham, PA 19044 215-657-7510
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
§ Bristol Babcock Inc., Watertown, CT 06795 .... 203-575-3000;800-243-3576
† Communications Sys. Technology, Inc., Hermosa Beach, CA 90254 213-374-3849
Dantel, Fresno, CA 93727 209-292-1111
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Dowty Control Technologies, Boonton, NJ 07005-0239 201-334-3100
† FEI Microwave, Inc., Frequency Electronics, Inc., Sunnyvale, CA 94086 .. 408-732-0880
HBM, Inc., Marlboro, MA 01752 508-624-4500
HDS Inc., Reston, VA 22091 703-620-6200
§† Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
† Solid State Electronics Corp., Northridge, CA 91324 818-993-8257
§ TransKinetic Sys., Canton, MA 02021 617-828-3000
Uniplex Corp., St. Paul, MN 55117 612-490-1936
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300
Verdure Industries Inc., Omaha, NE 68124 402-691-8300
VIZ Meteorological Instruments, Philadelphia, PA 19144-5782 215-844-2626

Transmitters, Tone-1900

§ Bristol Babcock Inc., Watertown, CT 06795 .... 203-575-3000;800-243-3576
Dantel, Fresno, CA 93727 209-292-1111
Dowty Avionics, Arcadia, CA 91006 818-445-5955
Electrocom Industries, S. Bend, IN 46615 219-232-2743
§† Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
Verdure Industries Inc., Omaha, NE 68124 402-691-8300
Western Multiplex Corp., Belmont, CA 94002 415-592-8832

Transponders-1900

Data Delay Devices, Clifton, NJ 07013-1915, 201-773-2299 .... A•1533
† Airtron, Litton Industries, Inc., Morris Plains, NJ 07950 201-539-5500
† Allied-Signal Aerospace Co., Bendix Communications Div., Towson, MD 21204 410-583-4000
† A.R.F. Prods., Boulder, CO 80301 303-443-4844
† Aydin Vector Div., Aydin Corp., Newtown, PA 18940-0328 215-968-4271
Computer Instruments Div., Hempstead, NY 11550 516-483-8200
Dowty Avionics, Arcadia, CA 91006 818-445-5955
† Radio Research Instrument Co., Inc., Waterbury, CT 06704-3506 203-753-5840
§† Seaboard Electronics, New Rochelle, NY 10805 914-235-8073
§† Vega Precision Labs., Vienna, VA 22180 703-938-6300

Transports, Tape (all kinds)-2000

Fujitsu America, Inc., Computer Products Group, San Jose, CA 95134, 408-432-1300 .... D•1091
Phi Technologies, Inc., Oklahoma City, OK 73105, 405-521-9000 .... D•1048-1049
Amilon Corp., Woodside, NY 11377 718-274-1794
† Analog Equipment Corporation, Palm Bch. Gardens, FL 33418 407-622-3715
Blackhole Technology, Winchester, MA 01890 617-721-7690
Cipher Data Products, Inc., an Archive Co., San Diego, CA 92131 619-578-9100
Digital Equip., Marlborough, MA 01752
International Electro Magnetics, Inc., Palatine, IL 60067 708-358-4622
† Memtec Corp., Salem, NH 03079 603-893-8080
Multi Products International, West Paterson, NJ 07424 201-890-1344
† Reproduction Technologies Inc., Bristol, IN 46507-0518 219-848-5233
§ Shinano Kenshi Corp. (SKC), N. Hollywood, CA 91605 818-764-4266
Shokai Far East Ltd., Peekskill, NY 10566 914-736-3500

Tubes, Counting-2200

§ International Components Corp., Melville, NY 11747 516-293-1500
§ Thorn EMI Electron Tubes Inc., Fairfield, NJ 07006 201-575-5586

Tubes, Ignitron-2200

† EEV Inc., Elmsford, NY 10523 914-592-6050
§ International Components Corp., Melville, NY 11747 516-293-1500

Tubes, Transmitting-1900

† EEV Inc., Elmsford, NY 10523 914-592-6050
§ International Components Corp., Melville, NY 11747 516-293-1500
† Litton Electron Devices, San Carlos, CA 94070 415-591-8411
SinoTECH, Technology Communications Group, Inc., West Linn, OR 97068 503-638-1000
Thomson Electron Tubes & Devices Corp., Thomson CSF, Totowa, NJ 07511 201-812-9000
Varian Associates, Electron Device Business, Palo Alto, CA 94304 .... 415-493-4000; 800-544-4636

Tubes, X-ray-2200

§ A E G Corporation, Somerville, NJ 08876-1269 908-231-8491
† EEV Inc., Elmsford, NY 10523 914-592-6050
Hamamatsu Photonics K.K., Hamamatsu City, Shizuoka Pref, JAPAN 0534-52-2141
Thomson Electron Tubes & Devices Corp., Thomson CSF, Totowa, NJ 07511 201-812-9000
Varian Associates, Electron Device Business, Palo Alto, CA 94304 .... 415-493-4000; 800-544-4636

Tuners, AM/FM-1300

E.P.D./General Power Corp., Anaheim, CA 92805-8508, 714-520-0881;1-800-343-1813 .... D•1069
Shokai Far East Ltd., Peekskill, NY 10566, 914-736-3500 .... D•1060
A E G Corporation, Telefunken Semiconductors Div., Somerville, NJ 08876-1269 201-231-8300
§† Aiphone, Bellevue, WA 98005 206-455-0510
§ Alps Electric (USA), Inc., San Jose, CA 95134 408-432-6000
§ Bogen Communications, Inc., Sound Prods., Ramsey, NJ 07446 201-934-8500
§† Dukane Corp., Communications Sys. Div., St. Charles, IL 60174-9984 708-584-2300
EPD Electronics, Inc., Gardena, CA 90247 213-515-4996
§ Paso Sound Products, Pelham, NY 10803 914-738-4800
§ Precision Electronics, Franklin Park, IL 60131 708-678-5350
§† PTS Corporation, Bloomington, IN 47401 812-824-9331
§ Toko America, Inc., Mt. Prospect,, IL 60056 708-297-0070
§ University Sound, Inc., Mark IV Industries, Sylmar, CA 91342 818-362-9516
† Watkins-Johnson Co., Palo Alto, CA 94304 415-493-4141

Ultraviolet Inspection Lighting-Also See Microscopes, Ultraviolet-4100

American Ultraviolet, Murray Hill, NJ 07974 908-665-2211
Aristo Grid Lamp Prods., Roslyn, NY 11576 516-484-6141
§ Clean Room Prods., Ronkonkoma, NY 11779-6528 516-588-7000
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Electronic Controls Design, Milwaukie, OR 97222 503-659-6100
§ Gates, Geo. W., & Co., Inc., Franklin Sq., NY 11010 516-352-2904
§ Mann, Henry, Inc., Huntingdon Valley, PA 19006 215-355-7200
§† Spectronics Corp., Westbury, NY 11590 .... 516-333-4840/1-800-274-8888
† Stenning Instrments, Inc., Pacific Palisades, CA 90272 213-459-2930
§ Techni-Tool, Plymouth Meeting, PA 19462 215-825-4990
§ UVP, Inc., San Gabriel, CA 91778 818-285-3123
Xenon Corp., Woburn, MA 01801 617-938-3594

Valves, Vacuum-4100

§† Automatic Switch Co., Florham Park, NJ 07932 1-201-966-2000
§ Barksdale Controls Div., Imo Industries Inc., Los Angeles, CA 90058 213-589-6181
† Bemco, Simi Valley, CA 93065 805-583-4970
Cooke Vacuum Prods., Inc., Norwalk, CT 06854 203-853-9500
§ Crouzet Corporation, Carrollton, TX 75006-2503 .... 214-250-1647;1-800-527-5311
§ CVC Products, Inc., Rochester, NY 14603 716-458-2550
Edwards High Vacuum International, Div. of the BOC Group, Wilmington, MA 01887 508-658-5410
General Protection Co., Inc., Circuit Protection Group, Chicago, IL 60659 312-761-0403
§ Hoke Incorporated, Cresskill, NJ 07626 201-568-9100
Materials Research Corporation, Orangeburg, NY 10962 914-359-4200
§† MKS Instruments, Inc., Andover, MA 01810 508-975-2350
Parker Hannifin Corp. Pneumatic Div., Richland, MI 49083 616-694-9411
§ Roean Industries, Inc., Pacoima, CA 91331 818-767-7047
§† ULVAC North America Corporation, Kennebunk, ME 04043 207-985-2973
Veeco Instruments Inc., Plainview, NY 11803 516-349-8300

Vibrators-4050

Wilcoxon Research, Rockville, MD 20850, 301-330-8811 .... B•1959
Alpha-M Corp., Dallas, TX 75229 214-406-0424
† Bruel & Kjaer Instrs. Inc., Marlboro, MA 01752-3093 508-481-7000
§ Endevco Corporation, Allied Signal Aerospace Co., San Juan Capistrano, CA 92675 714-493-8181
Endicott Coil Co., Inc., Binghamton, NY 13905 607-797-1263
† MB Dynamics Inc., Cleveland, OH 44146-1483 216-292-5850
† Thermotron Industries, A Venturedyne, Ltd. Co., Holland, MI 49423 616-393-4580
Unholtz-Dickie Corp., Wallingford, CT 06492 203-265-3929

Viewing Hoods, Cathode Ray Tube-2975

Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Tektronix, Inc., Beaverton, OR 97077 800-835-9433

Visual Micro Inspection Systems-2900

† ADVANCED MICRO SYSTEMS, INC., Hudson, NH 03051-4920 603-882-1447
§ Advanced Video Products, Littleton, MA 01460 508-486-0024
† Anorad Corp., Hauppauge, NY 11788 516-231-1995
# Norman N. Axelrod Assocs.:Electro-optical, Laser, & Machine Vision Div., New York, NY 10028 212-228-0900
† D. O. Industries, Rochester, NY 14623 716-359-4000
† Metron Optics Inc., Solana Beach, CA 92075-0690 619-755-4477
Ragen Corp., Systems Div., N. Arlington, NJ 07032 201-997-1000
§ TS Products, Inc., Arleta, CA 91331-3429 818-896-6676
Vista Systems, Inc., Peabody, MA 01960 508-532-1971

VME Bus Cards-2025

Graham Electronic Manufacturing Inc., Escondido, CA 92025, 619-747-9177;800-628-4095 ..... C•1057
§ National Instruments Corp., Austin, TX 78730-5039, 512-794-0100 ..... D•1124
Product Technology, Inc., Irvine, CA 92714, 714-474-8998 ..... C•1684
§ Zitel Corporation, Milpitas, CA 95035, 408-946-9600;800-622-5020 ..... D•2239
Analogic Corp., Peabody, MA 01960 508-977-3000
ASC Systems, St. Clair Shores, MI 48080 313-882-1133
Atlanta Signal Processors, Inc., Atlanta, GA 30308 404-892-7265
§ Ciprico Inc., Plymouth, MN 55441 612-559-2034
§ Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Datum Timing, Datum Inc., Anaheim, CA 92806-5790 714-533-6333
§† Dynatech Computer Company, Mountain View, CA 94039-7400 415-964-7400
Electronic Solutions, A Unit of Zero Corp., San Diego, CA 92121 619-452-9333
Electronic Tele-Communications, Inc., Atlanta, GA 30340-2178 404-455-4890
ELMA Electronic Inc., Fremont, CA 94538 415-656-3400
Engineered Assemblies & Components Corp., Teterboro, NJ 07608 ..... 201-288-4477; 800-447-5639
Interlogic Industries, Melville, NY 11747-4294 516-420-8111
† International Digital Electronics, San Jose, CA 95113 ..... 408-283-1010 (ext 107)
Ironics Incorporated, Ithaca, NY 14850 607-277-4060
Keithley MetraByte, Taunton, MA 02780 508-880-3000
KineticSystems, Lockport, IL 60441 815-838-0005
Logical Design Group, Inc., Raleigh, NC 27607 919-851-1101
Matrix Corp., Raleigh, NC 27610 919-231-8000
MicroDimensions, Inc., Mentor, OH 44060 216-974-8070
Mupac Corp., Carlo Gavazzi Co., Brockton, MA 02401 508-588-6110
§ Phoenix Contact Inc., Harrisburg, PA 17111 717-944-1300
Power Pac, Shelton, CT 06484 203-925-0123
Precision Filters, Ithaca, NY 14850 607-277-3550
Serial Lab Prods., Inc., Marlboro, MA 01752 617-481-1684
§ Spectrum Signal Proc., Blaine, WA 98230 ... 1-800-663-8986 (US);604-438-7266 (Can.)
Transmagnetics, Farmingdale, NY 11735 516-293-3100
§ Vector Electronic Co., Inc., Sylmar, CA 91342 ..... 818-365-9661;800-423-5659; 800-426-4652
VME Microsystems Intl. Corp., Huntsville, AL 35803-3308 205-880-0444

Voltage Sources-4000

† Electronic Development Corp., EDC, Boston, MA 02127-4198, 617-268-9696 ..... D•1243
General Resistance, A Prime Technology Company, N. Branford, CT 06471, 203-481-5721 ..... D•1253
IET Labs, Inc., Westbury, NY 11590, 516-334-5959 ..... D•1258,1265
Industrial Test Equipment Co., Inc., Port Washington, NY 11050, 516-883-1700 ..... D•2204
Integrated Technologies Solutions Inc., East Meadow, NY 11554, 516-481-0857 ..... D•1267
Julie Research Labs., New York, NY 10001, 212-633-6625 ..... D•1271
Keithley Instrs., Cleveland, OH 44139, 800-552-1115 ..... D•1275
§ Power Designs, Inc., Westbury, NY 11590, 516-333-6200 ..... D•1986
Todd Products Corp., Brentwood, NY 11717, 516-231-3366 ..... D•2077
† Valhalla Scientific, San Diego, CA 92121, 619-457-5576 ..... D•1332-1333
† Abacus Controls Inc., Somerville, NJ 08876 908-526-6010
Amphenol Spectra-Strip/ITD, Hamden, CT 06514 203-281-3200
BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
Burr-Brown Corp., Tucson, AZ 85734 602-746-1111
§ Calex Mfg. Co., Inc., Pleasant Hill, CA 94523 510-932-3911
† California Instruments Corp., San Diego, CA 92111-1216 .. 619-279-8620;800-356-2244
Clarke-Hess Communications Research Corp., New York, NY 10011 ... 212-255-2940
Datel, Inc., Mansfield, MA 02048-1194 508-339-3000
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
Endicott Research Group, Endicott, NY 13760 607-754-9187
John Fluke Mfg. Co., Inc., Everett, Wa 98206, WA 98203 206-347-6100
Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900
Hipotronics Inc., Brewster, NY 10509 914-279-8091
§ Keithley MetraByte, Taunton, MA 02780 508-880-3000
† Koep Precision Standards, Inc., South Plainfield, NJ 07080 ..... 201-757-2220/2277
Leeds & Northrup, General Signal, North Wales, PA 19454 215-699-2000
Marway Prods. Inc., Santa Ana, CA 92703 714-973-1800
North Hills Electronics, Glen Cove, NY 11542 516-671-5700
Omega Engineering, Stamford, CT 06907 800-826-6342
Power Test Division, Inc., Subsidiary of Analogic Corp., Burlingame, CA 94010 415-692-8001
Rotek Instrument Corp., Waltham, MA 02254 617-899-4611
† Sigmapower, Inc., Carson, CA 90746 ..... 213-32-Sigma
§ Sunshine Instruments, Philadelphia, PA 19115 ..... 215-673-5600;800-343-1199
§† Systron-Donner Instrument Div., Concord, CA 94518 415-676-5000
Tucker Electronics, Dallas, TX 75355-1419 ..... 214-348-8800;800-527-4642
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
Xitron Technologies, San Diego, CA 92121 619-458-9852

Voltmeter, Electrostatic-2900

† Jennings, San Jose, CA 95122-2696, 408-292-4025 ..... D•1274
# BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808
§ Contact East, N. Andover, MA 01845 508-682-2000
§ Control Cable, Inc., Baltimore, MD 21207 301-298-4411
Davis Instruments Mfg. Co., Inc., Baltimore, MD 21215 800-368-2516
§ Monroe Electronics, Inc., Lyndonville, NY 14098 716-765-2254
§ Semtronics Corp., Peachtree City, GA 30269 404-487-6681
Sensitive Research Instruments, Mt. Vernon, NY 10550 914-699-9717
§ Trek, Incorporated, Medina, NY 14103-0231 716-798-3140
Φ U.S. Instrument Rentals, Inc., AT&T Capital Corp., D/FW Airport, TX 75261 800-874-7123
§ Westberg Manufacturing Inc. (WESTACH), Sonoma, CA 95476 707-938-2121

VXIbus Modular Test Systems-2900

Tracewell Enclosures, Inc., Westerville, OH 43081, 614-846-6175;800-848-4525 ..... C•1120
§# A.D. Data Systems Corp., Photographic Sciences Corp., Webster, NY 14580-0748 716-265-1600
CDS - Colorado Data Sys., Englewood, CO 80110 ..... 303-762-1640;800-CDS-ATET
Colorado Data Systems, Inc., Englewood, CO 80110 ..... 303-762-1640; 800-TEK-4VXI
Datron Instruments, A Wavetek Company, Norwich, England, UNITED KINGDOM NR6 6JB 603-404824
Elgar Electronics Corporation, San Diego, CA 92121 ..... 619-450-0085;800-733-5427
KineticSystems, Lockport, IL 60441 815-838-0005
† North Atlantic Industries, Hauppauge, NY 11788 516-582-6500
Precision Filters, Ithaca, NY 14850 607-277-3550
Schlumberger Instruments, Schlumberger Technlgs., Billerica, MA 01821 ..... 508-671-9700;1-800-225-5765
Tektronix, Inc., Beaverton, OR 97077 800-835-9433
Transmagnetics, Farmingdale, NY 11735 516-293-3100

Welding Machines, Laser-4100

§ BEA electro-optics, inc., Des Plaines, IL 60016 708-298-1420
† Coherent General, Inc., Sturbridge, MA 01566 508-347-2681
† Coherent, Inc., Palo Alto, CA 94303 415-493-2111
† Control Laser Corp., Orlando, FL 32809 407-438-2500
U. S. Laser Corp., Wyckoff, NJ 07481 201-848-9200

Wire Strippers, Automatic-4100

DuPont Connector Systems, DuPont Elctrns., Wilmington, DE 19880-0019, 800-237-2374 ..... C•1350

Word Processors, Shared Logic Systems-2025

BEC Inc./Certified Calibration Labs, Horsham, PA 19044 800-523-3808

Word Processors, Standalone Systems-2025

Hewlett-Packard Co., Cupertino, CA 95014 800-752-0900

Work Stations, Computer-2000

Flexible Furniture Division, Metal Components, Inc., Plainwell, MI 49080, 616-685-6831 ..... C•1053

Work Stations, Laminar Flow-4100

§ Forma Scientific, Inc., Marietta, OH 45750 614-373-4763

Work Stations, 3-D Video Microscope-4100

§ Advanced Video Products, Littleton, MA 01460 508-486-0024

X-ray Detector Arrays (For Industrial Inspections)-4100

† Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456

X-ray Imaging System-4100

† Ball Corporation, Industrial Systems Division, Mogadore, OH 44260 216-784-4456

X-ray Inspection Equipment-4100

Aristo Grid Lamp Prods., Roslyn, NY 11576 516-484-6141

X-Y-Z Systems, Programmable-2550

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92 Manufacturers and Sales Offices Directory

Each manufacturer is listed alphabetically with complete address and telephone number of main offices. The names of those with data pages in this edition of EEM are shown in **boldface**

Many manufacturers also show FAX, TWX and Telex numbers, FSC (Federal Supply Code), other pertinent company data, their sales and/or local distributor offices and phones. The page numbers of their data pages in this edition are shown in all volumes.

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FAX: 508-373-8881

AAK CORP, 747 River St., Haverhill, MA 01832, Tel: 508-373-3769, 800-886-2225, TELEX: 04 26 3109-1; FSC No.: 04 26 3109-1; Empl.: 20; *Sls. Mgr.:* Marie Credit ..... **D•1507-1510**

Local Sales Offices & Reps

CA	Los Angeles, Power Partners	213-215-0800
IN	Indianapolis, Loren Green Assocs.	317-293-9827
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
OH	Cleveland, Tiby Co.	216-371-5335
PA	Cheltenham, Stein Instr. Corp.	215-379-1990

AALPHA PRECISION, Pacific Resistor Co., 18300 Oxnard St., Tarzana, CA 91356, Tel: 818-345-7811, FAX: 818-345-1507; FSC No.: 06416; *Sls. Mgr.:* Douglas Trewhitt ..... **A•1837**

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CA	San Jose, Comtech Mktg.	408-294-5448

Local Distributors

CA	San Jose, Comtech Mktg.	408-294-5448

A & D ELEC. INSTRS., 73-07 88th St, Glendale, NY 11385, Tel: 718-275-6516, FAX: 718-275-6516; FSC No.: 01914; Empl.: 7

A & J MANUFACTURING CO., 14131 Franklin Ave., Tustin, CA 92680, Tel: 714-544-9570, FAX: 714-544-4215; FSC No.: 08060; Empl.: 70; *Sls. Mgr.:* Wayne L. Seeley

AAVID ENGINEERING, INC., One Kool Path, P.O. Box 400, Laconia, NH 03247-0400, Tel: 603-528-3400, TWX: 510-298-1127, FAX: 603-528-1478; FSC No.: 30161; Empl.: 450; *Sls. Mgr.:* Charles Nelson; *Dist. Mgr.:* David Mendel ..... **C•1604**

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AL	Huntsville, Cartwright & Bean, Inc.	205-830-1540
AZ	Phoenix, Jarko Assocs. Inc.	602-243-4387
CA	Brea, Masco Elctrns.	714-529-0866
CA	Santa Clara, WestRep	408-988-8833
CO	Broomfield, SummitWest Mktg.	303-460-9600
FL	Apopka, Cartwright & Bean, Inc.	407-889-9100
FL	Deerfield Bch., Cartwright & Bean, Inc.	305-429-3400
GA	Norcross, Cartwright & Bean, Inc.	404-368-0160
IL	Itasca, Beta Technlg. Sls., Inc.	708-250-9586
IN	Carmel, Kahsar Sls. Inc.	317-844-9353
IA	Des Moines, S P S Assocs.	515-225-0607
KS	Olathe, S P S Assocs.	913-764-4460
LA	Covington, Cartwright & Bean, Inc.	504-892-1780
MD	Hunt Valley, Marktron, Inc.	301-628-1111
MD	Rockville, Marktron, Inc.	301-251-8990
MA	Millis, Selmark Assocs., Inc.	508-376-2914
MI	Ann Arbor, Kahsar Sls. Inc.	313-769-0131
MN	Brainerd, Mitchell Johnson	218-829-8180
MS	Jackson, Cartwright & Bean, Inc.	601-981-1170
MO	Earth City, S P S Assocs.	314-291-0520
NE	Panama, S P S Assocs.	913-764-4460
NJ	Berkeley Hgts., Cambridge-Allen & Assocs.	908-464-0203
NJ	Medford, Jack McCoy, Inc.	609-953-0770
NM	Albuquerque, Ron-Tek, Inc.	505-299-4124
NY	Endwell, Reagan/Compar Binghamton	607-754-2171,607-754-8946
NY	Fairport, Reagan/Compar Corp.	716-271-2230
NY	New Hartford, Reagan/Compar Syracuse/Utica	315-732-3775,315-735-9831
NC	Charlotte, Cartwright & Bean, Inc.	704-536-0303
NC	Raleigh, Cartwright & Bean, Inc.	919-876-4130
OH	Cincinnati, Kahsar Sls. Inc.	513-922-3133
OH	Columbus, Kahsar Sls. Inc.	614-252-4009
OH	Mentor, Kahsar Sls. Inc.	216-946-7659
OR	Portland, S P S Elctrns.	503-297-6919
PA	Exton, Jack McCoy, Inc.	215-363-0350
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TN	Memphis, Cartwright & Bean, Inc.	901-362-8345
TX	Austin, Mil-Rep Assocs., Inc.	512-346-6331
TX	Houston, Mil-Rep Assocs., Inc.	713-444-2557
TX	Richardson, Mil-Rep Assocs., Inc.	214-644-6731
UT	Salt Lake City, Butterworth Mktg.	801-969-5566
WA	Snohomish, S P S Elctrns.	206-794-0154
WI	Milwaukee, Beta Technlg. Sls., Inc.	414-543-6609
PR	Guaynabo, ISLA Caribe Electro Sls.	809-720-4430
Can	Markham, Ont., Avotronics, Ltd.	416-475-2024
Can	Ottawa, Ont., Avotronics, Ltd.	613-233-5527
Can	Pointe Claire, Que., Avotronics, Ltd.	514-697-2135

Local Distributors

AL	Huntsville, Century Fasteners Corp.	205-883-5344
AL	Huntsville, Hammond Elctrns. Inc.	205-830-4764
AZ	Phoenix, Aero-Space Southwest Inc.	602-582-2779
AZ	Tempe, Acacia/Deanco	602-894-2874
AZ	Tempe, D C Elctrns. Supp.	602-438-1234
AR	Ft. Smith, Carlton-Bates Co., Inc.	501-646-8201
AR	Little Rock, Carlton-Bates Co. Inc.	501-562-9100
AR	Pine Bluff, Carlton-Bates Co. Inc.	501-535-1355
AR	Springdale, Carlton-Bates Co. Inc.	501-756-5012
CA	Fountain Valley, Comps. Cen. Inc.	714-979-0433
CA	Fullerton, Pyramid Elctrns.	213-691-0561
CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	Hayward, Allied Elctrns.	415-487-5250
CA	Irvine, Acacia/Deanco	714-660-0834
CA	Mtn. View, Energy Sls. Inc.	415-969-0800
CA	Rancho Cordova, Acacia/Deanco	916-638-1861
CA	San Diego, Acacia/Deanco	619-565-4365
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Jose, Allied Elctrns.	408-727-1690
CA	San Jose, Future Elctrns. Inc.	408-435-9100
CA	Santa Clara, Comps. Cen.	408-988-3751
CA	Santa Clara, D C Elctrns. Supp.	408-980-1199
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Acacia/Deanco	408-745-7200
CA	Tustin, Added Value Elctrn.	714-259-8258
CO	Englewood, N E P Elctrns. Inc.	303-799-9898
CO	Lakewood, Acacia/Deanco	303-232-2882
CO	Westminster, Future Elctrns. Inc.	303-650-0123
CT	Danbury, Future Elctrns. Inc.	203-743-9594
CT	Wallingford, Cronin Elctrns., Inc.	800-982-4449
FL	Clearwater, Elctrn. Precepts of FL	813-530-9781
FL	Clearwater, Future Elctrns. Inc.	813-441-4771
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FL	Orlando, Hammond Elctrns. Inc.	407-849-6060
FL	Tampa, Century Fasteners Corp.	813-886-5770
GA	Decatur, Allied Elctrns.	404-377-3555
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GA	Norcross, Future Elctrns. Inc.	404-441-7675
GA	Norcross, Hammond Elctrns. Inc.	404-449-1996
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IN	Indianapolis, Bell Inds.;Jit Div.	317-299-5487
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MN	Minneapolis, Aero-Space Computer Supp.	612-884-4725

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NY Rochester, Summit Elctrns. Inc. 716-334-8110
NC Charlotte, Century Fasteners Corp. 704-554-0444
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NC Greensboro, Hammond Elctrns. Inc. ... 919-275-6391
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NC Raleigh, Century Fasteners Corp. 919-787-1800
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OH Twinsburg, Schuster Elctrns. 216-425-8134
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OR Beaverton, Murphy Elctrns. 503-642-2001
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PA Erie, REM Elctrns. 814-453-5626
PA Harrisburg, Cumberland Elctrns. 717-232-5999
PA Lancaster, Cumberland Elctrns. 717-393-8304
PA Lewistown, Cumberland Elctrns. 717-249-9631
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VA Richmond, Century Fasteners Corp. .. 804-262-8671
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Can Scarborough, Ont., Carsten Elctrns. Ltd. 416-495-9999
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Can Winnipeg, Manitoba, Future Elctrns. Inc. 204-339-0554

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AL Gurly, Saber Assocs. 800-327-0853
CA Los Angeles, Power Partners 800-468-5400
CA San Diego, Power Partners 800-468-5400
CA Sunnyvale, N-S Westronics 408-745-1102
CT New London, Elctrn. Sls. of New England 203-443-2646
FL Apopka, Saber Assocs. 800-432-6288
FL Melbourne, Saber Assocs. 800-432-6288
FL Plantation, Saber Assocs. 800-432-6288
FL Tampa, Saber Assocs. 800-432-6288
GA Dacula, Saber Assocs. 800-327-0853
MD Landover, Sel-Tronics 301-341-2700
MA Wareham, Elctrn. Sls. of New England 508-295-7634
NC Clayton, Saber Assocs. 800-327-0853
TX Dallas, True Technlg. 214-691-7870
VA Hampton, Sel-Tronics 301-341-2700
VA Herdon, Sel-Tronics 301-341-2700
WA Bellevue, Al Smith Co. 206-746-6770
WA Vancouver, Al Smith Co. 206-892-9912

ABALON PRECISION MFG., 1040 Home Street, Bronx, NY 10459, Tel: 212-589-5682, 1-800-888-ABALON, FAX: 212-589-0300; Empl.: 25; *Sls. Mgr.:* Harold Miller

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TX Richardson, Abbott Elctrns. 214-437-0697
UT Bountiful, Anderson & Assocs. 801-292-8991
AZ Scottsdale, Aztech-CPS Assocs. 602-991-6300
Can Ottawa, Subtec Ltd. 613-738-1470

ABBOTT TECHNOLOGIES, INC, Transformer Division, 8203 Vineland Ave., Sun Valley, CA 91352, Tel: 818-504-0644, 1-800-367-8200, 818-841-3630, TELEX: 75-2972, FAX: 818-768-0395,69-6282; FSC No.: 58910; Empl.: 62; *Sls. Mgr.:* Suresh Soni ..... **A•2134-2149; D•2152-2153**

Local Sales Offices & Reps

CA Mission Viejo, Abbott Technlgs., Inc. .. 714-454-1361
CA Sun Valley, Abbott Technlgs., Inc. 818-504-0644
NJ Palisades Pk., Abbott Technlgs., Inc. .. 201-461-4005

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ACC ELECTRONICS COMPANY, Echlin Inc., 1300 W. Oak, Independence, KS 67301, Tel: 316-331-1000, FAX: 316-331-1422; Empl.: 1000; *Sls. Mgr.:* Leon Allen

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ACCEL TECHNOLOGIES, INC., 6825 Flanders Dr., San Diego, CA 92121, Tel: 619-554-1000, TELEX: 201-582 ATI UR, FAX: 619-554-1019; Empl.: 26; *Sls. Mgr.:* Ray Schnorr

ACCESSORIES FOR ELECTRONICS, INC., 800 Merrick Rd., Baldwin, NY 11510-3593, Tel: 516-546-1751, FAX: 516-867-1922; FSC No.: 54355; Empl.: 27; *Sls. Mgr.:* Bill Harris

ACCU DATA, INC., 1220 Spring Creek Place, Springville, UT 84663-0963, Tel: 801-377-9156, FAX: 801-377-9158; Empl.: 10; *Sls. Mgr.:* Ralph D. Bradley; *Dist. Mgr.:* Ralph D. Bradley

ACCUDYNE CORP., P.O. Box 1429, Janesville, WI 53547, Tel: 608-752-4053, FAX: 608-752-9706; FSC No.: 18356; Empl.: 540; *Sls. Mgr.:* R. E. Mowris; *Dist. Mgr.:* R. E. Mowris

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ACCULIN, INC., 214 N. Main St., Suite 204, Natick, MA 01760, Tel: 508-650-1012, FAX: 508-650-1457; Empl.: 3; *Sls. Mgr.:* Barry Hilton

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ACCUPROBE, INC., 1 Harrison Ave, Box 1044, Salem, MA 01970, Tel: 508-745-7878, FAX: 508-745-7922; Empl.: 22; *Sls. Mgr.:* Thomas H. Murphy; *Dist. Mgr.:* T. H. Murphy

ACCURATE ELECTRONICS CORP., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036, Tel: 216-366-6330, 1-800-325-8979, FAX: 216-366-0522; FSC No.: 11375; Empl.: 35; *Sls. Mgr.:* J. F. Seybold

Local Sales Offices & Reps

FL Niceville, Adams Sls. Co. 904-897-4958
OH Worthington, Padgett Sls. Co. 614-885-5908

ACCURIDE, 12311 Shoemaker, Santa Fe Springs, CA 90670, Tel: 213-903-0373, TWX: 910-586-1632, FAX: 213-903-0208; *Sls. Mgr.:* Jackie Pinto

ACCUSONIC DIVISION, Ferranti O.R.E. Inc., Box 709, Falmouth, MA 02541, Tel: 508-548-5800, TELEX: 6817399 OREFAL UW, FAX: 508-540-3835; Empl.: 125; *Sls. Mgr.:* Robert Beede

ACCUSONIC SYSTEMS CORP., A DSG Company, 2101 Jericho Turnpike, New Hyde Park, NY 11040, Tel: 516-328-3300, FAX: 516-326-8827; Empl.: 116; *Sls. Mgr.:* Michael D'Agostino

ACCUTECH, Adaptive Instrs. Corp., 15 Bunazzoli Ave., Riverside Indl. Park, Hudson, MA 01749, Tel: 508-568-0500, FAX: 508-568-9085; *Sls. Mgr.:* Cliff Lewis

ACCUTECH BENCHMARK SERVICES, P.O. Box 252, Brick, NJ 08723, Tel: 1-908-206-0026, FAX: 908-206-0280 ..... **D•1024-1026**

ACCUTRONICS/CONNOR-WINFIELD, See Connor-Winfield

acdc electronics
A DIVISION OF ASTEC AMERICA, INC.

ACDC ELECTRONICS, DIV. OF ASTEC AMERICA, See Astec America

ACD-ELCOR PRODUCTS, P.O. Box 244, Bethel, CT 06801, Tel: 203-743-3510; Empl.: 3

ACHESON COLLOIDS, Div. of Acheson Industries, Inc., P.O. Box 611747, Port Huron, MI 48061-1747, Tel: 313-984-5581, FAX: 313-984-1446; Empl.: 200

A.C. INTERFACE INC., 22391 Gilberto, Rancho Santa Margarita, CA 92688, Tel: 714-858-1866, FAX: 714-858-1073; FSC No.: OAP 78; Empl.: 23; *Sls. Mgr.:* Bill Roth; *Dist. Mgr.:* Al Kile

ACL INC., 1960 E. Devon Ave., Elk Grove, IL 60007, Tel: 708-981-9212, 1-800-782-8420, FAX: 708-981-9212; Empl.: 12; *Sls. Mgr.:* Ralph D. Considine; *Dist. Mgr.:* Tony Banks

FAX: 716-968-3948

ACME ELECTRIC CORPORATION, 20 Water Street, Cuba, NY 14727, Tel: 716-968-2400; *Sls. Mgr.:* Dale Guilford; *Dist. Mgr.:* Bill Bengle
..... **D•1544-1547, 2154-2155**

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, O'Donnell Assocs. S.W.	602-944-9542
CA	San Jose, O'Donnell Assocs., North	408-432-1940
CO	Littleton, Harthun Assocs.	303-795-5545
FL	Apopka, Cartwright & Bean	407-422-4531
FL	Deerfield Bch., Cartwright & Bean	305-429-3400
GA	Norcross, Cartwright & Bean	404-368-0160
ID	Boise, Jas. J. Backer Co.	208-343-9831
IL	Des Plaines, Electron Mktg.	312-298-2330
IN	Ft. Wayne, Needler Sls. Co., Inc.	219-447-2123
IN	Indianapolis, Luebbe Sls.	317-845-7389
IN	Indianapolis, Needler Sls. Co., Inc.	317-255-8056
KS	Shawnee Mission, Lowell Kangas & Assocs.	913-631-3515
LA	Covington, Cartwright & Bean	504-892-1780
MD	Gaithersburg, Naudain Assocs.	301-258-5040
MA	Framingham, Marathon Sls.	508-875-3566
MI	Farmington Hills, Luebbe Sls.	313-489-8828
MS	Jackson, Cartwright & Bean	601-981-1170
MN	Minneapolis, Boerger & Assocs.	612-560-3435
MO	St. Louis, Lowell Kangas & Assocs.	314-821-4050
NM	Albuquerque, O'Donnell Assocs. S.W.	505-889-4522
NY	Clark Mills, KLM Garner	315-853-6126
CA	Torrance, O'Donnell Assocs. S. W.	213-539-9664
NC	Charlotte, Cartwright & Bean	704-536-0303
NC	Lumberton, Acme Elec. Corp.	919-738-9202
NC	Raleigh, Cartwright & Bean	919-876-4130
OH	Cincinnati, Luebbe Sls.	513-530-0600
OH	Cleveland, Luebbe Sls.	216-333-0425
OH	Cleveland, Marlow Assocs.	216-831-8232
OH	Columbus, Luebbe Sls.	614-431-0474
OH	Dayton, Luebbe Sls.	513-294-0426
OH	Dayton, Marlow Assocs.	513-274-9666
OR	Beaverton, Jas. J. Backer Co.	503-627-0775
PA	Pittsburgh, Luebbe Sls.	412-364-0490
PA	Pittsburgh, Marlow Assocs.	412-343-5050
TN	Knoxville, Cartwright & Bean	615-693-4750
TN	Memphis, Cartwright & Bean	901-362-8345
UT	Salt Lake City, Acme Elec. Corp.	801-539-0227
WA	Seattle, Jas. J. Backer Co.	206-285-1300
WI	Sullivan, Electron Mktg.	414-593-2981

Local Distributors

AL	Birmingham, American Elctrns. Supp.	205-942-4656
AL	Birmingham, Forbes Distrbg.	205-251-3941
AL	Decatur, Forbes Distbg.	205-353-4762
AL	Huntsville, Allied Elctrns.	205-721-3500
AL	Huntsville, Forbes Distbg.	205-837-1579
AL	Huntsville, Future Elctrns.	205-882-3190
AL	Mobile, Allied Elctrns.	205-476-1875
AL	Mobile, Forbes Distbg.	205-479-4535
AL	Mobile, Spectronics	205-344-0450
AL	Montgomery, Forbes Distrbg.	205-263-2083
AZ	Phoenix, Allied Elctrns.	602-437-9080
AZ	Phoenix, Future	602-968-7140
AZ	Tempe, L Comp	602-730-1633
AZ	Tempe, P&A Entprs.	602-894-1519
AR	Little Rock, Carlton Bates	501-562-9100
AR	N. Little Rock, Allied Elctrns.	501-376-0233
CA	Chatsworth, Allied Elctrns.	818-882-6981
CA	Chatsworth, Future Elctrns.	818-722-6240
CA	Fremont, Allied Elctrns.	415-770-0590
CA	Irvine, Allied Elctrns.	714-727-3010
CA	Irvine, Future Elctrns.	714-250-4141
CA	Irvine, ITT Multicomp.	714-727-3001
CA	Los Angeles, Bell Inds.	213-826-6778
CA	Rockland, Allied Elctrns.	916-632-3014
CA	S. San Francisco, Allied Elctrns.	415-952-9599
CA	San Diego, Allied Elctrns.	619-279-2550
CA	San Diego, Future Elctrns.	619-278-5020
CA	San Jose, Capstone	408-453-9804
CA	San Jose, Future Elctrns.	408-434-1122
CA	San Jose, ITT Multicomp.	408-453-1404
CA	San Jose, Rose Elctrns.	408-943-0255
CA	Sunnyvale, Target Elctrns.	408-733-0384
CA	Torrance, Allied Elctrns.	213-373-8828
CA	Tustin, Capstone	714-730-0349
CA	Yorba Linda, Target Elctrns.	714-692-1630
CO	Denver, Consolidated Parts	303-623-5313
CO	Englewood, Allied Elctrns.	303-790-1664
CO	Englewood, NEP Elctrns.	303-799-9898
CO	Westminster, ITT Multicomps.	303-451-8740
CT	Bethel, Future Elctrns.	203-743-9594
CT	Cheshire, Allied Elctrns.	203-272-7730
CT	Wallingford, Sager	203-265-7741
FL	Altamonte Springs, Future Elctrns.	407-767-8414
FL	Casselberry, Allied Elctrns.	407-831-3331
FL	Clearwater, Future Elctrns.	813-578-2770
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Jacksonville, Allied Elctrns.	904-346-0741
FL	Jacksonville, Hammond/EMSCO	904-356-4851
FL	Largo, Allied Elctrns.	813-541-4660
FL	Orlando, EMSCO	407-849-6362
FL	Orlando, Hammond Elctrns.	407-849-6060
FL	Pompano Bch., Allied Elctrns.	305-978-3008
FL	Riviera Bch., K & M Elctrl.	407-842-4911
GA	Doraville, Voltex Batteries	404-448-6021
GA	Norcross, Bell Inds.	404-662-0923
GA	Norcross, Future Elctrns.	404-441-7676
GA	Norcross, Hammond Elctrns.	404-449-1996
IL	Addison, LComp Elctrns.	312-628-1400
IL	Itasca, Capstone	708-250-3000
IL	Libertyville, Allied Elctrns.	708-918-0250
IL	Oak Forest, Allied Elctrns.	708-535-0038
IL	Wood Dale, Allied Elctrns.	708-860-0007
IN	Carmel, Altex Elctrns.	317-848-1323
IN	Ft. Wayne, Bell Inds.	219-742-4346
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Allied Elctrns.	317-875-0448
IN	Indianapolis, Bell Inds.	317-634-8202
IN	Indianapolis, Meunier Elctrns.	317-635-3511
IN	Indianapolis, R S Elctrns.	513-793-2450
ID	Boise, Radar Elec.	208-336-2227
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
IA	W. Des Moines, Allied Elctrns.	515-223-6488
KS	Lenexa, Allied Elctrns.	913-599-6227
KS	Overland Park, Olive Elctrns.	312-297-6200
IL	Schaumberg, Future Elctrns.	312-882-1255
KY	Florence, URI Elctrns.	606-371-4423
KY	Lexington, Radio Elctrn.	606-255-6661
KY	Louisville, Allied Elctrns.	502-452-2293
KY	Louisville, Peerless Elctrns.	502-637-7674
LA	Baton Rouge, Menard Elctrns.	504-355-0323
LA	Metairie, Allied Elctrns.	504-885-1195
LA	New Orleans, Menard Elctrns.	504-734-8445
LA	New Orleans, Radio Parts	504-581-5959
MD	Baltimore, Resco/Baltimore	301-931-8200
MA	Billerica, Allied Elctrns.	508-667-7921
MD	Columbia, Allied Elctrns.	301-381-1560
MD	Columbia, Future Elctrns.	301-290-0600
MD	Columbia, Sager	301-995-6580
MD	Jessup, Treeko Elctrns.	301-470-3300
MD	W. Friendship, Cerberus Sys.	301-489-7198
MA	Hingham, Sager Elctrl.	617-749-6700
MA	Norwood, Allied Elctrns.	617-255-0361
MA	Wilmington, Capstone	508-657-5874
MA	Wilmington, North Star Elctrns.	508-657-5155
MI	Battle Creek, Gt. Lakes Elctrns.	616-963-6282
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Grand Haven, Fitzpatrick Elec.	616-846-5591
MI	Grand Rapids, Allied Elctrns.	616-949-8200
MI	Grand Rapids, Fitzpatrick Elec.	800-968-9880
MI	Grand Rapids, R S Elctrns.	616-241-3483
MI	Holland, Fitzpatrick Elec.	800-968-4625
MI	Lansing, Battery Exchange(Dynalite)	517-694-0411
MI	Livonia, Allied Elctrns.	313-462-0190
MI	Livonia, Future Elctrns.	313-261-5270
MI	Livonia, R S Elctrns.	313-525-1155
MI	Muskegon, Fitzpatrick Elec.	800-968-6621
MI	Traverse City, Fitzpatrick Elec.	800-968-7262
MN	Eden Prairie, Allied Elctrns.	612-829-7554
MN	Eden Prairie, Future Elctrns.	612-944-2200
MN	Minneapolis, Bergquist Co.	612-835-2322
MN	Minneapolis, ISI-Instrmn. Svc.	612-544-8916
MS	Jackson, Ellington Elec.	601-355-0561
MO	Earth City, Allied Elctrns.	314-291-7031
MO	Kansas City, LComp Elctrns.	816-221-2400
MO	Maryland Hgts., LComp Elctrns.	314-291-6200
MO	Maryland Hgts., Olive Elctrns.	314-997-7709
MO	St Louis, ISL Corp.	314-535-5760
MO	St. Louis, Future Elctrns.	314-469-6805
MO	St. Louis, Vansickle Elctrns.	314-621-5000
NE	Omaha, Allied Elctrns.	402-697-0038
NH	Nashua, Allied Elctrns.	603-883-3008
NJ	Edison, Allied Elctrns.	908-572-9600
NJ	Fairfield, Future Elctrns.	201-227-4346
NJ	Green Brook, Apparatus Elec.	201-752-8400
NJ	Lodi, TRC	201-779-8282
NJ	Mt. Laurel, Capstone	609-727-7800
NJ	Oakland, Relay Specialties	201-337-1000
NJ	Parsippany, Allied Elctrns.	201-428-3350
NM	Albuquerque, International Elctrns.	505-291-9951
NJ	Mt. Laurel, Future Elctrns.	609-778-7600
NY	Buffalo, Summit Inds.	716-887-2800
NY	Cen. Islip, Circuit Sls.	516-348-7670
NY	E. Rochester, Rome Elctrns.	716-248-0160
NY	Fairport, Allied Elctrns.	716-425-3850
NY	Hauppauge, Future Elctrns.	516-234-4000
NY	Hauppauge, Sager Elctrl.	516-348-1300
NY	Lagrangeville, Allied Elctrns.	914-452-1470
NY	Liverpool, Future Elctrns.	315-451-2371
NY	Melville, Capstone	516-391-1300
NY	Mineola, Allied Elctrns.	516-248-2360
NY	Mt. Vernon, OAR Elctrns.	914-699-2224
NY	Mt. Vernon, QAR Elctrns.	914-699-2224
NY	Rochester, CAM/RPC Elctrns.	716-427-9999
NY	Rochester, Future Elctrns.	716-272-1120
NY	Rochester, Simcona	716-328-3230
NY	Rochester, Summit Inds.	716-334-8110
NY	Rockville Centre, Group 516 Inc.	516-678-7360
NY	Rome, Rome Elctrns.	315-337-5400
NC	Asheville, Southeastern Elctrns.	704-253-1446
NC	Charlotte, Future Elctrns.	704-529-5500
NC	Charlotte, Southeastern Elctrns.	704-523-1122
NC	Fayetteville, Southeastern Elctrns.	919-483-0371
NC	Greensboro, Hammond/EMSCO	919-275-6391
NC	Greensboro, Southeastern Elctrns.	919-273-8675
NC	Hickory, Southeastern Elctrns.	704-322-9493
NC	Jacksonville, Southeastern Elctrns.	919-353-4171
NC	Kingston, Southeastern Elctrns.	919-523-5113
NC	Lumberton, The Computer Store	919-738-3755
NC	Raleigh, Allied Elctrns.	919-876-5845
NC	Raleigh, Capstone	919-954-0600
NC	Raleigh, Sager Elctrns.	919-850-9550
NC	Raleigh, Southeastern Elctrns.	919-828-2311
NC	Wilmington, Southeastern Elctrns.	919-791-7365
OH	Cincinnati, Allied Elctrns.	513-771-6990
OH	Cincinnati, Hughes-Peters, Inc.	513-351-2000
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Cleveland, Acorn Inds.	216-289-2531
OH	Cleveland, CAM/RPC Elctrns.	216-461-4700
OH	Columbus, Foster Battery (Dynalite)	614-351-1500
OH	Dayton, Bell Inds.	513-435-8660
OH	Dayton, Duellman Elec.	513-461-8000
OH	Maumee, R S Elctrns.	419-893-0721
OH	Millbury, Dynalite Battery	419-837-6837
OH	Solon, Allied Elctrns.	216-248-4200
OH	Warren, REM Elctrns.	216-373-1300
OH	Worthington, Allied Elctrns.	614-785-1270
OK	Oklahoma City, Radio, Inc.	405-789-0741
OK	Tulsa, Allied Elctrns.	918-664-0844
OK	Tulsa, Altair Co.	918-252-9123
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Beaverton, Future Elctrns.	503-645-9454
OR	Beaverton, Rose Elctrns.	503-629-9288
OR	Portland, Radar Elec.	503-232-3404
PA	Allentown, Yates Battery	215-437-6700
PA	Bristol, Aim Elctrns.	215-785-3500
PA	Camp Hill, Allied Elctrns	717-975-3570
PA	Drexel Hill, Kass Elctrns.	215-449-2300
PA	Erie, REM Elctrns.	814-453-5626
PA	Essington, Tri-Com	215-521-3080
PA	Mars, Sager Elctrns.	412-772-2233
PA	N. Huntingdon, REM Elctrns.	412-864-7423
PA	Pittsburgh, Allied Elctrns.	412-367-4124
PA	Pittsburgh, CAM/RPC Elctrns.	412-782-3770
PA	Reading, Yates Battery	215-670-2515
SC	Charleston, Cameron & Barkley	803-554-9550
SC	Florence, Cameron & Barkley	803-664-0600
SC	Greenville, Allied Elctrns.	803-288-8835
TN	Clarksville, Randolph, Hale & Matthews	615-647-2325
TN	Columbia, Randolph & Williams	615-388-7566
TN	Memphis, Allied Elctrns.	901-367-2895
TN	Nashville, Randolph & Rice	615-255-5601
TN	Tullahoma, Randolph & Vandergaff	615-455-4531
TX	Austin, Allied Elctrns.	512-389-3771
TX	Austin, Altair Co.	512-837-4970
TX	Carrollton, Capstone	214-380-9049
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Dallas, Allied Elctrns.	214-553-4370
TX	El Paso, Allied Elctrns.	915-779-6294
TX	Ft. Worth, Allied Elctrns. Exp.	817-595-3500
TX	Houston, Altair Co.	713-462-3029
TX	Houston, Future Elctrns.	713-556-8696
TX	Humble, Allied Elctrns.	713-446-8005
TX	Irving, Allied Elctrns.	214-570-5196
TX	Richardson, Altair Co.	214-231-5166
TX	Richardson, Bell Inds.	214-744-2510
TX	Richardson, Future Elctrns.	214-437-2437
UT	Salt Lake City, Allied Elctrns.	801-261-5244
UT	Salt Lake City, Future Elctrns.	801-972-8489
VA	Alexanderia, Allied elctrns.	703-750-0206
VA	Roanoke, Southeastern Elctrns.	703-344-6611
VA	Virginia Bch., Allied Elctrns.	804-363-8662
WA	Bellevue, Syntek	206-488-0394
WA	Redmond, Future Elctrns.	206-881-8199
WA	Richland, Radar Elec.	509-943-8336
WA	Seattle, Allied Elctrns.	206-547-2827
WA	Seattle, Radar Elec.	206-282-2511
WA	Spokane, Radar Elec.	509-747-3053
WI	Mequon, Taylor Elctrns.	414-241-4321
WI	New Berlin, Allied Elctrns.	414-796-1280
WI	Sullivan, The Bergquist Co.	414-593-2020
WI	Waukesha, Future Elctrns.	414-786-1884
WI	Everett, Pringle Elctrns.	206-258-6161
PR	San Juan, Clary Corp.of P.R.	809-760-5845
Can	Calagary, Future Elctrns.	403-250-5550
Can	Downsview, Future Elctrns.	416-638-4771
Can	Edmonton, Future Elctrns.	403-438-2858
Can	Ottawa, Future Elctrns.	613-820-8313
Can	Ottawa, Ont., Wackid Radio	613-728-1821
Can	Pt. Claire, Que., Future Elctrns.	514-694-7710
Can	St. Foy, Future Elctrns.	418-682-8092
Can	Van Couver, Future Elctrns.	604-294-1166
Can	Winnipeg, Future Elctrns.	204-786-7711

Can Winnipeg, Westrock Battery 204-786-6034
Can Yellowknife, Yukon, Northern Comm .. 403-873-3953

ACME MODEL ENGINEERING CO., 654 Bergen Blvd., Ridgefield, NJ 07657, Tel: 201-943-7650; Empl.: 29

ACME TRANSFORMER, Acme Electric Corporation, 4815 West 5th St., Lumberton, NC 28358, Tel: 919-738-1121, FAX: 919-739-0024; *Sls. Mgr.:* Don Chesner

ACME-URDC, INC., 7915 South 1530 West, Box 10, West Jordan, UT 84084, Tel: 801-561-9385, FAX: 801-562-9004; *Sls. Mgr.:* Leland Coleman

ACON, INC., 15c Plymouth Dr., South Easton, MA 02375, Tel: 508-230-8022, FAX: 508-230-2371; Empl.: 10

ACOPIAN TECHNICAL COMPANY, Box 638, Easton, PA 18044, Tel: 215-258-5441, FAX: 215-258-2842; FSC No.: 14749; *Sls. Mgr.:* T. Skopal ..... **D•1549-1578**

Local Sales Offices & Reps
FL Melbourne, Acopian 407-727-1172
MD Jessup, Doss Elctrns. 301-880-3262

ACRODYNE CONTROLS, See Accudyne Corp.

ACROMAG INC., 30765 Wixom Rd., P.O. Box 437, Wixom, MI 48393-7037, Tel: 313-624-1541, FAX: 313-624-9234; Empl.: 100; *Sls. Mgr.:* C. Mitchell

ACROSYSTEMS CORP., 66 Cherry Hill Dr., Beverly, MA 01915, Tel: 508-927-8880; Empl.: 30; *Sls. Mgr.:* Herbert Tobey

ACR SYSTEMS INC., 8561-132nd St, Surrey,B.C., Canada V3W 4N8, Tel: 604-591-1128, FAX: 604-591-2252; Empl.: 5; *Sls. Mgr.:* Rick Schellenberg; *Dist. Mgr.:* Rick Schellenberg

ACTEL CORPORATION, 955 E. Arques Ave., Sunnyvale, CA 94086, Tel: 408-739-1010, FAX: 408-739-1540; Empl.: 86; *Sls. Mgr.:* Bob Duyn

ACTION INSTRUMENTS, 8601 Aero Dr., San Diego, CA 92123, Tel: 619-279-5726, FAX: 619-279-6290; Empl.: 230; *Sls. Mgr.:* Frank Williams, Sls. VP

ACTIVE CONTROL INSTRUMENTATION, P.O. Box 243-Wildwood Circle, Key Largo, FL 33037, Tel: 305-451-1000, FAX: 305-451-3232; FSC No.: 55116; Empl.: 6 ..... **D•1126**

ACTOWN-ELECTROCOIL, INC., 2414 Highview, Spring Grove, IL 60081, Tel: 815-675-6641, FAX: 815-675-2050; Empl.: 200; *Sls. Mgr.:* Les Friedman

AC TRANSFORMER, 89 Madison St., Newark, NJ 07105, Tel: 201-589-8574, FAX: 201-589-3155; FSC No.: 3677; Empl.: 13; *Sls. Mgr.:* George Giangrande, Sls. Consit.

ACUREX CORP./AUTODATA DIV., 555 Clyde Ave., P.O. Box 7042, Mountain View, CA 94039, Tel: 415-967-9100, TELEX: 34-6391, TWX: 910-379-6593, FAX: 415-967-7727; Empl.: 40; *Sls. Mgr.:* David Swartz; *Dist. Mgr.:* David Swartz

ADALET-PLM/DIV. OF SCOTT & FETZER CO., 4801 W. 150th St., Cleveland, OH 44135, Tel: 216-267-9000, TELEX: 98-5349, FAX: 216-267-1681; FSC No.: 73389; Empl.: 177

ADAMS-MAXWELL DIVISION, Coast Magnetics, 1207 North La Brea Ave., Inglewood, CA 90302-1284, Tel: 213-673-3245, TELEX: 686103AMISPACEASA, FAX: 213-673-8828; FSC No.: 22558; Empl.: 60; *Sls. Mgr.:* Allen Adams

ADAMS RITE PRODUCTS, INC., 540 W. Chevy Chase Dr., Glendale, CA 91204, Tel: 818-241-5121, TWX: 910-497-2276, FAX: 818-500-7239; Empl.: 150; *Sls. Mgr.:* Jonas Williams

ADAMS-RUSSELL, INC., DIV. OF M/A COM, INC., 110 Haverhill Rd., Amesbury, MA 01913, Tel: 508-388-5210, TWX: 710-347-6360, FAX: 508-388-9758; FSC No.: 11556; Empl.: 400; *Sls. Mgr.:* H. Adjemian

ADAPTEC, INC., 691 South Milpitas Blvd., Milpitas, CA 95035, Tel: 408-945-8600, TELEX: 910-338-0060, FAX: 408-262-2533; Empl.: 6000; *Sls. Mgr.:* Wayne Gartin; *Dist. Mgr.:* Roy Safire

ADAPTIVE NETWORKS, P.O. Box 1020 Kendall Sq., Cambridge, MA 02142, Tel: 617-497-5150; Empl.: 20; *Sls. Mgr.:* Sumin Tchen

ADATEK, INC., 700 Airport Way, Sandpoint, ID 83864, Tel: 208-263-1471, 800-323-3343, TELEX: 62903932, FAX: 208-263-6596; Empl.: 18; *Sls. Mgr.:* Jeff Siebert; *Dist. Mgr.:* Suzy Hook

ADCOUR, INC., 18 Billings St., PO Box 277, Sharon, MA 02067, Tel: 617-784-8123, FAX: 617-784-5563; Empl.: 29; *Sls. Mgr.:* William O'Connell; *Dist. Mgr.:* William O'Connell

ADC TELECOMMUNICATIONS, INC., 4900 W. 78th St., Minneapolis, MN 55435, Tel: 612-835-6800, TELEX: 290321, FAX: 612-893-3292; Empl.: 2200; *Sls. Mgr.:* Mark Lonergan, VP. Sls. ..... **C•1157-1159**

ADDACON GREENSBORO, 3702-C Alliance Dr., Greensboro, NC 27407, Tel: 919-852-6200, FAX: 919-852-6256; *Sls. Mgr.:* Lynn Cummings

A.D. DATA SYSTEMS CORP., Photographic Sciences Corp., 770 Basket Rd., Webster, NY 14580-0748, Tel: 716-265-1600, FAX: 716-265-1689; FSC No.: 23389; Empl.: 12; *Sls. Mgr.:* J. Cessna, J. Butters

Local Sales Offices & Reps
CA Torrance, AMASCO-South 213-781-9494
FL Melbourne, Saber Assocs. 800-327-0853
KS Lenexa, Midtec Assocs. 913-541-0505
MD Landover, Sel-Tronics 301-341-2700
MA Westford, ICS Assocs. 508-692-3545
NM Albuquerque, Trembly Assocs. 505-266-8616
OH Westlake, TMS, Inc. 216-327-3527
PA N. Wales, Scientific Devs. 215-699-7707
TX Richardson, Scientific Devs. (SW) 214-231-8106
WA Seattle, Datacom Assocs. 206-285-2525
EXP Leport Marly, France, Euromeasure, SA ... 395-84863
EXP Warwickshire, England, Measurement LTD 926-35411
Can Scarborough, Ont., Multitest Elctrns. ... 416-609-8396

ADDITIVE CIRCUITS, AMP-AKZO Corp., P.O. Box 700, West La., Aquebogue, NY 11931, Tel: 516-722-4100, FAX: 516-722-4154; Empl.: 500; *Sls. Mgr.:* Lenny Smookler, Nat. Sls. Mgr.

ADE, INC., 1430 E. 130th St., Chicago, IL 60633, Tel: 312-646-3400, FAX: 312-646-3919; FSC No.: 62049; *Sls. Mgr.:* Fred Tenzer

ADIRONDACK WIRE & CABLE, ACS Industries Inc., 160 Hamlet Ave., Woonsocket, RI 02895, Tel: 1-401-769-1600, FAX: 1-401-769-1607; Empl.: 650; *Sls. Mgr.:* Julian Caduto

FAX: 714-634-0802

ADTECH POWER INC., 1620 S. Sunkist St., Anaheim, CA 92806, Tel: 714-634-9211; FSC No.: 56410; Empl.: 55; *Sls. Mgr.:* Royston A. Allman; *Dist. Mgr.:* Royston A. Allman ..... **D•1580-1583**

Local Sales Offices & Reps
CA Campbell, Sedillo Co. 408-374-5220
FL Deerfield Beach, Jack Krutek & Assoc. 305-427-4202
IL Elk Grove Vl, Carlson Elect. Sls. 312-956-8240
MA Natick, Wayland Eng. Sls. 508-655-6080
MI Troy, C.B. Jensen & Assoc. 313-643-0506
NY New York, Morgan Elctrn. Sls. 516-549-5180
OR Beaverton, Quest Mktg. 503-641-7377
TX Dallas, Spectra Sls. Corp. 214-234-3600
WA Bellevue, Quest Mktg. 206-747-9424

Local Distributors
AL Birmingham, Industrial Elec. Supp. 205-956-8504
CA Palo Alto, Zack Elctrns. 415-326-5432
CA San Francisco, Zack Elctrns. 415-626-1444
IL Chicago, Newark Elctrns. 1-312-784-5100
LA Lafayette, Ralph's of Lafayette 318-233-0105
MD Gaithersburg, M S Elctrns. 301-921-0200
MA Woburn, Mac Bearing 617-933-2110
PA Philadelphia, Philadelphia Elctrns. 215-673-0400
TX Ft. Worth, Allied Elctrns. 1-800-433-5700

ADTRON CORPORATION, 128 W. Boxelder Ste. 102, Chandler, AZ 85224, Tel: 602-926-9324, FAX: 602-926-9359; Empl.: 4; *Sls. Mgr.:* Shiela Fitzgerald

ADVACOM, INC., 5620 West Rd., McKean, PA 16426, Tel: 1-800-458-0512, 814-476-7774

ADVANCE, A Unit of Zero Corporation, 6900 Beck Avenue, N. Hollywood, CA 91605, Tel: 818-983-0333; *Sls. Mgr.:* Kevin Quinn

ADVANCE CONVERSION DEVICES CO.UNIT OF TRANSITOR DVCS., INC., 85 Horsehill Rd., Cedar Knolls, NJ 07927, Tel: 201-267-1900, FAX: 201-267-2047; FSC No.: 52298; Empl.: 24; *Sls. Mgr.:* Ron Zeman ..... **D•2156-2159**

Local Sales Offices & Reps
AL Huntsville, Reynolds & Assocs., Inc. 205-539-1485
AZ Scottsdale, Dave Menegay & Assocs. 602-994-9519
AR El Dorado, Kemp Instrs. Co., Inc. 501-862-5869
CA Bakersfield, FLW, Inc. 805-398-0720
CA Campbell, SMA 408-370-6900
CA Canoga Park, FLW, Inc. 818-719-0037
CA Carlsbad, FLW, Inc. 619-434-5251
CA Costa Mesa, FLW Inc. 714-751-7513
CA Costa Mesa, FLW, Inc. 714-751-7512
CO Denver, Elcom, Inc. 303-337-2300
CT Watertown, May Technlg. 203-274-3777
FL Ft. Lauderdale, Reynolds & Assocs., Inc. 305-344-4536
FL Melbourne, Reynolds & Assocs., Inc. .. 407-259-7000
FL Tampa, Reynolds & Assocs., Inc. 818-372-8369
GA Duluth, Reynolds & Assocs. 404-476-4992
IL Wheeling, Ed Joyner & Co. 708-520-1200
KS Overland Pk., WEB Assocs., Inc. 913-381-7986
MD Hunt Valley, Elctrn. Resources, Inc. ... 301-584-8157
MA Lexington, E.F. Delfino,Inc. 617-862-1118
MI Ann Arbor, Ashby Assocs., Inc. 313-995-4082
MN St. Louis Pk., Elctrn. Innovation, Inc. ... 612-922-2945
MO Florissant, WEB Assocs./Elctrns. Inc. 314-921-5720
NY Endicott, Advanced Comp. Corp. 607-785-3191
NY Kingston, Advanced Comp. Corp. 914-339-1730
NY N. Syracuse, Advance Comps. 315-699-2671
NY Rochester, Advanced Comps. Corp. 716-544-7017
NY Scottsville, Advanced Comps. Corp. ... 716-889-1429
NC Raleigh, Reynolds & Assocs., Inc. 919-876-0282
OH Arcanum, Ashby Assocs., Inc. 513-692-8713
OH Cleveland, Ashby Assocs., Inc. 216-461-0826
OK Tulsa, Kemp Instrs.,Inc. 918-663-4501
OR Portland, Topp Engrg. Sls. Corp. 503-244-7265
PA Pittsburgh, Ashby Assocs., Inc. 412-343-5105
PA Southampton, Campbell Assocs. 215-322-6630
PA West Chester, Elctrn. Resources, Inc. 215-431-0198
SC Greenville, Reynolds & Assocs., Inc. .. 803-288-8701
TX Lewisville, J. Hughes Co. ..... 214—221-1536, 214-221-1538
UT Murray, Elcom 801-262-2400,801-262-2472
VA Alexandria, Dyna-Rep Co. 703-354-1222
VA Harrisburg, Elctrn. Resources, Inc. 703-289-5571
VA Norfolk, Elctrn. Resources, Inc. 804-583-4859
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400
EXP NY/New York, Roburn Agencies, Inc. 914-968-1016
Can Weston, Ont., Duncan Instrs., Canada Ltd. 416-742-4448

ADVANCED ANALOG, Intech, 2270 Martin Ave., Santa Clara, CA 95050, Tel: 408-988-2702, FAX: 408-988-2702; FSC No.: 52467; Empl.: 200; *Sls. Mgr.:* Michael Sullivan ..... **D•1548**

Local Sales Offices & Reps
AL Huntsville, Sides Assoc. 205-859-9395
AZ Tempe, Thor Engrg. 602-438-8494
CA La Jolla, Thorson 619-292-8525
CA Newport Bch., Leading Concept 714-851-0654
CA Sunnyvale, Pass Assoc. 408-735-9040
CT North Haven, Kitchen & Kutchin 203-239-0212
IL Berkeley, ESA Tech. Mktg. 708-544-0120
IN Indianapolis, CC Electro Sls. 317-921-5000
IA Cedar Rapids, Delltron 319-393-0075
KS Wichita, Miller Aerospace 316-689-8292
MD Randallstown, Beacon North 703-478-2480
MA Burlington, Kitchen & Kutchin 617-229-2660
MI Madison Hgts., Pine Sls. 313-589-0350
MN Eden Prairie, Electro Mark 612-944-5850
MO Hazelwood, Acorn 314-731-2002
MO St. Louis, Acorn 314-421-1751
NY Huntington, Compar 516-423-5660
NY Rochester, Foster & Wager 716-385-7744
OH Cincinnati, Makin 513-871-2424
OH Dayton, Del Steffen 513-293-3145
OR Beaverton, Micro Sls. 503-645-2841
PA Collegeville, HB Sys. 215-489-3256
TX Dallas, MGR 214-238-5246
UT Ogden, Taylor Mktg. 801-546-9570
VA Sterling, Beacon North 703-478-2480
WA Bellevue, Micro Sls. 206-451-0568
Can Quebec, Kaytronics 514-745-5000

ADVANCED CIRCUIT TECHNOLOGY, 118 Northeastern Blvd., Nashua, NH 03062, Tel: 603-880-6000, 800-234-FLEX, TWX: 710-228-8961, FAX: 603-880-1785; FSC No.: 57034; Empl.: 185; *Sls. Mgr.:* David Bouley, Dir. of Sls.

ADVANCED COMPONENTS INDUSTRIES, INC.

FAX: 310-328-0062

ADVANCED COMPONENTS INDS., INC., Spitznagel GmbH, 1308 Sartori Ave., No. 105, Torrance, CA 90501, Tel: 213-328-0060, 310-328-0060; *Sls. Mgr.:* Irma Spreitzer ..... **A•2150-2151; B•1492**

Local Sales Offices & Reps

CT	Hopkinton, Berkshire Elctrns.	508-435-9356
IL	Schaumburg, Terry McNulty & Assocs.	708-894-2529
MA	Hopkinton, Berkshire Elctrns.	508-435-9356

ADVANCED CONNECTOR TECHNOLOGY, 326 Oakwood St., Ventura, CA 93001, Tel: 805-653-5753, FAX: 805-653-0940; Empl.: 5; *Sls. Mgr.:* Karin Kalli

ADVANCED CONTROL SYS., 10 Old Mine Rock Way, Hingham, MA 02043, Tel: 617-740-0223, FAX: 617-740-4227; Empl.: 13; *Sls. Mgr.:* Leopold Bric ..... **D•1127**

ADVANCED CONVERSION TECH., 2001 Fulling Mill Rd. P.O.B. 70, Middletown, PA 17057, Tel: 717-939-2300, FAX: 717-939-7170; FSC No.: 60642; Empl.: 100; *Sls. Mgr.:* LM. Reis

ADVANCED ELECTRONIC PACKAGING, 21562 Surveyor Circle, Huntington Beach, CA 92646, Tel: 714-969-1150, FAX: 714-536-0936; Empl.: 12; *Sls. Mgr.:* Douglas A. Hill ..... **A•1719**

Local Sales Offices & Reps

Can	Mississauga, Ont., Vitel Elctrns.	416-676-9720

ADVANCED FILTER DEVICES, INC., 6241 Yarrow Dr., Ste. D, Carlsbad, CA 92009, Tel: 619-438-2074, FAX: 619-438-5937; FSC No.: 56620; Empl.: 45; *Sls. Mgr.:* Herbert Johnson

ADVANCED HARDWARE ARCHITECTURES, INC., P. O. Box 9669, Moscow, ID 83843, Tel: 208-883-8000, FAX: 208-883-8001; Empl.: 50; *Sls. Mgr.:* Jack Maynard

ADVANCED HARDWARE MANUFACTURING, INC., 925 Horan Drive, Fenton, MO 63026, Tel: 314-343-3850, FAX: 314-343-3937; Empl.: 11

ADVANCED HIGH VOLTAGE CO. INC., P.O. Box 32408, Tucson, AZ 85751, Tel: 818-997-7222, 602-721-2424; *Sls. Mgr.:* John Richardson ..... **D•1579**

ADVANCED INPUT DEVICES, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814, Tel: 208-765-8000, TWX: 510-776-0584; FSC No.: 95666; Empl.: 300; *Sls. Mgr.:* Jim Bennett ..... **B•1795**

Local Sales Offices & Reps

CO	Aurora, Electrodyne	303-695-8903
CT	Wallingford, Apex Assocs.	203-269-8401
FL	Casselbury, Southern Elctrn. Sls.	407-332-4718
ID	Coeur'd Alene, Advanced Input Dvcs.	208-765-8000
IL	N. Arlington Hgts., Coombs Assocs. Inc.	312-439-9810
MD	Gaithersburg, Carwither Assocs. Inc.	301-912-9545
MA	Westwood, Apex Assocs.	617-326-5042
MN	Minneapolis, Debeck-Hays	612-835-3610
NJ	Matawan, Shepard & Assocs.	201-566-0095
NJ	Matawau, Shepard	201-566-0095
NY	Victor, Net Sls.	716-924-1844
PA	Prospect Park, Elf Sls.	215-534-3340
PA	Warrendale, Baehr-Greenleaf & Assocs.	412-934-3088
FL	Casselberry, S.E.M.I.	305-962-2255
OH	Westlake, Baehr-Greenleaf	216-892-1770
UT	Salt Lake City, Electrodyne	801-264-8050
WI	Milwaukee, Coombs Assocs. Inc.	414-351-6123
Can	Hamilton, Ont., Cartwright Southall Assoc., Inc.	416-528-0294

ADVANCED INTERCONNECTIONS CORP., P.O. Box 1019, West Warwick, RI 02893, Tel: 401-823-5200, TWX: 910-240-3454, FAX: 401 823-8723; FSC No.: 05-0394638; *Sls. Mgr.:* Max E. Rice

ADVANCED LINEAR DEVICES, INC., 1180F Miraloma Way, Sunnyvale, CA 94086-4606, Tel: 408-720-8737, FAX: 408-720-8297; Empl.: 10; *Sls. Mgr.:* G. M. O'Neal; *Dist. Mgr.:* G. M. O'Neal

ADVANCED MATERIALS SYSTEMS, See Handy & Harman Electronic Materials Corp.

ADVANCED MICRO SYSTEMS, INC., 31 Flagstone Drive, Hudson, NH 03051-4920, Tel: 603-882-1447, FAX: 603-881-7600; Empl.: 50

ADVANCED POWER PRODUCTS, 1510 Garden St. Ste. 17, Santa Barbara, CA 93101, Tel: 805-965-0042, FAX: 805-684-4400

ADVANCED SYSTEMS CONCEPTS, INC., 2333 N. Lake Ave., Altadena, CA 91001, Tel: 818-791-0983, TELEX: 701 215 ASCI, FAX: 818-791-8347; FSC No.: 6U785; Empl.: 15; *Sls. Mgr.:* Maria Reddix; *Dist. Mgr.:* B. Lee ..... **D•1144**

Local Sales Offices & Reps

IA	Des Moines, Beams Co.	515-255-1148
MN	Edina, Integrated Peripheral Sys.	612-831-0349
OH	Dayton, Ashby Assocs.	513-252-5627
VA	Vienna, Advanced Technlg. Assocs.	703-556-0500

FAX: 619-727-4436

ADVANCED TECHNOLOGY COMPANY, 2142 F Industrial Ct., Vista, CA 92083, Tel: 619-727-7430; Empl.: 10; *Sls. Mgr.:* Bill Linko ... **B•1235-1237; C•1605-1608**

ADVANCED THERMAL PRODUCTS, INC., P.O. Box 249, St. Marys, PA 15857, Tel: 814-834-1541, FAX: 814-834-1556; Empl.: 15; *Sls. Mgr.:* John M. Sidoni

Local Sales Offices & Reps

GA	Atlanta, DHR Mktg.	404-564-0529
MA	Andover, Crawford & Assoc.	508-470-2122
NY	Syracuse, John R. Costello	315-472-0322
NC	Raleigh, DHR Mktg.	919-829-1970
TX	Dallas, Eatman Engineering	214-771-1903
WI	New Berlin, Thomas Labant	414-425-7157

ADVANCED VIDEO PRODUCTS, P.O. 1450/543 Great Rd., Littleton, MA 01460, Tel: 508-486-0024, FAX: 508-486-8488; Empl.: 65; *Sls. Mgr.:* Christopher Mohen

AD-VANCE MAGNETICS, INC., 625 Monroe St., Rochester, IN 46975, Tel: 219-223-3158, TWX: 810-290-0294, FAX: 219-223-2524; FSC No.: 50788; Empl.: 31; *Sls. Mgr.:* Kay Nixon ..... **C•1686**

Local Sales Offices & Reps

AL	Huntsville, Murcota Corp	205-539-8476
CA	El Cajon, ATronix Technlg.	619-444-1501
CA	Mountain View, Frauman Assoc.	415-964-9464
CA	Solvang, ATronix Technlg.	805-686-4366
CO	Arvada, Arrowhead	303-423-5556
CA	Mission Viejo, ATronix Technlg., Inc.	714-858-9009
CT	Branford, Abbott-Allison	203-481-0405
FL	Miramar, DAN-Tech Sls., Inc.	305-963-6142
IL	Wheaton, EMTronics, Inc.	708-665-6222
NJ	Flanders, K & R Engrg. Sls. Corp.	201-584-5235, 800-631-9362
NC	Winston-Salem, Murcota Corp.	919-722-9445
PA	W. Conshohocken, Eastern Comps.	215-825-8610
MD	Baltimore, Eastern Comps. Sls. Corp.	301-788-7050
TX	Dallas, J.M. Spell Co. Inc.	214-620-0040
UT	Midvale, Arrowhead	801-561-5688
Can	Nepean, Ont., Subtec Ltd.	613-723-7720
WA	Bellevue, Caruso & Assocs.	206-455-8811

ADVANCE POWER SUPPLIES, INC., See Farnell Advance Power, Inc.

ADVANCE WIRE & CABLE, The Advance Group, 1661 Industrial Way, Belmont, CA 94002, Tel: 415-592-4550, TELEX: 334475, FAX: 415-593-8859; FSC No.: 57775; Empl.: 158; *Sls. Mgr.:* Ed Mittelbusher; *Dist. Mgr.:* Ed Mittelbusher

Local Sales Offices & Reps

AZ	Phoenix, The Advance Grp.	602-437-1334
CA	Anaheim, The Advance Grp.	714-870-0300
CA	Belmont, The Advance Grp.	415-592-4550
CT	Torrington, Phoenix Sls.	203-496-7709
CO	Lakewood, CDT	303-989-6563
MI	Livonia, JFCO Inc.	513-421-7590
FL	Orlando, Gillum Sls.	305-857-2110
FL	Tampa, Gillum Sls.	813-531-2248
GA	Duluth, DTM Inc.	404-381-5592
IL	Deerfield, Flaherty-Haines, Inc.	312-948-7800
MD	Ellicott City, Tech. Sls. Inc.	301-461-2400
MN	Minneapolis, TecTeam Sls. Inc.	612-854-6616
NY	Glen Cove, Dynorep	516-676-1598
OH	Cleveland, JFCO Inc.	216-398-6300
OH	Vandalia, JFCO Inc.	513-890-8322
SC	Greer, Advance Wire & Cable	803-877-9600
TX	Richardson, Promark	214-644-0467
WA	Redmond, The Advance Grp.	206-867-0416

ADVANTEST®
Advantest America, Inc.

FAX: 708-634-2610

ADVANTEST AMERICA, INC., 300 Knightsbridge Parkway, Lincolnshire, IL 60069, Tel: 708-634-2552, FAX: 708-634-2610; Empl.: 233; *Sls. Mgr.:* John Heitman ..... **D•1214-1215**

Instruments

Local Sales Offices & Reps

AL	Huntsville, Southern Mktg. Assocs.	205-534-6020
AZ	Phoenix, Advantest America, Inc.	602-840-9470
AZ	Phoenix, Tech. Mktg. Svc.	602-678-4940
CA	Cypress, Ward Davis	213-402-2458
CA	Redondo Bch., Ward Davis	213-643-6977
CA	Santa Clara, Advantest America, Inc.	408-970-9922
CA	Santa Clara, Ward Davis	408-245-3700
CA	Santa Monica, Advantest America, Inc.	213-392-0088
CA	Westlake Village, Advantest America,Inc.	805-496-2523
CO	Englewood, Tech. Mktg. Svc.	303-781-8819
CT	Wallingford, Pat Jenks Assocs.	203-265-9939
FL	Longwood, Southern Mktg. Assocs.	407-682-7317
FL	Orlando, Advantest America, Inc.	407-859-0722
GA	Marietta, Southern Mktg. Assocs.	404-565-0603
IL	Arlington, Dytec/Midwest	708-255-3200
IL	Lincolnshire, Advantest America, Inc.	708-634-2552
IL	Park Ridge, Aegis	708-823-1587
IN	Indianapolis, Dytec/Midwest	317-849-9898
KS	Lenexa, Dytec/Midwest	913-888-0215
LA	Metairie, Data Mktg. Assocs.	504-833-3655
MD	Rockville, Creative Mktg. Assocs.	301-880-4161
MA	Beverly, Pat Jenks Assocs.	508-921-4600
MA	Marlboro, Advantest America, Inc.	508-481-1141
MA	Reading, Aegis	617-944-0974
MN	Edina, Dytec Instrs.	612-831-7169
MO	Maryland Hgts., Dytec/South	314-739-0665
NJ	Fort Lee, Advantest America, Inc.	201-886-0300
NJ	Teaneck, Scientific Dvcs.	201-837-1004
NM	Albuquerque, Tech. Mktg. Svc.	505-884-3444
NC	Greensboro, Southern Mktg. Assocs., Inc.	919-479-6034
OH	Dayton, WKM Associates, Inc.	513-434-7500
OK	Tulsa, Data Mktg. Assocs.	918-494-2711
OR	Portland, Advantest America, Inc.	503-255-8985
OR	Wilsonville, SYNTEK	503-682-2750
PA	Allentown, Advantest America, Inc.	215-264-7680
PA	Coopersburg, Aegis	215-965-6840
PA	Northampton, AEGIS	215-837-8400
PA	Southampton, Eastern Instrmn. of PA	215-355-7700
PA	Stroudsburg, AEGIS	717-421-8660
TX	Austin, Advantest America, Inc.	512-451-3936
TX	Austin, Aegis	512-451-6188
TX	Austin, Data Mktg. Assocs.	512-338-4701
TX	Farmers Branch, Advantest America, Inc.	214-239-7834
UT	Salt Lake City, Tech. Mktg. Svc.	801-596-8803
VT	Williston, Advantest America, Inc.	802-879-8974
WA	Bellevue, SYNTEK	206-462-7700
Can	Mississauga, Ont., Allan Crawford Assocs., Ltd.	416-890-2010
Can	N. Vancouver, B.C., Allan Crawford Assocs., Ltd.	604-988-2195
Can	Ottawa, Ont., Allan Crawford Assocs., Ltd.	613-596-9300
AL	Huntsville, Southern Mktg. Assoc.	205-534-6020
CA	Camarillo, Advantest America, Inc.	808-987-6415
CT	Wallingford, Pat Jenks	203-265-9939
FL	Longwood, Southern Mktg.Assoc.	407-682-7317
GA	Marietta, Southern Mktg. Assoc.	404-565-0603
MD	Frederick, Advantest America, Inc.	301-662-1696
MA	Beverly, Pat Jenks Assocs.	508-921-4600
MI	Madison Heights, WKM Assocs.	313-588-2300
NM	Albuquerque, Barnhill Assocs.	505-299-7658

NY Canastota, New York Hytek Assocs. .. 315-697-8415
NC Greensboro, Southern Mktg. Assoc. ... 919-854-5588
OH Dayton, WKM Assocs. ... 513-434-7500
OH Independence, WKM Assocs. ... 216-524-5930
OR Wilsonville, Syntek ... 503-682-2750
PA Pittsburgh, WKM Assocs. ... 412-892-2953
PA Southampton, Eastern Instrs. of PA ... 215-355-7700
TX Dallas, Data Mktg. Assocs. ... 214-661-0300
TX Houston, Data Mktg. Assocs. ... 713-954-5023
TX San Antonio, Data Mktg. Assocs. ... 512-342-3031
VA Sterling, Advantest America, Inc. ... 703-444-3372
WA Bellevue, Syntek ... 206-462-7700
WI Hartland, Dytec/Midwest ... 414-367-4550
Can Calgary,AL, Allan Crawford Assocs. ... 403-295-0822
Can Mississauga, Ont., Allan Crawford Assocs. ... 416-890-2010
Can N. Vancouver, B.C., Allan Crawford Assocs. ... 604-988-2195
Can Ottawa, Ont., Allan Crawford Assocs. ... 613-596-9300
Can St. Laurent, QE, Allan Crawford Assocs. ... 514-747-7878

ADVANTEST CORPORATION, NS Bldg. 2-4-1, Nishi-Shinjuku, Tokyo 163, Japan, Tel: 03-3342-7500, TELEX: 232-4914 ADVAN; Empl.: 1444; *Sls. Mgr.:* Shinpei Takeshita

ADVANZ TECHNOLOGIES, INC., 455 Industrial Drive, Warwick, RI 02887, Tel: 800-669-9987/401-737-1050, FAX: 401-732-0240; Empl.: 80; *Sls. Mgr.:* Richard J. DeGiacomo, Jr.; *Dist. Mgr.:* Richard J. DeGiacomo, Jr.

ADVOTECH, INC., 670 Mercer Rd., Butler, PA 16001, Tel: 412-283-4497, FAX: 412-283-4713

A E G CORPORATION, 3140 Rte. 22, P.O. Box 3800, Somerville, NJ 08876-1269, Tel: 908-231-8491, FAX: 908-231-8353; Empl.: 200; *Dist. Mgr.:* Graham Wells

A E G CORPORATION, Telefunken Semiconductors Div., 3140 Route 22, Somerville, NJ 08876-1269, Tel: 201-231-8300, FAX: 201-231-8353; *Sls. Mgr.:* John Szafranski

AEG TELEFUNKEN, SEMICONDUCTOR GRP., See AEG Corp.

AEL DEFENSE CORP., 305 Richardson Rd., Lansdale, PA 19446, Tel: 215-822-2929; FSC No.: 93346; Empl.: 1,600; *Sls. Mgr.:* Denis Ritchie

AEMC CORPORATION, 99 Chauncy Street, Boston, MA 02111, Tel: 617-451-0227, 800-343-1391, TELEX: 95-1073, FAX: 617-423-2952; *Sls. Mgr.:* George Wood

AEROCOM, 3090 S.W. 37th Ave., Miami, FL 33133, Tel: 305-448-6503, TELEX: 6812020, FAX: 305-448-6916; FSC No.: 81535; Empl.: 55; *Sls. Mgr.:* Thomas A. Coleman

AERODYNE CONTROLS CORPORATION, 30 Haynes Court, Ronkonkoma, NY 11779, Tel: 516-737-1900, FAX: 516-737-1912; FSC No.: 14923; Empl.: 80; *Sls. Mgr.:* Anthony R. Pipitone

AEROFLEX

FAX: 516-694-6771

AEROFLEX LABORATORIES INC., ARX, Inc., 35 South Service Road, Plainview, NY 11803, Tel: 516-694-6700, TWX: 510-224-6417; FSC No.: 88379; Empl.: 490 ... **A•1720-1721**

Local Sales Offices & Reps

AL Huntsville, EMA ... 205-830-4030
AL Huntsville, South Design and Mktg. ... 205-880-3623
AZ Phoenix, JBS Assocs. ... 602-893-2382
CA Camarillo, RD & D Sls. Engrg. ... 805-388-8220
CA Long Beach, RD & D Sls. Engrg. ... 213-988-1116
CA Los Altos Hills, HB Mktg. ... 415-941-4080
CA Mt. View, Bay Area Sls. ... 415-969-7959
CA Woodland Hills, Peterson Engrg. Co. .. 818-346-1201
CO Englewood, Delltron Co. ... 303-741-2122
CO Lakewood, Tech. Mktg. ... 303-989-3611
CT Southbury, Dynamic Technlgs. ... 203-262-6220
CT Thomaston, Tygren Co. ... 203-283-8722
FL Altamonte Sp., EMA ... 407-339-2604
FL Pinellas Park, P & M Tech Sls. ... 813-546-4175
FL Tampa, APM Assocs. ... 813-886-2457
FL Winterpark, Max Tech ... 407-679-1220
GA Roswell, EMA ... 404-992-7240
IL Northfield, Feller Assocs., Inc. ... 312-446-8065
IL West Dundee, American Specialties Prods. ... 708-428-2100
IA Cedar Rapids, Richardson Assocs. Grp. ... 319-364-2003
MD Columbia, Autek Assocs. ... 301-740-5100
MA N. Andover, Russett Assoc. ... 508-794-4995
MA Needham Hghts., Kanan Assoc. ... 617-449-7400
MN Minneapolis, International Elctrns., Inc. ... 612-571-0000
MO St. Louis, Rush & West Assoc., Inc. ... 314-965-3322
NJ Ft. Lee, Nexus Technlg. Sls., Inc. ... 201-947-0151
NY Buffalo, Vibratech, Inc. ... 716-895-8000
NY East Syracuse, Fountain, Young & Co. ... 315-437-7733
NY Great Neck, F & F Metro, Inc. ... 516-482-4080
NY Oswego, Fountain, Young & Co., Inc. ... 607-687-3373,FAX:607-687-7511
NC Burlington, EMA ... 919-227-1832
NC Charlotte, EMA ... 704-365-0547
NC Raleigh, EMA ... 919-846-6888
AZ Phoenix, Hartland Sls. Inc. ... 602-492-0012
PA Horsham, Nexus Technlg. Sls., Inc. ... 215-675-9600
PA Nottingham, Excel Tech ... 717-529-6059
TX Austin, Tesco Inc. ... 512-834-8374
TX Dallas, Tesco Inc. ... 214-553-1200
TX Houston, Tesco, Inc. ... 713-370-8117
VA Alexandria, Dyna Rep. ... 703-354-1222
NY Mendon, Tech Mark ... 716-624-3840
WA Mercer Island, Eagle Entprs., Inc. ... 206-232-7401
MA N. Andover, Russet Assoc. ... 508-794-4995
Can Dorval, PQ., Korfund Sampson, Ltd. ... 514-631-3565
Can Laval, Que., Elcom GMB Inc. ... 514-668-3361
Can St. Eustache, Que., Elcom GMB Inc. ... 514-623-4766

AEROSPACE OPTICS, INC., 3201 Sandy La., Fort Worth, TX 76112, Tel: 817-451-1141, FAX: 817-654-3405; Empl.: 60; *Sls. Mgr.:* Ben L. Fryrear

AEROSPACE WIRE & CABLE INC., 129-09 18 Ave., College Point, NY 11356, Tel: 718-358-2345, FAX: 718-358-2522; Empl.: 15

AEROTECH, INC., 101 Zeta Dr., Pittsburgh, PA 15238, Tel: 412-963-7470, TWX: 710-795-3125, FAX: 412-963-7459; Empl.: 156; *Sls. Mgr.:* K. Wyman; *Dist. Mgr.:* K. Ross

AEROVOX INC., 370 Faunce Corner Rd., North Dartmouth, MA 02747-1217, Tel: 508-995-8000; FSC No.: 4K459; Empl.: 700; *Sls. Mgr.:* Jack Chmura .... **A•1618**

Local Sales Offices & Reps

AL Huntsville, 20th Century Mktg. ... 205-772-9999
AZ Scottsdale, Interstate Mktg. ... 602-244-9050
CA Los Gatos, Luscombe Engrg. Co. ... 408-370-2020
CA Woodland Hills, Interstate Mktg. ... 818-883-7606
CO Franktown, M.R.C. ... 303-660-8750
CT North Haven, J.E. Boeing Co. ... 203-265-7378
DE Greenville, H. Anderson ... 302-655-2917
FL Orlando, E.P.M. Corp. ... 407-425-6149
GA Norcross, 20th Century Mktg. ... 404-446-1999
IL Elk Grove Village, Carlson Elctrn. Sls. ... 708-956-8240
IN Ft. Wayne, F.J. Campisano Co. ... 219-486-6443
IN Indianapolis, F.J. Campisano Co. ... 317-577-0319
IA Cedar Rapids, Carlson Elctrn. Sls. ... 319-379-1450
MD Baltimore, Burgin-Kreh Assoc., Inc. ... 301-265-8500
MA Chelmsford, J.E. Boeing Co. ... 508-256-5800
MA Marion, Raymond F. Swoish Co. ... 508-748-2536
MI Farmington Hills, Carrier & Gable ... 313-477-8700
MN Minneapolis, Comstrand ... 612-788-9234
KS Overland Park, Beneke & McCaul ... 816-765-2998
NJ Moorestown, TAI Corp. ... 609-778-5353
NM Albuquerque, Hewitt & Assocs. ... 505-299-7746
NY Ithaca, B. Dean ... 607-257-1111
NY Melville, Comtronic Assocs. ... 516-249-0505
NY Wappingers Falls, Bob Dean ... 914-297-6406
NC Raleigh, 20th Century Marketing ... 919-790-9389
OH Cincinnati, F.J. Campisano Co. ... 513-574-7111
OH Dayton, Schmidt & Assocs. ... 513-293-6652
OH Mentor, F.J. Campisano Co. ... 216-975-9300
OK Tulsa, Ammom & Rizos Co. ... 918-749-6116
PA Coraopolis, F.J. Campisano Co. ... 412-264-5151
TN Knoxville, 20th Century Mktg., Inc. ... 615-966-2099
TX Austin, Ammon & Rizos ... 512-454-5131
TX Houston, Ammon & Rizos Co. ... 713-781-6240
TX Richardson, Ammon & Rizos ... 214-644-5591
WI Milwaukee, Carlson Elctrn. Sls. ... 414-476-2790
EXP Santurce, PR, J.E. Boeing Co. ... 809-753-9805
CA San Diego, Bestronics, Inc. ... 619-693-1111

AERTECH INDS., See TRW Microwave

AES CORP., 285 Newbury St., Peabody, MA 01960, Tel: 508-535-7310, TELEX: 387852 AES CORP INTL, FAX: 508-535-7313; Empl.: 25; *Sls. Mgr.:* Brian Rockett

AETNA ENGINEERING, P.O. Box 7749, Van Nuys, CA 91409-7749, Tel: 818-341-9409, FAX: 818-882-5131; Empl.: 6; *Sls. Mgr.:* T. W. Collins

AFE DISPLAYS INC., 3046A Berkmar Dr., Charlottesville, VA 22901, Tel: 804-974-7801, FAX: 804-974-7803; Empl.: 3(USA) 75(UK); *Sls. Mgr.:* Mike Humpherson; *Dist. Mgr.:* Mike Humpherson

AFI/DATATROL, See Datatrol, Div. of Data Card Corp.

AHAMTOR INC., 999 Inc., 27901 Front St., Temecula, CA 92390, Tel: 714-676-4151, FAX: 714-676-3031; *Sls. Mgr.:* John Markley

AIL, DIV. CUTLER-HAMMER, See Eaton Corp. AIL Div.

AIL SYSTEMS, INC., Eaton Corp., Commack Rd., Deer Park, NY 11729, Tel: 516-595-3094, TWX: 510-227-6073; FSC No.: 00752; Empl.: 2400; *Sls. Mgr.:* J.B. Migliaccio

AILTEC DIV. CUTLER-HAMMER, See Eaton Corp., Elctrn. Instrmn. Div.

AIMSCO INC., Cheler Corp., 5707 Airport Way So., Seattle, WA 98108, Tel: 206-762-8014, 800-426-0244, TWX: 910-444-1333, FAX: 206-762-8394; FSC No.: 3D536; Empl.: 30; *Sls. Mgr.:* C. Ernst; *Dist. Mgr.:* Carl Teichman

AIPHONE, 1700 130th Ave. NE, Bellevue, WA 98005, Tel: 206-455-0510, FAX: 206-455-0071; Empl.: 44; *Sls. Mgr.:* John Mosebar

AirBorn

FAX: 214-931-9305

AIRBORN, INC., 4321 AirBorn Dr., Addison, TX 75001-0519, Tel: 214-931-3200; FSC No.: 10400;Multiple; Empl.: 412; *Sls. Mgr.:* W.A. Clark, Sls. Mgr.; *Dist. Mgr.:* Jerry Jameson ... **C•1160**

Local Sales Offices & Reps

AL Huntsville, South Design & Mktg. ... 205-880-3623
AZ Tempe, Piper Sls. Co. ... 602-949-0048
CA Downey, Buffa Co., Inc. ... 213-923-4618
CA Sunnyvale, Advanced Tech. Sls. ... 408-746-0800
CT Torrington, Phoenix Sls. Co. ... 203-496-7709
FL Ft. Lauderdale, Southland Comps. ... 305-491-6110
IL Des Plaines, ESCO Assoc. ... 708-298-5310
IA Cedar Rapids, Dytronix ... 319-377-8275
KS Wichita, Dytronix ... 316-838-0884
MD Hunt Valley, Eagle Sls. Corp. ... 301-666-3930
MO Bridgeton, Dytronix ... 314-291-4777
KS Leawood, Dytronix ... 913-339-6333
NH Nashua, Solla - Tronics ... 603-882-7146
NY Glen Cove, Dynorep ... 516-676-1598
NM Albuquerque, Piper Sls. Co. ... 505-883-9090
NY Penfield, Upstate Comps. ... 716-381-6070
NC Raleigh, GWC ... 919-790-7879
OH Kettering, Electro-Com ... 513-299-0864
WA Bellevue, Eltech Inc. ... 206-643-4330
Can Mississauga, Ont., Source Elctrns. Ltd. ... 416-676-0830
Can Ottawa, Ont., Source Elctrns. Ltd. ... 613-737-7580

Local Distributors

NY Elmsford, Gemini Elect ... 914-592-5252
TX Dallas, Hall Mark Elctrns. ... 214-343-5000
CA Monrovia, Erik-A-Elect ... 818-574-1020
AZ Scottsdale, Spirit Elctrns. ... 602-998-1533

Distributor

FAX: 818-988-4746

AIR ELECTRO INC., 7700 Gloria Ave., Van Nuys, CA 91406, Tel: 213-873-6400, 818-988-4400, TELEX: 66-2459, TWX: 910-495-1794 ... **C•1280**

AIR FILTRATION PRODUCTS, INC., 707 No. Main Ave., Tuscon, AZ 85705, Tel: 602-624-2272, FAX: 602-624-2279; Empl.: 10; *Sls. Mgr.:* Ike Campos

AIR/FLEX INDS. INC., 2422 Merced Ave., S. El Monte, CA 91733, Tel: 818-579-7060, FAX: 1-818-579-7063; FSC No.: 22782; *Sls. Mgr.:* Brett Hoffman

Airflyte ELECTRONICS CO.

FAX: 201-436-6024

AIRFLYTE ELCTRNS. CO., 56 New Hook Rd., P. O. Box 231, Bayonne, NJ 07002, Tel: 201-436-2230; Empl.: 85; *Sls. Mgr.:* John Piret ..... **B•1238-1243**

Local Sales Offices & Reps

CA	Los Altos, Poltronics	415-941-3020
CA	Signal Hill, Thorson Co.	213-595-0361
CT	No. Haven, Kitchen & Kutchin	203-239-0212
FL	Naples, Techtron Sls. Corp.	813-566-3800
IL	Park Ridge, Probe Elctrns.	312-698-2044
MA	Lexington, Kitchen & Kutchin	617-862-8230
NJ	Kinnelon, Avionics Equip.	201-838-8105
NY	Rochester, Milton C. Matthews Co.	716-271-1910
PA	Downingtown, Budd Elctrns. Corp.	215-458-8258
TX	Austin, Electra Reps., Inc.	512-339-1163
TX	Dallas, Electra Reps., Inc.	214-248-3852

AIR MAZE CORP., 25000 Miles Rd., Cleveland, OH 44146, Tel: 216-292-6800, TELEX: 98-5413, FAX: 216-292-6812; Empl.: 300; *Sls. Mgr.:* J.B. Ernster

AIR-O-TRONICS, Trush, Inc., 2747 Rt 20 E., P.O. Box 326, Cazenovia, NY 13035, Tel: 315-655-2387, TWX: 710-541-1530, FAX: 315-655-3862; FSC No.: 16663; Empl.: 15

AIRPAX-CAMBRIDGE DIVISION, A North American Philips Co., Woods Rd., Cambridge, MD 21613, Tel: 301-228-4600, TELEX: 6849138, TWX: 710-865-9655, FAX: 301-228-8910; FSC No.: 81541; Empl.: 1100; *Sls. Mgr.:* Sandy Monaghan ..... **B•1348**

Local Sales Offices & Reps

AL	Huntsville, BCI	205-539-4411
AZ	Tempe, Westrep	602-820-9932
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Airpax	408-980-0410
CO	Littleton, Lange Sls.	303-795-3600
FL	Pompano Bch., Airpax	305-978-9019
GA	Chamblee, BCI	404-455-0405
ID	Boise, Lange Sls., Inc.	208-345-8207
IL	Lake Zurich, Somers-Stanton, Inc.	708-438-2999
IN	Indianapolis, Airpax	317-573-9911
IA	Marion, Rep Assocs.	319-373-0152
MD	Frederick, Airpax	301-243-3133
MA	Northboro, Airpax	508-393-1919
MI	Farmington Hills, Airpax	313-553-6030
MN	Eagan, Airpax	612-683-9007
NY	Rochester, Airpax	716-654-7470
NY	Syosset, Airpax	516-364-1217
OH	Dayton, Baehr, Greenleaf	513-439-0724
OH	Westlake, Baehr, Greenleaf	216-892-1770
OH	Worthington, Baehr, Greenleaf	614-847-0220
OR	Beaverton, Airpax	503-641-6130
PA	Pittsburgh, Russell F. Clark	412-242-9500
TX	Dallas, Airpax	214-851-7433
UT	Salt Lake City, Lange Sls.	801-487-0843
WI	Wauwatosa, Larson Assocs.	414-258-0529

AIRPAX-CHESHIRE DIVISION, A North American Philips Co., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, Tel: 203-271-6000, TWX: 710-455-4048, FAX: 203-271-6100; Empl.: 800; *Sls. Mgr.:* Jerry Gabbard ..... **B•1875; D•1128**

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Tempe, Westrep	602-820-9932
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Airpax	408-980-0410
CO	Littleton, Lange Sls.	303-795-3600
FL	Pompano Bch., Airpax Co.	305-978-9019
GA	Chamblee, B.C.I.	404-455-0405
ID	Boise, Lang Sls., Inc.	208-345-8207
IL	Lake Zurich, Somers-Stanton, Inc.	708-438-2999
IN	Indianapolis, Airpax	317-573-9911
IA	Marion, Rep Assocs.	319-373-0152
MD	Frederick, Airpax	301-243-3133
MA	Northboro, Airpax	508-393-1919
MI	Farmington Hills, Airpax	313-553-6030
MN	Eagan, Airpax	612-683-9007
NY	Rochester, Airpax	716-654-7470
NY	Syosset, Airpax	516-364-1217
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OH	Westlake, Baehr, Greenleaf & Assocs.	216-892-1770
OH	Worthington, Baehr, Greenleaf & Assocs.	614-847-0220
OR	Beaverton, Airpax	503-641-6130
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
TX	Dallas, Airpax	214-851-7433
UT	Salt Lake City, Lange Sls.	801-487-0843
WI	Wauwatosa, Larson Assocs.	414-258-0529

AIRPAX-FREDERICK DIVISION, A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, Tel: 301-663-5141, FAX: 301-698-0624; Empl.: 600; *Sls. Mgr.:* Dennis Karr, Prod. Mgr.; *Dist. Mgr.:* Mike Zusi, Mktg. Mgr. ..... **B•1832**

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Tempe, Westrep	602-820-9932
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Airpax	408-980-0410
CO	Littleton, Lange Sls.	303-795-3600
FL	Pompano Bch., Airpax	305-978-9019
GA	Chamblee, B.C.I.	404-455-0405
ID	Boise, Lange Sls., Inc.	208-345-8207
IL	Lake Zurich, Somers-Stanton Inc.	708-438-2999
IN	Indianapolis, Airpax	317-573-9911
IA	Marion, Rep Assocs., Inc.	319-373-0152
MD	Frederick, Airpax	301-243-3133
MA	Northboro, Airpax	508-393-1919
MI	Farmington Hills, Airpax	313-553-6030
MN	Eagan, Airpax	612-683-9007
NY	Rochester, Airpax	716-654-7470
NY	Syosset, Airpax	516-364-1217
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OH	Westlake, Baehr, Greenleaf & Assocs.	216-892-1770
OH	Worthington, Baehr, Greenleaf & Assocs.	614-847-0220
OR	Beaverton, Airpax	503-641-6130
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
TX	Dallas, Airpax	214-851-7433
UT	Salt Lake City, Lange Sls.	801-487-0843
WI	Wauwatosa, Larson Assocs.	414-258-0529

AIRPAX-INTERNATIONAL DIVISION, A North American Philips Co., West Johnson Ave., Cheshire, CT 06410, Tel: 203-271-6000, FAX: 203-271-6400; Empl.: 350; *Sls. Mgr.:* Art Catano ..... **B•1875; D•1128**

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Tempe, Westrep	602-820-9932
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westerep	619-566-6580
CA	Santa Clara, Airpax	408-980-0410
CO	Littleton, Lange Sls.	303-795-3600
FL	Pompano Bch., Airpax	305-978-9019
GA	Chamblee, B.C.I.	404-455-0405
ID	Boise, Lang Sls., Inc.	208-345-8207
IL	Lake Zurich, Somers-Stanton, Inc.	708-438-2999
IN	Indianapolis, Airpax	317-573-9911
IA	Marion, Rep Assocs.	319-373-0152
MD	Frederick, Airpax	301-243-3133
MA	Northboro, Airpax	508-393-1919
MI	Farmington Hills, Airpax	313-553-6030
MN	Eagan, Airpax	612-683-9007
NY	Rochester, Airpax	716-654-7470
NY	Syosset, Airpax	516-364-1217
OH	Dayton, Behr, Greenleaf & Assocs.	513-439-0724
OH	Westlake, Behr, Greenleaf & Assocs.	216-892-1770
OH	Worthington, Behr, Greenleaf & Assocs.	614-847-0220
OR	Beaverton, Airpax	503-641-6130
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
TX	Dallas, Airpax	214-851-7433
UT	Salt Lake City, Lange Sls.	801-487-0843
WI	Wauwatosa, Larson Assocs.	414-258-0529

AIRPAX SENSOR DIV., A North American Philips Co., Cheshire Industrial Park, Cheshire, CT 06410, Tel: 203-271-6000, TELEX: 962421, TWX: 710-455-4048, FAX: 203-271-6100; Empl.: 200; *Sls. Mgr.:* Jim Rochford ..... **B•1875; D•1128**

Local Sales Offices & Reps

AL	Birmingham, Dwight W. Prouty Co., Inc.	205-988-8110
AZ	Tempe, Westrep	602-820-9932
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Airpax	408-980-0410
CO	Littleton, Lange Sls., Inc.	303-795-3600
FL	Pompano Bch., Airpax	305-978-9019
GA	Marietta, Control Equip. Co.	404-427-8776
ID	Boise, Lange Sls, Inc.	208-345-8207
IL	Lake Zurich, Somers-Stanton Inc.	708-438-2999
IN	Indianapolis, Airpax	317-573-9911
IA	Cedar Rapids, Rep Assocs.	319-373-0152
LA	Kenner, D & W System Sls.	504-466-1692
MA	Northboro, Airpax	508-393-1919
MI	Farmington Hills, Airpax	313-553-6030
MN	Eagan, Airpax	612-683-9007
MS	Jackson, D & W Sys. Sls.	601-956-9292
NY	Rochester, Airpax	716-654-7470
NY	Syosset, Airpax	516-364-1217
NC	Charlotte, MacGuire & Crawford Inc.	704-366-3454
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OH	Westlake, Baehr, Greenleaf, & Assocs.	216-892-1770
OH	Worthington, Baehr, Greenleaf & Assocs.	614-847-0220
OR	Beaverton, Airpax	503-641-6130
PA	Warrendale, Baehr, Greenleaf & Assocs.	412-934-3088
TX	Dallas, Airpax	214-851-7433
UT	Salt Lake City, Lange Sls.	801-487-0843
VA	Salem, Process Specialities	703-562-0707
WI	Wauwatosa, Larsen Assocs.	414-258-0529

Local Distributors

AL	Birmingham, Dwight D. Prouty	205-988-8110
AL	Mobile, Dwight D. Prouty	205-476-5056
AZ	Mesa, FLW, Inc.	602-641-9157
CA	Costa Mesa, FLW Inc.	714-751-7512
CA	Santa Clara, MANCO	408-496-6611
CT	Milford, Motors & Drivers Inc.	203-877-6509
FL	Ft. Lauderdale, Indl. Instrs.	305-971-0209
FL	Tampa, Wacco Inc.	813-621-6441
GA	Marietta, Control Equip. Co.	404-427-8776
ID	Boise, Radar Elec. Co., Inc.	208-336-2227
IL	Countryside, Chicago Chain & Transmission	708-482-9000
IN	Mishawaka, Power Comps. of Midwest	219-256-6630
IA	Des Moines, Kim Controls	515-274-9194
KY	Louisville, Automatic Controls	502-426-4666
LA	Baton Rouge, D & W Sys. Sls.	504-753-0992
LA	Kenner, D & W. Sys. Sls.	504-466-1692
MA	Hingham, Hingham Bay Corp.	617-740-1900
MI	Detroit, Automatic Controls	315-533-8890
MN	Minneapolis, Kim Controls	612-780-2991
MO	Fenton, Hi-Tech Elec.	314-343-6060
NY	Johnson City, Help Elctrns.	607-729-3528
NY	N. Tonawanda, N.E. Controls of Buffalo	716-691-0081
NY	New Hyde Park, 1/0 Corp.	516-355-0130
NY	Thompson Ridge, Vespo Mktg.	914-361-2800
NC	Charlotte, McGuire & Crawford	704-366-3454
OH	Brunswick, Automatic Controls	216-273-1117
OH	Cleves, ATR Distrs.	513-353-1800
OR	Portland, Radar Elec. Co., Inc.	503-232-3404
PA	Conshohocken, I/O Corp.	215-825-4610
PA	Pittsburgh, Friday Engrg.	412-341-1444
TX	Dallas, Automatic Sys.	214-688-1810
TX	Houston, The Haltom Co.	713-782-5625
VA	Salem, Process Specialties	703-563-0707
WA	Richland, Radar Elec, Co., Inc.	509-943-6790
WA	Seattle, Radar Elec, Co., Inc.	206-282-2511
WA	Spokane, Radar Elec, Co., Inc.	509-747-3053
WI	New Berlin, Electric Sales & Engrg.	414-782-2400

AIRTRON, Litton Industries, Inc., 200 E. Hanover Ave., Morris Plains, NJ 07950, Tel: 201-539-5500, TWX: 710-986-7473, FAX: 201-539-0357; FSC No.: 80006; Empl.: 500; *Sls. Mgr.:* M. R. Grosso, Natl. Sls. Mgr.

AIR-VAC ENGRG., 100 Gulf St, Milford, CT 06460, Tel: 203-874-2541, FAX: 203-783-1383; Empl.: 40

AJAX MAGNETHERMIC CORP., 1745 Overland Ave., N.E., Warren, OH 44482, Tel: 216-372-8511, TELEX: 098-2482, FAX: 216-372-8644; Empl.: 500

A.J.'S POWER SOURCE, 214A Cox Drive, Land-O-Lakes, FL 34639, Tel: 800-933-7725, FAX: 813-996-5037; Empl.: 10; *Sls. Mgr.:* Allen L. Johnson Jr. ..... **D•1584**

Local Sales Offices & Reps

FL	Land-O-Lakes, AJ's Power Source	813-996-2583
GA	Duluth, AJ's Power Source	404-441-7927
NC	Raleigh, Overton Assocs.	919-781-7004
SC	Walhalla, Overton Assocs.	803-638-7101
TN	New Tazewell, Overton Assocs.	615-626-6009

AKG ACOUSTICS, INC., 1525 Aluardo St, San Leandro, CA 94577, Tel: 415-351-3500, FAX: 415-351-0500; Empl.: 100; *Sls. Mgr.:* David Angress

AKRO-MILS, Myers Industries, 1293 S. Main St, Akron, OH 44301, Tel: 216-253-5593, TELEX: 98-6321, FAX: 216-253-9801; Empl.: 200; *Sls. Mgr.:* W. J. Tonachio; *Dist. Mgr.:* D. Martin

ALADDIN ELCTRNS., See AIE Div. of Vernitron

ALAN INDUSTRIES INC., P.O. Box 1203, Columbus, IN 47202, Tel: 812-372-8869, FAX: 812-372-5909; FSC No.: 52750; Empl.: 36; *Sls. Mgr.:* Blayde A. Kennedy

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
AZ	Scottsdale, Arcom Sls., Inc.	602-947-5745
CA	Calabasas, Pamcor, Inc.	818-348-8701
CA	Palo Alto, RF Assocs.	415-494-3331
FL	Apopka, Saber Assocs.	800-432-6288
FL	Melbourne, Saber Assoc.	800-432-6288
FL	Tampa, Saber Assocs.	800-432-6288
GA	Lawrenceville, Saber Assocs.	800-327-0853
IN	Fort Wayne, TX Sls.	219-489-4447
KS	Roeland Park, Abrams & Assocs.	913-432-2303
MD	Kensington, Koebert Assocs.	301-493-8924
MA	Topsfield, Liberty Electro Mktg.	508-887-6655
MO	St. Louis, Abrams & Assocs.	314-569-0447
NY	New Rochelle, Ascor Elctrns.	914-235-8838
NY	Syracuse, T-Squared Elctrns.	315-463-8592
NC	Clayton, Saber Assocs.	800-327-0853
OH	Dayton, Frederic L. Ohmer	513-434-1454
OR	Portland, Caruso & Assocs.	503-246-5439
PA	Glenside, Koebert Assocs.	215-887-2310
TX	Addison, Robert R. Thomas Co.	214-233-8235
WA	Bellevue, Caruso & Assocs.	206-455-8811
WV	Inwood, Koebert Assocs.	304-229-8401
EXP	CT, Stamford, Dage Corp.	203-324-3123
Can	Ottawa, Ont., Giga-Tron	613-225-4090,

ALARM CONTROLS CORPORATION, P.O. Box 280, Deer Park, NY 11729, Tel: 516-586-4220, FAX: 516-586-6500; FSC No.: 55042; Empl.: 50; *Sls. Mgr.:* John Benedetto

ALASCO RUBBER & PLASTICS CORP., 617 Mountain View Ave.67, Belmont, CA 94002, Tel: 415-595-4100, FAX: 415-595-0298; FSC No.: 13862; Empl.: 25

ALBAR, INC., 19013 36th Ave. W., Lynnwood, WA 98036, Tel: 206-771-4006, 800-822-5227, FAX: 206-771-2163; Empl.: 50; *Sls. Mgr.:* David C. Stiffler ..... **A•2152**

Local Sales Offices & Reps

CA	Granada Hills, Crown Elctrns.	818-368-7475
GA	Marietta, B-C Elctrns. Sls.	404-565-2088
PA	Newtown, Indl. Sls. Assocs.	215-860-2076

ALBEROX CORPORATION, New Bedford Ind'l. Pk., New Bedford, MA 02745, Tel: 508-995-1725, FAX: 508-995-6954; Empl.: 180

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ALBION INDUSTRIES, 800 N. Clark St., Albion, MI 49224, Tel: 517-629-9441

ALDEC, INC., 3525 Old Conejo Rd., , Newbury Park, CA 91320, Tel: 805-499-6867, TELEX: 239-447, FAX: 805-498-7945; Empl.: 57; *Sls. Mgr.:* Harry Tosado

ALDEN COMPUTER SYSTEMS, One Salem Green, Ste. 420, Salem, MA 01970, Tel: 508-744-1314; *Sls. Mgr.:* Donald O'Brien

ALDEN ELECTRONICS, INC., 40 Washington Street, Westboro, MA 01581, Tel: 508-366-8851, TELEX: 94-8404, FAX: 508-898-2427; Empl.: 125; *Sls. Mgr.:* L. A. Farrington

ALDEN PRODUCTS CO., P.O. Box 860, 117 N. Main St., Brockton, MA 02403, Tel: 508-583-0160, FAX: 508-583-0164; FSC No.: 01009; Empl.: 150; *Sls. Mgr.:* Donald J. Paul ..... **C•1161-1163**

ALDEN SYSTEMS, Alden Products Co., 262 N. Main St., P.O. Box 860, Brockton, MA 02403-0860, Tel: 508-583-0160, TELEX: 287 793 ALDN UR, FAX: 508-583-0164; Empl.: 150; *Sls. Mgr.:* D. Paul

A. L. DESIGN, INC., 1411 Military Rd., Buffalo, NY 14217, Tel: 716-875-6240, FAX: 716-875-2404; Empl.: 25

ALEPH INTERNATIONAL CORP., Nippon Aleph Corp., 1026 Griswold, San Fernando, CA 91340, Tel: 818-365-9856, 800-423-5622, FAX: 818-365-7274; Empl.: 17; *Sls. Mgr.:* Frank Mastrolonardo

A.L.E. SYS., INC., 150 Homer Ave., Ashland, MA 01721, Tel: 508-881-5252, FAX: 617-235-6588; Empl.: 70; *Sls. Mgr.:* John Boyd/Ken Duval; *Dist. Mgr.:* John Boyd/Ken Duval ..... **D•1604**

ALEXANDER BATTERIES, New Product/OEM Divison, P.O. Box 28880, San Diego, CA 92198, Tel: 619-480-4445, TELEX: 371-9855, FAX: 619-480-1351; Empl.: 390; *Sls. Mgr.:* Dave Zeman ..... **D•1430**

Local Sales Offices & Reps

CA	San Diego, Alexander Batteries;New Prod./OEM Div.	619-480-4445-619-480-1351

ALEXANDER MANUFACTURING COMPANY, P.O. Box 1508, Mason City, IA 50401, Tel: 800-247-1821, 515-423-8955, TELEX: 3719855, FAX: 515-423-1644; Empl.: 270; *Sls. Mgr.:* Bill Sapp ..... **D•1430**

ALEXANDRIA EXTRUSION CO., P.O. Box 847 Cty. Rd. 22 North, Alexandria, MN 56308, Tel: 612-763-6537, FAX: 612-763-6530; Empl.: 140; *Sls. Mgr.:* Brian L. Bloedorn

ALFA ELECTRONICS, INC., P. O. Box 8089, Princeton, NJ 08543-8089, Tel: 609-275-0220, FAX: 609-275-9536; Empl.: 9; *Sls. Mgr.:* Jeff Kao

ALGO, INC., 1237 Queen Anne Avenue, ODENTON, MD 21113, Tel: 301-672-1544, TELEX: FAX: (301) 672-1456; Empl.: 12; *Sls. Mgr.:* G. J. O'Mara

ALINABAL, 28 Woodmont Rd., Milford, CT 06460, Tel: 203-877-3241, TWX: 710-462-1178, FAX: 203-877-3241 (ext. 360); Empl.: 255

ALLEGRO MICROSYSTEMS, INC., formerly Sprague Semiconductor Grp., 363 Plantation St., Worcester, MA 01605, Tel: 508-795-1300, FAX: 508-792-9024; FSC No.: 31019,0CVK3,2D532; Empl.: 2000; *Sls. Mgr.:* D. Ax; *Dist. Mgr.:* J. Nardone

ALLEN AVIONICS, INC., 224 E. 2nd St., Mineola, NY 11501, Tel: 516-248-8080, FAX: 516-747-6724; Empl.: 300; *Sls. Mgr.:* Jeffrey Buchman ..... **A•1494, 1653**

Local Sales Offices & Reps

AZ	Phoenix, J. F. Hurlbut Co.	602-952-2079
CA	Arcadia, Van Gott & Assocs.	818-445-9728
CA	Palo Alto, Adtek Assocs.	415-323-5414
CA	San Diego, Van Gott & Assocs.	619-308-0667
CO	Golden, J. F. Hurlbut Co.	303-279-7796
FL	Melbourne, Reynolds & Assocs., Inc.	407-259-7000
IA	Des Moines, The Beams Co.	515-255-1148
KS	Shawnee Mission, The Beams Co.	913-631-0300
MA	Scituate, D&M Tech. Sls.	617-545-9369
MO	St. Louis, The Beams Co.	314-434-8448
NY	Plainview, Eastern Metro Assocs.	516-931-1414
NC	Raleigh, Reynolds Assocs.	407-259-7000
PA	W. Conshohocken, Eastern Comp. Sls. Inc.	215-825-8610
TX	Dallas, Bradenco Corp.	214-352-3554
VA	Alexandria, Vanguard Engrg. Sls.	703-768-1660
WA	Seattle, Evergreen Mktg. Grp.	206-633-3160

ALLEN BRADLEY CO., ELECTRONIC COMPONENTS DIV., A Rockwell International Co., 1414 Allen-Bradley Dr., El Paso, TX, 79936, Tel: 915-592-4888, 800-592-4888, TELEX: 749-400, FAX: 915-594-8922; Empl.: 6500; *Sls. Mgr.:* George Hackstadt; *Dist. Mgr.:* George Hackstadt

ALLEN- BRADLEY CO., Div. of Industrial Control Grp., 1201 S. Second St., Milwaukee, WI 53201, Tel: 414-382-2000, TELEX: 26699, TWX: 4311016, FAX: 414-382-4444; Empl.: 1600; *Dist. Mgr.:* Dick Zajork

FAX: 818-765-2387

ALLEN CO., INC., ROBERT G., 7267 Coldwater Canyon, N. Hollywood, CA 91605, Tel: 818-765-8300, 800-999-3711; Empl.: 35; *Sls. Mgr.:* Bob Keltz ..... **A•1008-1009, 1839-1842**

Local Sales Offices & Reps

CA	Sunnyvale, Robert G. Allen Co., Inc.	408-243-7007
CT	Windsor, Janeco	203-688-4513
IL	Chicago, Rendell Sls.	312-967-1513
NJ	Palisades Park, Janco Technlg. Inc.	201-941-4008
NM	Albuquerque, Nelco Elctrns.	503-293-1399
NC	Kernsville, Wallace Elctrns.	919-996-2742
MN	Oakdale, Complete Sls.	612-731-2923
TX	Irving, Kite Elctrns.	214-986-0321
WA	Redmond, Interstate Elctrns.	206-885-5257
EXP	Dublin, Ireland, Standard Comps. Ltd.	375-25025

Local Distributors

CA	Anaheim, Deco Elctrns.	714-630-8252
CA	Oakland, Brill Elctrns.	405-834-5888
CA	Redwood City, H D B	415-368-1388
CA	San Diego, Deco Elctrns.	619-693-1595
CA	San Diego, Mock III	619-560-0515
CA	San Leandro, Gateway Elctrns.	415-632-4500
CT	Greenwich, Wise Comps.	203-531-4880
CT	Stratford, C-Tronics, Inc.	800-243-9967
ID	Boise, Radar Elec. Co., Inc.	208-336-2227
IL	Itasca, Voyager Elctrns. Corp.	312-773-4900
MA	Wilmington, Heiland Elctrns., Inc.	617-657-4870
MN	Fridley, Voyager Elctrns. Corp.	612-571-7766
NJ	Garfield, B & R Elctrns.	201-470-0700
OR	Portland, Radar Elec. Co., Inc.	503-232-3404
UT	Provo, Central Utah Elctrn. Supp.	801-373-7522
WA	Richland, Radar Elec. Co., Inc.	509-943-8336
WA	Seattle, Radar Elec. Co., Inc.	206-282-2511
WA	Spokane, Radar Elec. Co., Inc.	509-747-3053

ALLEN DATAGRAPH, INC., 2 Industrial Way, Salem, NH 03079, Tel: 603-893-1983, FAX: 603-893-9042; *Sls. Mgr.:* Tom Allen

ALLEN SYSTEMS, 2346 Brandon Rd., Columbus, OH 43221, Tel: 614-488-7122; Empl.: 10

ALLEN TECHNOLOGY, PO Box 575, Sutton, NE 68979, Tel: 402-773-5285

ALLIED CONTROLS INCORPORATED, 562 Captain Neville Dr., Waterbury, CT 06705-3827, Tel: 203-757-4200, FAX: 203-757-4204; FSC No.: 5945; *Sls. Mgr.:* John T. Kryjak, VP Sls. & Mktg. ..... **B•1400-1403**

Local Sales Offices & Reps

AL	Huntsville, Hughes Assocs. Inc.	205-533-9108
CA	Irvine, Component Mktg. Assocs., Inc.	714-727-0688
CA	Tarzana, Component Mktg. Assocs., Inc.	818-708-8058
CT	Clinton, Selmark Assocs., Inc.	203-573-9088
FL	Orlando, Trimark Assocs., Inc.	407-859-5504
GA	Norcross, Hughes Assocs. Inc.	404-662-1587
IL	Skokie, Industrial Reps., Inc.	708-967-8430
IN	Indianapolis, M & L Elctrn. Sls.	317-359-4742
MD	Burtonsville, Chesapeake Technlg. Inc.	301-236-0530
MA	Millis, Selmark Assocs., Inc.	508-376-2914
MN	Bloomington, Indl. Reps., Inc.	612-854-8027
MS	Corinth, Hughes Assocs. Inc.	601-287-2915
NH	Hopkinton, Selmark Assocs., Inc.	603-746-3299
NJ	Englewood, Gray Assocs., Inc.	201-894-0894
NJ	Kenvil, Gray Assocs. Inc.	201-927-6662
NC	Cary, Hughes Assocs. Inc.	919-467-7029
OH	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
AZ	Phoenix, BLS Comms.	602-841-6613
PA	Pittsburgh, Process Engrg. Co.	412-561-5050
TN	Knoxville, Hughes Assocs. Inc.	615-558-0283

TX Austin, Comp. Technlg. 512-250-2450
TX Dallas, Comp. Technlg. 214-783-8831
TX El Paso, Alexander Entprs. 915-591-3142
TX Houston, Component Technlg. 713-961-1262
WI Brookfield, Industrial Reps., Inc. 414-789-9393

Local Distributors

CA Los Angeles, Master Distrs. 213-452-1229
CA Santa Ana, El-Com, Inc. 714-432-6633
CA Santa Ana, Norstan Elctrns. Inc. 213-924-7651
FL Ft. Lauderdale, Peerless Radio 305-973-4141
IL Chicago, Newark Elctrns. 312-784-5100
IN Indianapolis, Bell Inds. 317-875-8200
MA Newton, Greene-Shaw 617-969-8900
MN Minneapolis, Control Design 612-721-1628
NJ Oakland, Relay Specialties 201-337-1000
NY Buffalo, Summit Distrbg. 716-887-2800
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Plainview, ACI 516-293-6630
NY Rome, Rome Elctrns. 315-337-5400
OH Willoughby, Gateway Megatech 216-953-0333
OK Oklahoma City, Electro Entprs. 405-427-6591
PA Philadelphia, P. E. I. Genesis 215-673-0400
PA Philadelphia, Shap Elctrns. 215-969-3300
Can Pointe Claire, Que., Future Elctrns. 514-694-7710

ALLIED ELCTRNS., SUBSIDIARY OF HALL-MARK, 7410 Pebble, Fort Worth, TX 76118, Tel: 800-433-5700, FAX: 817-595-6470; Empl.: 250; *Sls. Mgr.:* Ed Bridges

ALLIED-SIGNAL AEROSPACE CO., Bendix Communications Div., 1300 E. Joppa Rd., Towson, MD 21204, Tel: 410-583-4000, TWX: 710-232-1823, FAX: 410-337-7485; FSC No.: 06845; Empl.: 1500; *Sls. Mgr.:* Jack L. Shagena

ALLIGATOR TECHNOLOGIES, P.O. Box 9706, Fountain Valley, CA 92708, Tel: 714-850-9984, FAX: 714-850-9987; Empl.: 10; *Sls. Mgr.:* Bertil Wanner; *Dist. Mgr.:* Robert Galter

ALL-STATES, INC., 1801 W. Foster Ave., Chicago, IL 60640, Tel: 312-728-0525, TELEX: 317027, FAX: 312-728-6410; FSC No.: 26863

ALMOND INSTRUMENTS, See EG & G Almond Instruments

ALPHA COMPONENTS, 1106 E. Simpson Rd., Mechanicsburg, PA 17055, Tel: 717-697-8595, FAX: 717-697-8608; FSC No.: 52748; *Sls. Mgr.:* Jerry Buckwalter

ALPHA-CORE INC., 915 Pembroke St., Bridgeport, CT 06608, Tel: 203-335-6805, FAX: 203-384-8120; Empl.: 15; *Sls. Mgr.:* Sandu Pescaru

ALPHA DIST. CORP., 3554 Brecksville Rd., Richfield, OH 44286, Tel: 216-659-7100, 1-800-628-0841, FAX: 216-659-3435

ALPHA INDUSTRIES, INC., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, TELEX: 949436, TWX: 710-393-1236; FSC No.: 17540; Empl.: 1400; *Sls. Mgr.:* David Barker

ALPHA-M CORP., 11518 Reeder Rd S.W., 115, Dallas, TX 75229, Tel: 214-406-0424; Empl.: 8; *Sls. Mgr.:* W. L. Cowley

ALPHA METALS, 600 Rte 440, Jersey City, NJ 07304, Tel: 201-434-6778, FAX: 201-434-7508; Empl.: 350; *Sls. Mgr.:* Dave Zerfoss, VP Assembly Prods.

ALPHA OMEGA COMPUTER SYSTEMS, 33815 Eastgate Circle, Corvallis, OR 97333, Tel: 503-754-1911, FAX: 503-757-7415; Empl.: 5; *Sls. Mgr.:* Gary Oliver; *Dist. Mgr.:* Gary Oliver

ALPHA PRODUCTS, INC., 5740 Corsa Ave. 6104, Westlake Village, CA 91362, Tel: 818-889-9304, TELEX: 65-9210, FAX: 818-706-8986

ALPHA-TECH INC., P.O. Box 209, Riverdale, NJ 07457, Tel: 201-831-1222; Empl.: 8; *Sls. Mgr.:* M. Rice

ALPHA THERMISTOR, INC., 7181 Construction Ct., San Diego, CA 92121, Tel: 619-549-4660, 800-235-5445, FAX: 619-549-4791; Empl.: 30; *Sls. Mgr.:* Dan McGillicuddy

ALPHA WIRE CORP., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207-0711, Tel: 908-925-8000, TELEX: 6853017, TWX: 710-996-5895, FAX: 908-925-7938; Empl.: 376; *Sls. Mgr.:* Linda Smith

ALPS ELECTRIC (USA), INC., 3553 N. First St., San Jose, CA 95134, Tel: 408-432-6000, FAX: 408-432-6035(37); Empl.: 700; *Sls. Mgr.:* Mattie Alesi,

ALTAIR

FAX: 818-701-5508

ALTAIR EXCHANGE CORPORATION, 19201 Parthenia St. No.E, Northridge, CA 91324, Tel: 818-701-6977, 800-824-5620 ..... **B•1034-1036**

ALTECH CORP., 120 Old Camplain Rd., Somerville, NJ 08876, Tel: 908-707-8484, FAX: 908-707-4455; Empl.: 35; *Sls. Mgr.:* Steve Stahovic, V.P.; *Dist. Mgr.:* Mort Gelfand, V.P. ... **B•1349, 1643; C•1006-1007, 1148, 1164-1171**

ALTEK CO., P.O. Box 1128, Torrington, CT 06790, Tel: 203-482-7626, FAX: 203-496-7113; FSC No.: 53939; Empl.: 65; *Sls. Mgr.:* Stephen Altschuler

ALTEK CORPORATION, 12210 Plum Orchard Dr., Silver Springs, MD 20904-7802, Tel: 301-572-2555, TWX: 710-825-0422, FAX: 301-572-2510; FSC No.: 7D336; Empl.: 80; *Sls. Mgr.:* Thomas A. Rainone; *Dist. Mgr.:* Thomas A. Rainone

ALTERNATIVE MANUFACTURING, INC., 8 Summer St., P.O. Box 200, Winthrop, ME 04364-200, Tel: 207-377-9377, FAX: 207-377-9379; Empl.: 20

ALTRON, INC., 6700 Industry Ave., N.W., Anoka, MN 55303, Tel: 612-427-7735, FAX: 612-427-3980; Empl.: 185; *Sls. Mgr.:* Waldo W. Hasse

ALUMINUM FILTER, 1000 Cindy Lane, Carpinteria, CA 93013, Tel: 805-684-7651, TELEX: 6713624, FAX: 805-684-3654; FSC No.: 17504; Empl.: 120; *Sls. Mgr.:* B. L. Baker

ALUSETT U.S.A., INC., 3 Cecilia Lane, Pleasantville, NY 10570, Tel: 914-737-0120, FAX: 914-737-8697; Empl.: 35

AMADOR CORPORATION, Taylors Falls, MN 55084-0270, Tel: 612-631-2487, TELEX: 5106007012, ESYLNK: 62911738, FAX: 612-465-3073; Empl.: 31; *Sls. Mgr.:* Gene A. Panger

AMATOM ELECTRONIC HARDWARE, 446 Blake St., New Haven, CT 06515, Tel: 203-397-3311, TELEX: 963-419, FAX: 203-387-4101; FSC No.: 06540; Empl.: 125; *Sls. Mgr.:* James Marshall

Local Sales Offices & Reps

AL Huntsville, Advanced Comps. Mktg. ... 205-881-5493
AZ Phoenix, Carlberg & Assoc. 602-468-0750
CA Moor Park, Interconn 805-529-4276
CA San Diego, Coastal Elctrns. 619-922-5525
CA Sunnyvale, Logan Sls. 408-732-6020
CO Highland Ranch, Valcomp 303-791-0330
CT Bethany, Reps. Corp. 203-393-0024
FL Longwood, R.O. Whitsell & Assoc. 407-682-6662
IL Elk Grove Village, Control Sls. 708-595-2110
IN Ft. Wayne, Outman Sls. 219-489-7699
IA Marion, M.S.B. Assocs. 319-377-6261
KS Roeland Pk., M.S.B. Assocs. 913-432-2131
MD Walkersville, Jadelectronics 301-845-6036
MA Wellesley, Reps. Corp. 617-237-6476
MI Dearborn, Pitcher-Poulin 313-582-5450
MN Edina, Jay Borman Sls. 612-922-5525
MO St. Charles, M.S.B. Assocs. 314-946-5577
NM Albuquerque, Carlberg & Assoc. 505-899-2155
NY New Rochelle, R D I Assocs. 914-632-2828
NY Syracuse, Lenard Co. 315-479-9191
NC Raleigh, Tingen Tech. Sls. 919-870-6670
OH Cleveland, J. Olsen Co. 216-838-0510
OR Beaverton, Luscombe Eng./NW 503-636-6664
PA Birchrunville, Jadelectronics Assocs. .. 215-296-3800
TX Dallas, Nesbitt 214-696-8700
WA Bellevue, Luscombe Eng./NW 206-223-1541
WI Brookville, Control Sls. 414-797-9500
EXP NY Edgewood, Kaytech Ind. 516-242-6606
Can Rexdale, Truenorth Technlgs. 416-744-2233

AMBER ELECTRIC DESIGN, 6969 Trans-Canada Hwy., St. Laurent, PQ,, Canada H4T 1V8, Tel: 514-333-8748, 800-361-3697, TELEX: 514-333-1388; FSC No.: 38047; Empl.: 40; *Sls. Mgr.:* Wayne Jones

AMBER INDS., INC., 14902 Preston Rd. Ste. 212, Dallas, TX 75379, Tel: 214-490-9801, FAX: 214-980-0329; *Sls. Mgr.:* R. Bacon ..... **B•1351**

Local Sales Offices & Reps

AZ Scottsdale, ESCO Elctrns. 602-948-4404
CA Redlands, ESCO Sls. 714-335-1444
CA San Carlos, Electronic Engrg. Assoc. .. 415-593-2189
FL Indian Rocks Beach, PAR Assocs. 813-596-8841
GA Atlanta, PAR Assocs. 404-391-9117
IL Park Ridge, G. McL. Cole Co. 312-692-0665
IN Jasper, E & K Elec., Inc. 812-482-3161
KS Lenexa, Dytec/South (west) 913-888-0215
KS Wichita, Dytec/South 316-263-7090
MD Westminster, Chesapeake Technlgs. .. 301-875-0004
MA Reading, May Technlg. 617-942-7135
MI Southfield, Comtel Instruments 313-358-2505
MN Crystal, Abtech 612-537-3384
MO Maryland Hgts., Dytec/South (east) ... 314-739-0665
NJ Medford, McCoy Grp. 609-953-0770
NM Albuquerque, ESCO Elctrns. 505-243-3470
NC Charlotte, PAR Assocs. 704-535-9858
OH Cleveland, Comtel Instrs. 216-442-8080
OH Dayton, Comtel Instruments 513-426-5310
OR Portland, SPS Elctrns. 206-323-4140
PA Exton, McCoy Grp. (east) 215-363-0350
PA Pittsburgh, Comtel Instrs. (west) 412-922-5720
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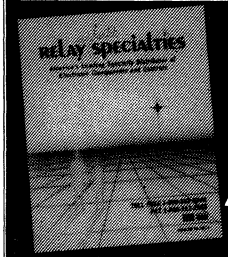
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TX	Carrolton, Sterling Elctrns.	713-243-1600
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TX	Dallas, Wallace Elctrns., Inc.	214-340-0400
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WA	Redmond, Hamilton Avnet Elctrns.	206-881-6697
WA	Redmond, Pyramid Elctrns. Supp., Inc.	206-883-7200
WA	Redmond, Time Elctrns.	206-882-1600
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WI	Oshkosh, Electronic Inds.	414-235-8930
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CT	Meriden, MPS Elctrns.	203-235-1414
FL	Melbourne, Reynolds & Assocs., Inc.	800-255-1965,407-259-7000
MD	Baltimore, Muncy Sls.	301-484-6376
MA	Norwood, MPS Elctrns.	617-769-8700
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ANALOGIC CORP., Data Conversion Prods. Grp., Audubon Rd., Wakefield, MA 01880, Tel: 508-977-3000, TELEX: 466-069; Empl.: 1300; *Sls. Mgr.:* D. Travers ..... **D•1145-1148**

Local Sales Offices & Reps

AZ Scottsdale, Arcom Sls., Inc. 602-947-5745
CA Huntington Bch., Mil-Com Sls. 714-840-2424
NY Manhassett, Win-Cor Elctrns. 516-627-9474
OK Tulsa, Norcom, Inc. 918-832-7747
TX Austin, Norcom, Inc. 512-451-2757
TX Dallas, Norcom 214-386-4888
TX Houston, Norcom, Inc. 713-778-0392
TX San Antonio, Norcom, Inc. 512-680-4513

ANALOG MODULES INC.

FAX: 407-834-3806

ANALOG MODULES, INC., 126 Baywood Avenue, Longwood, FL 32750, Tel: 407-339-4355; FSC No.: 61651; Empl.: 48; *Sls. Mgr.:* W.C. Hudson, Exec. VP; *Dist. Mgr.:* Mark Roberts ..... **D•1004**

ANALOG SYSTEMS, P.O. Box 17389, Tucson, AZ 85731-7389, Tel: 602-290-1818, FAX: 602-885-1189; Empl.: 9; *Sls. Mgr.:* Sharon Raban; *Dist. Mgr.:* Sharon Raban

ANALYTIC INSTRUMENTS CORPORATION, P.O. Box 542845, Dallas, TX 75354, Tel: 214-357-3882; Empl.: 15; *Sls. Mgr.:* Carl Dreher

ANALYTIC TECHNOLOGY CORP., 15233 N.E. 90th, Redmond, WA 98052, Tel: 206-883-2445, 800-428-2808, FAX: 206-882-2138; Empl.: 10; *Sls. Mgr.:* C. Johan Masreliez

ANAREN MICROWAVE, INC., P.O. Box 178, 6635 Kirkville Rd., E. Syracuse, NY 13057, Tel: 315-432-8930, FAX: 315-432-9121; FSC No.: 31597; Empl.: 424

ANATECH ELECTRONICS, INC., 213 First St., Ho Ho Kus, NJ 07423, Tel: 201-612-0066, FAX: 201-612-0404; Empl.: 10

ANCO ELECTRONICS, INC., 9477 Archibald Avenue, Rancho Cucamonga, CA 91730, Tel: 1-800-545-ANCO, FAX: 714-989-9935 ..... **D•1080**

ANCOT, 115 Constitution Drive, Menlo Park, CA 94025, Tel: 415-322-5322, FAX: 415-322-0455; Empl.: 7; *Sls. Mgr.:* Tom Lau

AND, William J. Purdy Co., 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-9916, TELEX: 677-1439, FAX: 415-340-1670; FSC No.: (PURDY UW); Empl.: 32; *Sls. Mgr.:* Clarence Bruce ..... **B•1038-1039, 1137-1139**

Local Sales Offices & Reps

AL Huntsville, Currie, Peak, Frazier 205-536-1506
CA Burbank, Darco 818-504-2425
CA Burlingame, William J. Purdy 415-347-7701
CO Englewood, William J. Purdy Assoc. 303-790-2211
FL Orlando, Currie, Peak, Frazier 407-855-0843
IL Addison, Hedge Assocs., Inc. 708-543-0888
IN Indianapolis, John Sukup, Inc. 317-253-5501
MA Framingham, Gallagher Assocs., Inc. 508-626-2346
MI E. Detroit, Jack M. Thorpe Co. 313-779-6363
MN Minneapolis, Hei-Lite Sls. 612-550-0506
MO Grandview, Harris-Hanson 816-763-6200
NJ Leonia, Peter E. Schmitt Co., Inc. 201-944-2806
NY Victor, Net Sls., Inc. 716-924-1844
NC Greensboro, Currie, Peak & Frazier, Inc. 919-373-0380
OH Cleveland, Marlow Assocs. 216-831-8232
OR Beaverton, Pacific Mktg. Specialists 503-641-9373
TN Smyrna, Currie, Peak & Frazier 615-459-0743
TX Dallas, Elcom Mktg. 214-241-2166
WA Redmond, Pacific Mktg. Specialists 206-882-3144

Local Distributors

AL Huntsville, Newark Elctrns. 205-837-9091
AZ Tempe, Newark Elctrns. 602-968-7441
CA Anaheim, A to Z Elctrns. 714-632-1620
CA Fremont, Allied Elctrns. 415-770-0590
CA Los Angeles, Newark Elctrns. 213-664-5252
CA Los Angeles, Trebor Elctrns. 213-641-8304
CA Milpitas, Sierra West Elctrns. 408-945-1050
CA Sacramento, Integrated Elctrns. 916-363-6030
CA San Jose, Rose Elctrn. 408-943-0200
CA Sunnyvale, Penstock 408-730-0300
CA Torrance, Kent Elctrns. 213-320-2700
CO Arvada, Denver Beta Wintronics 303-431-7161
CO Denver, Integrated Elctrns. 303-292-6121
CO Denver, Newark Elctrns. 303-757-3351
CT Stratford, Coghlin, Inc. 203-265-2724
CT Wallingford, Sager Electrical Supp. 203-265-4600
FL Clearwater, Allied Elctrns. 800-433-5700
MD Gaithersburg, MS Elctrns., Inc. 301-921-0200
FL Melbourne, Rome Elctrns. South 407-242-8151
GA Norcross, Allied Elctrns. 404-446-8595
IL Chicago, Fed. Screw Prods. 312-478-5744
IL Chicago, Newark Elctrns. 312-784-5100
IL Elgin, Allied Elctrns. 312-697-8200
IL Rosemont, Advent Elctrns. 708-297-6200
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Newark Elctrns. 317-872-7070
IA Cedar Rapids, Advent Elctrns. 800-332-8407
KS Overland Park, Newark Elctrns. 913-677-0727
MA Lynn, Land Elctrn. Supp. 617-592-2220
MA Wilmington, Allied Elctrns. 617-942-0150
MI Farmington Hills, Advent Elect. 313-447-1650
MI Grand Rapids, Newark Elctrns. 616-455-9190
MI Livonia, Shand Elctrns. 313-422-7000
MN Minneapolis, Newark Elctrns. 612-331-6350
NE Omaha, Newark Elctrns. 402-592-2423
NH Nashua, Newark Elctrns. 603-883-9110
NJ Cranford, Garden State Elect. 201-272-6400
NM Albuquerque, Newark Elctrns. 505-883-6181
NY Fairport, Allied Elctrns. 716-425-3850
NY Rome, Rome Elctrns. 315-337-5400
NY Syracuse, Newark Elctrns. 315-437-6611
NC Greensboro, Newark Elctrns. 919-292-7240
NC Raleigh, Allied Elctrns. 919-876-5845
OH Cleveland, Newark Elctrns. 216-391-9330
OH Dayton, Stotts-Friedman 513-298-5555
OH Warren, REM Elect. 216-373-1300
OR Beaverton, Almac Elctrns. Grp. 503-629-8090
OR Portland, Radar Elec. Co., Inc. 503-232-3404
PA Drexel Hill, Kass Elect. 215-449-2300
PA Pittsburgh, Newark Elctrns. 412-367-2790
TX Fort Worth, Allied Elctrns. 817-336-5401
TX Irving, Newark Elctrns. 214-258-1355
UT Salt Lake City, Standard Supp. Co. 801-486-3371
UT West Valley City, Salt Lake Beta Wintronic 801-483-1882
VA Richmond, Newark Elctrns. 804-282-5671
WA Bellevue, Almac Elctrns. Corp. 206-643-9992
WA Richland, Radar Elec. 509-943-8336
WA Seattle, Allied Elctrns. 206-547-2827
WI Grafton, Lakeview Elctrns. Corp. 414-377-8250
Can Rexdale, Ont., Newark Elctrns. 416-675-1130

ANDEEN-HAGERLING, INC., 31899 Miles Road, Chagrin Falls, OH 44022, Tel: 216-349-0370, TELEX: 4931432, FAX: 216-349-0359; Empl.: 14; *Sls. Mgr.:* Eric Whitman

ANDERS, INC., 77 Wolcott Rd., Simsbury, CT 06070, Tel: 203-658-7666, FAX: 203-651-5597; FSC No.: 52045; Empl.: 18; *Sls. Mgr.:* Donald W. Miner

ANDERSEN LABORATORIES, 45 Old Iron Ore Rd., Bloomfield, CT 06002, Tel: 203-286-9090, FAX: 203-242-4472; FSC No.: 03947; Empl.: 130; *Sls. Mgr.:* Richard Johnson

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FAX: 814-696-0403

ANDERSON ELECTRONICS, P. O. Box 89, Hollidaysburg, PA 16648, Tel: 814-695-4428; Empl.: 60; *Sls. Mgr.:* Mike Martin ..... **A•1304-1305**

Local Sales Offices & Reps

CA La Habra, Cygnus Sls. Engrg. Corp. 213-691-2993
CA Sunnyvale, Logan Sls 408-732-6020
GA Lawrenceville, B. T. Funderburk, Inc. 404-963-9495
IL South Elgin, R.K. Elctrn. 708-695-8552
KS Roeland Park, Abrams & Assocs. 913-432-2303
MA Woburn, Microwave Comp. Mktg., Inc. 617-273-3106
MI Southfield, R. C. Nordstrom & Co. 313-559-7373
MO St. Louis, Abrams & Assocs. 314-569-0447
NC Raleigh, B. T. Funderburk, Inc. 919-846-2373
OR Beaverton, Harry Levinson Co. 503-690-1312
PA Souderton, Intek, Inc. 215-723-0433
TX Plano, GW Prods. 214-422-1746
WA Seattle, Harry Levinson Co. 206-382-1300
Can Hamilton, Ont., Cartwright South All Assocs. 416-528-0294

ANDERSON POWER PRODUCTS, Div. of High Voltage Engineering, 145 Newton St., Boston, MA 02135, Tel: 617-787-5880, TELEX: 940453, FAX: 617-254-9217

AEC

FAX: 401-333-0287

ANDON ELCTRNS. CORP., 4 Court Dr., Lincoln, RI 02865, Tel: 401-333-0388; FSC No.: OEBT2; Empl.: 55; *Sls. Mgr.:* Irene Small; *Dist. Mgr.:* Irene Small ..... **C•1274-1279**

Local Sales Offices & Reps

AZ Tempe, Elctrn. Dvc. & Sls., Inc. 602-438-1547
CA Milpitas, Inter-Tech Mktg. 408-263-7635
GA Norcross, ELCOM 404-447-8200
IL Rolling Meadows, Eagle Tech. Sls. 708-991-0700
KS Stanley, R. C. Napper & Assoc. 913-897-3719
MN Minneapolis, Electro Serv Co. 612-338-3475
NY Huntington, Applied Tech. Mktg. 516-271-0200
OH Akron, Augnat Assocs. 216-273-1211
OH Dayton, Dirckson & Assoc. Inc. 513-294-3657
PA Montgomeryville, Quick Response 215-362-9225
TX Dallas, SW Mktg. Assoc. 214-341-8631
WA Lynnwood, Blair Hirsh Co. 206-774-8151

Local Distributors

CA Milpitas, J-DOIT 408-956-1301
CA San Jose, Spectra Elctrns. 408-452-1590
CA Santa Clara, Trinity Elctrns. 408-980-9011
TX Houston, Wofford Elctrns. 713-847-3583

ANDOVER, INC., 310 North Earl Avenue, Lafayette, IN 47904, Tel: 317-447-1157, FAX: 317-447-1150; Empl.: 120; *Sls. Mgr.:* Harry O. Minns

ANDREW CORP., 10500 W. 153rd St., Orland Pk., IL 60462, Tel: 800-255-1479, TELEX: 25-3897, FAX: 708-349-5943; *Sls. Mgr.:* Carl Van Hecke

ANDREW/KMW SYSTEMS, 6034 West Courtyard Dr., Austin, TX 78730, Tel: 800-531-5167, 512-338-3082, TELEX: 28-338-3199, FAX: 512-338-3199; Empl.: 135; *Sls. Mgr.:* John McLellan, Dir. of Sls.

ANGO ELECTRONICS CORP., 16 North Third St., Harrison, NJ 07029, Tel: 201-484-1115, FAX: 201-484-0530; *Sls. Mgr.:* Brian K. Yuen ..... **C•1012**

ANGSTROHM POWER RHEOSTATS, A Sub. of Vishay Intertechnology, P.O. Box 1827, Hagerstown, MD 21740, Tel: 301-739-8722, FAX: 301-797-6852; Empl.: 500

ANGSTROHM PRECISION, INC., A Company of Vishay, One Precision Ple. P.O. Box 1827, Hagerstown, MD 21740, Tel: 301-739-8722, FAX: 301-797-6852; Empl.: 500 ..... **A•1844-1845, 2015**

Local Sales Offices & Reps

AL	Huntsville, JWL Assocs.	205-883-1712
AZ	Phoenix, Howe & Howe	602-264-7971
CA	Redwood City, James S. Heaton Co.	415-367-9000
CA	San Diego, VEC	619-690-5112
CA	Tustin, VEC	714-544-7024
CO	Loveland, VEC	303-667-7500
CT	Yalesville, Comp. Rep. Assocs.	203-269-1145
FL	Altamonte Springs, Semtronic Assocs.	407-831-8233
FL	Clearwater, VEC	813-461-4675
FL	Ft. Lauderdale, Semtronic Assocs.	305-731-2484
GA	Atlanta, JWL Assocs.	404-993-0100
IN	Indianapolis, Scott Elctrns.	317-841-0010
IL	Skokie, IRI-Illinois	312-967-8430
IN	Ft. Wayne, Scott Elctrns.	219-489-5690
KS	Olathe, Technical Sls. Assocs.	913-829-2800
MD	Lutherville, J.A. Doughterty Sls. Co.	301-321-7890
MA	Westwood, Comp. Rep. Assocs.	617-329-3454
MI	Plymouth, Jay Mktg. Assocs.	313-459-1200
MN	Bloomington, IRI of Minnesota	612-854-8027
MO	St. Louis, Technical Sls. Assocs.	314-521-2044
NJ	Flanders, K & R Engrg. Sls. Co.	201-584-5235
NM	Albuquerque, Nelco Electronix	505-293-1399
NY	Rochester, L-Mar Assocs.	716-381-9100
NC	Charlotte, JWL Assocs.	704-541-5750
NC	Raleigh, JWL Assocs.	919-787-4826
OH	Aurora, EMA, Inc.	216-562-6104
OH	Centerville, EMA, Inc.	513-433-2800
OR	Beaverton, N. R. Schultz Co.	503-643-1644
PA	Horsham, TMI	215-441-4300
PA	Malvern, Vishay Resistive Sys. Grp.	215-644-1300
TX	Dallas, Edward F. Aymond Co.	214-826-7620
TX	Houston, Edward F. Aymond	713-943-3149
WA	Bellevue, N.R. Schultz Co.	206-746-1890
WI	Milwaukee, IRI-Wisconsin	414-789-9393
PR	Caguas, Comp. Rep. Assocs.	809-746-6550
Can	Burnaby, B.C., Kaytronics, Inc.	604-294-2000
Can	Concord, Ont., Kaytronics, Inc.	416-669-2262
Can	Kanata, Ont., Kaytronics, Inc.	613-564-0080
Can	St. Laurent, Que., Kaytronics, Inc.	514-745-5800

Local Distributors

AZ	Tempe, Shelley-Ragon, Inc.	602-894-2058
AZ	Tempe, TTI, Inc.	602-431-1191
CA	Agoura Hills, Zeus Comps.	818-889-3838
CA	Chatsworth, Passive Comps. Inc.	818-700-8838
CA	Chatsworth, Shelley-Ragon, Inc.	818-998-3333
CA	Laguna Hills, Jaco Elctrns.	714-837-8966
CA	Milipitas, TTI, Inc.	408-946-5577
CA	Mission Hill, TTI, Inc.	818-891-8885
CA	San Diego, Shelley-Ragon, Inc.	619-453-7133
CA	San Diego, TTI, Inc.	619-748-2025
CA	San Diego, Zeus Comps.	619-277-9681
CA	San Jose, Jaco Elctrns.	408-432-9290
CA	San Jose, Passive Compnts.	408-441-1441
CA	San Jose, Shelley-Ragon, Inc.	408-432-0600
CA	San Jose, Zeus Comps.	408-629-4789
CA	Santa Ana, TT I, Inc.	714-641-9393
CA	Westlake Village, Jaco Elctrns.	805-495-9998
CA	Yorba Linda, Zeus Comps.	714-921-9000
CO	Denver, TTI, Inc.	303-429-6806
CT	Meriden, Jaco Elctrns.	203-235-1422
CT	Wallingford, TT I, Inc.	203-284-7474
FL	Boca Raton, Jaco Elctrns.	800-776-5226
FL	Orlando, TT I, Inc.	407-859-1000
FL	Oviedo, Zeus Comps.	407-365-3000
FL	Pinellas Park, MMG Elec./L & S	813-545-1700
FL	Tampa, C & D Elctrns.	813-839-5486
FL	Tampa, Shelley-Ragon, Inc.	813-623-6560
GA	Norcross, Jaco Elctrns.	404-449-9508
GA	Norcross, TTI, Inc.	404-662-0911
MA	Chelmsford, Shelley-Ragon, Inc.	508-250-9666
IL	Glendale Heights, Shelley-Ragon, Inc.	708-529-9977
IA	Cedar Rapids, Shelley-Ragon, Inc.	319-373-0525
MD	Baltimore, RESCO/Baltimore	301-931-8200
MD	Beltsville, RESCO/Washington	301-937-9100
MD	Columbia, Jaco Elctrns.	301-995-6620
MD	Columbia, TTI, Inc.	301-995-1331
MD	Columbia, Zeus Comps.	401-997-1118
MA	Springfield, C & D Elrtns.	413-781-1776
MA	Tewksbury, Jaco Elctrns.	508-640-0010
MA	Wakefield, Zeus Comps.	617-246-8200
MA	Wilmington, TT I, Inc.	508-658-4700
MN	Minnetonka, TTI, Inc.	612-933-8555
MN	St. Paul, Shelley-Ragon, Inc.	612-642-2828
MO	Hazlewood, Shelley-Ragon, Inc.	314-895-1515
MO	Independence, Shelley-Ragon, Inc.	816-254-3410
NJ	Mt. Laurel, TTI Inc.	609-234-6400
NY	Farmingdale, Command Elctrns. Corp.	516-293-1212
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Medford, Shelley-Ragon, Inc.	516-447-2000
NY	Port Chester, Zeus Comps.	914-937-7400
NY	Ronkonkoma, Mast Distrs., Inc.	516-471-4422
NY	Ronkonkoma, TTI, Inc.	516-737-2000
NY	Ronkonkoma, Zeus Comps.	516-737-4500
NY	Valley Stream, L & S Elctrns.	516-561-2474
NC	Raleigh, Jaco Elctrns.	919-876-7767
OH	Cincinnati, G & A Sls.	513-385-1105
OH	Dayton, Micro Mil Div.	513-434-8231
OH	Dayton, Zeus Comps.	513-293-6162
OH	Worthington, TTI, Inc.	614-848-5770
TX	Addison, Jaco Elctrns.	214-733-4300
SC	Charleston, L&S	803-720-4242
TX	Ft. Worth, TT I, Inc.	817-831-8300
TX	Ft. Worth, TTI, Inc.	817-595-3100
TX	Houston, Texas Comps.	713-468-3882
TX	Richardson, Zeus Comps.	214-783-7010
WA	Redmond, Shelley-Ragon	206-883-2220
WA	Redmond, TTI, Inc.	206-882-0291
Can	Burnaby, B.C., Kaytronics, Inc.	604-294-2000
Can	Concord, Ont., Kaytronics	416-669-2262
Can	Kanata, Ont., Kaytronics, Inc.	613-564-0080
Can	Quebec, Kaytronics, Inc.	514-745-5800

ANNULUS TECHNICAL INDUSTRIES, INC., P.O. Box 7407, 1296 Osprey Dr., Ancaster, Ontario, CAN L9G 4G4, Tel: 416-648-8100, FAX: 416-648-8102; Empl.: 21; *Sls. Mgr.:* Don MacAdam

ANORAD CORP., 110 Oser Ave., Hauppauge, NY 11788, Tel: 516-231-1995, TWX: 510-227-9894, FAX: 516-435-1612; Empl.: 280; *Sls. Mgr.:* Richard Scherer,VP Sls.

Anritsu

FAX: 201-337-1033

ANRITSU, 15 Thornton Rd., Oakland, NJ 07436, Tel: 201-337-1111, 800-255-7234, TELEX: 64-2141 ANRITSUOKLD; Empl.: 75; *Sls. Mgr.:* Chuck Smith ..... **D•1218-1219**

Local Sales Offices & Reps

CA	San Jose, Anritsu	408-434-6666
FL	Melbourne, Anritsu	305-951-7302
GA	Norcross, Anritsu	404-662-1541
IN	Columbus, Anritsu	812-372-0516
KS	Overland Park, Anritsu	913-451-4438
MD	Gaithersburg, Anritsu	301-590-0300
MA	Nashua, Anritsu	603-888-0230
TX	Dallas, Anritsu	214-991-8864

ANSLEY ELECTRONICS, DIVISION OF THOMAS & BETTS, See T & B/Ansley Corp.

ANSONICS, INC., P.O. Box 910, Halfway, OR 97834, Tel: 503-742-7475, FAX: 503-742-2991; Empl.: 6

ANTEL OPTRONICS INC., 3325B Mainway, Burlington, Ontario, Canada L7M 1A6, Tel: 416-335-5507, TELEX: 061-8514, FAX: 416-335-5141; Empl.: 25; *Sls. Mgr.:* J. D. Brown

ANTENNA RESEARCH ASSOCIATES, 11317 Frederick Ave., Beltsville, MD 20705, Tel: 301-937-8888, TELEX: 374-6620, FAX: 301-937-2796; FSC No.: 23360; Empl.: 30; *Sls. Mgr.:* H.W. Rapalus

ANTENNA SPECIALISTS, The Allen Group, 30500 Bruce Industrial Pkwy., Cleveland, OH 44139, Tel: 216-349-8400, TELEX: 4332133 (AS INTL CLV), FAX: 216-349-8407; Empl.: 1000; *Dist. Mgr.:* Bob Levy, VP Sls.

ANTEX DIVISION, 24 Tioga Way, P.O.Box 615, Marblehead, MA 01945, Tel: 617-631-7100, FAX: 617-631-8887; *Sls. Mgr.:* C. Loutrel; *Dist. Mgr.:* C. Loutrel

ANTEX ELECTRONICS CORP., 16100 S. Figueroa St., Gardena, CA 90248, Tel: 213-532-3092, FAX: 213-532-8509; Empl.: 53; *Sls. Mgr.:* Richard Gross; *Dist. Mgr.:* Richard Gross

ANTONA CORP., 1643 1/2 Westwood Blvd., Los Angeles, CA 90024-5603, Tel: 213-473-8995, FAX: 213-473-7112; *Sls. Mgr.:* Katherine Capanna

ANZAC, M/A-COM, 80 Cambridge St., Burlington, MA 01803, Tel: 617-273-3333, TELEX: 200155, TWX: 710-332-0258; FSC No.: 21912; Empl.: 300; *Sls. Mgr.:* Lee Cooper; *Dist. Mgr.:* Lisa Owens

AOFR, INC., 800 E. Campbell, Suite 108, Richardson, TX 75081, Tel: 214-644-1394, FAX: 214-480-9278; Empl.: 50; *Sls. Mgr.:* Dwain Lawhon

A. P. CIRCUIT, 397 Linden St., Brooklyn, NY 11237, Tel: 718-456-2717, TELEX: 428759, FAX: 718-456-2717 ..... **A•1654**

Local Sales Offices & Reps

MI	Southfield, Comtel Instrs.	313-358-2505
NJ	Matawan, Reps Five	201-495-2315
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573

A.P.C.S. AMERICA, 3286 Kentland Ct. SE, Grand Rapids, MI 49548, Tel: 616-247-1453; Empl.: 13; *Sls. Mgr.:* Julie A. Corby

APEX® μtech

FAX: 602-888-3329

APEX MICROTECHNOLOGY CORP., 5980 N. Shannon Rd., Tucson, AZ 85741, Tel: 602-742-8600, TELEX: 170631; FSC No.: 60024; Empl.: 100; *Sls. Mgr.:* Richard Spielman; *Dist. Mgr.:* Bridget Riceci-Byrne, Intl. Sls. Mgr. ..... **D•1005-1007, 1598**

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier, Inc.	205-536-1506
AZ	Tucson, Apex Microtechnology	602-742-8600
CA	Laguna Hills, Conprod	714-361-0765
CA	Los Altos, Kolm Mktg.	415-948-2635
CA	Los Altos, KOLM Mktg.	415-948-2635
CT	Guilford, Data Mark Inc.	203-453-0575
MD	Elicott City, Nelson Elctrns.	301-747-7887
GA	Duluth, Currie, Peak & Frazier, Inc.	404-497-9404
IL	Buffalo, Torkelson Assocs.	312-520-0710
IN	Indianapolis, Torkelson Assocs.	317-244-7867
IA	Cedar Rapids, Torkelson Assocs.	319-373-0200
MD	Ellicot City, Nelson Elctrns.	301-747-7887
MD	Ellicott City, Nelson Elctrns.	301-747-7887
MA	Woburn, Signal Sls. Engrg.	617-938-7872
MN	Minneapolis, Torkelson Assocs.	612-835-2414
NJ	Flanders, K & R Engrg. Sls.	201-584-5235
NC	Greensboro, Currie, Peak & Frazier Inc.	919-373-0380
IN	Fort Wayne, TX Sales	219-489-4447
TX	Dallas, Repmasters	214-247-6236
TX	Sherman, Repmaster	214-247-6236
WI	Waukesha, Torkelson Assocs.	414-784-7736

Local Distributors

AZ	Tuscon, Apex	602-742-8600
FL	Tampa, Currie, Peak & Frazier	813-963-1076
KS	Olathe, Tech Sls. Assoc.	913-829-2800
NY	Southern, K & R Engrg. Sls.	800-631-9362
NY	St. Louis, Tech Sls. Assocs.	314-521-2044
Can	Mississauga, Ont., bbd Elctrns.	416-821-7800

APOLLO DISPLAY TECHNOLOGIES, INC., 182-2 Morris Ave., Holtsville, NY 11742, Tel: 516-654-1143, FAX: 516-654-1496; *Sls. Mgr.:* Richard Eicher ..... **B•1040**

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FAX: 201-385-0702

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ARIES ELECTRONICS, Box 130, Frenchtown, NJ 08825, Tel: 908-996-6841; FSC No.: 51167; Empl.: 160; *Sls. Mgr.:* Frank Folmsbee ..... **A•1722; B•1649; C•1281-1288**

Local Sales Offices & Reps

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CO	Denver, West Inc.	303-477-8180
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GA	Norcross, Benchmark Tech. Sls.	404-446-1711
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WI	Hartland, Selective Sls.	414-367-1133
IN	Indianapolis, Hi-Tek Sls.	317-887-2564
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MA	Harvard, Enterprise Tech.	508-772-6003
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MO	Kansas City, Delltron Co.	816-436-6445
NJ	Ho-Ho-Kus, DJ Fisher Co.	201-652-0080
NY	Fairport, TAC Sls., Inc.	716-377-2250
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CT	Wallingford, Cronin	203-265-3134
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ARK LES CORPORATION, 51 Water St., Watertown, MA 02172, Tel: 617-924-2330, TELEX: 24-4659, FAX: 617-924-5460; Empl.: 600; *Sls. Mgr.:* Ted Devnew

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CT	Plainville, Northeast Reps.	203-866-6030
FL	Maitland, EIR, Inc.	407-660-9600
FL	Orlando, Aromat Corp.	407-855-1075
GA	Atlanta, Beacon Elctrns. Assoc.	404-256-9640
IL	Elk Grove Village, Aromat Corp.	708-593-8535
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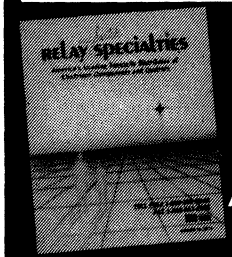

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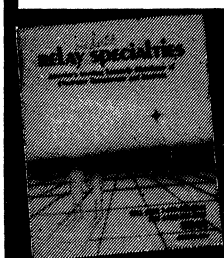

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ASPEN IMAGING, International, Inc., 555 Aspen Ridge Dr., Lafayette, CO 80026-9300, Tel: 303-666-5750, 1-800-955-5555, TELEX: 45-0055; FSC No.: 84-0724829; Empl.: 380; *Sls. Mgr.:* Elizabeth Ema

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ASSEMBLY SPECIALISTS, 14 Alpha Rd., Chelmsford, MA 01824, Tel: 508-250-5900, FAX: 508-250-5902; Empl.: 15

ASSEM-PRO INSTRS., See Overnight Engineering, Inc.

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ASSOCIATED MAGNETICS INTERNATIONAL, 1849 West Sequoia Ave., Orange, CA 92668, Tel: 800-854-1881, CA:800-472-8421

ASSOCIATED RESEARCH, INC., 905 Carriage Pk. Ave., Lake Bluff, IL 60044, Tel: 708-295-3312, FAX: 708-295-9165; FSC No.: 04273; Empl.: 58; *Sls. Mgr.:* Joe Guerriero; *Dist. Mgr.:* Joseph Guerriero ... **D•1220-1221**

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ASSOCIATED TESTING LABS:HANSON PLC, 53 Second Ave., Burlington, MA 01803, Tel: 617-272-9050, FAX: 617-272-8184; *Sls. Mgr.:* Robert Croft

ASTEC

FAX: 619-439-4243

ASTEC AMERICA, 401 Jones Rd., Oceanside, CA 92054, Tel: 619-439-4200; Empl.: 600; *Sls. Mgr.:* Ray Burchill; *Dist. Mgr.:* Bev Montgomery ..... **D•1606-1613**

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AZ	Phoenix, Odessey I(Arizona)	602-246-8846, FAX:602-870-1340
CA	Cameron Park, Emerging Technlgs.	916-676-4387, FAX:916-676-3030
CA	Milpitas, Emerging Technlgs.	408-263-9366, FAX:408-263-9566
CA	San Diego, SC Cubed	619-458-5808, FAX:619-458-5823
CA	Thousand Oaks, SC Cubed	805-496-7307, FAX:805-495-3601
CA	Tustin, SC Cubed	714-731-9206, FAX:714-731-7801
CO	Englewood, Omega Ltd.	303-762-1921, FAX:303-762-1928
CT	Wallingford, Technlg. Sls. Inc.	203-269-8853, FAX:203-269-2099
FL	Maitland, EIR	407-660-9600,FAX:407-660-9091
GA	Lawrenceville, R.W. Mitscher Co., Inc.	404-923-3239,FAX:404-923-4179
IL	Elk Grove, Tri-Star Grp., Inc.	708-593-0200, FAX:708-364-6507
IN	Indianapolis, CC Electro Sls.	317-921-5000, FAX:317-921-5005
MD	Columbia, Delta III Assocs., Inc.	301-730-4700, FAX:301-730-0790
MA	Needham, Com-Sale, Inc.	617-444-8071, FAX:617-449-8047
MI	Canton, CC Electro Sls.	313-981-9296, FAX:313-981-0188
MI	Grand Rapids, CC Electro Sls.	616-281-8800, FAX:616-281-9139
MN	Edina, Ohms Technlg., Inc.	612-932-2920, FAX:612-932-2918
MO	Blue Springs, Palatine Engrg.	816-229-4007, FAX:816-229-4471
MO	Florissant, Palatine Engrg.	314-839-0800, FAX:314-839-6023
NJ	Hackensack, Coakley, Boyd & Abbett, Inc.	201-440-4114,FAX:201-440-4623
NJ	Moorestown, T.A.I. Corp.	609-778-5353, FAX:609-778-7828
NM	Albuquerque, Odessey I (New Mexico)	505-345-9659,FAX:505-345-7289
NY	E. Rochester, Tri-Tech Elctrns.	716-385-6500, FAX:716-385-7655
NY	Endwell, Tri-Tech Elctrns.	607-754-1094, FAX:607-754-1094
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881, FAX:315-446-3047
NC	Davidson, R.W. Mitscher Co., Inc.	704-896-7434, FAX:704-896-7842
NC	Raleigh, R.W. Mitscher Co., Inc.	919-848-0941, FAX:919-848-9156
OH	Dayton, Lyons Corp.	513-278-0714, FAX:513-278-3609
OH	Richfield, Lyons Corp.	216-659-9224, FAX:216-659-9227
OH	Westerville, Lyons Corp.	614-895-1447
OR	Tigard, Earl & Brown Co.	503-639-2100, FAX:503-684-2001
TN	Johnson City, R.W. Mitscher Co., Inc.	615-929-7258,FAX:615-929-0786
TX	Austin, OM Assocs.	512-794-9971, FAX:512-794-9987
TX	Houston, OM Assocs.	713-789-4426, FAX:713-789-4825
TX	Richardson, Om Assocs.	214-690-6746, FAX:214-690-8721
VA	Midlothian, Delta III Assocs., Inc.	804-379-1816, FAX:804-379-3474
WA	Redmond, Earl & Brown Co.	206-885-5064, FAX:206-885-2262
WI	Brookfield, Tri-Star Grp., Inc.	414-782-2670, FAX:414-782-2187
Can	Brampton,Ont., Cantec Reps.	416-791-5922, FAX:416-791-7940
Can	Ottawa, Ont., Cantec Reps.	613-725-3704, FAX:613-725-0940
Can	St. Eustache, Que., Cantec Reps.	514-874-9204, FAX:514-623-5482

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CA	Santa Clara, Cypress Elctrns.	408-980-8400
CA	Santa Clara, Wyle Labs Elctrn. Mktg. Grp.	408-727-2500
IL	Chicago, Newark Elctrns.	312-784-5100
IN	Indianapolis, Custom Svc. Elec.	317-879-9119
MI	Flint, Royalite	313-238-4641
NH	Hudson, Diamond	603-894-4420
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Hauppauge, Sager Elctrns.	516-348-1300
OH	Cincinnati, Hughes Peters	513-351-2000
TX	Dallas, Hall-Mark Elctrns.	214-553-4300
Can	Scarborough, Ont., Carsten	416-495-7705

ASTER CORPORATION, 113 Cedar Street, Milford, MA 01757, Tel: 508-478-5995, FAX: 508-478-6909; Empl.: 60

ASTON ELECTRONICS, INC., Aston Electronic Designs, Ltd., 346 N. Lindenwood, Olathe, KS 66062, Tel: 913-782-4007, FAX: 913-782-1681; Empl.: Paul Stewart; *Sls. Mgr.:* Mike Brunsky

ASTRO CABLE CO., INC., Carol Cable Co., Inc., Box 15086, Worcester, MA 01615-0086, Tel: 508-754-3281, FAX: 508-755-5189; Empl.: 150; *Sls. Mgr.:* Peter Kunigonis; *Dist. Mgr.:* Mike Koshgarian

ASTRO DYNAMICS, INC., 2 Gill St., Woburn, MA 01801, Tel: 617-935-4944, FAX: 617-935-4982; Empl.: 50; *Sls. Mgr.:* Leo Donahue

ASTRO-GEO-MARINE, INC., 2186 Knoll Dr. B, Ventura, CA 93003, Tel: 805-654-8300, FAX: 805-654-8314; FSC No.: 51473; Empl.: 12

ASTRO INSTRUMENT CORP., 450 Goolsby Blvd., Deerfield, FL 33442-3019, Tel: 305-698-6000, FAX: 305-698-6011; FSC No.: 51761; *Sls. Mgr.:* Peter J. Sinatra, Jr.

ASTRO INTERNATIONAL CORP., 100 Park Ave., League City, TX 77573, Tel: 713-332-2484, FAX: 713-554-6795; Empl.: 50; *Sls. Mgr.:* Curt Nicholls

ASTROMEC, INC., 2950 Arrowhead Dr., Carson City, NV 89706, Tel: 702-883-9226, FAX: 702-883-9228; Empl.: 40; *Sls. Mgr.:* Ken Irvin

FAX: 401-822-2430

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WA Auburn, West-Air International, Inc. 206-939-2322
WA Seattle, Radar Elec. Co., Inc. 206-282-2511

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MA Framingham 508-626-2161
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NJ Berkeley Hgts. 908-771-2000
NY Poughkeepsie, AT&T Microelectronics 914-485-7744
NC Raleigh 919-881-8023
OR Portland 503-244-3883
PA Allentown, AT&T Microelectronics 215-770-2100
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GA Norcross, Schweber 404-449-9170
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NJ Fairfield, Schweber 201-227-7880
NY Rochester, Schweber 716-424-2222
NY Westbury, Schweber 516-334-7474
OH Dayton, Schweber 513-439-1800
OK Tulsa, Schweber 918-622-8000
PA Pittsburgh, Schweber 412-782-1600
TX Houston, Schweber 713-784-3600

AT&T NETWORK SYSTEMS,NETWORK CABLE SYS. DIV., 111 Madison Ave., Morristown, NJ 07962, Tel: 1-800-344-0223, Ext. 1027

ATC POWER SYSTEMS, INC., 472 Amherst Street, Nashua, NH 03063, Tel: 603-882-1366, TELEX: 756779, FAX: 603-882-2994; FSC No.: 61814; Empl.: 40; *Sls. Mgr.:* Andrea Onufer, Off. Mgr.

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ATKINS TECHNICAL INC., 3401 S.W. 40th Blvd., Gainesville, FL 32608, Tel: 904-378-5555, FAX: 904-335-6736; Empl.: 45; *Sls. Mgr.:* Robert M. Atkins; *Dist. Mgr.:* Liddon Dell

ATLANTA SIGNAL PROCESSORS, INC., 770 Spring Street N.W., Atlanta, GA 30308, Tel: 404-892-7265, FAX: 404-892-2512; Empl.: 20; *Sls. Mgr.:* William E. Jouris

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MI Madison Hgts., WKM Assocs., Inc. 313-588-2300
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NJ Sparta, Latronics Assocs., Inc. 201-729-5303
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TX Plano, Acudata Inc. 214-424-3567
UT Lake City, Hanna-Hill, Inc. 801-364-0606
WI Waukesha, Torkelson Assocs., Inc. 414-784-7736

Local Distributors
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ATLEE

FAX: 508-686-2934

ATLEE INC., 10 Bayfield Dr., North Andover, MA 01845, Tel: 508-681-1003, TELEX: 928252; FSC No.: 99378; Empl.: 40; *Sls. Mgr.:* Tom Fiocco; *Dist. Mgr.:* Tom Fiocco ..... **C•1014, 1679**

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FL Casselberry, T-Squared Mktg. 407-699-9992
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PA Paoli, Stitzer Assocs. 215-644-5500
TX Arlington, Rem-Air Corp. 214-234-1069

Local Distributors
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NY Plainview, G & B Fasteners 516-694-0990
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ATOCHEM NORTH AMERICA, Three Pkwy., Philadelphia, PA 19102, Tel: 215-587-7520, TELEX: 84-5234, FAX: 215-587-7497

ATOMERGIC CHEMETALS CORP., 222 Sherwood Ave., Farmingdale, NY 11735-1718, Tel: 516-694-9000, TELEX: 144612, TWX: 6852289, FAX: 516-694-9177; Empl.: 40; *Sls. Mgr.:* M. Hollander

ATV RESEARCH, INC., 1301 Broadway, Dakota City, NE 68731, Tel: 402-987-3771; *Sls. Mgr.:* Mel Shadbolt

THE AUBURN MANUFACTURING COMPANY, 29 Stack Street/P.O. Box 251, Middletown, CT 06457, Tel: 203-346-6677, FAX: 203-346-1334; Empl.: 45; *Sls. Mgr.:* Gary L. Mittelman, VP

AUDIO PRECISION, INC., PO Box 2209, Beaverton, OR 97075, Tel: 503-627-0832, TELEX: 283957 AUDIO UR, FAX: 503-641-8906; Empl.: 25; *Sls. Mgr.:* Thomas Mintner

AUDIOSEARS, South St., Stamford, NY 12167, Tel: 607-652-7305, 800-533-7863, FAX: 607-652-3653; FSC No.: 97101; Empl.: 120; *Sls. Mgr.:* Fred Rosscoe

AUDIOSONE, INC., 335 Benton St., Stratford, CT 06497, Tel: 203-377-4475, FAX: 203-377-3374; *Sls. Mgr.:* Rudolph Duris

AUDIOTRONICS CORP., 7428 Bellaire Ave., N. Hollywood, CA 91605, Tel: 818-765-2645, TELEX: 69-1241; Empl.: 15; *Sls. Mgr.:* Gordon Anderson

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AUGAT ALCOSWITCH, Augat Inc., 1551 Osgood St., N. Andover, MA 01845, Tel: 508-685-4371, TELEX: 275423, FAX: 508-686-9545; FSC No.: 95146; Empl.: 150; *Sls. Mgr.:* Robyn Goodwin; *Dist. Mgr.:* Jon Siccoe

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Local Sales Offices & Reps

AL	Huntsville, Interep Assoc.	205-881-1096
AL	Daphne, Interep Assoc.	205-621-1036
AL	Huntsville, Alpha Mktg.	205-533-0766
AZ	Phoenix, Augat Sls.	602-224-6104
AZ	Scottsdale, Spectrum Mktg.	602-890-9000
CA	Los Angeles, Wiley Co.	213-666-1611
CA	Montrose, Signal Entprs.	818-957-0640
CA	San Diego, Wiley Co.	619-453-9018
CA	San Jose, Augat Sls.	408-249-8801
CA	SAnta Clara, Interconnect Sls. Grp.	408-980-1166
CO	Denver, Spectrum Mktg.	303-480-9991
CT	Noack, Augat Sls.	203-572-7503
FL	Lantana, Augat Sls.	407-967-6150
FL	Orlando, Augat Sls.	407-352-2020
GA	Norcross, Interep	404-449-8680
HI	Honolulu, Hawaii Elctrns.	808-845-8207
ID	Boise, J.J. Backer Co.	308-378-4680
IL	Downers Grove, Rockford Controls	312-960-2046
IN	Indianapolis, Luebbe Sls.	317-845-7389
IN	Indianapolis, Luebbe Sls. Co.	317-845-7387
IA	Cedar Rapids, Dy-Tronix	319-377-8275
KS	Leawood, Dy-Tronix	913-339-6333
KS	Wichita, Dy-Tronix	316-838-0884
MA	Sharon, Augat Sls.	617-784-7766
MI	Farmington Hills, Luebbe Sls.	313-489-8828
MN	Minneapolis, H.M.R.	612-888-2122
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NY	Syracuse, Leonard D. Allen, Inc.	315-437-8387
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NC	Charlotte, Quantum Mktg.	704-523-8828
NC	Kernersville, Wallace Elect. Sls.	919-996-2742
NC	Raleigh, Quantum Mktg.	919-846-5728
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PA	Pittsburgh, Luebbe Sls.	412-364-0490
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TX	Houston, Augat Sls.	713-781-9343
UT	Salt Lake City, Butterworth Mktg.	801-972-5566
VA	Charlottesville, Trinkle Sls. Inc.	609-795-4200
WA	Seattle, J.J. Backer Co.	206-285-1300
WI	Madison, Rockford Controls	608-223-8750
PR	Rio Piedras, DK Mktg.	809-765-5380
Can	Mississauga, Ont., Augat Elctrns. Inc.	416-677-1500

Local Distributors

CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Gardenia, Calswitch	213-770-2330
CA	San Jose, Capstone	408-453-9804
CA	Sunnyvale, Abacus	408-732-2000
CA	Sunnyvale, Time Elctrns.	408-734-9888
CT	Wallingford, Sager Elec.	203-265-4600
FL	Orlando, Sager Elec.	407-240-3114
FL	Orlando, Time Elctrns.	407-841-6565
IL	Addison, Pioneer	312-495-9680
IL	Bensenville, Hamilton/Avnet Elctrns.	312-860-7700
IL	Itasca, Capstone	708-250-0200
IL	Shaumburg, Time Elctrns.	708-303-3900
MD	Columbia, Sager Elec. Supp.	301-995-6580
MA	Hingham, Sager Elec.	617-749-6700
MA	Lexington, Pioneer	617-861-9200
MA	Peabody, Hamilton/Avnet Elctrns.	508-531-7430
MA	Wilmington, Capstone	508-657-5874
MA	Woburn, Sterling Elctrns.	617-938-6200
NH	Salem, Sager Elec.	603-898-1348
NJ	Cherry Hill, Hamilton/Avnet Elctrns.	609-424-0100
NY	E. Syracuse, Time Elctrns.	315-432-0555
NY	Hauppauge, Sager Elec.	516-348-1300
NY	Hauppauge, Time Elctrns.	516-273-0100
NC	Raleigh, Sager Elec. Supp.	919-850-9550
PA	Mars, Sager Elec. Supp.	412-772-2233
PA	Philadelphia, Sager Elec. Supp.	215-464-4336
TX	Austin, Hamilton/Avnet Elctrns.	512-837-8911
TX	Austin, Time Elctrns.	512-339-3054
TX	Carrollton, Capstone	214-347-4301

Components

MA	Norwood, Gerber Elect.	617-769-6000
MA	Peabody, Time Elect.	508-532-6200
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, Milgray Elect.	516-420-9800
NY	Melville, Capstone Elec.	516-391-1300
OH	Cleveland, Pioneer Technlgs.	216-587-3600
TX	Houston, Sterling Elect.	713-623-6600

Systems

CA	Monrovia, Erik-A Elect	213-574-1020
IN	Indianapolis, Bell Inds./Graham Div.	317-634-8202
IA	Cedar Rapids, Deeco Inc.	319-365-7551
NY	Bohemia, Car-Lac Elect	516-567-4200
TX	El Paso, Ideal Elect	915-779-6647

Test Probes and Fixtures

AZ	Tempe, D.C. Elect Supp.	602-438-1234
CA	Costa Mesa, Hamilton Electro Sls.	714-641-1850
CA	Santa Clara, D.C. Elect. Supp.	408-980-1199
CA	Tustin, DC Elect Supp.	714-259-9066
IL	Addison, Pioneer	312-495-9680
IL	Chicago, Newark Elect	312-784-5100
MA	Waltham, Vector Sls.	617-893-7780
NJ	Union, Meridian Supp. Co.	800-648-8378, 201-687-6220
OR	Beaverton, Comp. Resources	503-641-8488
TX	El Paso, REM Elect. Supp.	915-778-7333
TX	Houston, Arrow Elctrns.	713-530-4700
WA	Redmond, Comp. Resources	206-454-8666

Test Probes and Fixtures

CT	Wallingford, Arrow Elctrns.	203-265-7741
CT	Wallingford, Sterling Elctrns.	203-265-9535
FL	Altamonte Springs, Pioneer/Technlgs.	305-834-9090
FL	Winter Pk, Hamilton/Avnet Elctrns.	305-628-3888
FL	Winter Pk, Milgray/Florida	305-647-5747

AUGAT/PYLON CO., INC., P.O. Box 2510, Attleboro Falls, MA 02763, Tel: 508-699-9800, TELEX: 948095; Empl.: 400; *Sls. Mgr.:* Gillis Mellon

AUGAT/RDI, 525 Randy Rd., Carol Stream, IL 60188, Tel: 708-682-4100, FAX: 708-682-4562; FSC No.: 53337; Empl.: 85; *Sls. Mgr.:* Jim Steranko, Mktg. Mgr.; *Dist. Mgr.:* Jim Steranko, Mktg. Mgr.

FAX: 612-493-1911

AULT, INCORPORATED, 7300 Boone Ave. N, Minneapolis, MN 55428, Tel: 612-493-1900; Empl.: 300; *Sls. Mgr.:* Greg Harris ..... **D•1618-1619**

Local Sales Offices & Reps

AL	Huntsville, L & D, Inc.	205-837-1469
CA	Santa Clara, Magna Sls.	408-727-8753
CT	Wallingford, Marathon Sls., LTD	203-663-2734
FL	Deerfield Bch., Sls. Engrg. Concepts Inc.	305-426-4601
GA	Atlanta, L & D, Inc.	404-395-7079
IL	Itasca, MSI	708-285-1000
IA	Des Moines, Beams Co.	515-255-1148
KS	Shawnee Mission, Beams Co.	913-631-0300
MA	Framingham, Marathon Sls., LTD	508-875-3566
MI	Plymouth, Jay Mktg. Assocs.	313-459-1200
MN	Minneapolis, Cahill, Schmitz & Cahill	612-646-7217
MO	St. Louis, Beams Co.	314-434-8448
NJ	Fairfield, T.A.M.	201-575-4130
NC	Raleigh, L & D, Inc.	919-876-5301
OH	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
OR	Portland, Jas. J. Backer Co.	503-627-0775
PA	Philadelphia, All-Tech Mktg.	717-540-1204
TX	Austin, R. F. Kimball Co.	512-443-5284
TX	Richardson, R. F. Kimball Co.	214-231-3447
WA	Seattle, Jas. J. Backer Co.	206-285-1300
Can	Toronto, Deskin Sls.	416-475-1412

Local Distributors

Can	Markham, Deskin Sls.	416-475-1412
CA	Van Nuys, Natl. Electro Sls. Corp.	800-423-2664
CO	Littleton, Lange Sls.	303-795-3600
MA	Sharon, Adcour	617-784-8123
MO	St. Charles, Finnigan Elctrns.	314-946-6201
OH	Cincinnati, Hughes Peters	513-351-2000
TX	Fort Worth, Allied Elctrns.	800-433-5700
UT	Salt Lake City, Std. Supp. Co.	801-453-3371
WA	Seattle, Radar Elec.	206-282-2511
Can	St. Laurent, Que., Tech-Rep Elctrns., Ltd.	514-331-2860

AURIC CORP., 470 Frelinghuysen Ave., Newark, NJ 07114, Tel: 201-242-4100, FAX: 201-242-5796; Empl.: 60; *Sls. Mgr.:* Michael Aleksinas

AUSTRIA MIKRO SYSTEME INTERNATIONAL, Schloss Premstaetten, Unterpremstaetten, Austria A-8141, Tel: (03136) 36 66-0, TELEX: 312547 AMS A, FAX: (03136) 2501, 3650; Empl.: 550; *Sls. Mgr.:* Mr. Wilfried Beie

AUSTRON, INC., See FTS Austron

AUTEC POWER SYSTEMS, 9301-101 Jordan Ave., Chatsworth, CA 91311, Tel: 818-341-6123, FAX: 818-341-5726; Empl.: 100; *Sls. Mgr.:* Jeanne Hirsch ..... **D•1620-1624**

Local Sales Offices & Reps

CA	Los Alamitos, Power Specialists, Inc.	213-594-9418
Can	Etobicoke, Ont., Canadian Mktg. Technlg.	416-740-4005
Can	Pointe Claire, Que., Canadian Mktg. Technlg.	514-694-6088

AUTOMATED PRODUCTION CONCEPTS, 63 Hillside Terrace, Wayne, NJ 07470, Tel: 201-831-8300, FAX: 201-633-7755; Empl.: 4

AUTOMATED PROD. EQUIP. CORP., 142 Peconic Ave., Medford, NY 11763, Tel: 516-654-1197, TWX: 510-228-2120, FAX: 516-289-4735; FSC No.: 57216; *Sls. Mgr.:* Arthur Ayala

AUTOMATIC COIL CORP., A DSG Company, 3545 N.W. 71st Street, Miami, FL 33147, Tel: 305-696-6660, FAX: 305-696-0626; FSC No.: 03765; Empl.: 245; *Sls. Mgr.:* Roger Millheim .. **A•1159-1163, 1495-1498, 2174**

Local Sales Offices & Reps

AL	Huntsville, Mountain Electro Mktg.	205-881-3937
CA	San Clemente, Com-Star	714-498-8722
CT	Glastonbury, Liberty Electro.	203-657-8023
FL	Spring Hill, Mountain Electro Mktg.	813-996-7653
GA	Norcross, Mountain Electro Mktg.	404-448-5594
IN	Indianapolis, Joe Keith	317-856-3619
KS	Kansas City, Hitec Central	816-796-6684
MA	Topsfield, Liberty Electro.	508-887-6655
MO	Bridgeton, Hitec Central	314-291-5920
MO	Bridgeton, HiTec Central	314-291-5920
NJ	Cherry Hill, Vantage Sls. Co.	609-424-6777
NJ	S.Orange, Kahgan Brody Assoc.	201-763-6038
NY	Hempstead, Kahgan Brody Assoc.	516-538-2300
TX	Plano, Corwin Assoc. Inc.	214-424-8333
NC	Raleigh, Mountain Electro Mktg.	919-878-8606
OK	Brethany, Design Mktg.	405-789-5911
PA	Pittsburgh, Catalyst Sls., Inc.	412-826-3434

AUTOMATIC SWITCH CO., 50-60 Hanover Road, Florham Park, NJ 07932, Tel: 1-201-966-2000, TELEX: 136422, FAX: 1-201-966-2628; Empl.: 1,200; *Sls. Mgr.:* Wayne Bouchard

AUTOMATIC SYSTEMS DEVELOPERS, P.O. Box 3210, Industry St., Poughkeepsie, NY 12603, Tel: 914-473-5530, FAX: 914-454-2538; Empl.: 650; *Sls. Mgr.:* Stanley Bachman

AUTOMATIC TIMING & CONTROLS CO., 201 So. Gulph Rd., King of Prussia, PA 19406, Tel: 215-337-5500, 800-441-8245, TELEX: 84-6437; Empl.: 300; *Sls. Mgr.:* R. L. Swanson ..... **D•1129**

Local Sales Offices & Reps

AZ	Chandler, Automation West	602-940-0884
CA	Gardena, Instrument Lab.	213-327-3282
CA	San Francisco, Instr. Lab	408-434-0160
CO	Englewood, E & M Sls.	303-761-6202
FL	Lakeland, A.A. Elec. Div.	813-665-6941
GA	Norcross, A.A.Electric Div. of AEC	404-449-8670
IL	Downers Grove, Rockford Controls	708-960-2046
KY	Louisville, Air-Hydro Power	502-451-1000
LA	New Orleans, Mid South Sls.	504-641-7480
MD	Baltimore, Jobe & Co.	301-288-0560
MA	Hingham, Hingham Bay Corp.	617-740-1900
MI	Brighton, H. H. Barnum Co.	313-229-2961
MN	Minneapolis, Daniel J. Minor Co.	612-885-0622
MO	Salina, Kriz Davis Co.	913-827-4497
MO	St. Louis, E. Mooney Co.	314-878-9910
NE	Omaha, Lakeland Engrg. Equipt.	402-734-2600
NJ	Newark, ATC	201-278-1121
NM	Albuquerque, E & M Sls.	505-883-8955
NY	Buffalo, Niagara Electric Sls.	716-825-3100
NY	Rochester, Niagara Electric Sls.	716-272-9150
NY	Syracuse, Niagara Elec. Sls.	315-437-1656
NC	Charlotte, Brown & Morrison	704-554-8570
OH	Cincinnati, Anderson-Bolds	513-528-5680
OH	Cleveland, Anderson-Bolds	216-360-9800
OK	Tulsa, Driscoll Auto. Control	918-663-6625
OR	Portland, Coons Western	503-295-0411
PA	King of Prussia, Applied Controls	215-265-3832
PA	Pittsburgh, Gilson Engrg. Sls.	412-369-0100
TX	Houston, GEA of Texas	713-781-3005
UT	Salt Lake City, Control Equip.	801-487-7741
VA	Richmond, Jobe & Co.	804-672-6508
WA	Everett, T&T Instr. Co.	206-742-9833
WI	Cedarburg, Automation Engrg.	414-377-7500

AUTOMATION DISPLAYS INC., 3533 N. White Ave., Eau Claire, WI 54703, Tel: 715-834-9595, FAX: 715-834-9596; Empl.: 21

AUTOMATION ELCTRNS., R.J.A. Inds., Inc., 9640 Topanga Cyn Pl. Bldg. J, Chatsworth, CA 91311, Tel: 818-998-5124, FAX: 818-998-6654; Empl.: 25; *Sls. Mgr.:* Robert J. Aiani

AUTOMATION PRODS., INC., 3030 Max Roy, Houston, TX 77008, Tel: 713-869-0361, TELEX: 775-959, FAX: 713-869-7332

AUTOMATIX INC., 755 Middlesex Turnpike, Billerica, MA 01821, Tel: 506-667-7900, FAX: 508-663-5482; Empl.: 92; *Sls. Mgr.:* Peter Mayek, Dir. of Sls.

AUTOMOTION, INC., 683 Airport Blvd., Ann Arbor, MI 48108, Tel: 313-662-7771, FAX: 313-662-3707; Empl.: 25; *Sls. Mgr.:* David E. Drenning ..... **B•1245**

Local Sales Offices & Reps

CA	Laguna Hills, South Rep	714-951-1084
CT	Seymour, Sturdy Corp.	203-888-1480
FL	Ft. Lauderdale, Motion Controls, Inc.	305-434-5682
MA	Wellesley Hills, Sturdy Corp.	617-235-2330
MN	Little Canada, Assured Sls.	612-482-1309
NH	Derry, Sturdy Corp.	603-434-8440
KS	Shawnee Mission, J.F. Gleeson & Assoc.	913-362-4422
NY	Sidney, Charles Co.	607-563-8064
MO	Florissant, J.F. Gleeson & Assoc.	314-921-8446
OR	Portland, Controltek, Inc.	503-641-0876
PA	Wexford, Intek Sys.	412-935-0440
TX	Richardson, Control Dynamics	214-644-6945
WA	Spokane, Controltek, Inc.	509-922-2971

AUTOROLL MACHINE CORPORATION, 11 River St., Middleton, MA 01949, Tel: 508-777-2160, TELEX: 940250, FAX: 508-777-9453; Empl.: 120

AUTOSPLICE, INC., 10121 Barnes Canyon Rd., San Diego, CA 92121, Tel: 619-535-0077, FAX: 619-535-0130; Empl.: 197; *Sls. Mgr.:* Ken Krone

AUTOSWAGE PRODUCTS, 726 River Rd., Shelton, CT 06484, Tel: 203-929-1401, FAX: 203-929-6187; Empl.: 170; *Sls. Mgr.:* R. D'Autrechy

Local Sales Offices & Reps

AZ	Phoenix, McKee & Assoc., Inc., I.	602-494-1020
CA	Glendale, Haldeman & Frazier	818-957-4554
CO	Arvada, Darrell Higgins & Assoc.	303-421-8601
IN	Greensburg, Comp. Resources	812-663-5608
MD	Upperco, Berwanger & Co.	301-374-5354
MI	Harper Woods, Wm. S. Turner & Co.	313-881-8585
MN	Minnetonka, Crum Co., Inc.	612-938-2573
MO	Maryland Heights, Meiners Sls.	314-739-1114
NY	Pittsford, Production Mktg. Grp.	716-248-5835
PA	Mechanicsburg, Par Assocs., Inc.	717-761-1797
SC	Fort Mills, Eagle Sales, Inc.	803-548-2222
TX	Arlington, Paine & Murray, Inc.	817-461-6331
WA	Bellevue, H.J. Sls. Co.	206-453-1957
Can	Candiac, Que., W. H. Elctrns. Registered	514-632-3685

AUTOTROL CORPORATION, P.O. Box 557, Crystal Lake, IL 60014, Tel: 815-459-3080, TELEX: 72-2417, FAX: 815-459-3227; Empl.: 140; *Sls. Mgr.:* Debora L. DeVries

AUTRONICS CORP., 314 E. Live Oak, Ste. A, Arcadia, CA 91006, Tel: 818-445-5470, TWX: 910-582-3216, FAX: 818-446-0014; FSC No.: 03972; Empl.: 100; *Sls. Mgr.:* Annabelle Cloud, Contracts Mgr.; *Dist. Mgr.:* Gary Noyes

AVA ELECTRONICS CORPORATION, P.O. Box 184, 4000 Bridge St., Drexel Hill, PA 19026, Tel: 215-284-2500, TELEX: 3711411, FAX: 215-259-8379; Empl.: 100; *Dist. Mgr.:* Martin Bisk

AVA INSTRUMENTATION, INC., 8010 Highway 9, Ben Lomond, CA 95005, Tel: 408-336-2281, FAX: 408-336-5049; FSC No.: 61933; Empl.: 7; *Sls. Mgr.:* Allan Hughes

AVANTEK, INC., 481 Cottonwood Dr., Milpitas, CA 95035-7492, Tel: 408-432-3080, TWX: 310-371-8717, FAX: 408-954-0633; Empl.: 2300; *Dist. Mgr.:* John Locke

Local Sales Offices & Reps

CA	Westlake Vl., Avantek, Inc.	805-373-3870
IL	Palatine, Avantek, Inc.	708-358-8963
MD	Columbia, Avantek, Inc.	301-381-2600

Local Distributors

AZ	Tempe, Sertek, Inc.	800-334-7127
CA	San Diego, Insight Elctrns.	800-677-7716
CA	Sunnyvale, Penstock, Inc.	408-730-0300
CA	Westlake Vl., Sertek, Inc.	800-334-7127
FL	Ft. Lauderdale, Nu Horizons	305-735-2555
FL	Melbourne, Comp. Dists. Inc.	800-558-2351
IL	Palatine, Penstock Midwest	708-934-3700
MD	Beltsville, Applied Specialists, Inc.	301-595-5395
MD	Columbia, Nu Horizons	301-995-6330
MA	Wakefield, Nu Horizons	617-246-4442
NJ	Fairfield, Penstock-East	201-808-1414
NJ	Marlton, Nu Horizons	215-557-6540
NJ	Pinebrook, Nu Horizons	201-882-8300
NY	Amityville, Nu Horizons	516-226-6000
NY	Rochester, Nu Horizons	716-248-5980
NC	Raleigh, Comp. Dists. Inc.	919-859-3391
PA	Ardmore, Penstock East	201-808-1414
TX	Dallas, Insight Elctrns.	800-677-7716
TX	Dallas, Thorson Distbg. Co.	214-233-5744
WA	Bellevue, Penstock, Inc.	206-454-2371
Can	Sertek, Inc.	800-548-0409

AVANTI CIRCUITS, INC., 17650 N. 25th Ave., Phoenix, AZ 85023, Tel: 1-800-234-1556, FAX: 1-602-375-1909; Empl.: 65; *Sls. Mgr.:* Steve Tappan

AVASEM CORPORATION, 1271 Parkmoor Ave., San Jose, CA 95126, Tel: 408-297-1201, FAX: 408-925-9460; Empl.: 55; *Sls. Mgr.:* Richard Konrad

AVELEM, La Billardiere, Gargilesse, France 36190, Tel: 33-54478672, FAX: 33-54477799; Empl.: 20

AVEL-LINDBERG INC., 5 Old Town Park Rd., Unit 47, New Milford, CT 06776, Tel: 203-355-4711, FAX: 203-354-8597; Empl.: 225; *Sls. Mgr.:* Melanie B. Roman ..... **A•2175-2177; D•1625**

Local Distributors

CT	Wallingford, Sager Elctrl. Supp. Co.	203-265-4600
MA	Hingham, Sager Elctrl. Supp. Co.	617-749-6700
MA	Hingham, Sager Electrical Supp. Co.	617-749-6700

AVENS CORP., 256 Lincoln Ave., Brooklyn, NY 11208, Tel: 718-827-5991, 800-452-1966, FAX: 718-235-9805; Empl.: 15; *Sls. Mgr.:* Peter Eng ..... **A•1658-1660**

AVEX ELECTRONICS, 1683 Winchester Rd., P.O. Box 1026, Bensalem, PA 19020, Tel: 215-638-1515, 800-345-1295, FAX: 215-638-9108; FSC No.: 58414; *Sls. Mgr.:* Dona Logan; *Dist. Mgr.:* Michael S. Batley VP/GM ..... **D•1431-1433**

Local Sales Offices & Reps

CO	Denver, Tessco	303-778-1119
IL	Cary, Bob Burns Assoc.	708-516-3322
IN	Carmel, New Era	317-844-4530
NM	Albuquerque, Genl. Mktg.	505-892-3426
PA	Philadelphia, Allpower Tech.	215-289-6025
TX	Rowlett, Campion Sls.	800-877-7623

AVIBANK MANUFACTURING, INC., 210 S. Victory Blvd, P.O. Box 391, Burbank, CA 91503-0391, Tel: 818-843-4330, TWX: 910-498-2215; FSC No.: 84256; Empl.: 485; *Sls. Mgr.:* D. Ladin

FAX: 908-382-4996

AVIONIC INSTRUMENTS, 1414 Randolph Ave., Avenel, NJ 07001, Tel: 201-388-3500, 908-388-3500, TELEX: 844413; Empl.: 160; *Sls. Mgr.:* Bryce Wiedeman; *Dist. Mgr.:* Mike Barnaba ..... **D•2160-2166**

Local Distributors

NJ	Avenel, REA Intl. Ltd.	201-382-7100

AVTECH

FAX: 613-226-2802

AVTECH ELECTROSYSTEMS LTD., P.O. Box 5120, Stn. F, Ottawa, Ontario, Canada K2C 3H4, Tel: 613-226-5772; Empl.: 8 ..... **D•1222**

Local Sales Offices & Reps

MA	Westford, ICS Assocs, Inc.	508-692-3545
NM	Albuquerque, Tech. Mktg. Specialists	505-884-3444
NY	Ogdensburg, Avtech Electrosystems Ltd.	315-472-5270
Can	Ottawa, Ont., Avtech Electrosystems Ltd.	613-226-5772

AVTEL DIV., UNITRON INC., 10925 Miller Rd., Dallas, TX 75238, Tel: 214-340-8600, TELEX: 882511, FAX: 214-341-2099; FSC No.: 6130; Empl.: 75; *Sls. Mgr.:* Fred Cullum

AVX CORPORATION, Box 867, Myrtle Bch., SC 29577, Tel: 803-448-9411, TWX: 810-661-2252, FAX: 803-626-2442; FSC No.: 9K916; *Sls. Mgr.:* Allan Cole; *Dist. Mgr.:* Robert Burns

AVX FILTERS CORP., 11144 Penrose St., Sun Valley, CA 91352, Tel: 818-767-6770, TWX: 910-498-4998; FSC No.: 59942; Empl.: 210; *Sls. Mgr.:* Terry Cantine, Prod. Mktg. Mgr.

AXEL ELECTRONICS, INC., 134-20 Jamaica Ave., Jamaica, NY 11418, Tel: 718-291-3900, FAX: 718-526-0248; FSC No.: 13058; Empl.: 160; *Sls. Mgr.:* J. Alaimo, VP Sls.

NORMAN N. AXELROD ASSOCS.: ELECTRO-OPTICAL, LASER, & MACHINE VISION DIV., 445 East 86th Street, New York, NY 10028, Tel: 212-228-0900

AXIAL MAGNETICS, Tencal Inc., 450 W. Los Angeles Ave., Simi Valley, CA 93065, Tel: 805-527-0900, FAX: 805-527-4968; *Sls. Mgr.:* K. G. Kroll

AXIS CORPORATION, 4715 Viewridge Ave.,Ste. 110, San Diego, CA 92123, Tel: 619-560-7737, FAX: 619-560-8260; FSC No.: 9S849; Empl.: 21; *Sls. Mgr.:* Mark J. Prager; *Dist. Mgr.:* Jack Robinson

AYDIN CORP., 700 Dresher Rd., Horsham, PA 19044, Tel: 215-657-7510, TELEX: 685-1211, FAX: 215-657-3830; Empl.: 2,000; *Sls. Mgr.:* B. Jack Miller

AYDIN CORPORATION (WEST), 30 Great Oaks Boulevard, San Jose, CA 95119-1371, Tel: 408-629-1100, TWX: 910-373-1238, FAX: 408-224-4625; FSC No.: ZV23-1686808; *Sls. Mgr.:* R. Hartung; *Dist. Mgr.:* D. Rutledge

AYDIN VECTOR DIV., Aydin Corp., Box 328, Newtown, PA 18940-0328, Tel: 215-968-4271, TWX: 510-667-2320, FAX: 215-968-3214; FSC No.: 13923; Empl.: 400

AZCO CORP., 385 Falmouth Ave., Elmwood Park, NJ 07407, Tel: 201-791-1428, FAX: 201-791-8420; Empl.: 11

AZIMUTH ELECTRONICS, INC., 2605 So. El Camino Real, San Clemente, CA 92672, Tel: 714-492-6481, FAX: 714-492-0744; *Sls. Mgr.:* Kenneth C. Johnsen

A/Z-TECH, INC. R&D LAB, Indiana Institute of Technlg., 1600 East Washington Blvd., Fort Wayne, IN 46803, Tel: 219-422-5561, FAX: 219-422-7696; Empl.: 25

aztec INDUSTRIES

FAX: 602-844-9625

AZTEC INDUSTRIES, INC., 333 S. Nina Drive, Mesa, AZ 85210, Tel: 602-833-3131, 800-729-3132; Empl.: 40; *Sls. Mgr.:* Anthony G. Shumway ..... **B•1799**

Local Sales Offices & Reps

CA	San Jose, Landia Sls. Grp.	408-453-5695, FAX:408-453-5699
IL	Glendale Heights, Synergistic Sls., Inc.	708-858-8686
KS	Shawnee Mission, Marc E. Nelson Assoc.	913-268-9099
NE	Omaha, Label Concepts	402-496-3997, FAX:402-496-3855
TX	Dallas, Kay Todd Assocs.	214-458-8833, FAX:214-458-8837
WI	Mukwanago, Synergistic Sls., Inc.	414-363-2020

BABCOCK, INC., 1717 West Collins Ave., Orange, CA 92667, Tel: 714-633-3700, TWX: 910-595-1517, FAX: 714-538-9740; FSC No.: 56623; Empl.: 270; *Sls. Mgr.:* Bosie White; *Dist. Mgr.:* Bosie White ..... **B•1041**

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BABCOCK DISPLAY PRODUCTS, INC., A Subsidiary of Babcock, Inc., 1051 S. East St. Anaheim, CA 92805, Tel: 714-491-5100, TELEX: 249646 FAX: 714-490-1368; Empl.: 150; *Sls. Mgr.:* Brian Lundstram ..... **B•104**

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BALLANTINE LABORATORIES, Noise Unlimited Inc., 9 Saddle Rd., Cedar Knolls, NJ 07927, Tel: 201-984-1900, FAX: 201-984-1479; FSC No.: 50423; Empl.: 30; *Sls. Mgr.:* Joe Deery; *Dist. Mgr.:* Joe Deery

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BALL CORP., EFRATOM DIVISION, 3 Parker, Irvine, CA 92718-1605, Tel: 714-770-5000, TELEX: 68-5635, FAX: 714-770-2463; Empl.: 225 ..... **A•1307**

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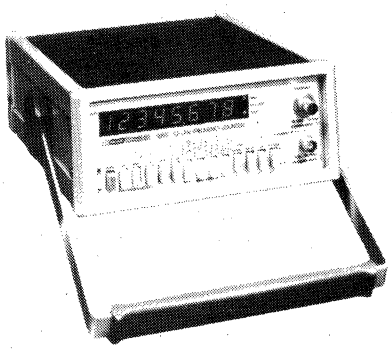

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BASCOM-TURNER INSTRUMENTS, 111 Downey St., Norwood, MA 02062, Tel: 617-769-9660, TELEX: 92-2413, FAX: 617-551-0283; Empl.: 35; *Sls. Mgr.:* D. Weise

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FAX: 805-642-0790

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Local Sales Offices & Reps
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MN Eden Prairie, Professional Mktg. Svcs. Inc. 612-934-5939,FAX:612-934-9433
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Can Willowdale, Willer Engrg., Ltd. 416-499-4421

BEI MOTION SYSTEMS COMPANY, Computer Products Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, Tel: 619-471-2600, TWX: 910-333-4534, FAX: 619-471-2675; *Sls. Mgr.:* Hank Robinson .... **B•1879**

Refer to BEI Motion Sys. Co., Corporate Off. Carlsbad, CA for sales off. info.

BEI MOTION SYSTEMS COMPANY, Digital Products Div., P.O. Box 3838, Little Rock, AR 72203 Tel: 501-851-4000, TWX: 910-722-7384, FAX: 501-851-5476; *Sls. Mgr.:* Mike Jumper .... **B•1879**

Refer to BEI Motion Sys. Co., Corporate Off., Carlsbad, CA for sales office information.

BEI MOTION SYSTEMS COMPANY, Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117 Tel: 805-968-0782, TELEX: 888069, FAX: 805-968-3154; *Sls. Mgr.:* Glenn Avolio .... **B•1879**

Refer to BEI Motion Sys. Co., Corporate Off., Carlsbad, CA for sales office information.

BEI MOTION SYSTEMS COMPANY, Itek Encoder Div., 178 A Street, Needham Hgts., MA 02194, Tel: 617-455-1414, FAX: 617-455-6514; *Sls. Mgr.:* Marvin Kansk .... **B•1879-188**

Refer to BEI Motion Systems Co., Corporate Off., Carlsbad, CA for sales office info.

BEI MOTION SYSTEMS COMPANY, Kimco Magnetics Div., 150 Vallecitos de Oro, San Marcos, CA 92069, Tel: 619-744-5671, TWX: 910-322-1168, FAX: 619-744-8815; *Sls. Mgr.:* Mike Lopez ..... **B•1879**

Refer to BEI Motion Systems Co., Corporate Off., Carlsbad, CA for sales office info.

BEI MOTION SYSTEMS COMPANY, Chatsworth Encoder Div., 9223 Deering Avenue, Chatsworth, CA 91311, Tel: 818-341-6161, FAX: 818-882-4553; *Sls. Mgr.:* Ken Rendler ..... **B•1879**

Refer to BEI Motion Sys. Co., Corporate Off.,Carlsbad, CA for sales office information.

BELDEN WIRE AND CABLE COOPER INDS., See Cooper Industries/Belden

bel BEL FUSE INC.

FAX: 201-432-9542

BEL FUSE, 198 Van Vorst St., Jersey City, NJ 07302, Tel: 201-432-0463; Empl.: 225; *Sls. Mgr.:* A. Sutta; *Dist. Mgr.:* Dennis Ackerman ..... **A•1492, 1499-1528, 2178-2181; B•1346, 1352-1355; D•1629-1630**

Local Sales Offices & Reps

CA	Irvine, Groh Assoc.	714-837-9871
FL	Maitland, D.J. Ellis & Assoc.,Inc.	407-645-1101

Fuses

AL	Huntsville, Beacon Elect.	205-881-5031
CA	Irvine, Groh Assocs.	714-837-9871
CA	Redwood City, James S. Heaton Co.	415-367-9000
FL	Maitland, Beacon Elect.	305-647-3498
FL	Boca Raton, Beacon Elec.	305-997-5740
IL	Chicago, LTD	708-773-2900
FL	Clearwater, Beacon Elect.	813-769-2378
FL	Melbourne, Beacon Elect.	305-724-8010
GA	Atlanta, Beacon Elect.	404-256-9640
ID	Boise, N.R. Schultz Co.	208-377-8686
MN	St. Paul, Northport Engrg.	612-457-8000
IN	Indianapolis, Insul. Reps., Inc.	317-251-1994
KS	Leawood, Dy-Tronix	913-339-6333
MD	Randallstown, Beacon North, Inc.	703-478-2480
NH	Amherst, David A. Cowley Assoc.	603-673-7050
NY	Rochester, Tri-Tech Elec.	716-385-6500
NJ	New Brunswick, Winch Sls. Assocs.	201-613-1515
NC	Raleigh, Beacon Elect.	919-787-0330
OH	Cleveland, Arthur Baier Co.	216-461-6161
OR	Beaverton, N.R. Schultz Co.	503-643-1644
PA	Hatboro, AQS	215-674-3562
TN	Knoxville, Insul-Reps., Inc.	615-691-7586
VA	Sterling, Beacon North, Inc.	703-478-2480
WA	Bellevue, N.R. Schultz Co.	206-454-0300
PR	Hato Rey, Max Anderson Co., Inc.	809-751-2026
Can	Scarboro, Ont., Cantronics, Ltd.	416-297-8668

Delay Lines

AL	Hunstville, Beacon Elect.	205-881-5031
AZ	Scottsdale, SMS & Assoc.	602-998-0831
CA	Irvine, Groh Assoc.	714-837-9871
CO	Boulder, Front Range Mktg.	303-443-4780
FL	Longwood, D-Assocs., Inc.	407-830-8976
CA	Redwood City, James S. Heaton Co.	415-367-9000
ID	Boise, N.R. Schultz Co.	208-377-8686
IL	Chicago, LTD	708-773-2900
GA	Atlanta, Beacon Elect.	404-256-9640
KS	Leawood, Dy-Tronix	913-339-6333
MD	Randallstown, Beacon North, Inc.	703-478-2480
MN	S. St. Paul, Northport Engrg.	612-457-8000
IN	Indianapolis, Insul. Reps., Inc.	317-251-1994
NH	Amherst, David A. Cowley Assocs.	603-673-7050
NJ	E. Brunswick, Winch Sls. Assoc.	201-613-1515
MO	St. Louis, Dy-Tronix	314-291-4777
OH	Cleveland, Arthur Baier Co.	216-461-6161
NY	E. Rochester, Tri-Tech Elec.	716-385-6500
OR	Beaverton, N.R. Schultz	503-643-1644
PA	Hatsboro, AQS	215-674-3562
NC	Raleigh, Beacon Elect.	919-787-0330
TX	Austin, Oeler & Menelaides	512-453-0275
TX	Dallas, Oeler & Menelaides	214-361-8876
UT	Midvale, Front Range Mktg.	801-566-2500
VA	Sterling, Beacon North, Inc.	703-478-2480
WA	Bellevue, N.R. Schultz Co.	206-454-0300
TN	Knoxville, Insul. Reps.	615-691-7586
PR	Hato Rey, M. Anderson Co., Inc.	809-751-2020
Can	Scarboro, Ont., Cantronics, Ltd.	416-297-8668

Local Distributors

FL	Boca Raton, D & R	407-977-8751
PA	Bristol, Aim Elctrns.	215-785-3500
Can	Scarborough, Ont., Carsten Elctrns.	416-495-7705
AL	Huntsville, CDI	205-883-7501
CA	Anaheim, Deco	714-630-8252
CA	City of Industry, Ital Elctrns.	818-968-8515
CA	El Segundo, Force Elctrns.	213-772-1324
CA	Hayward, Kea Elctrns.	415-887-2900
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Jose, Force Elctrns.	408-943-1324
CA	Santa Clara, Pyramid	408-727-9810
FL	Ft. Lauderdale, CDI	305-971-4950
GA	Norcrosss, CDI	404-441-3320
MD	Columbia, DK Elctrns.	301-995-1950
MO	St. Charles, Finnigan Elctrns.	314-946-6201
MA	Marlboro, Hardware Specialty	617-481-8622
MN	New Brighton, Chris Elctrns.	612-631-2647
NH	Hudson, Bell Inds.	603-882-1133
NY	Bohemia, Key Comps.	516-567-7500
NC	Raleigh, CDI	919-787-7311
OR	Beaverton, Comp. Resources	503-641-8488
PA	Cornwall Hgts., Reliance Merchandising	215-638-8200
PA	Harrisburg, Cumberland Elctrns.	717-232-9715
TX	Dallas, Fuses Inc.	214-341-6407
VA	Falls Church, CDI	703-241-8227
WA	Kent, Pyramid	206-872-5800

BELL, FLOYD, INC., 897 Higgs Ave., Columbus, OH 43212, Tel: 614-294-4000, FAX: 614-291-0823; FSC No.: 56493; *Sls. Mgr.:* Tom Shain ..... **D•1028-1029**

Local Sales Offices & Reps

IL	Mt. Prospect, Robert Adams Sls. Co.	312-297-8733
MD	Columbia, Tyler Griffin Co.	301-995-1215
PA	Paoli, Tyler Griffin Co.	215-647-1550

BELL, F. W., INC., 6120 Hanging Moss Rd., Orlando, FL 32807, Tel: 407-678-6900, TWX: 810-853-3115, FAX: 407-677-5765; FSC No.: 18479; *Sls. Mgr.:* Stephen L. Dakel; *Dist. Mgr.:* Stephen L. Dakel ..... **B•1882; D•1130, 1226-1228**

Local Sales Offices & Reps

AL	Adamsville, Southrep	205-674-3056
AZ	Tempe, Trembly Assoc.	602-967-2058
CA	Arcadia, Jim Robins Assocs.	818-574-0049
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CO	Wheat Ridge, Trembly Assoc.	303-421-8900
FL	Winter Springs, Lighthouse Mktg.	407-366-0073
IL	Palatine, Golbeck Milota Assoc.	708-705-0602
KS	Lenexa, Dytec/South, Inc.	913-888-0215
KS	Wichita, Dytec/South, Inc.	316-263-7090
ME	Bethel, Shain Assoc.	207-836-3200
MD	Hampstead, Technical Instr. Sls.	301-239-4452
MA	Bellmont, Shain Assocs.	617-489-3598
MA	Hingham, Shain Assoc.	617-740-2334
MO	Maryland Hgts., Dytec/South Inc.	314-739-0665
NE	Omaha, Dytec/South, Inc.	402-334-1222
NV	Las Vegas, Trembly Assoc.	702-739-9770
NH	Nashua, Shain Assoc.	603-881-4881
NJ	Ridgewood, Ballou, Inc.	201-444-6990
NM	Albuquerque, Trembly Assoc.	505-266-8616
NC	Raleigh, Eastern Elctrns.	919-876-7591
PA	Lansdale, Technical Instr. Sls.	215-361-7850
PA	Pittsburgh, Technical Instr. Sls.	412-767-5110
TX	Carrollton, Seaton Corp.	214-980-9860
UT	Salt Lake City, Trembly Assoc.	801-295-4703
WA	Bellevue, Scientific Dvcs.-NW	206-747-5169
WI	Madison, Golbeck Milota Assoc.	608-222-7037

Local Distributors

AZ	Phoenix, Jensen Tools & Alloys	602-968-6241
AL	Birmingham, Argo & Co.	205-787-1100
ID	Boise, Radar Elec. Co. Inc.	208-336-2227
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
MA	N. Andover, Contact East	508-682-2000
CA	Pomona, Inspection Technigs.	714-626-2600
CA	San Marcos, Mitchell Instrs.	619-744-2690
OR	Portland, Radar Elec. Co.	503-232-3404
GA	Atlanta, P & R Instrs.	404-391-9117
IN	Muncie, Wesco	317-284-6335
IL	Mattoon, Electronic Lab & Sls.	217-235-0546
IL	Palatine, Golbeck Milota Assocs.	708-705-0602
MD	Baltimore, Davis Instrmn.	301-358-3900
MA	Hingham, Shain Assocs.	617-740-2334
MI	Livonia, Electro Sls. Assoc.	313-421-7500
NY	Rochester, Transcat	800-828-1470
NY	Whitehouse, Power Electro Supply	718-767-1447
OH	Chesterland, Electro Sls. Assoc.	216-729-0190
OH	Dayton, Electro Sls. Assoc.	513-426-5551
TX	Dallas, Seaton Elctrns.	214-980-9860
PA	Reading, Barbey Elctrns.	215-376-7451
SC	Charleston, Cameron Barkley Co.	803-745-2837
TN	Chattanooga, Edwin Bohr Elctrns.	615-877-8207
PA	Pittsburgh, Electro Sls. Assoc.	412-322-9000
WA	Seattle, Radar Elec. Co.	206-282-2511

BELL INDS., J. W. Miller Div., 306 E. Alondra Blvd. P.O. Box 2859, Gardena, CA 90247-1059, Tel: 213-515-1720, FAX: 213-515-1962; FSC No.: 76493; Empl.: 30 ..... **A•1164-1169**

Local Sales Offices & Reps

AZ	Mesa, Fetty/Schoenduve, Inc.	602-844-8289
CA	Campbell, Shur Sls.	408-374-5577
NC	Raleigh, C-Tech Sls. Co.	919-782-8100
CO	Denver, West, Inc.	303-477-8180
FL	Clearwater, HHP Assocs., Inc.	813-797-4447
FL	Pompano Bch., HHP Assocs., Inc.	305-971-5750
FL	Winter Park, HHP Assocs., Inc.	407-740-0320
IL	Elk Grove VL, Levy, Grams & Lassers	708-272-8500
IN	Carmel, Current Elctrn. Mktg., Inc.	317-844-1770
MD	Sykesville, DJC Elctrn. Sls., Inc.	301-795-7020
MA	Burlington, Conti-Younger Assocs., Inc.	617-273-1582
MD	Woodbine, DJC Elctrn. Sls.	301-795-7020
MI	E. Detroit, Jack M. Thorpe Co.	313-779-6363
MN	Eden Prairie, Electro Mark, Inc.	612-944-5850
MS	Hattiesburg, Mfgs. Sls. & Mktg. Svcs.	601-264-4755
NJ	Englewood, Epstein & Siebel Assoc.	201-569-7600
NY	Marcellus, J.G. Welch Sales	315-673-1009
NY	Rochester, J.G. Welch Sales	716-244-1100
OH	St. Mary's, Thomas Shelby & Co., Inc.	419-394-3377
OR	Portland, Caruso Assoc. Inc.	503-246-5439
TX	Ft. Worth, Chet Wells & Co.	817-284-0261
WA	Bellevue, Caruso Assoc. Inc.	206-455-8811
EXP	N.Y., Yonkers, Robum Agencies, Inc.	914-968-1016
Can	Calgary, Alberta, Cana Rep Group	403-243-5148
Can	Montreal, Que., Cana-Rep. Grp., Inc.	514-276-4477
Can	Surrey, B.C., Cana Rep Group	604-589-8593
Can	Willowdale, Cana Rep Group	416-250-6683

BELLOFRAM CORPORATION, State Route 2, Box 305, Newell, WV 26050, Tel: 304-387-1200, 800-727-5646, FAX: 304-387-1212; Empl.: 300; *Sls. Mgr.:* David Lewis; *Dist. Mgr.:* David Lewis

BELTING INDUSTRIES CO., INC., 20 Boright Ave., Kenilworth, NJ 07033, Tel: 201-272-8591, TELEX: 229854, FAX: 201-272-3825; Empl.: 125; *Sls. Mgr.:* Gene Hobson

BELMONT INSTRUMENT CORP., Pinehurst Pk., 8 Cook St., Billerica, MA 01821, Tel: 508-663-0212, FAX: 508-663-0214 ..... **D•2176**

BEMCO, 2255 Union Place, Simi Valley, CA 93065, Tel: 805-583-4970, FAX: 805-583-5033; Empl.: 43; *Sls. Mgr.:* Glenn Elliott

BENCHMARQ MICROELECTRONICS, INC., 2611 Westgrove 101, Carrollton, TX 75006, Tel: 214-407-0011, FAX: 214-407-9845; Empl.: 35; *Sls. Mgr.:* John Landau

BENDIX CONNECTOR OPERATIONS, See Amphenol, Bendix Connector Ops.

BENDIX CORP., MOTOR COMPS. DIV., See Facet Entprs.

BENDIX ELECTRIC POWER DIVISION, Allied Signal Aerospace, 118 Hwy. 35, Eatontown, NJ 07724, Tel: 201-542-2000, TELEX: 132-444, FAX: 201-389-7758; FSC No.: 83298;Multiple; Empl.: 1,000; *Sls. Mgr.:* R. Freeman

BENJAMIN INTERNATIONAL, INC., 16 Newtown Plaza, Plainview, NY 11803, Tel: 516-753-0700, FAX: 516-753-0839

BENTLY NEVADA CORP., P.O. Box 157, Minden, NV 89423, Tel: 800-227-5514, 702-782-3611, TELEX: 354437, FAX: 702-782-9253; FSC No.: 1561105

BERG, W. M., INC., 499 Ocean Ave., East Rockaway, NY 11518, Tel: 516-599-5010, TELEX: 9103506176, FAX: 516-599-3274; Empl.: 150; *Sls. Mgr.:* Marie Raitz

BERGQUIST
When Performance Counts

FAX: 612-835-4156

BERGQUIST, 5300 Edina Ind'l, Minneapolis, MN 55435, Tel: 800-347-4572; FSC No.: 55285; Empl.: 170; *Sls. Mgr.:* Bob Savage; *Dist. Mgr.:* Duane Dungey ..... **B•1800-1801; C•1670-1673, 1714-1715**

Local Sales Offices & Reps

CA	Foster City, Bergquist	415-572-9439
CA	Santa Ana, Bergquist Co.	714-542-3383

FL Clearwater, Tech-Rep 813-530-1619
MI Minneapolis, Bergquist 612-835-2322
MA Brookline, Harman Assocs. 617-232-6687
NY Lynbrook, P. Saftler Assocs. 516-593-7880
NY No. Syracuse, Leonard D. Allen 315-458-7470
OH Cleveland, Staff Co. 216-331-5100
OR Tigard, Elctrn. Comp. Sls. 503-245-2342
TX Lewisville, Bergquist 214-317-1502
WA Mercer Island, Elctrn. Comp. Sls. 206-232-9301

Local Distributors

AL Huntsville, Component Dist., Inc. 205-883-7501
CA Fountain Valley, Components Center 213-582-0667
CA Hawthorne, Electrosonic 213-970-0997
CA Mtn. View, Energy Sls. 415-969-0800
CA San Diego, Southland Fasteners 619-578-6630
CO Aurora, JET Elctrns. 303-364-1000
FL Ft. Lauderdale, Components Dist. Inc. 305-973-6915
GA Norcross, Components Dist. Inc. 404-441-3320
IL Chicago, NEP Elctrns. 312-625-8400
MA Brookline, Harman Sls. 617-232-6687
NC Raleigh, Components Dist. Inc. 919-834-9465
TX Dallas, Components Dist. Inc. 214-694-0373
WA Redwood, Murphy Elctrns. 206-881-1234

BERKELEY NUCLEONICS CORP., 1121 Regatta Sq., Richmond, CA 94804, Tel: 510-234-1100, TELEX: 677-1167, FAX: 510-236-3105; Empl.: 30; *Sls. Mgr.:* E. J. Buchs ..... **D•1229**

For immediate assistance please contact: Tele-sales Department (510-234-1100) All sls. engrg. svcs. in U.S. & Canada are provided by our factory-direct sls. & applications staff.

BERKELEY PROCESS CONTROL, INC., 5327-K Jacuzzi St., Richmond, CA 94804, Tel: 415-526-3333, FAX: 415-525-1894; Empl.: 33; *Sls. Mgr.:* Ken Shane; *Dist. Mgr.:* Ken Shane

BERKSHIRE TRANSFORMER CORP., Route 341, P.O. Box 129, Kent, CT 06757, Tel: 203-927-3541, FAX: 203-927-4583; FSC No.: 89870; Empl.: 105; *Sls. Mgr.:* Janis R. Donovan

BERK-TEK INC., 132 White Oak Road, New Holland, PA 17557-9722, Tel: 717-354-6200, FAX: 717-354-7944; FSC No.: 19449; Empl.: 350; *Sls. Mgr.:* Brad Hubinek, Jerry Petty, Natl. Sls. Mgrs.; *Dist. Mgr.:* Allan Schoonover, Mktg. Mgr.

BERMAR CORP., P.O. Box 12844, Research Triangle Park, NC 27709, Tel: 919-489-4316; *Sls. Mgr.:* M. Conland

BA

FAX: 516-935-1766

BERTAN ASSOCS., 121 New South Rd., Hicksville, NY 11801, Tel: 516-433-3110, TWX: 510-221-2144; FSC No.: 6130; Empl.: 140; *Sls. Mgr.:* Jim Donley ... **D•1631-1636**

Local Sales Offices & Reps

AL Huntsville, Currie, Peak, Frazier 205-536-1506
AZ Phoenix, Thor Engrg. 602-437-1463
CA Encino, King-Way Assoc. 818-788-4124
CA Los Altos, Cain-White & Co. 415-948-6533
CO Boulder, H. Bass Assocs. 303-530-7509
CT Farmington, Ray Perron & Co., Inc. 203-673-4825
GA Norcross, Currie, Peak, Frazier 404-449-7662
IL Arlington Hgts., Coombs Assocs. 312-439-9810
KS Lenexa, Midtec Assoc. 913-541-0505
MD Randallstown, Beacon North 703-591-1300
MA Needham, Ray Perron & Co., Inc. 617-449-6162
MI Detroit, Geotronix, Inc. 313-559-2440
MN Minneapolis, Electronic Instrs. 612-374-5628
MO St. Louis, Midtec Assoc. 314-275-8666
NM Albuquerque, Thorson/Desert States Co. 505-293-8555
NY Elmont, Crane & Egert Corp. 516-872-0800
NY Hicksville, Bertan Assocs., Inc. 516-433-3110
NY Liverpool, Northern Tech. Sls. Co. 315-451-1091
OH Cleveland, Geotronix 216-659-6100
PA Audubon, Holmes Assocs. 215-666-0636
TX Dallas, Automated Motion Control 214-340-4192
UT Bountiful, H. Bass Assoc. 801-295-7100
VA Fairfax, Beacon North 703-591-1300
WA Bellevue, Cain-White & Co., Inc. 206-462-2118
WI Milwaukee, Coombs Assocs. 414-351-6123
Can Downsview, Ont, Rayonics Sci., Inc. 416-736-1600

BERTSCH U.S.

FAX: 619-727-4436

BERTSCH U.S., 2142F Industrial Ct., Vista, CA 92083, Tel: 619-727-7420; FSC No.: 619-727-4436; Empl.: 25; *Sls. Mgr.:* B. Linko ..... **B•1246-1247**

BEST POWER TECHNOLOGY, INC., P.O. Box 280, Necedah, WI 54646, Tel: 608-565-7200, 800-356-5794, TELEX: 701934, FAX: 608-565-2221; Empl.: 6000; *Sls. Mgr.:* Donald Soe ..... **D•2177**

Local Sales Offices & Reps

WI Necedah, Best Power Technlg. Inc. ... 800-356-5794

BEST TECHNOLOGY INC., 400 Boren Ave. North, Seattle, WA 98109, Tel: 206-382-1300, FAX: 206-382-0186; Empl.: 8 ..... **B•1833**

Local Sales Offices & Reps

CA Mountain View, Straube Assocs. 415-969-6060
CO Westminster, Straube Assocs. 303-426-0890

BESWICK:COOPER U.K. LTD., Alert Works, Frome, United Kingdom BA11 1PP, Tel: (0373) 64311, TELEX: 449196 G, FAX: (0373) 73175

BETA AUTOMATION, INC., 3541 Old Conejo Rd., Newbury Park, CA 91320, Tel: 805-499-5785, FAX: 805-499-9071; Empl.: 8; *Sls. Mgr.:* James Valentino

BETA REVIEW, INC., PO Box 38, Millwood, VA 22646, Tel: 703-837-1436, FAX: 703-837-3063; Empl.: 2; *Sls. Mgr.:* Norman M. Fine

BT

FAX: 508-842-0748

BETATHERM CORP., 910 Turnpike Rd. (Rte. 9), Shrewsbury, MA 01545, Tel: 508-842-0516; Empl.: 80 ..... **B•1834-1837**

BEY ELECTRIC, INC., 362 Main St., Box 548, Lincoln Park, NJ 07035, Tel: 201-694-5000, FAX: 201-694-7975; *Sls. Mgr.:* Fred DeMauro, Gen. Mgr. ..... **A•2182**

BG ELECTRONICS, EPC Corp., 519 South 5th Avenue, Mt. Vernon, NY 10550-4430, Tel: 914-664-5591, FAX: 914-664-4729; FSC No.: 33791; Empl.: 6; *Sls. Mgr.:* Don Edwards ..... **D•1081**

B-G INSTRUMENTS, INC., P.O. Box 1867, Vashon, WA 98070, Tel: 206-567-5000, FAX: 206-567-5010; *Sls. Mgr.:* John Baum ..... **D•1081**

Local Sales Offices & Reps

WA Spokane, B-G Instrs., Inc. 509-238-4757

B. G. LABORATORIES, INC., 75 Travis Ave., Binghamton, NY 13904, Tel: 607-722-2376, FAX: 607-722-4204; FSC No.: 26522; Empl.: 150

BH Electronics

FAX: 612-894-9380

BH ELECTRONICS, INC., 12219 Wood Lk. Dr., Burnsville, MN 55337, Tel: 612-894-9590; FSC No.: 08450; Empl.: 300; *Sls. Mgr.:* Fred LaMarche ..... **A•1170-1171, 2184-2185**

Local Sales Offices & Reps

AZ Fountain Hills, Halbar Assocs. 602-837-2464
CA San Mateo, Halbar North, Inc. 415-349-4700
CA Van Nuys, Halbar Assocs. 818-906-3941
CO Denver, Electro Comp. Sys. 303-762-9576
NJ Montville, PAF Assocs. 201-335-0680
MA Norwood, Tom Maguire Assocs. 617-551-0500
MI Detroit, I. E. Hampton & Assocs. 313-344-8860
MI St. Joseph, I. E. Hampton & Assocs. ... 616-983-0862
MN Osseo, Gaffney Sls. Co. 612-425-5484
NC Raleigh, Tingen Tech. Sls. 919-870-6670
OH Worthington, R J Mktg. 614-888-7638
NY Smithtown, PAF Assocs. 516-360-0940
PA West Chester, TCA Assocs. 215-692-6853
TX Dallas, Precision Sls. 214-701-9031
WA Redmond, Halbar PNW, Inc. 206-882-0990
WI Theinsville, TFL Assoc. 414-242-6800
Can Toronto, Strategic Elctrns. 416-602-0855

BIBCO, INC., 258 Territorial, Benton Harbor, MI 49022, Tel: 616-925-8445, 800-851-5701, FAX: 616-925-3081; Empl.: 150; *Sls. Mgr.:* Carol McMellen

BICC-VERO ELECTRONICS, INC., 1000 Sherman Ave, Hamden, CT 06514, Tel: 203-288-8001, TWX: 510-227-8890, FAX: 203-287-0062; Empl.: 50; *Sls. Mgr.:* John Bruno

Local Sales Offices & Reps

AL Huntsville, ACM, Inc. 205-881-5493
CA Sunnyvale, Logan Sls. 408-732-6020
CA Walnut, Cook Entprs., Inc. 714-594-0091
CO Littleton, Simpson Assocs. 303-794-8381
FL Coral Springs, CBC Elctrns. 305-755-1111
GA Duluth, A C M, Inc. 404-447-5499
IL Hoffman Estates, Panatek Tech. Sls. .. 708-519-0867
IN Indianapolis, Mohrfield Mktg. 317-546-6969
KS Overland Park, Markline Technologies 913-681-8880
MD Lutherville, J. A. Dougherty Sls. 301-321-7890
MA Plainville, Entprs. Tech. 617-695-4700
MI Brighton, Elctrn. Sources, Inc. 313-227-3598
MN Chanhassen, Jen-Ray Sys. 612-934-8607
NY Centerport, Big Apple Reps. 516-261-3012
NM Albuquerque, BSE, Inc. 505-293-2582
NY Rochester, Apex Assocs. 716-254-6050
NC Greensboro, Magaro Assocs. 919-294-4783
OH Cleveland, KT/Depco 216-442-6200
OH Columbus, KT/Depco 614-262-9159
OR Beaverton, Luscombe 503-636-6664
PA Holicong, John Bell Assocs. 215-794-7075
PA Pittsburgh, KT/Depco 412-367-1011
TX Houston, Microlog 713-956-0837
TX Richardson, Microlog 214-644-2945
WI Madison, Panatek Tech. Sls. 608-831-3103

BICRON ELECTRONICS, 50 Barlow Street, Canaan, CT 06018, Tel: 203-824-5125, FAX: 203-824-1137; FSC No.: 10617; Empl.: 120; *Sls. Mgr.:* Frank Pierzga ..... **A•2186-2187; B•1615, 1883**

Local Sales Offices & Reps

AL Madison, Southern Elec. Rep. 205-461-8925
CA San Clemente, ATA Assocs. 714-498-7180
CO Denver, Omega, Ltd. 303-762-1921
MN Minneapolis, PSI 612-944-8545
NY Pittsford, W.A. Franklin Sls. 716-248-8251
NC Jamestown, Homersmith, Inc. 919-883-3999
PA Media, Homersmith Co. 215-543-2434
PA Pittsburgh, S.K.A. Co. 203-582-5897
UT Salt Lake City, Omega, Ltd. 303-762-1921
VA Arlington, Homersmith 215-543-2434
VA Salem, Homersmith, Inc. 703-387-1600
WI Milwaukee, KMA Sls. Co. 414-259-1771

BIDDLE INSTRUMENTS, 510 Township Line Rd., Blue Bell, PA 19422, Tel: 215-646-9200, TELEX: 685 1045 JGBCO, FAX: 215-643-2670; Empl.: 285

BIKOR, Microsemi Corporation, 1504 W. 228th St. Torrance, CA 90501, Tel: 213-539-6320, FAX: 213-539-0296; FSC No.: 58996; Empl.: 70; *Sls. Mgr.:* James Rorke

BINDICATOR, P.O. Box 61009, 1915 Dove St., Port Huron MI 48061-0009, Tel: 313-987-2700, TWX: 810-231-526 BINDICATOR P THY, FAX: 313-987-4476; Empl.: 60; *Sls Mgr.:* Rick Secord; *Dist. Mgr.:* Rick Secord

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BIOMATION, 19050 Pruneridge Ave., Cupertino, CA 9501 0718, Tel: 408-988-6800, FAX: 408-988-1647; *Sls. Mgr* Mark Zamoyski

BIOSOFT, P.O. Box 10938, Ferguson, MO 63135, Tel: 31 524-8029, FAX: 314-525-8129

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BIRTCHER CORP., See EG & G Birtcher

BISHOP ELECTRONICS CORP., 3729 San Gabriel River Pkwy., Pico Rivera, CA 90660, Tel: 213-695-0446, 213-692-9391, FAX: 213-692-4008

BISHOP GRAPHICS, INC., 5210 Lewis Rd., Agoura, CA 91304, Tel: 818-991-2600, TELEX: 66-2400 BISHOP WKVG, FAX: 818-889-3744; Empl.: 140; *Sls. Mgr.:* Robert Reiss

BIT 3 COMPUTER CORPORATION, 8120 Penn Avenue S., Minneapolis, MN 55431-1393, Tel: 612-881-6955, FAX: 612-881-9674; FSC No.: 7Y590; *Sls. Mgr.:* Merle Lonnon

Bivar

FAX: 714-951-3974

BIVAR, INC., 4 Thomas, Irvine, CA 92718, Tel: 714-951-8808, TELEX: 852348; FSC No.: 32559; Empl.: 20; *Sls. Mgr.:* Thomas Silber; *Dist. Mgr.:* Thomas Silber ..... **C•1015**

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AZ	Tempe, Jarko Assocs.	602-243-4387
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CA	Solana Beach, Cook Entprs.	619-753-7272
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FL	Indian Harbour Beach, Symco, Inc.	407-777-0994
GA	Norcross, Twentieth Century Mktg.	404-446-1999
IL	Downers Grove, Richmar Elec. Corp.	708-968-0118
IN	Indianapolis, Richmar Elec. Corp.	317-577-9950
IA	Iowa City, Richmar Elctrns.	319-354-8894
MN	Minneapolis, Holmgren Assocs.	612-574-9983
MA	Norwood, The MacInnis Co.	617-762-8090
NC	Raleigh, 20th Century Mktg. Inc.	919-790-9383
OH	Cleveland, Marlow Assocs.	216-831-8232
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WI	Butler, Richmar Elec. Corp.	414-781-1730
Can	Markham, Ont., Avotronics, LTD.	416-475-2024
NY	Victor, Net Sls.	716-924-1844

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CA	Fountain Valley, Components Ctr.	714-979-0433
CA	Fremont, Alatec	415-657-7701
CA	Fremont, Vic/Tal Sls.	415-651-6420
CA	Manhattan Beach, Prime Electro Prods.	213-379-3642
CA	Milpitas, MS Inserts	408-946-6565
CA	Mission Hills, Coast Air Inc.	818-898-2288
CA	Mission Viejo, Opto Plus, Inc.	714-380-8654
CA	Monrovia, Erik-A-Elctrn. Distb.	818-574-1020
CA	North Hollywood, Elctrn. Hardware Ltd.	818-982-6100
CA	Oxnard, R. C. Dudek	805-988-4882
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Diego, Western Fasteners	619-292-5115
CA	Santa Ana, BDS Elctrns.	714-662-1050
CA	Santa Clara, Components Ctr.	408-988-3751
CA	Santa Fe Springs, F T R Fasteners	714-957-0202, 213-946-6464
CA	Sunnyvale, R. C. Dudek	408-734-3830
CA	Torrance, MS Inserts	213-539-1530
CO	Littleton, Indelco	303-795-3431
CO	Wheatridge, Colorado Elctrn. Hdwr.	303-431-4334
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CT	Wallingford, Midstate Elctrns.	203-265-9900
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GA	Peachtree City, Engineered Comps.	404-487-7600
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IL	Elmhurst, Miltex Sls.	708-941-7100
IL	Lisle, Comps. Inc.	312-852-7707
IN	Carmel, Altex Elctrns.	317-848-1323
IN	Indianapolis, MAR Elctrns.	317-633-6699
MD	Beltsville, Petricko Sls.	301-937-4960
MD	Gaithersburg, Capital Fasteners	301-948-9310
MA	Ashland, Quality Comps.	508-881-6504
MA	Billerica, MS Inserts	508-670-5600
MA	Marlborough, Hardware Spec. Co.	508-481-8622
MA	Waltham, Electronic Fasteners	617-890-7780
MA	Winchester, Webb Distbn.	617-729-5800
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MN	Hibbing, Minn-Tech Elctrns.	218-267-5228
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MO	St. Louis, Electro-Mechco Co.	314-993-4083
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NY	Holtsville, Tower Fastener Co.	516-289-8800
NY	Long Island City, Hardware Specialty Co.	718-361-9393
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OH	Columbus, Hughes-Peters	614-294-5351
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OH	Solon, Repco	216-248-8900
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OR	Beaverton, Murphy Elctrns.	503-642-2001
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PA	Norristown, Century Elctrns.	215-631-5400
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TN	Nashville, Tebco Prods.	615-255-1234
TX	Dallas, Global Fasteners	214-340-6068
TX	Houston, Rainbow Fasteners Co.	713-957-0500
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WA	Redmond, Murphy Elctrns.	206-881-1234
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BKL, 421 Feheley Dr., King of Prussia, PA 19406, Tel: 215-277-2910, FAX: 215-277-2956; Empl.: 34

BLACKHAWK NETWORKS CORP., 14 N. Parker Dr., P.O. Box 919, Janesville, WI 53545, Tel: 608-752-8701, FAX: 608-752-8701; FSC No.: 12724; Empl.: 10; *Sls. Mgr.:* D. Adee

BLACKHOLE TECHNOLOGY, 225 East St., Winchester, MA 01890, Tel: 617-721-7690, FAX: 617-721-7260; Empl.: 5; *Sls. Mgr.:* John W. McDonough, Jr.

BLATEK, INC.

FAX: 814-231-2087

BLATEK, INC., 2820 E. College Ave., Ste. F, State College, PA 16801, Tel: 814-231-2085, 814-231-2086; Empl.: 20 ..... **B•1885**

BLH ELECTRONICS, INC., 75 Shawmut Road, Canton, MA 02021-9111, Tel: 617-821-2000, TELEX: 172116, FAX: 617-828-1451; FSC No.: 03089; Empl.: 170; *Sls. Mgr.:* Kristin Scharf

BLILEY ELECTRIC CO., 2545 W. Grandview Blvd., Erie, PA 16506, Tel: 814-838-3571, FAX: 814-833-2712; FSC No.: 71034;3098; Empl.: 135 ..... **A•1308-1317**

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NM	Albuquerque, C. T. Carlberg & Assocs., Inc.	505-899-2155
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KS Shawnee Mission, J. F. Gleeson & Assocs. 913-362-4422
MD Denton, Motion Specialists South, Inc. 301-479-1164,65
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MN Mound, John F. Rynkar 612-472-4252
NY Commack, Motion Specialists North, Inc. 516-366-0383
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NY Rochester, Application Specialists, Inc. 716-586-6226
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EXP IL, Chicago, Export Dept., Bodine Elec. 312-478-3515
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CA Fullerton, South Coast Controls 714-525-0471
CA Santa Fe Springs, Power Transmission Specs. 213-907-7650
CO Denver, Wazee Elec. Co. 303-623-8658
CO Englewood, Motion Solutions, Inc. 303-792-5518
CT Berlin, B & B Motor & Control 203-828-8550
CT Hartford, Machine Drives & Controls 203-728-0403
CT Norwalk, Machine Drives & Controls 203-846-2007
FL Hialeah, Condo Elec. & Ind. Supp., Inc. 305-691-5400
FL Orlando, Brownell Electro, Inc. 407-843-6770
FL Tampa, Electrical-Mech. Dr., Inc. 813-621-8675
GA Forest Park, Brownell Electro, Inc. 404-362-9009
GA Tucker, Research Designs, Inc. 404-491-0745
IL Chicago, Excel Elec. Svc. Co. 312-421-7220
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IL Loves Park, Tek-Matic, Inc. 815-282-1775
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KS Kansas City, Kornfeld Thorp Elec. 913-321-7070
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MI Detroit, Howard Elec. Co. 313-923-0430
MI Grand Rapids, MacKay Ind. Sls. 616-241-1671
MI Southfield, Reserve Motion Control Sys. 313-557-0800
MN Minneapolis, Boustead Elec. & Mfg. 612-544-9131
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NY Victor, Vordex, Inc. 716-924-4360
NC Charlotte, Brownell Electro, Inc. 704-597-1270
NC Charlotte, Piedmont Motor &Control Ltd. 704-523-7121,
OH Dayton, Thal Mor Assoc., Inc. 513-298-9939
OH Middleburg Hgts., Reserve Motion Control Sys. 216-826-0290
OK Oklahoma City, Evans Elec. Mtr. Ctrs., Inc. 405-631-1344
OK Tulsa, Southwest Drives, Inc. 918-665-1455
OR Portland, North Coast Elec. 503-281-8888
PA Altoona, Miller Elec. Svc. & Supp. 814-942-9943
PA Pittsburgh, Braunlich-Roessle 412-471-6995
SC Taylors, B & B Motor & Control 803-268-5702
TN Cookeville, Cookeville Elec. Motor, Inc. 615-526-5461
TN Memphis, Brownell Electro, Inc. 901-795-8487
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TX Dallas, Purvis Bearing Svc. 214-358-5588
TX Houston, B & B Motor & Control 713-444-9260
TX Houston, Research Des., Inc. 713-995-8591
VA Richmond, Ind. Supp. Corp. 804-355-8041
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Can St. Laurent, Seltron, Inc. 514-341-3685
Can Vancouver, B.C., Armature Elec. 604-879-6141

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BOGEN COMMUNICATIONS, INC., Sound Prods., 50 Spring St., P.O. Box 575, Ramsey, NJ 07446, Tel: 201-934-8500, FAX: 201-934-9832; *Sls. Mgr.:* David A. Chambers; *Dist. Mgr.:* Christopher Wildfoerster

BOKER'S, INC., 3104 Snelling Ave., Minneapolis, MN 55406-1937, Tel: 612-729-9365, FAX: 612-729-8910; FSC No.: 85446; Empl.: 110; *Sls. Mgr.:* Andy Tscholl

BOMAR CRYSTAL COMPANY, 201 Blackford Ave., Middlesex, NJ 08846, Tel: 908-356-7787, 800-526-3935, FAX: 1-908-356-7362; Empl.: 40; *Sls. Mgr.:* Beth Shapiro, OEM Sls. Mgr. ..... **A•1318-1320**

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TX Ft. Worth, Allied Elctrns. 1-800-433-5700

BOMCO, See MuShield Co.

BOMEM INC., 450 Ave. St-Jean Baptiste, Quebec, Canada G2E-5S5, Tel: 418-877-2944, 1-800-888-FTIR, TELEX: 051-31543, FAX: 418-877-2834; Empl.: 120; *Sls. Mgr.:* Henry Buijs

BONAR-KARD-O-LITE, See BKL (formerly Bonar-Kard-O-Lite)

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BOPLA ENCLOSURES, 7330 Executive Way, Frederick, MD 21701, Tel: 301-696-9300, FAX: 301-696-9494; FSC No.: 4Y520; Empl.: 35 ..... **C•1016**

Local Sales Offices & Reps

CA Irvine, Comp. Mktg. Assocs. 714-951-5950
FL Tampa, FL Comp. Sls. 813-960-7044
IL Chicago, Paddock Mktg./Sls. 312-452-7852
MA Needham, T.E.S.C.O. 617-444-7925
PA Lancaster, Indl. Comps. Inc. 215-889-0650
WA Federal Way, K. R. Jensen Sls. 206-874-2772

Local Distributors

OR Portland, Radar Elctrns. 503-232-3404
PA Harrisburg, Cumberland Elctrns. 717-232-5999
PA Lancaster, Peak Elctrns. 215-293-9000
WA Seattle, Radar Elec. 206-282-2511

BORG-WARNER THERMOELECTRICS, BORG-WARNER CORP., See TECA, ThermoElectric Cooling America Corp.

BOSCH

FAX: 708-865-5203

BOSCH, ROBERT, CORP., 2800 S. 25th Ave., Broadview, IL 60153, Tel: 708-865-5200; *Sls. Mgr.:* Dieter Bloecks; *Dist. Mgr.:* Dave Robson ..... **B•1429**

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AL Huntsville, Hughes Assocs. 205-533-9108
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CA Montrose, Luscombe Engrg. 818-249-9000
CO Longmont, Piper Sls. 303-443-5337
IL Woodridge, Trend-Tronics, Inc. 708-972-1166
MA Burlington, Conti-Younger Assocs. 617-273-1582
MN Minneapolis, H.M.R., Inc. 612-888-2122
MO St. Louis, Rush & West Assocs. 314-965-3322
OH Richfield, Geotronix Inc. 216-659-6100
PA Norristown, Brandon Assocs. 215-278-0500
TX The Colony, Juliana Co. 214-625-1075
WA Mercer Island, Electronic Comp. Sls. 206-232-9301

Local Distributors

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CA Carson, Accele Elctrns. 213-637-3533
CA Cerritos, David Levy Co. 800-421-3536
CA N. Hollywood, Mobile Sound 213-668-1699
CA Santa Monica, Distr. Specialities 213-452-3445
FL Naranja, L.E.S. Distrs. 305-248-6701
GA Norcross, Whitehead Elctrn. 404-923-6667
IL Lemont, Trend-Tronics, Inc. 708-972-1166
IL N. Chicago, Sound Quest/Delta 708-473-1200
MA Burlington, Conti-Younger Assoc. 617-273-1582
MI Livonia, Delta Supp. Co. 313-525-5858
MN Minneapolis, Control Design Supp. 612-721-1628
MO St. Louis, Wes Garde Comp. 314-567-7776
NY Elmsford, Kin-Tronics, Inc. 914-968-7736
PA Norristown, Brandon Assocs. 215-278-0500
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VT Cavendish, C S Svc. & Supp. Co. 802-226-7582
VA Norfolk, Todd Elec. 804-855-3111
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CABLE SYSTEMS, INC., 210 Broadway, Everett, MA 02149, Tel: 617-389-7080, FAX: 617-389-4758; FSC No.: 33426; Empl.: 70; *Sls. Mgr.:* James R. Collmer

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CABLETRON SYSTEMS, INC., 35 Industrial Way, Rochester, NH 03867, Tel: 603-332-9400, FAX: 603-332-4616; Empl.: 1500; *Sls. Mgr.:* Jack Branowski

CABLE USA, INC., 2584 So. Horseshoe Dr., Naples, FL 33942-3560, Tel: 813-643-6400, FAX: 813-643-4230; FSC No.: 67050; Empl.: 55; *Sls. Mgr.:* Joe Giordano

CABLEX, INC., 96 Inverness Dr. E., Ste. J, Englewood, CO 80112, Tel: 303-792-5760, FAX: 303-792-3006; Empl.: 50; *Sls. Mgr.:* Ken Harms; *Dist. Mgr.:* Reed C. Mulder

CABOT BERYLCO, DIV. OF CABOT CORP., See NGK Berylco, Div. of NGK Metals Corp.

CABTRON SYSTEMS INC.

FAX: 708-272-1095

CABTRON SYSTEMS, INC., 200 N. Anets Dr., Northbrook, IL 60062, Tel: 708-498-6090; Empl.: 45; *Sls. Mgr.:* Mike Gober ..... **C•1018**

Local Sales Offices & Reps

AZ Tempe, Sierra Tech. Grp. 602-894-2335
CA Hayward, Larsen Assocs. 415-358-9559
CA Orange, XBX Sls., Inc. 714-998-8200
CA San Diego, XBX Sls., Inc. 619-586-1577
CO Englewood, Sierra Tech. Grp. 303-790-1700
CT Watertown, May Tech 203-274-3777
FL Orlando, D.A.I. 407-299-7754
GA Lilburn, Phillip Matthews Corp. 404-381-1662
IN Indianapolis, Liberty Sls. 317-888-8396
KS Wichita, Buckman & Assocs. 316-267-2052
MD Silver Spring, Ansell Engrg. 301-949-1655
MA Reading, May Tech. 617-942-7135
MI Livonia, Lowell-Wendt 313-464-2722
MN St. Paul, Countryman Assocs. 612-645-9151
MO St. Charles, Buckman & Assocs. 314-947-4727
NJ Kenvil, Components for Elctrns. 201-927-6662
NM Organ, Sierra Tech. Grp. 505-382-5542
NC Kings, Phillip Matthews Corp. 919-983-9790,
OH Dayton, Geotronix 513-854-5939
OH Richfield, Geotronix 216-659-6100
OR Portland, McLaren, Inc. 503-297-2248
PA Allison Pk., Geotronix 412-487-1770
PA Blue Bell, Comp. for Elctrns. 215-825-3939
TX Dallas, Dunbar Assocs. 214-239-7151
UT Holladay, Sierra Tech. Grp. 801-272-3733
WA Kirkland, McLaren 206-827-9400

CAC MICROCIRCUITS INC., Bel Fuse, 2 Southgate Dr., Mt. Carmel, IL 62863, Tel: 618-263-4343, FAX: 618-263-4295; Empl.: 148; *Sls. Mgr.:* Warren Mitch ..... **A•1723**

Local Sales Offices & Reps

AL Huntsville, Interep 205-881-1096
AZ Scottsdale, Arcom Sls. 602-947-5745
CA Redwood City, James S. Heaton Co. .. 415-367-9000
CA Valencia, C & N and Assoc. 805-254-5844
CO Boulder, Front Range Mktg. 303-443-4780
FL Longwood, D-Assocs. 407-830-8976
GA Norcross, Interep 404-449-8680
IL Itasca, LTD Technlgs. 708-773-2900
IN Indianapolis, Insul-Reps, Inc. 317-251-1994
IA Cedar Rapids, Dy-Tronix 319-377-8275
KS Wichita, Dy-Tronix Inc. 316-838-0884
MN S. St. Paul, Northport Engrg. 612-457-8000
MO Raytown, Dy-Tronix 913-229-6333
MO St. Louis, Dy-Tronix 314-291-4777
NH Amherst, D. A. Crowley & Assocs., Inc. 603-673-7050
NJ Ft. Lee, Neptune 201-461-2789
NY Plainview, Neptune 516-349-1600
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Cleveland, Arthur H. Baier, Inc. 216-461-6161
OR Beaverton, N.R. Schultz Co. 503-643-1644
PA Hatboro, AQS Electro 215-674-3562
TN Knoxville, Insul-Reps 615-691-7586
TX Austin, Oeler & Menelaides, Inc. 512-453-0275
UT Salt Lake City, Front Range Mktg. 801-566-2500
VA Charlottesville, DVS 804-973-0303
WA Bellevue, N.R. Schultz Co. 206-746-1890
WI Milwaukee, LTD Technlgs. 414-774-1000

CADDELL-BURNS MFG., 258 E. 2nd St., Mineola, NY 11501-3508, Tel: 516-746-2310, FAX: 516-742-2416; Empl.: 30 ..... **A•1172-1186**

CADDELL COIL CORP., P.O. Box 1235, South St., Middletown Springs, VT 05757, Tel: 802-235-2019; Empl.: 6; *Sls. Mgr.:* James Caddell

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Local Sales Offices & Reps

OH	Cleveland, Arthur H. Baier Co.	216-461-6161
OH	Dayton, Arthur H. Baier Co.	513-276-4128
OR	Beaverton, Elctrn. Sources	503-627-0838
WA	Bellevue, Elctrn. Sources	206-451-3500

Local Distributors

TX	Houston, Lenert Co.	713-225-1465

CAD ENGRG. & ASSEMBLY INC., 8663 Tyler Blvd., Mentor, OH 44060, Tel: 216-255-7744, FAX: 216-255-5900; Empl.: 28

CADILLAC PLASTIC & CHEM. CO. DIV. OF M.A. HANNA, 143 Indusco Ct., Troy, MI 48083, Tel: 313-583-1200, TWX: 810-232-1886, FAX: 313-583-4715; Empl.: 1000

CAD UTILITY CO., 21115 Devonshire St., Ste.318, Chatsworth, CA 91311, Tel: 805-527-8630, FAX: 805-526-5093; Empl.: 6; *Sls. Mgr.:* Stan Chambers

CAIG LABS., 1175-0 Industrial Ave., Escondido, CA 92029-1431, Tel: 619-743-7143, FAX: 619-743-2460; Empl.: 15; *Sls. Mgr.:* Laurie Skultety; *Dist. Mgr.:* Laurie Skultety

CALABRO INDS., INC., See UNITRACK Div., Calabro Inds., Inc.

CAL-AV, INC., 515B Westchester Drive, Campbell, CA 95008, Tel: 408-371-0666, FAX: 408-371-0672; Empl.: 8

CALAY SYSTEMS, INC., 16842 Von Karman Ave., No. 100, Irvine, CA 92714, Tel: 714-863-1700, TELEX: 6711321, FAX: 714-863-0310; Empl.: 70

CAL CRYSTAL LAB., INC., 1142 N. Gilbert, Anaheim, CA 92801, Tel: 714-991-1580, 800-333-9825, FAX: 714-491-9825; Empl.: 30; *Sls. Mgr.:* Audrey Gevers

CALEX MFG. CO., INC., 3355 Vincent Rd., Pleasant Hill, CA 94523, Tel: 510-932-3911, TELEX: 269888, FAX: 510-932-6017; FSC No.: 29988; Empl.: 75; *Sls. Mgr.:* Steve Mathias ..... **D•1008, 1641-1648**

Local Sales Offices & Reps

CA	Long Bch., Saber Entprs., Inc.	213-595-5646
CA	Mtn. View, Saber Entprs., Inc.	415-968-0427
CA	San Diego, Saber Entprs., Inc.	619-271-1523
CO	Parker, Davis Assocs.	303-841-8648
CT	Tolland, R.G. Assocs.	203-875-4201
GA	Marietta, Testech Entprs., Inc.	404-971-2298
IL	Carpentersville, Precision Meas. Prods. Inc.	708-426-4446
MA	Hanover, R.G. Assocs.	617-293-5233
MA	Lowell, R.G. Assocs.	508-458-9802
NJ	Cherry Hill, Analectro Tech. Rep., Inc.	609-795-6676
NC	Richfield, Geotronix	216-659-6100
OH	Trotwood, Geotronix	513-854-5939
OR	Portland, Topp Engrg.	503-244-7265
PA	Allison Pk., Geotronix	412-487-1770
MI	Sterling Hgts., Geotronix	313-254-0520
TX	Houston, Chauvin Engrg. Co.	713-668-4770
TX	Richardson, Chauvin Engrg. Co.	214-220-1234
VA	Burke, Analectro Tech. Rep., Inc.	703-922-4317
WA	Bellevue, Topp Engrg. Sls. Co.	206-747-5400
WA	Greenacres, Topp Engrg. Sls.	509-928-4177

Local Distributors

OH	Richfield, Alpha Distr.	216-659-7100

CALIBRON INSTRUMENTS, Burton-Rogers Co., 220 Grove St., Waltham, MA 02154, Tel: 617-894-6440, FAX: 617-893-8393; Empl.: 14; *Dist. Mgr.:* W. Burton

CALIFORNIA AUTOMATION INC., 11815 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-452-1341

CALIFORNIA AVIONICS LABS., See Cal-Av, Inc.

CALIFORNIA DC, 2150 Anchor Ct., Newbury Park, CA 91320, Tel: 805-499-3621, FAX: 805-498-8381; Empl.: 100; *Sls. Mgr.:* C. Paton; *Dist. Mgr.:* C. Paton

CALIFORNIA EASTERN LABS. INC., 4590 Patrick Henry Dr., Santa Clara, CA 95056-0964, Tel: 408-988-3500, TELEX: 346393, TWX: 171197; Empl.: 118

California INSTRUMENTS

FAX: 619-279-8139

CALIFORNIA INSTRUMENTS CORP., 5125 Convoy St., Ste. 201, San Diego, CA 92111-1216, Tel: 619-279-8620, 800-356-2244, TELEX: 695047 CALICO SDG; FSC No.: 16067; Empl.: 70; *Sls. Mgr.:* D.R. Chilcoat, G.R. Holland ..... **D•2179-2181**

Local Sales Offices & Reps

AL	Huntsville, Sci. Dvcs.-SE	205-536-1969
AZ	Tempe, Sci. Dvcs.-West	602-730-9774
CA	Huntington Beach, Sci. Dvcs. West	714-840-3501
CA	San Jose, Scientific Dvcs.	408-554-0455
CO	Broomfield, Sci. Dvcs.-West	303-469-5145
CT	Mt. Carmel, Sci. Dvcs.-NE	203-248-9361
FL	Orlando, Scientific Dvcs.-SE	407-841-8180
IL	Arlington Hts., Berndt Assoc.	708-632-0900
IN	Carmel, Berndt Assoc.	317-844-0114
KS	Overland Park, Ramsey Assocs.	913-541-1007
LA	Metairie, Data Mktg. Assocs.	504-833-3655
MD	Hunt Valley, Electronic Resources, Inc.	301-584-7547
MA	Waltham, Sci. Dvcs.-NE	617-890-5816
MN	Minneapolis, Berndt Assoc.	612-546-2021
MO	St. Louis, Ramsey Assocs.	314-532-9386
NJ	Ridgefield Park, Sci. Dvcs. East, Inc.	201-440-3430
NM	Albuquerque, Sci. Dvcs.-West	505-883-3668
NY	Rochester, TAE-Rep, Inc.	716-586-8710
NY	Whitney Pt., TAE-Rep, Inc.	607-692-3705
NC	Raleigh, Sci. Dvcs.-SE	919-859-0868
OH	Cincinnati, Dietrich & Assoc.	513-984-8924
OH	Independence, Dietrich & Assoc.	216-642-7965
OK	Tulsa, Data Mktg. Assocs.	918-494-2711
OR	Beaverton, Northwest T&M	503-645-9000
PA	Horsham, Sci. Dvcs. East	215-956-0700
PA	Pittsburgh, Dietrich & Assoc.	412-892-2992
TX	Austin, Data Mktg. Assocs.	512-338-4701
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-579-2995
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
WA	Bellevue, N.W. Test & Measurement	206-881-8857
WI	Milwaukee, Berndt Assocs.	414-545-8400
Can	Markham, Ont., Multitest Elctrns.	416-470-2929
Can	N. Vancouver, B.C., Jerome & Francis Co., Ltd.	604-986-1286

CALIFORNIA MICRO DEVICES, INC., 215 Topaz Street, Milpitas, CA 95035, Tel: 408-263-3214, FAX: 408-263-7846; FSC No.: 56427; Empl.: 70; *Sls. Mgr.:* Stephen R. Pass

CALIFORNIA MICROWAVE, 990 Almanor Ave., Sunnyvale, CA 94086, Tel: 408-732-4000, TELEX: 35 2016, TWX: 910-339-9231, FAX: 408-732-4244; Empl.: 1020

CALMARK CORPORATION

FAX: 818-287-7350

CALMARK CORP., 4915 Walnut Grove Ave., San Gabriel, CA 91776, Tel: 818-287-0451; FSC No.: 52094; Empl.: 90; *Sls. Mgr.:* Peter Jeanseau; *Dist. Mgr.:* Peter Jeanseau ..... **C•1019**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Oceanside, Noo Rep. Tech. Sls.	619-941-0558
CA	San Gabriel, Calmark Corp.	818-287-0451
CA	Santa Clara, Calmark Corp.	408-988-1260
FL	Winter Springs, Sunland Assocs.	407-365-9533
IL	Downers Grove, Golten Assoc.	708-512-0093
IA	Cedar Rapids, Stan Clothier Co.	319-393-1576
KS	Olathe, Stan Clothier Co.	913-829-0013
MD	Cockeysville, Dalbrook Corp.	301-666-2212
MI	Farmington Hills, W.R.Hummon	313-474-0661
MN	St. Paul, Innovate Sls.	612-225-9772
MO	St. Charles, Stan Clothier Co.	314-928-8078
NJ	Fort Lee, Neptune Elect.	201-461-2789
NY	E. Syracuse, Fountain, Young & Co.	315-437-7733
NY	Plainview, Neptune Elect.	516-349-1600
NC	Matthews, Arthur, Harris & Assocs.	704-845-1085
OH	Miamisburg, Electronics Comps., Inc.	513-866-3340
OH	Rocky River, Electronic Comps., Inc.	216-331-5330
OR	Beaverton, Unicomp, Inc.	503-643-1645
PA	Colmar, Dalbrook Corp.	215-997-2770
TX	Richardson, Zonk Assocs.	214-238-7651
TX	Stafford, Zonk & Assocs.	713-561-7777
WA	Snohomish, Unicomp, Inc.	206-568-0511
EXP	Ireland/Cappoquin, Calmark Ireland, Ltd.	353-58-54205
EXP	San Gabriel, CA, Calmark Corp.	818-287-0451
PR	Santruce, SISCO	809-726-3137
Can	Islington, Ont., Pipe-Thompson Ltd.	416-236-2355

Local Distributors

AZ	Phoenix, Aero-Space Southwest	602-582-2779
CA	Fremont, Terminal Sls. Corp.	415-656-7722
CO	Denver, Solder Tec.	303-623-5000
IL	Elk Grove, Martec Assocs.	708-956-8090
MD	Beltsville, Petricko, Inc.	301-937-4960
MA	Haverhill, Cord	617-374-0100
MN	Minneapolis, Aero-Space Computer Supp.	612-884-4725
NJ	Corbin City, Index	609-628-4040
NM	Albuquerque, Betatron	505-821-1122
NY	Elmsford, Multimetrics Co.	914-347-3667
NY	Endwell, Pryme-Line Distrs.	607-748-5200
OH	Miamisburg, E.C.I. Distrs.	513-866-3340
TX	El Paso, International Elex.	915-598-3406
TX	Richardson, Zec Sls.	214-669-0895
Can	Mississauga, Ont., Rush Elex. Ltd.	416-677-7280

CALMOS SEMICONDUCTOR, INC., 20 Edgewater Street, Kanata, Ontario, Canada K2L 1V8, Tel: 613-836-1014, 800-267-7231, TELEX: 053-4501, FAX: 613-831-1742; Empl.: 52; *Sls. Mgr.:* Vince Venebs; *Dist. Mgr.:* Carol Norton

CAL-R, INC., See Sfernice, Inc.

CAL-SCOPE, Exceltron Inc., 473-707 Macara Ave., Sunnyvale, CA 94086, Tel: 408-730-4573, 1-800-828-3547, FAX: 408-730-9537; Empl.: 4; *Sls. Mgr.:* Michi A. Kawaguchi

CAL-TEK ENGINEERING, 36 Riverside Drive, Kingston, MA 02364, Tel: 617-585-5666; Empl.: 5

CAMBRIDGE AEROFLO, INC., 900 Mt. Laurel Circle, Shirley, MA 01464, Tel: 508-45-2346, TELEX: 948503, FAX: 508-425-2338; Empl.: 25

CAMBRIDGE ELECTRONICS LABORATORIES, 20 Chester St., Somerville, MA 02144, Tel: 617-629-2805, TELEX: 948580 RACE

CAMBRIDGE FILTER CORP., P.O. Box 4906, Syracuse, NY 13221-4906, Tel: 315-457-1000, TELEX: 322096, FAX: 315-457-7341; Empl.: 400-500

CAMBRIDGE INSTRUMENTS, INC., Optical Systems Division, P.O. Box 123, Buffalo, NY 14240, Tel: 716-891-3000, TELEX: 91-285 REICHERT BUF UW; Empl.: 650; *Sls. Mgr.:* Ronald Armstrong, VP Sls. & Mktg.

CAMBRIDGE PRODUCTS, 244 Woodland Ave., Bloomfield, CT 06002, Tel: 203-243-1761, 800-243-8814, FAX: 203-242-7006; Empl.: 32; *Sls. Mgr.:* Bill Pitcher; *Dist. Mgr.:* Bill Pitcher

CAMBRIDGE TECHNOLOGY, INC., 23 Elm Street, Watertown, MA 02172, Tel: 617-923-1181, TWX: 910-250-7539 CAMTECH BSN, FAX: 617-924-8378; Empl.: 33; *Sls. Mgr.:* Bruce Rohr

C.A.M. GRAPHICS CO., INC., 15 Ranick Dr. W., Amityville, NY 11701, Tel: 516-842-3400, FAX: 516-842-1005; FSC No.: 63203; Empl.: 50; *Sls. Mgr.:* Michele Forbes

CANADA WIRE AND CABLE LIMITED, 250 Ferrand Dr., Don Mills, Ontario, Canada M3C 3J4, Tel: 416-424-5000, TELEX: 065-24120, FAX: 416-424-1008; Empl.: 5,000; *Sls. Mgr.:* John Murphy (Long Beach)

CANADIAN THERMOPLASTICS OP., FERRO CORP., Ferro Indl. Prods. Ltd. Thermoplas.Div., 354 Davis Road, Oakville, ONT. L6J 2X1, Tel: 416-845-4277, TELEX: 06-982218; *Sls. Mgr.:* Wayne Smith

CANADIAN THERMOSTATS & CONTROL DEVICES LTD., 8415 Mountian Sights, Montreal, PQ, Canada H4P2B8, Tel: 514-739-3274, TELEX: 05-825619, FAX: 514-739-2902; Empl.: 20; *Sls. Mgr.:* Richard W. Murk

C & C JETRONIC, INC., Research Pk. 318 Wall St., Princeton, NJ 08540, Tel: 609-921-8540, FAX: 609-921-7971; Empl.: 30; *Sls. Mgr.:* C. Jerry Chiang ..... **A•2188; C•1393; D•1652**

C & C TECHNOLOGY INC., Bldg. 9, Unit 60, 245 W. Roosevelt Rd., West Chicago, IL 60185, Tel: 708-231-0015, TELEX: 4974811, FAX: 708-231-0345; Empl.: 6; *Sls. Mgr.:* Randy Cochran

C&D CHARTER POWER SYSTEMS, 3043 Walton Rd., Plymouth Meeting, PA 19462, Tel: 215-828-9000, TELEX: 685 1059 CD BAT UW, TWX: 510-660-8436, FAX: 215-828-6579; Empl.: 1500

C & K COMPONENTS, INC., 2035 Hwy. 70 East, Clayton, NC 27520, Tel: 919-553-3131, ESYLNK: 62951859, FAX: 919-553-4758; Empl.: 250 ..... **B•1655**

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C & K COMPONENTS, INC., 15 Riverdale Ave., Newton, MA 02158-1082, Tel: 617-964-6400, TELEX: 92-2544, TWX: 710-335-1163; FSC No.: 09353; Empl.: 450; *Sls. Mgr.:* T. Hankins; *Dist. Mgr.:* James Martinec, Gen. Mgr. ..... **B•1654**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Reptronix, Ltd.	602-345-4580
CA	Auburn, Ewing-Foley, Inc.	916-885-6591
CA	Los Altos, Ewing-Foley	415-941-4525
CA	Montrose, Luscombe Eng.	818-249-9000
CA	San Diego, Luscombe Eng.	619-292-4323
CO	Boulder, Front Range Mktg.	303-443-4780
FL	Boca Raton, Beacon Elctrns.	407-997-5740
FL	Longwood, Beacon Elctrns.	407-332-1940
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Elk Grove Vlg., Control Sls.	708-595-2110
IN	Carmel, Technlg. Mktg. Corp.	317-844-8462
IN	Ft. Wayne, Technlg. Mktg. Corp.	219-432-5553
MO	Raytown, Cen Tech, Inc.	816-358-8100
KY	Louisville, Bromberg & Assoc.	502-456-1498
KY	Louisville, Technlg. Mktg. Corp.	502-893-1377
MD	Randallstown, Beacon North, Inc.	703-478-2480
MI	Farmington Hills, Rathsburg Assoc.	313-489-1500
MN	Minnetonka, Gibb Elctrns.	612-935-4600
MO	Bridgeton, Cen Tech, Inc.	314-291-4230
MO	Kansas City, Hill & Co.	816-361-1669
MO	St. Louis, Hill & Co.	314-842-6868
NM	Albuquerque, Reptronix	505-292-1718
NY	Port Washington, Ashtec, Inc.	516-767-0336
NY	Victor, Net Sls.	716-924-1844
NC	Raleigh, Beacon Elctrns.	919-787-0330
NC	Raleigh, JLS Assoc.	919-846-6445
OH	Beachwood, Thompson & Assocs.	216-831-6277
OH	Dayton, Thompson & Assocs.	513-435-7733
OR	Tigard, LD Elctrns.	503-684-8221
PA	Santurce, Beacon Elctrns.	809-728-5040
PA	Wayne, Quality Comps.	215-687-3553
TX	Austin, R. F. Kimball Co., Inc.	512-443-5284
TX	Richardson, R. F. Kimball Co.	214-231-3447
UT	Salt Lake City, Aspen Sls., Inc.	801-467-2401
VA	Sterling, Beacon North	703-478-2480
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Brookfield, Control Sls.	414-797-9500
Can	Markham, Ont., Avotronics, Ltd.	416-475-2024
Can	Pointe Clare, QUE, Avotronics, Ltd.	514-697-2135

C & K/UNIMAX, INC., C & K Components, Inc., Ives Rd., P.O. Box 152, Wallingford, CT 06492, Tel: 203-269-8701, FAX: 203-265-5398; FSC No.: 80207; Empl.: 250; *Sls. Mgr.:* B. D'Amico

CANDELA LASER CORPORATION, 530 Boston Post Rd., Wayland, MA 01778, Tel: 508-358-7637, TELEX: 216475, FAX: 508-358-5602; Empl.: 171; *Sls. Mgr.:* Philip Crowby

CANFIELD CONNECTOR, Canfield Industries, 8433 South Ave., Bldg. 1, Suite 4, Youngstown, OH 44514, Tel: 216-758-8299, FAX: 216-758-8912; Empl.: 35; *Sls. Mgr.:* Todd Harmon; *Dist. Mgr.:* Todd Harmon

CANOGA-PERKINS CORP., 21012 Lassen St., Chatsworth, CA 91311, Tel: 818-718-6300, TELEX: 182341, TWX: 510-6013-836, FAX: 818-718-6312; Empl.: 107; *Sls. Mgr.:* Paul Stennes

Canon

FAX: 516-354-1114

CANON U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, Tel: 516-488-6700, TELEX: 516-354-1114; Empl.: 500; *Sls. Mgr.:* Ron Travis ..... **B•1886-1887**

Local Sales Offices & Reps

CA	Santa Clara, Canon USA, Comps. Div.	408-986-8780

CANYON ELCTRNS., 2001 W. North Lane, Phoenix, AZ 85021, Tel: 602-944-4421, FAX: 602-943-0739; *Sls. Mgr.:* George J. Mitlak ..... **B•1043**

CAPACITOR SPECIALIST, See CSI Capacitors

CAPACITOR TECHNOLOGY PRODUCTS, INC., 5015 Speedway Dr., Ft. Wayne, IN 46825, Tel: 219-484-9054, FAX: 219-484-8275; *Sls. Mgr.:* Kevin Kurtz

CAPCON, INC., 147 West 25th Street, New York, NY 10001, Tel: 212-243-6275, FAX: 212-645-0185; *Sls. Mgr.:* Ed Reeves; *Dist. Mgr.:* B. Cameron

CAPINTEC INSTRUMENTS, 6 Arrow Rd., Ramsey, NJ 07446, Tel: 201-825-9500, TELEX: 642375, FAX: 201-825-1336; FSC No.: 6666;6685; Empl.: 150; *Sls. Mgr.:* Eric Weis; *Dist. Mgr.:* Robert Kanzler

CAPITAL EQUIPMENT CORPORATION, 99 South Bedford St., Burlington, MA 01803, Tel: 617-273-1818, FAX: 617-273-9057; FSC No.: 3825; *Sls. Mgr.:* Sid Mayer

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CA	Los Altos, Frauman Assoc.	415-941-0660
CA	San Diego, Tauber & Assoc.	619-274-7247
GA	Marietta, B-C Elctrn. Sls. Inc.	404-565-2088
IL	Barrington, Richard Fisk Mktg., Inc.	312-381-0653
NY	Marcellus, Mullahy Sls., Inc.	315-685-6280
OH	Dayton, Lessis Assoc.	513-294-1551
PA	Southampton, Campbell Assoc.	215-322-6630

THE CARBORUNDUM COMPANY, Electric Products, P. O. Box 156, Niagara Falls, NY 14302, Tel: 716-278-2521, FAX: 716-278-2298; Empl.: 2000; *Sls. Mgr.:* G.G Innocenti; *Dist. Mgr.:* D.E. Cooke, Prod. Mgr. ..... **A•1880-1881**

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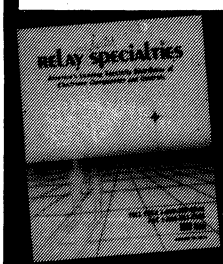

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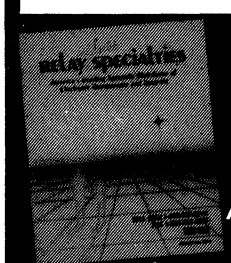

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CARLINGSWITCH, INC., 60 Johnson Avenue, Plainville, CT 06062-1156, Tel: 203-793-9281, FAX: 203-793-9231; Empl.: 1200; *Sls. Mgr.:* Alex Jamieson, Natl.Sls. Mgr. ..... **B•1356-1359, 1657-1659**

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FL	Tampa, Florida Comp. Sls. Inc.	813-873-3622
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KS	Mission, Mertens Co.	913-432-9323
MD	Gaithersburg, Naudain Assocs.	301-258-5040
MA	Hopkinton, Berkshire Elctrns.	508-435-9356
MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
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MO	Clayton, Mertens Co.	314-993-6600
NH	Nashua, Berkshire Elctrns.	603-888-1668
NJ	Burlington, VDE Elctrns.	609-387-9331
NJ	Eatontown, Pacent Engrg.	908-389-1409
NY	Great Neck, Pacent Engrg.	516-482-4678
NY	Rochester, VDE Elctrns.	716-473-5015
NC	Siler City, Crossroads Elctrns. Assoc.	919-742-2372
OH	Columbus, Gerry Bryant	614-870-7338
OR	Hillsboro, Temco Northwest	503-645-2030
SC	W. Columbia, Crossroads Elctrns.	803-791-8898
TX	Dallas, Control Comps.	214-458-8877
UT	Salt Lake City, Quorum 3 Sls. Grp.	801-943-9227
WA	Bothell, Temco Northwest	206-481-6150
WI	Mequon, Wm. Bolles Assocs.	414-241-3320
Can	Markham, Ont., Deskin Sls.	416-475-1412

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AR	Little Rock, Carlton Bates	501-562-9100
CA	Buena Park, Cypress Elctrns.	213-744-0355
CA	Chatsworth, Poco Sls.	818-700-8727
CA	Gardena, Cal Switch	213-770-2330
CA	Hayward, Electro Comps.	415-783-5800
CA	Los Angeles, Electric Switches	213-660-1310
CA	San Diego, Cypress Elctrns.	619-535-0011
CA	Santa Clara, Cypress Elctrns.	408-980-2500
CA	Van Nuys, Wes-Garde Comps.	818-786-3724
CO	Englewood, Cypress Elctrns.	303-792-5829
KS	Overland Park, Wes-Garde Comps.	913-262-2718
CT	Hartford, Wes-Garde Comps.	203-527-7705
CT	Wallingford, Sager Elec. Supp.	203-265-4600
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MD	Jessup, Treeko Sls., Inc.	1-800-638-0582
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MN	Minneapolis, Bergquist Co.	612-835-2322
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OH	Westerville, Wes-Garde Comps.	614-885-0319
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IN	Indianapolis, Current Elex. Mktg.	317-257-1851
MD	Gaithersburg, Carwithen Assocs., Inc.	301-921-9545
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OH Dayton, Tech. Dvcs. 513-890-6811

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CELCO, 70 Constantine Dr., Mahwah, NJ 07430, Tel: 201-327-1123, TWX: 710-988-1018; FSC No.: 05954; Empl.: 25; *Sls. Mgr.:* Art Weirgen, Engrg. Sls. Mgr.

CELESCO TRANSDUCER PRODS., INC., 7800 Deering Ave., Canoga Pk., CA 91304-5005, Tel: 818-884-6860, TELEX: 499-8137; *Sls. Mgr.:* Richard Proud

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CENTENT CO., 3879 S. Main St., Santa Ana, CA 92707, Tel: 714-979-6491; Empl.: 14; *Sls. Mgr.:* A. Freimanis

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CERAMASEAL, Box 260, New Lebanon, NY 12125, Tel: 518-794-7800, TELEX: 14-5442, FAX: 518-794-8080; FSC No.: 07601; Empl.: 85; *Sls. Mgr.:* Gene D. Sawin

CERAMAWIRE, Box 1084, Cranford, NJ 07016, Tel: 908-276-1170; Empl.: 4; *Sls. Mgr.:* Edward Hamilton

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CHACE PRECISION METALS, INC., 1704 Barnes St., Reidsville, NC 27320, Tel: 919-342-2381, FAX: 919-342-4012; Empl.: 190; *Sls. Mgr.:* Pat J. Urban

CHA INDUSTRIES, 4201 Business Center Dr., Fremont, CA 94538, Tel: 415-683-8554, TELEX: 334426, FAX: 415-683-3848; *Sls. Mgr.:* Jack Patten

CHALCO ENGRG. CORP., Chalco Industries, Inc., 15126 S. Broadway, Gardena, CA 90248-1898, Tel: 213-321-0121, 213-323-5525, FAX: 213-323-0405; Empl.: 95; *Sls. Mgr.:* Steven Kierman, Dir. Sls.

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FAX: 708-451-7585

CHAMPION TECHNOLOGIES, INC., 2553 N. Edgington, Franklin Park, IL 60131, Tel: 708-451-1000; Empl.: 175; *Sls. Mgr.:* Greg Dec ..... **A•1321**

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CA	Irvine, Prism Assocs.	714-252-1208
CA	San Diego, Spinnaker Sls.	619-451-8595
FL	Longwood, Delmac Sls.	407-831-0040
GA	Atlanta, L & D, Inc.	404-395-7079
IL	Itasca, Micro Sls.	708-285-1000
IN	Indianapolis, Schank Elctrn. Mktg.	317-842-6204
AZ	Phoenix, Integrated Sys. & Dvc. Sls.	602-971-8250
MD	Columbia, Third Wave Solutions	301-290-5990
MA	Natick, Wayland Engrg. Sls.	508-655-6080
MI	Farmington Hills, Schank Elctrn. Mktg. Inc.	313-626-2551
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CO	Littleton, Contec Mktg., Inc.	303-973-8490
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NC	Raleigh, Godwin Assocs.	919-878-8000
OH	Solon, J.R. Thornberry Co.	216-248-4995
TX	Austin, Electra Reps.	512-339-1163
TX	Dallas, Electra Reps.	214-248-3852
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WI	Brookfield, Micro Sls.	414-786-1403
IL	Franklin Pk., Champion Technlgs.	708-451-1000

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NY	Bayshore, Brookdale Elctrns.	516-242-8033

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CHEMREX INC., ResTech Prods. Div., 6120 E. 58th Ave., Commerce City, CO 80022, Tel: 303-289-5651, FAX: 303-289-5283; *Sls. Mgr.:* Michael P. Manegold

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KS	Prairie Village, Crosslink Elctrns.	913-649-7100
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NH	Amherst, Bennetron	603-880-7008
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NJ	Lawrenceville, DVS Co.	609-896-1112
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NY	Wappinger Falls, Bob Dean, Inc.	914-297-6406
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OH	Richfield, Geotronix	216-659-6100
OH	Trotwood, Geotronix, Inc.	216-659-6100
OR	Beaverton, Elctrns. N.W.	503-629-9241
PA	Allison Pk., Geotronix, Inc.	412-487-1770
TX	Dallas, Richmar Elctrns.	214-424-8388
VA	Charlottesville, DVS Co.	804-973-0303
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CO	Denver, Spectrum Mktg. Assocs., Inc.	303-480-9991
CT	Branford, Coakley, Boyd & Abbett, Inc.	203-481-2218
FL	Orlando, Cahill Assocs.	407-282-5117
FL	Palm City, Cahill Assocs.	407-288-3113
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KS	Wichita, Dy-Tronix, Inc.	316-838-0884
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MI	Novi, Miltimore Sls., Inc.	313-349-0260
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MO	Bridgeton, Dy-Tronix, Inc.	314-291-4777
NJ	Pitman, Colrud Corp.	609-589-5866
NJ	W. Caldwell, Grimm, Siegel Assocs., Inc.	201-575-9300
NM	Albuquerque, O'Donnell Assocs., S.W.	505-889-4522
NY	Pittsford, Elcom Sls., Inc.	716-385-1400
NY	Skaneateles, Elcom Sls., Inc.	315-685-8967
NC	Raleigh, CSR Elctrns., Inc.	919-878-9200
OK	Tulsa, Comptech Sls., Inc.	918-622-7744
OR	Beaverton, Westmark Elctrns., Inc.	503-641-8780
TN	Knoxville, CSR Elctrns.	615-689-7911
TX	Austin, Comptech Sls., Inc.	512-343-0300
TX	Houston, Comptech Sls., Inc.	713-492-0005
TX	Irving, Comptech Sls., Inc.	214-751-1181
UT	Ogden, Spectrum Mktg. Assocs., Inc.	801-972-8552
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Can	Mississauga, Ont., r.n. Longman Sls., Inc.	416-670-8100
Can	Ottawa, Ont., r.n. Longman Sls., Inc.	613-564-0100

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CA	San Jose, Powell Elctrns.	408-943-9020
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CA	San Jose, Harper S.I.D.	408-943-9490
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CT	Wallingford, Sager Elctrns.	203-265-4600
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MA	Newton, Greene-Shaw Co.	617-969-8900
MI	Livonia, Reptron Elect., Inc.	313-525-2700
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MN	Minneapolis, Sterling Elctrns.	612-831-2666
MO	Kansas City, L Comp, Inc.	816-241-0111
MO	Maryland Hgts., L Comp, Inc.	314-291-6200
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NH	Salem, Sager Elctrns.	603-898-1348
NJ	Oakland, Relay Specs.	201-337-1000
NJ	Teterboro, E.A.C. Elec., Inc.	201-288-4477
NM	Albuquerque, Walker Elctrn. Supp.	505-883-2992
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NY	Hauppauge, Sager Elctrns.	516-348-1300
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Rochester, Summit Dists.	716-334-8110
NC	Cary, Powell Elctrns.	919-467-1212
NC	Raleigh, Sager Elctrns.	919-850-9550
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OH	Columbus, Hughes-Peters, Inc.	614-294-5351
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OH	Warren, REM Elctrns. Supp. Co.	216-373-1300
OH	Worthington, Reptron Elctrns.	614-436-6675
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OR Portland, Tek-Elec. 503-246-5451
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PA Philadelphia, Powell Elctrns. 215-365-1900
PA Philadelphia, PEI Genesis Elect. 800-523-0727, 800-222-1772
PA Philadelphia, Sager Elctrns. 215-464-4336
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MA Hingham, Sager Elctrns. 617-749-6700
TX Houston, Newark Elctrns. 713-270-4800
TX Irving, Harper S.I.D. 214-621-0500
TX Irving, Powell Elctrns. 214-550-0547
MI Oak Park, Newark Elctrns. 313-967-0600
TX Stafford, Southwest Elec., Inc. 713-240-4000
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VA Richmond, Sterling Elctrns. 804-226-2190
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CHESSELL CORP., 1 Pheasant Run, Newtown, PA 18940, Tel: 215-968-0660, FAX: 215-968-0662; Empl.: 82; *Sls. Mgr.:* Richard Veit; *Dist. Mgr.:* R. Veit

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CHESTERFIELD PRODUCTS, INC., 37 Midland Ave., Elmwood Park, NJ 07407, Tel: 201-797-9655, FAX: 201-797-9504; Empl.: 35; *Sls. Mgr.:* Bob Fiordalisi ..... **A•1661-1663**

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MA Framingham, Bengal Assocs. 617-877-2639
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TX Richardson, Carl Tinch Sls. Co. 214-231-1322

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CHIU TECHNICAL CORP., 252 Indian Head Rd., Kings Park, NY 11754, Tel: 516-544-0606, FAX: 516-544-0809; FSC No.: 38-32, 38-41; Empl.: 25; *Sls. Mgr.:* Frank A. Denny, V.P. Mktg.

FAX: 716-538-6345

CHLORIDE ELECTRO NETWORKS, Chloride Power Electronics, Inc., 1 Technology Place, Caledonia, NY 14423, Tel: 716-538-4421, TWX: 510-254-0422; Empl.: 350; *Sls. Mgr.:* Gary Balfour ..... **A•2189; D•1658, 2182**

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CHROMALOX INSTRS. & CONTROLS, 1382 Heil-Quaker Blvd., La Vergne, TN 37086-3536, Tel: 615-793-3900, TELEX: 55-5129, FAX: 615-793-3563; Empl.: 110; *Sls. Mgr.:* Mary Hausman ..... **D•1131**

CHROMATICS, 2558 Mountain Ind. Blvd, Tucker, GA 30084, Tel: 404-493-7000, FAX: 404-493-1314; FSC No.: FSCM 59992

CHRONO-LOG CORP., 2 W. Park Rd., Havertown, PA 19083, Tel: 215-853-1130, FAX: 215-853-3972; Empl.: 20; *Sls. Mgr.:* Kathy Jacobs ..... **D•1084**

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AL Huntsville, Dynamic Measurements ... 205-535-6663
Can Scarborough, Canadian Applied Technlg. 416-431-0004

CHURCHILL CORP., 344 Franklin St., Box G, Melrose, MA 02176, Tel: 617-665-4700, FAX: 617-662-5291; FSC No.: 94867; Empl.: 30; *Sls. Mgr.:* W. Schermerhorn

CIC COMPONENTS INDS. CO., LTD., 4FL No. 5 Lane 130, Min-Chung Rd., Hsin Tien City, Taiwan R.O.C., Tel: 886-2-9174302, TELEX: 35261 MEISCO, FAX: 886-2-9124480; Empl.: 30; *Sls. Mgr.:* James Huang

CICOIL CORP., 24960 Ave. Tibbitts, Valencia, CA 91355-3428, Tel: 805-295-1295, FAX: 805-295-0813; Empl.: 75; *Sls. Mgr.:* James Alderson

CIDTEC (CID TECHNOLOGIES INC.), 101 Commerce Blvd., Liverpool, NY 13088, Tel: 315-451-9410, FAX: 315-451-9421

CIMCO WIRE & CABLE, INC., See Specialty Cable Corp.

CINCH CONNECTOR DIVISION, Labinal Components & Systems Inc., 1501 Morse Ave., Elk Grove Village, IL 60007, Tel: 312-981-6000, TWX: 910-222-1796; *Sls. Mgr.:* James L. Hartranft Jr.; *Dist. Mgr.:* Scott Campbell

CINCH CYLINDRICAL DIVISION, Labinal Comps. & Systems, Inc., 8821 Science Center Dr., Minneapolis, MN 55428, Tel: 612-537-1010, FAX: 612-537-9614; *Sls. Mgr.:* Jim Simmons; *Dist. Mgr.:* Scott Campbell

CINCINNATI ELECTROSYSTEMS, 420 Wards Corner Rd., Loveland, OH 45140, Tel: 513-831-6800, TELEX: 312328, FAX: 513-831-4866; Empl.: 110; *Sls. Mgr.:* Brian Doherty

CINCINNATI SUB-ZERO PRODS., 12011 Mosteller Rd., Cincinnati, OH 45241, Tel: 513-772-8810, TELEX: 214390 SUBZERO CIN, FAX: 513-772-9119; Empl.: 117; *Sls. Mgr.:* Harold Zeilman

CIPHER DATA PRODUCTS, INC., an Archive Co., 10101 Old Grove Rd., San Diego, CA 92131, Tel: 619-578-9100, FAX: 619-693-4435; Empl.: 1500; *Sls. Mgr.:* Wes Bankston, VP Sls.

CIPRICO INC., 2955 Xenium Lane, Plymouth, MN 55441, Tel: 612-559-2034, FAX: 612-559-8799; Empl.: 79; *Sls. Mgr.:* Bill Rost

CIRCOM INC., 505 W. Main St., Bensenville, IL 60106, Tel: 708-595-4460, FAX: 708-595-4615; Empl.: 38; *Sls. Mgr.:* R. Alan Rosenberg

CA CIRCUIT ASSEMBLY CORP.

FAX: 714-855-4298

CIRCUIT ASSEMBLY CORP., 18 Thomas St., Irvine, CA 92718-2703, Tel: 714-855-7887, TELEX: 183109UD; FSC No.: 52072; Empl.: 275; *Sls. Mgr.:* Robert R. Brinckman; *Dist. Mgr.:* Robert R. Brinckman ..... **C•1316-1322**

Local Sales Offices & Reps
AL Huntsville, L & D, Inc. 205-837-1469
AZ Scottsdale, BSE, Inc. 602-483-0373
CA San Diego, Varigon-San Diego, Inc. ... 619-576-0100
CA Santa Clara, Westrep 408-988-8833
CO Englewood, Delltron Co. 303-741-2122
FL Clearwater, Tech-Rep Assoc., Inc. 813-572-9900
FL Ft. Lauderdale, Tech-Rep Assoc., Inc. 305-791-2708
FL Merritt Island, Tech-Rep Assoc., Inc. .. 407-453-3313
FL Winter Sprgs., Tech-Rep Assoc., Inc. .. 407-699-4010
GA Atlanta, L & D, Inc. 404-395-7079

IL Itasca, LTD Technlgs., Inc. 708-773-2900
IL Roscoe, LTD Technlgs., Inc. 815-389-4316
IN Carmel, Frank E. Kahsar Sls. 317-844-9353
MD Rising Sun, LHR Elctrns., Inc. 301-658-4058
MA Randolph, The TMR Grp. 617-961-4486
MI Grand Haven, Frank E. Kahsar Sls. ... 616-846-7590
MI Warren, Frank E. Kahsar Sls. 313-795-3530
MN Osseo, Gaffney Sls., Inc. 612-425-5484
MO Grandview, Harris Hanson Co. 816-763-6200
MO St. Louis, Harris Hanson Co. 314-432-3611
NJ Berkeley Hgts., Cambridge Allen & Assoc. 201-464-0203
NJ Moorestown, LHR Elctrns., Inc. 609-778-1019
NM Albuquerque, SynTech 505-266-7951
NY Forest Hills, Cambridge Allen & Assoc. 718-592-6361
NY Rochester, Apex Assocs., Inc. 716-272-7040
NC Raleigh, L & D, Inc. 919-876-5301
NC Wilmington, L & D, Inc. 919-256-8110
OH Cincinnati, Frank E. Kahsar Sls. 513-922-3133
OH Columbus, Frank E. Kahsar Sls. 614-252-4009
OH Mentor, Frank E. Kahsar Sls. 216-257-1166
OR Portland, General Elctrns. 503-297-8500
PA Sewickley, Frank E. Kahsar Sls. 412-741-4155
PA Wexford, Frank E. Kahsar Sls. 412-935-8561
TN Bristol, L & D, Inc. 615-878-2266
TX Houston, Procomp Sls. Co. 713-681-1591
TX Hurst, Procomp Sls. Co. 817-589-0336
TX Richardson, Procomp Sls. Co. 214-669-1500
UT American Fork, Delltron Co. 801-263-9413
VA Midlothian, LHR Elctrns., Inc. 804-794-6013
VA Richmond, L & D, Inc. 804-257-7717
WA Redmond, General Elctrns. 206-867-0969
WI Milwaukee, LTD Technlgs., Inc. 414-774-1000

Local Distributors

AL Birmingham, Newark Elctrns. 205-942-4044
AL Huntsville, Comp. Resources 205-837-1469
AL Huntsville, Component Distrs. 205-851-7800
AL Huntsville, Newark Elctrns. 205-837-9091
AL Huntsville, Powell Elctrns. 205-539-2731
AZ Phoenix, Arizona Comps. 602-269-5655
AZ Phoenix, Newark Elctrns. 602-244-0133
AZ Phoenix, Tri Tek 602-371-0860
AZ Tempe, Circuit Specialists 602-966-0764
AZ Tucson, Newark Elctrns. 602-628-7891
AR Little Rock, Newark Elctrns. 501-225-8130
CA Chatsworth, Passive Comps. 818-341-1745
CA Costa Mesa, Powell Elctrns. 714-754-1717
CA Foster City, Newark Elctrns. 415-572-8300
CA Irvine, Mann Southwest 714-380-4170
CA Los Angeles, All American 213-320-0240
CA Orange, Newark Elctrns. 714-634-8224
CA San Diego, Southland Comps. Inc. 619-673-3800
CA San Jose, All American 408-943-1200
CA San Jose, Powell Elctrns. 408-943-9020
CA San Jose, Rose Elctrns. 408-263-9700
CA Santa Ana, B D S Elctrns. 714-662-1050
CA Santa Clara, Trinity Elctrns. 408-980-9011
CA Santee, Mouser Elctrns. 619-449-2222
CO Colorado Springs, Newark Elctrns. 719-576-2644
CO Denver, C.S.I.D. 303-292-9594
CO Denver, Comp. Distributors 303-770-6214
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CO Englewood, Indelco 303-694-9444
CO Englewood, Nep Elctrns. 303-799-9898
CT Bloomfield, Newark Elctrns. 203-243-3985
CT Bridgeport, Park Distrs. 203-366-7200
CT East Hartford, Newark Elctrns. 203-289-1416
CT Wallingford, Midstate Elctrns. 203-265-9900
FL Clearwater, Component Distrs. 813-796-0466
FL Deerfield Beach, Vantage Comps. 305-429-1001
FL Ft. Lauderdale, All American 305-572-7999
FL Ft. Lauderdale, Powell Elctrns. 305-484-8377
FL Jacksonville, Newark Elctrns. 904-399-5041
FL Longwood, Intertec 407-834-7777
FL Maitland, Electronic Equip. 407-539-0888
FL Melbourne, Component Distrs. 407-724-9910
FL Miami, All American 305-621-8282
FL Miami, Electronic Equip. 305-526-6000
FL Plantation, Newark Elctrns. 305-587-2372
FL Pompano Bch., Electronic Equip. 305-960-1200
FL Tampa, Electronic Equip. 813-988-0810
FL West Palm Beach, Atlantic Electronics 407-686-8553
GA Atlanta, Newark Elctrns. 404-951-2363
GA Norcross, Component Distrs. 404-441-3320
GA Norcross, Newark Elctrns. 404-448-1300
HI Aiea, Newark Elctrns. 808-487-8951
ID Boise, Newark Elctrns. 208-342-4311
IL Addison, Belford Elctrns. 708-691-1000
IL Bensenville, Goold Elctrns. 708-860-7171
IL Champaign, Klaus Radio 217-356-1986
IL Elk Grove, Bell Inds. 708-640-1910
IL La Salle, Klaus Radio 815-223-7400
IL Peoria, Klaus Radio 309-691-4840
IL Quincy, Klaus Radio 217-223-7560
IL Schaumberg, Q P S Elctrns. 708-884-6620
IL Schaumburg, Newark Elctrns. 312-843-0700
IL Springfield, Newark Elctrns. 217-787-9972
IL Wood Dale, Nep Elctrns. 708-595-8500
IN Indianapolis, Bell Inds. 317-875-8200
IN Indianapolis, Mar Elctrns. 317-633-6699
IN Indianapolis, Newark Elctrns. 317-872-7070
IN Merrillville, Newark Elctrns. 312-768-5059
IA Cedar Rapids, Newark Elctrns. 319-393-3800
IA Des Moines, Newark Elctrns. 515-278-0670
IA Eldridge, Klaus Radio 319-285-8484
IA Marion, Brenneman & Assoc. 319-377-6394
KS Overland Pk., Newark Elctrns. 913-677-0727
KS Wichita, Newark Elctrns. 316-267-8755
KY Lexington, Newark Elctrns. 606-255-4161
LA Metairie, Newark Elctrns. 504-838-9771
MD Annapolis, Powell Elctrns. 301-953-3435
MD Beltsville, Newark Elctrns. 301-206-3300
MD Columbia, Vantage Comps., Inc. 301-720-5100
MD Gaithersburg, Axis Elctrns., Inc. 301-840-9640
MD Hanover, Newark Elctrns. 301-796-9092
MD Rockville, All American 301-251-1205
MA Boston, All American 617-846-2300
MA Holliston, Goold Elctrns. 508-429-8154
MA Milford, Car Lac Indl. 508-478-7797
MA Norwood, Gerber Elctrns. 617-329-2400
MA W. Springfield, Newark Elctrns. 413-785-5851
MA Westboro, In Stock Prods. 508-870-5750
MA Westborough, Powell Elctrns. 508-366-6100
MA Woburn, Newark Elctrns. 617-932-9040
MI Ann Arbor, Wedemeyer Elctrn. Supp. Co. 313-665-8611
MI Grand Rapids, Newark Elctrns. 616-455-9190
MI Mt. Clemens, Spec Connector Corp. .. 313-465-3232
MI Oak Park, Newark Elctrns. 313-967-0600
MN Burnsville, Cassidy Elctrns. 612-895-9026
MN Crystal, Newark Elctrns. 612-535-4280
MN Minneapolis, All American 612-944-2151
MN Minneapolis, Newark Elctrns. 612-331-6350
MN Vadnais Hts., N A A Connectron 612-481-0022
MO Blue Springs, Newark Elctrns. 816-228-3170
MO St. Louis, Beckwith Elctrns. 314-343-6463
MO St. Louis, Newark Elctrns. 314-298-2505
MT Helena, Newark Elctrns. 406-443-6192
NE Omaha, Newark Elctrns. 402-392-1221
NV Las Vegas, Newark Elctrns. 702-796-5090
NV Reno, Newark Elctrns. 702-322-6090
NH Goffstown, Key Comps. 603-626-1717
NH Manchester, Yankee Elctrns. 603-625-9746
NH Nashua, Newark Elctrns. 603-888-5790
NJ Bellmawr, Mid-Atlantic 609-931-5303
NJ Clifton, Vantage Comps. 201-777-4100
NJ E. Hanover, State Elctrns. 201-887-2550
NJ Englewood, Powell Elctrns. 201-894-0800
NJ Pennsauken, Newark Elctrns. 609-663-9490
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NJ Randolph, Mouser Elctrns. 201-328-3322
NJ Union, Newark Elctrns. 908-851-2290
NM Albuquerque, Bestech 505-298-0034
NM Albuquerque, Betatron 505-821-1122
NM Albuquerque, Connecting Comps. 505-345-8921
NM Albuquerque, Newark Elctrns. 505-883-6181
NY Bohemia, Car Lac Indl. 516-567-4200
NY Bohemia, Key Comps. 516-567-7500
NY Cheektowaga, Newark Elctrns. 716-862-9700
NY Comack, Car Lac Indl. 516-493-0556
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Long Island, All American 516-981-3935
NY Mt. Vernon, All American/QAR 914-699-2224
NY Redcreek, Advacom 315-754-8796
NY Smithtown, Vantage Comps. 516-543-2000
NY Syracuse, Newark Elctrns. 315-437-6611
NY Valley Stream, Newark Elctrns. 516-561-8400
NC Cary, Powell Elctrns. 919-467-1212
NC Greensboro, Newark Elctrns. 919-292-7240
NC Raleigh, Component Distrs. 919-859-3391
NC Raleigh, Newark Elctrns. 919-781-7677
OH Bedford, Advacom 216-439-0321
OH Cincinnati, Newark Elctrns. 513-771-9700
OH Cleveland, Car Lac Indl. 216-881-0050
OH Columbus, Wedemeyer Elctrns. 614-436-9600
OH Warrensville Hgts., Newark Elctrns. ... 216-587-1700
OK Oklahoma City, Newark Elctrns. 405-495-5000
OK Tulsa, Newark Elctrns. 918-832-7004
OR Eugene, Newark Elctrns. 503-484-2158
OR Portland, Newark Elctrns. 503-257-0741
PA Cornwall Hgts., Newark Elctrns. 215-245-7300
PA Export, Advacom 412-733-5910
PA Levittown, G.W. Elctrns. 215-547-7422
PA McKean, Advacom 814-476-7774
PA Philadelphia, Powell Elctrns. 215-365-1900
PA Pittsburgh, Newark Elctrns. 412-788-4790
SC Greenville, Newark Elctrns. 803-288-9610
SC N. Charleston, Newark Elctrns. 803-764-3091
TN Brentwood, Newark Elctrns. 615-371-1341
TN Memphis, Newark Elctrns. 901-365-8060
TX Allen, Prime Distrs. 214-231-0170
TX Austin, Carlton Bates 512-458-1175
TX Dallas, All American 214-231-5300
TX Dallas, Component Distrs. 214-644-0373
TX Dallas, Off The Shelf 214-247-0052
TX Ft. Worth, Carlton Bates 817-831-0395
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Newark Elctrns. 713-270-4800
TX Irving, Powell Elctrns. 214-550-0547
TX Mansfield, Mouser Elctrns. 817-483-0165
TX Richardson, Off The Shelf 214-238-0808
UT Provo, Omega Elctrns. 801-375-4664
UT Salt Lake City, Newark Elctrns. 801-484-8611
UT Salt Lake City, Standard Supp. Co. 801-486-3371
VT Burlington, Newark Elctrns. 802-860-1856
VA Arlington, Newark Elctrns. 703-522-7552
VA Richmond, Newark Elctrns. 804-282-5671
WA Bellevue, Newark Elctrns. 206-641-9800
WA Spokane, Newark Elctrns. 509-327-1935
WV Dunbar, Newark Elctrns. 304-768-6872
WI Green Bay, Newark Elctrns. 414-494-1660
WI New Berlin, Nep Elctrns. 414-785-9100
WI Wauwatosa, Newark Elctrns. 414-453-9100
Can Dartmouth, NS, Arcom Elctrns. 902-464-1600
Can Laval, PQ, Newark Elctrns. 514-681-6476
Can London, Ont., Newark Elctrns. 519-685-4280
Can Mississauga, Ont., Newark Elctrns. 416-673-5449
Can Nepean, Ont., Carsten Elctrns. 613-725-9250
Can New Westminster, BC, Newark Elctrns. 604-520-5721
Can Scarborough, Ont., Carsten Elctrns. ... 416-495-7705
Can St. Laurent, PQ, Carsten Elctrns. 514-334-8321
Can St. Laurent, PQ, Newark Elctrns. 514-738-4488

CIRCUITECH, INC., Division of Heyco, Inc., 542 Industrial Way West, Eatontown, NJ 07724, Tel: 201-542-6550, FAX: 201-542-1612; Empl.: 80; *Sls. Mgr.:* Ron Calvo

CIRCUIT IMAGES, INC., 1600 NW 167th Pl, Ste. 345, Beaverton, OR 97006, Tel: 503-629-2133, FAX: 503-645-9857; Empl.: 5; *Sls. Mgr.:* Tom Stevenson

CIRCUIT SPECIALISTS, INC., 738 S. Perry Lane, Tempe, AZ 85281, Tel: 602-966-0764, FAX: 602-967-2539

CIR-Q-TEL MICROWAVE, INC., 6600 Virginia Manor Rd., Beltsville, MD 20705, Tel: 301-470-2900, FAX: 301-776-3882; FSC No.: 21377; Empl.: 17; *Sls. Mgr.:* Henry D. Nibbe

CIRRIS SYSTEMS CORP.

FAX: 801-973-4609

CIRRIS SYSTEMS CORP., 1991 Parkway, Salt Lake City, UT 84119, Tel: 801-973-4600, 800-441-9910, TELEX: 446786; Empl.: 30; *Sls. Mgr.:* Brent Stringham ..... **D•1235**

CIRRUS LOGIC, INC., 3100 West Warren Ave., Fremont, CA 94538, Tel: 415-623-8300, TELEX: 171918, FAX: 415-226-2180; Empl.: 420; *Sls. Mgr.:* William Caparelli; *Dist. Mgr.:* Frank Reynolds

CITIZEN BUSINESS MACHINES, See CBM America Corporation

CP Clare CORPORATION

FAX: 312-262-7819

C.P. CLARE CORP., 3101 W. Pratt Blvd., Chicago, IL 60645, Tel: 312-262-7700, TELEX: 210075; Empl.: 2400; *Sls. Mgr.:* Thomas Cunneen; *Dist. Mgr.:* William Sowa ..... **B•1396, 1430-1431**

Local Sales Offices & Reps

AL Decatur, El Tech Inc. 205-353-7899
AL Huntsville, El Tech Inc. 205-464-0599
AZ Scottsdale, Summit Sls. 602-998-4850
CA El Toro, C.P. Clare Corp. 714-586-0650
CA Los Angeles, Landa & Assocs. 213-879-0770
CA San Diego, Gary Chilcote Assocs. 619-728-7678
CA San Jose, Ruppert Sls. & Engrg. 408-998-8717
CA Santa Ana, Landa & Assocs. 714-543-7805
CO Broomfield, Western Region Mktg. 303-428-8088
CT Stamford, Fran Bigoa 203-322-0240
FL Altamonte Springs, Sls. Engrg. Concepts 407-682-4800
FL Deerfield Beach, Sls. Engrg. Concepts 305-426-4601

GA Lilburn, El Tech Inc. 404-564-1236
IL Itasca, Beta Tech Sls., Inc. 708-250-9586
IN Indianapolis, Schank Elctrn. Mktg. 317-842-6204
IA Cedar Rapids, Delltron Co. Inc. 319-393-0075
KY Fort Wright, El Tech Inc. 606-331-3495
MD Baltimore, Advanced Tech Sle Inc. 301-323-3140
MA Tewksbury, Procomp Assoc. 508-858-0100
MI Farmington Hills, Schank Elctrn. Mktg. 313-626-2551
MN Eden Prairie, High Technlg. Sls. Assocs. 612-944-7274
MO Florissant, Delltron Co., Inc. 314-839-0033
MO Kansas City, Delltron Co., Inc. 816-436-6445
NJ Fort Lee, Nexus Technlg. Sls. 201-947-0151
NM Albuquerque, Summit Sls. 505-345-5003
NY Hicksville, C.P. Clare Corp. 516-933-3645
NY Rochester, Electra Sls. Corp. 716-427-7860
NY Syracuse, Electra Sls. Corp. 315-463-1248
NC Raleigh, Zucker Assocs. 919-782-8433
OH Cleveland, Baehr, Greenleaf & Assoc. 216-892-1770
OH Dayton, Baehr-Greenleaf & Assocs. ... 513-439-0724
OH Worthington, Baehr-Greenleaf & Assocs. 614-847-0220
OR Portland, Westmark Elctrns. Inc. 503-641-8780
PA Erdenheim, Omni Sls. 215-233-4600
PA Warrendale, Baehr-Greenleaf & Assocs. 412-934-3088
TX Austin, Norcom Inc. 512-451-2757
TX Dallas, Norcom Inc. 214-386-4888
TX Houston, Norcon Inc. 713-778-0392
UT Salt Lake City, Western Region Mktg. 801-268-9768
WI Milwaukee, Beta Tech Sls., Inc. 414-543-6609
WA Bellevue, Westmark Elctrns. Inc. 206-454-1944
Can Dorval, Que., John G. Weiss Co. Ltd. .. 514-685-6644
Can Mississauga, Ont., John G. Weiss Co. Ltd. 416-673-0011

CLARCOR TUBULAR PRODUCTS, Clarcor, Box 7007, Rockford, IL 61125, Tel: 815-962-8867, FAX: 815-962-0417; Empl.: 2000; *Sls. Mgr.:* Douglas W. Franklin

CLARKE-HESS COMMUNICATIONS RESEARCH CORP., 220 West 19th St., New York, NY 10011, Tel: 212-255-2940, TELEX: 238667-RAPID NYK, FAX: 212-691-8158; FSC No.: 34423; Empl.: 14 ..... **D•1236-1237**

Local Sales Offices & Reps
CT Manchester, ICS Assocs. 203-649-3765
IL Chicago, Pat Lind Elctrns. 312-726-3513
IN Indianapolis, Pat Lind Elctrns. 317-632-7444
MA Westford, ICS Assocs. 617-692-3545
MN Circle Pines, Pat Lind Elctrns. 612-786-5770
OR Wilsonville, Syntek 503-682-2750
WI Milwaukee, Pat Lind Elctrns. 414-224-0146

HAWKER SIDDELEY CLAROSTAT

FAX: 603-742-0481

CLAROSTAT MFG. CO., INC., Hawker Siddeley, PLC., 1 Washington St, Dover, NH 03820-1507, Tel: 603-742-1120,800-872-0042, TELEX: MCI 6713344; FSC No.: 12697; Empl.: 900; *Sls. Mgr.:* Al Tapscott; *Dist. Mgr.:* Al Tapscott ..... **A•2030; B•1888**

Local Sales Offices & Reps
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AZ Phoenix, More Sls. 602-788-9181
AR Little Rock, J. Y. Schoonmaker 501-375-2168
CA Irvine, Gravley & Assocs. 714-852-9994
CO Englewood, Purdy Co. Assocs. 303-790-2230
CT Meriden, Delta Conn Corp. 203-238-1240
FL Coral Springs, HHP Assocs., Inc. 305-753-8389
FL Palm Bay, H H P Assocs. 407-951-9236
FL Tarpon Springs, H H P Assocs., Inc. ... 813-937-6099
FL Winter Park, HHP Assocs., Inc. 407-740-0320
GA Atlanta, ELCOM 404-594-1392
IL Rolling Meadows, Sumer, Inc. 708-991-8500
IN Fort Wayne, Needler Sls. 219-447-2123
IN Indianapolis, Needler Sls. 317-255-8056
MI Farmington Hills, W.R. Hummon & Assocs., Inc. 313-474-0661
MN St. Paul, Cahill, Schmitz & Cahill, Inc. 612-646-7217
MO St. Louis, K K B & Co. 314-647-2400
NH Home Off., Clarostat 603-742-1120, 1-800-872-0042
NJ Cherry Hill, Trinkle Sls., Inc. 609-795-4200
NY Manhasset, Win-Cor Elctr. Sls. 516-627-9474
NY Syracuse, L. D. Allen 315-437-8387
NC Raleigh, C-Tech Sls., Inc. 919-782-8100
OH Dayton, K.W. Elctrn. Sls. 513-890-2150
OH Shaker Hgts., K.W. Elctrn. Sls. 216-491-9177
NM Albuquerque, More Sls., Inc. 505-255-6265
OR Beaverton, Electronic Sources, Inc. ... 503-627-0838
PA Pittsburgh, K.W. Elctrn. Sls. 412-366-9396
TX Dallas, J. Y. Schoonmaker 214-349-1650
WA Bellevue, Elctrn. Sources, Inc. 206-451-3500
WI Brookfield, Sumer 414-784-6641

CLARY CORP., Precision Instrs. Div., 320 W. Clary Ave., San Gabriel, CA 91776, Tel: 818-287-6111, FAX: 818-286-7216; Empl.: 100ò; *Sls. Mgr.:* Stewart Nowak; *Dist. Mgr.:* Chris Dean

CLAUSS CUTLERY CO., Alco Industries, 223 N. Prospect St., Fremont, OH 43420, Tel: 419-332-7344, 800-225-2877, FAX: 419-332-8077; Empl.: 90; *Sls. Mgr.:* Thomas D. Reinert; *Dist. Mgr.:* Thomas D. Reinert

CLEAN ROOM PRODS., 1800 Ocean Ave., Ronkonkoma, NY 11779-6528, Tel: 516-588-7000, TELEX: 645151; Empl.: 110; *Sls. Mgr.:* Robert S. Kearton

CLEARPOINT RESEARCH CORP., 35 Parkwood Drive, Hopkinton, MA 01748, Tel: 508-435-2000, FAX: 508-435-7504; Empl.: 300; *Sls. Mgr.:* Dennis Kirshy

CLEVELAND CRYSTALS, Box 17157, Euclid, OH 44117, Tel: 216-486-6100, TWX: 810-421-8031, FAX: 216-486-6103; FSC No.: 8K400; Empl.: 46; *Sls. Mgr.:* P. D. Marlowe

CLIFFORD OF VERMONT, INC., Route 107, P.O. Box 51, Bethel, VT 05032, Tel: 802-234-9921, 800-451-4381, FAX: 802-234-5006; Empl.: 47; *Sls. Mgr.:* John F. Baxter

CLIFTON PRECISION, Litton Systems, Inc., Marple at Broadway, Clifton Hgts., PA 19018, Tel: 215-622-1000, TWX: 510-669-9782, FAX: 215-623-6344; FSC No.: 86197; Empl.: 1000; *Sls. Mgr.:* C.Scalies ..... **B•1251**

Local Sales Offices & Reps
AL Huntsville, L&D, Inc. 205-837-1469
AZ Phoenix, Clifton Precision 602-242-0911
CA Cupertino, Clifton Precision 408-996-7507
CA Ontario, Clifton Precision 714-983-9374
CA San Clemente, Clifton Precision 714-492-6904
CO Denver, Motion Technlg. 303-757-3003
FL Sorrento, Boetto Corp. 904-735-0077
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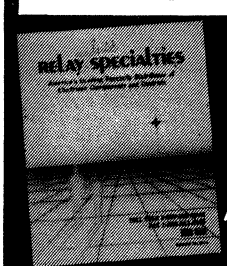

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IL	Wood Dale, Nep Elctrns.	312-595-8500
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NY Buffalo, Summit Distrs., Inc. 716-887-2800
NY Westbury, Schweber Elctrns. 516-334-7474
TX Dallas, Hall-Mark Elctrns. 214-343-5000
TX Ft. Worth, Allied Elctrns. 817-595-3500
WA Bellevue, Almac Elctrns. Corp. 206-643-9992
WA Seattle, Radar Elec. 206-282-2511
Can Don Mills, Ont., Saynor Varah, Inc. 416-445-0723
Can Scarborough, Ont., Carsten Elctrns. ... 416-495-7705
Can Willowdale, Ont., Electrosonic 416-494-1666

COMARK CORP., 93 West Street, Medfield, MA 02052, Tel: 508-359-8161, FAX: 508-359-2267; Empl.: 35

COMATEL USA, INC., 22 Eagle Rd., Commerce Pk, Danbury, CT 06810, Tel: 203-797-9445, TELEX: 643-011, FAX: 203-790-9298; Empl.: 10; *Sls. Mgr.:* Tim Papp

COMCAB, 8255 Black Run Rd., Nashport, OH 43830, Tel: 614-828-2468, FAX: 614-828-2796; Empl.: 40; *Sls. Mgr.:* Cheryl Mumma; *Dist. Mgr.:* Cheryl Mumma

COMCLOK, INC., 1142 N. Gilbert St., Anaheim, CA 92801, Tel: 714-991-1580, 800-333-9825, 213-836-9592(Tech. Asst.), FAX: 714-491-9825; Empl.: 30; *Sls. Mgr.:* Herb Plumhoff ..... **A•1323**

Local Sales Offices & Reps

CA Arcadia, HMC 818-447-0958
CA San Jose, Blue Elctrns. Sls. 408-248-4399
CO Denver, Electrophase 303-296-0443
TX Rockwall, Eatman Mfg. Rep. 214-771-1903

Local Distributors

CA Fountain Valley, Ecliptek 714-963-4009
CA Stanton, Inductive Comps. 714-828-3420
CA Sunnyvale, Target Elctrns. 408-734-5611

COMDATA CORP., 7900 N. Nagle Ave., Morton Grove, IL 60053, Tel: 708-470-9600

COMLINEAR CORP., 4800 Wheaton Drive, Fort Collins, CO 80525, Tel: 303-226-0500; FSC No.: 62839; Empl.: 160; *Sls. Mgr.:* John Perzow; *Dist. Mgr.:* Bill Henderson

COMM CON CONNECTORS INC., 4111 Ocean View Blvd., Montrose, CA 91020, Tel: 818-957-2018, FAX: 818-957-4851; Empl.: 13; *Sls. Mgr.:* Robert Farnum; *Dist. Mgr.:* James Orr ..... **C•1323**

Local Sales Offices & Reps

AL Huntsville, Effective Mktg. Force 205-233-2947
AZ Tempe, Elctrn. Tech. Sls. 602-921-7122
CA Montrose, Signal Entprs. 818-957-0640
CA Napa, Stewart/Fullerton Assoc. 707-258-1160
CT New Fairfield, Sales Engrg. 203-746-6905
GA Atlanta, Effective Mktg. Force 404-948-6023
IL Wheaton, CS Tech. Sls. 708-653-8126
NH Salem, Sales Engrg. 603-893-5521
NC Raleigh, Effective Mktg. Force 919-867-6221
OR Portland, Caruso & Assoc. 503-246-5439
PA Souderton, Intek Inc. 215-723-0433
TX Plano, Connector Specialists Inc. 214-517-1207
Can Markham, Matrix Technlg. Ltd. 416-477-4442

Local Distributors

AZ Phoenix, Be-Switched 602-275-4805
CA Fremont, KEA Elctrns. 415-651-2691
CA Gardena, Cal Switch 213-538-9830
CA Riverside, Elctrn Supp. 714-781-0453
CA Sunnyvale, PSC Elctrns. 408-737-1333
CT Danbury, Heilind Elctrns 203-797-8600
GA Norcross, Century Elctrns. 404-449-3424
IL Chicago, Leeds Electro Comps. 312-625-3800
MA Wilmington, Heilind Elctrns. 508-657-4870
MN Plymouth, Leeds Electro Comps. 612-557-1277
NC Raleigh, Century Elctrns. 919-782-2116
OK Tusla, Radio Inc. 918-587-9123
PA Norristown, Century Elctrns. 215-631-5400
TX Richardson, Duke Elctrns 214-680-3853
WA Vancouver, Interconnect Sls. 206-256-4085
WI Milwaukee, Progressive Image 414-321-4722

COMM/SCOPE, INC., Network Cable Div., P.O. Box 879, Claremont, NC 28610, Tel: 704-324-2200, 800-982-1708, TELEX: 802-166, FAX: 704-459-5099; *Sls. Mgr.:* Nita Hunsucker

FAX: 312-637-8564

COMMUNICATION COIL INC., 2839 N. Narragansett Ave., Chicago, IL 60634, Tel: 312-637-1333; FSC No.: 81815; Empl.: 75; *Sls. Mgr.:* E. Goldman ..... **A•1193, 1665, 2190**

Local Sales Offices & Reps

AZ Chandler, Lindberg & Co. 602-786-9115
CO Denver, Lindberg & Co. 303-758-9033
GA Maitland, E.I.R. Inc. 407-660-9600
IL Chicago, CCI 312-637-1333
MA Brookline, TPG Inc. 617-731-0858
NM Albuquerque, Lindberg & Co. 505-881-1006
OH Beavercreek, Electro-Com 513-427-2696
UT Salt Lake City, Lindberg & Co. 801-277-2643

COMMUNICATION DEVICES, INC., 1-130 McLevin Ave., Scarborough, Ont., CAN M1B3R6, Tel: 416-292-4463, TELEX: 065-25428, FAX: 416-292-4295; Empl.: 70

COMMUNICATIONS INSTRUMENTS, INC., P.O. Box 520, Hwy. 74 East, Fairview, NC 28730, Tel: 704-628-1711, TELEX: 577436, FAX: 704-628-1439; FSC No.: 58614; Empl.: 260; *Sls. Mgr.:* R. McClinton ..... **B•1432-1436**

Local Sales Offices & Reps

AL Huntsville, Dean Assocs. 205-534-2255
AZ Phoenix, CPS Assocs. 602-246-1097
CA Santa Clara, Ross Mktg. 408-988-8111
CO Denver, Con-Tek Mktg. 303-973-8490
CT Torrington, Phoenix Sls. 203-496-7709
FL Oviedo, Conley & Assocs. 305-365-3283
GA Atlanta, Dean Assocs. 205-534-2255
IL Arlington Hts., MB Sls. 312-392-9499
IN Kokomo, Schillinger Assocs. 317-455-2708
IA Cedar Rapids, C. H. Horn & Assocs. .. 319-393-8703
KS Lenexa, Midwest Tech. Sls. 913-888-5100
MA Needham, Component Technlg., Inc. .. 617-449-8490
MI Grosse Pointe Park, Greiner Assocs., Inc. 313-499-0188
MN North Mankato, EI Sls. 507-345-5786
NY Babylon, ASTROREP 516-422-2500
NY Syracuse, M. M. Hare Co. 315-457-6859
NC Raleigh, Godwin Assocs. 919-878-8000
OH Vandalia, Stegman Blaine 513-890-7975
PA Philadelphia, Tech. Sls. Assoc. 215-784-0170
WA Seattle, Eclipse Mktg. 206-885-6991
Can Montreal, Que., Empro Sls. Co. 514-341-6420
Can Richmond Hill, Ont., Renmark Elctrns., Ltd. (Off. No. 1) 416-881-8844

Local Distributors

AZ Tempe, Time Elctrns. 602-967-2000
CA Anaheim, Time Elctrns. 714-937-0911

CA	Chatsworth, Time Elctrns.	818-998-7200
CA	San Diego, Time Elctrns.	619-586-1331
CA	Santa Ana, Norstan Elctrns.	714-540-4165
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Englewood, Time Elctrns.	303-799-8851
FL	Orlando, T & T Prods., Inc.	305-857-2282
FL	Orlando, Time Elctrns.	305-841-6565
GA	Norcross, Time Elctrns.	404-448-4448
IL	Wood Dale, Time Elctrns.	312-350-0610
MD	Columbia, Time Elctrns.	301-964-3090
MA	Peabody, Time Elctrns.	617-532-6200
NJ	Pine Brook, Time Elctrns.	201-582-4611
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Centereach, Gemcap Comps.	516-736-0069
OH	Dublin, Time Elctrns.	614-761-1100
OR	Portland, Time Elctrns.	503-684-3780
PA	King of Prussia, Time Elctrns.	215-337-0900
TX	Carrollton, Time Elctrns.	214-241-7441
TX	Houston, Time Elctrns.	713-530-0800
UT	Salt Lake City, Time Elctrns.	801-973-8181
WA	Redmond, Time Elctrns.	206-882-1600

COMMUNICATIONS SYS. TECHNOLOGY, INC., 2018 Rhodes Street, Hermosa Beach, CA 90254, Tel: 213-374-3849; Empl.: 4; *Sls. Mgr.:* A.L. Perry

COMPAC™

FAX: 516-585-3534

COMPAC, 1320-13 Lincoln Ave., Holbrook, NY 11741, Tel: 516-585-3400; FSC No.: 62099; Empl.: 35; *Sls. Mgr.:* Peter C. Rao ..... **C•1021-1025**

Local Sales Offices & Reps

GA	Atlanta, EMA Inc.	404-448-1215
TX	Dallas, Talo Products	214-644-6010
SC	Greenville, EMA Inc.	803-233-4637
CA	Westlake Village, CAL-Rep.	818-991-1940
AL	Huntsville, EMA Inc.	205-837-7363
CA	Campbell, Senah	408-374-1031
MA	Haverill, L-K Assoc.	617-373-1313
MO	St. Louis, Abrams & Assocs.	314-569-0447
NC	Raliegh, EMA Inc.	919-847-8800
OR	Portland, Temper Tech Mktg.	503-292-8201
VA	Fairfax, Schibley Assocs.	703-591-3008

Local Distributors

CA	Cupertino, DC Elctrns.	408-996-8858

COMPACT POWER COMPANY, 17282 Orange Drive, Yorba Linda, CA 92686, Tel: 714-996-5826; *Sls. Mgr.:* Charles Lindberg ..... **D•2183**

COMPACT SOFTWARE, INC., 483 McLean Boulevard, Paterson, NJ 07504, Tel: 201-881-1200, TELEX: 130073, FAX: 201-881-8361; FSC No.: 43304; Empl.: 60; *Sls. Mgr.:* Ray Pengelly; *Dist. Mgr.:* Scott Wheelis

COMPAR, D.G.W. Electronics Corporation, 85 Spy Ct., Markham, Ontario, Canada L3R 4Z4, Tel: 416-475-8500, FAX: 416-475-4158; Empl.: 36; *Sls. Mgr.:* Rick Lewis

COMPAS, 100 Chimney Point Dr., Ogdensburg, NY 13669, Tel: 315-393-3573, FAX: 315-393-7638; Empl.: 350; *Sls. Mgr.:* James L. Clare

COMPEX CORP., Taunton Professional Park, 238 Taunton Blvd., Medford, NJ 08055, Tel: 609-596-9388, FAX: 609-596-3482; Empl.: 24

COMPIX, INC., 16195 SW 72nd St., Tigard, OR 97224, Tel: 503-639-8496; Empl.: 14; *Sls. Mgr.:* James G. Walcutt-VP Sls. Mktg.

COMPLIANCE DESIGN INC., 593 Massachusetts Ave., Boxboro, MA 01719, Tel: 508-264-4668, TWX: 317-632-DASH; *Sls. Mgr.:* Chip Digirolamo

COMPONENT GENERAL, INC., 2445 Success Dr., Odessa, FL 33556, Tel: 813-376-6655, FAX: 813-372-9096; Empl.: 30; *Sls. Mgr.:* Thomas Floridio

Local Sales Offices & Reps

CA	Santa Ana, Landa & Assocs., Inc.	714-543-7805
CA	Los Angeles, Landa & Assocs., Inc.	213-879-0770
CA	Mountain View, Bridge Mktg.	415-965-8045
DC	Washington, M. Lader Co.	1-800-442-3177
GA	Lawrenceville, M. Lader Co.	404-264-8111
MA	N. Andover, Bee Assoc.	508-475-2124
MN	Minneapolis, Comstrand	612-788-9234
MO	Grandview, R. R. Burton	816-763-5385
NY	Buffalo, Upstate Engrg. Sls.	716-632-0011
NY	Rochester, Upstate Engrg. Sls.	716-225-2383
PA	Conshohocken, M. Lader Co.	215-825-3177, 1-800-442-3177
PA	Murrysville, Pittsburgh Sls. Assoc.	412-327-3268
TX	Austin, Allied Comps., Inc.	512-331-4494
TX	Dallas, Allied Comps., Inc.	214-238-0408
TX	Ft. Worth, Allied Comps., Inc.	817-589-0456
EXP	Odessa, FL, Comp. Gen. Inc.	813-376-6655

COMPONENT MFG. SVC., INC., 1 Component Park, W. Bridgewater, MA 02379, Tel: 508-580-0111, FAX: 508-559-9893; Empl.: 600; *Sls. Mgr.:* Scott Allen; *Dist. Mgr.:* Wayne Douglas

COMPONENT RESEARCH CO. INC., 1655-26 St., Santa Monica, CA 90404, Tel: 213-829-3615, FAX: 213-829-9584; FSC No.: 12517;Multiple; Empl.: 230; *Sls. Mgr.:* Sylvia Kellerman ..... **A•1022-1050**

Local Sales Offices & Peps

SC	Greenville, Walter Lamphier	803-232-4687

COMPONENTS CORP., 6 Kinsey Pl., Denville, NJ 07834, Tel: 201-627-0290, FAX: 201-361-5801; FSC No.: 26364; Empl.: 20; *Sls. Mgr.:* Fred Bielenberg

COMPONENTS ELECTRONICS CORP., 629A Lowther Rd., Lewisberry, PA 17339, Tel: 717-938-4151, FAX: 717-938-5910; Empl.: 45; *Sls. Mgr.:* J.Galli; *Dist. Mgr.:* J.Galli

COMPONENT SPECIALTIES CORP., 9143 E. La Rosa Dr., Temple City, CA 91780, Tel: 213-283-0015, FAX: 818-287-7189; FSC No.: 28984; Empl.: 45; *Sls. Mgr.:* D.R. Heins

COMPUCART, Versa Tec, P.O. Box 2095, Tampa, FL 33601-2095, Tel: 800-237-9024, 813-251-2431; Empl.: 25

COMPU-CRAFT FABRICATORS INC., 669 Mary St., Warminster, PA 18974, Tel: 215-443-7107, FAX: 215-443-7195; FSC No.: 76977; Empl.: 18; *Sls. Mgr.:* Stephen Dalton

COMPU-MECH INC., 2375 Dorr St., Toledo, OH 43607, Tel: 419-535-6702, TWX: 510-601-7362, FAX: 419-535-0805; *Sls. Mgr.:* John Stanley III

COMPUMOTOR DIVISION, Parker Hannifin Corp., 5500 Business Park Dr., Rohnert Park, CA 94928, Tel: 707-584-7558, FAX: 707-584-8015; Empl.: 150; *Sls. Mgr.:* K. McNicholas; *Dist. Mgr.:* A. Wales

COMPUTER AVIONICS, See CAC Microcircuits, Inc.

COMPUTER CABLE & PRODS., INC., Vertex Computer Cable & Products

COMPUTER COMPONENTS INC.

FAX: 914-738-6706

COMPUTER COMPONENTS, INC., 629 Fifth Ave., Pelham, NY 10803, Tel: 914-738-1611; FSC No.: 12965; Empl.: 25; *Sls. Mgr.:* John Hunsicker; *Dist. Mgr.:* John Hunsicker ..... **B•1399**

COMPUTER CONVERSIONS CORP., 6 Dunton Ct., E. Northport, NY 11731, Tel: 516-261-3300, FAX: 516-261-3308; FSC No.: 51086; Empl.: 100; *Sls. Mgr.:* S. J. Renard ..... **D•1150-1151**

Local Sales Offices & Reps

IN	Mishawaka, Engrd. Sls.	219-255-5111
WI	Delavan, Clawson Controls	414-728-8325
MA	Brookline, Technology Prod. Grp.	617-731-0858
MI	Newport, Industrial Sensors, Inc.	313-289-3374
NY	Moravia, Electrotech Sys.	315-497-1598
OH	Cincinnati, Rilco	513-271-0630
PA	Ingoma, Greye Glass	412-366-6664
TX	Lewisville, Automated Dynamics	214-221-0052

COMPUTER DEVICES, 34 Linnell Cir., Nutting Lake, MA 01865, Tel: 508-663-4980, TELEX: 949398; Empl.: 30; *Sls. Mgr.:* Sandra R. Clark

COMPUTER DOCTORS, 9204-B Baltimore Blvd., College Park, MD 20740, Tel: 1-800-RAM-STAR, 301-474-3095, FAX: 301-474-0805

COMPUTER DYNAMICS SALES, 107 S. Main St., Greer, SC 29650, Tel: 803-877-8700, FAX: 803-879-2030; *Sls. Mgr.:* Barry Steele

COMPUTER INSTRUMENTS CORP., 1000 Shames Drive, Westbury, NY 11590, Tel: 516-476-8400, FAX: 516-876-9153

COMPUTER INSTRUMENTS DIV., 100 Madison Ave., Hempstead, NY 11550, Tel: 516-483-8200, TWX: 510-222-4189, FAX: 516-483-8327; Empl.: 65; *Sls. Mgr.:* Cary Ratner

COMPUTERIZED COIL WINDERS, INC., 5 W. Kenosia Ave., Danbury, CT 06810, Tel: 203-744-6715, FAX: 203-798-7563; Empl.: 6

COMPUTER MAINTENANCE CORP., 405 Murray Hill Pkwy, East Rutherford, NJ 07073, Tel: 201-896-0707, FAX: 201-896-8503; Empl.: 105; *Sls. Mgr.:* Arthur Young

COMPUTER OPTICAL PRODUCTS, INC., Sub. of Hathaway Corp., 9321 Eton Ave., Chatsworth, CA 91311-6910, Tel: 818-882-0424, TELEX: 18-33-73-UD, FAX: 818-882-0492; Empl.: 50; *Sls. Mgr.:* David Richards

COMPUTER PERIPHERALS INC., 667 Rancho Congo Blvd., Newbury Pk., CA 91320, Tel: 805-499-5751, 800-854-7600, TELEX: 759299CPI, FAX: 805-498-8848; Empl.: 100; *Sls. Mgr.:* Davius Antia; *Dist. Mgr.:* Mike Krunic

COMPUTER POWER INC., 124 W. Main St., High Bridge, NJ 08829, Tel: 908-638-8000, 800-526-5088, TELEX: 847481, FAX: 908-638-4931; FSC No.: 3643; Empl.: 170; *Sls. Mgr.:* John Deliman; *Dist. Mgr.:* Angela Anderson

COMPUTER PRODUCTS, INC., Measurement & Control Div., 2900 Gateway Dr., Pompano Beach, FL 33069, Tel: 305-974-5500, FAX: 305-979-7371; Empl.: 150; *Sls. Mgr.:* Gene Ackerman

COMPUTER PRODUCTS™ POWER CONVERSION

FAX: 510-683-6400

COMPUTER PRODUCTS INC., Power Conversion America, 3797 Spinnaker Ct. (P.O. Box 5102), Fremont, CA 94537-5102, Tel: 510-657-6700; FSC No.: 62125; Empl.: 1,200; *Sls. Mgr.:* Ken Clouther, VP, Sls.; *Dist. Mgr.:* Emilie Creager, Distbn. Mgr. ..... **D•1500, 1661-1679**

Local Sales Offices & Reps

AZ	Phoenix, C.T. Carlberg	602-488-0750
CA	Encinitas, Jones & McGeoy Sls.	619-753-6784
CA	San Diego, Jones & McGeoy Sls.	714-756-6269
CA	Santa Ana, Jones & McGeoy Sls.	714-547-6466
CA	Santa Clara, Criterion Sls.	408-988-6300
CO	Aurora, Electrodyne	303-695-8903
CT	New Milford, Alpha-Omega Sls.	203-354-2923
FL	Oviedo, Conley & Assocs.	407-365-3283
GA	Norcross, Mountain Electro Mktg.	404-448-5594
IL	Itasca, Janus, Inc.	708-250-9650
IN	Indianapolis, Leslie M. Devoe Co.	317-842-3245
IA	Cedar Rapids, Dy-Tronix, Inc.	319-377-8275
KS	Leawood, Dy-tronix, Inc.	913-339-6333
KS	Wichita, Dy-tronix, Inc.	316-838-0884
MD	Columbia, Third Wave Solutions, Inc.	301-290-5990
MA	North Reading, Alpha Omega Sls.	508-664-1118
MN	Minneapolis, Stan Clothier Co.	612-944-3456
MO	Bridgeton, Dy-tronix, Inc.	314-291-4777
NJ	Mt. Laurel, Paragon Sls. & Mktg.	609-778-1190
NM	Albuquerque, C.T. Carlberg	505-899-2155
NY	Binghamton, Empire Tech. Assocs.	607-772-0651
NY	Rochester, Empire Tech	719-381-8500
NY	Rockville Centre, S-J Assocs.	516-536-4242
NY	Skaneateles, Empire Tech	315-685-5703
NC	Raleigh, Zucker Assocs., Inc.	919-782-8433
OH	Cleveland, Elctrn. Salesmasters	216-831-9555
OK	Tulsa, Ammon & Rizos	918-749-6116
OR	Beaverton, Micro Sls., Inc.	503-645-2841
TX	Austin, Ammon & Rizos	512-454-5131
TX	Houston, Ammon & Rizos	713-781-6240
TX	Richardson, Ammon & Rizos	214-644-5591
UT	Salt Lake City, Electrodyne, Inc.	801-264-8050
WA	Bellevue, Micro Sls., Inc.	206-451-0568
WI	Waukesha, Janus, Inc.	414-542-7575
Can	Montreal, Electro Source	514-630-7486
Can	Ottawa, Ont., Electro Source	613-592-3214
Can	Toronto, Electro Source	416-675-4490
Can	W. Vancouver,B.C., Blakewood Elctrns. Sys., Inc.	604-273-9910

Local Distributors

AL	Huntsville, Bell Inds.	205-837-1074
AL	Huntsville, Lex Elctrns.	205-895-0480
AL	Huntsville, Marshall Inds.	205-881-9235
AZ	Phoenix, Lex Elctrns.	602-431-0030
AZ	Phoenix, Marshall Inds.	602-496-0290
AZ	Tempe, Bell Inds.	602-966-7800
CA	Canoga Park, Lex Elctrns.	818-999-4702
CA	Chatsworth, Marshall Inds.	818-407-4100, 818-880-9680
CA	El Monte, Marshall Inds.	818-307-6000
CA	Fountain Valley, Bell Micro Products	714-963-0667
CA	Garden Grove, Bell Inds.	714-895-7801
CA	Gardena, Bell Inds.	213-515-1800
CA	Irvine, Lex Elctrns.	714-587-0404,213-537-4321
CA	Irvine, Marshall Inds.	714-458-5380
CA	Los Angeles, Bell Inds.	213-826-6778
CA	Milpitas, Bell Micro Products	408-434-1150
CA	Milpitas, Marshall Inds.	408-943-4600
CA	N. Hollywood, B. J. Wolfe Entprs.	213-877-5518
CA	Sacramento, Lex Elctrns.	916-929-9732
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Lex Elctrns.	619-495-0015
CA	San Diego, Marshall Inds.	619-578-9600
CA	San Jose, B.J. Wolfe Entprs.	408-371-3443
CA	San Jose, Lex Elctrns.	408-432-7171
CA	Sunnyvale, Bell Inds.	408-745-0400,408-773-1100
CA	Thousand Oaks, Bell Inds.	805-499-6821
CO	Englewood, Lex Elctrns.	303-799-0258
CO	Thornton, Marshall Inds.	303-451-8383
CO	Wheat Ridge, Bell Inds.	303-424-1985
CT	Oxford, Lex Elctrns.	203-264-4700
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Altamonte Springs, Lex Elctrns.	407-331-7555
FL	Altamonte Springs, Marshall Inds.	407-767-8585
FL	Deerfield Bch., Bell Inds.	305-421-1997
FL	Deerfield Bch., Lex Elctrns.	305-977-7511
FL	Ft. Lauderdale, Marshall Inds.	305-977-4880
FL	Largo, Bell Inds.	813-541-4434
FL	St. Petersburg, Marshall Inds.	813-576-1399
GA	Norcross, Bell Inds.	404-662-0923
GA	Norcross, Lex Elctrns.	404-449-9170
GA	Norcross, Marshall Inds.	404-923-5750
IL	Elk Grove, Bell Inds.	312-640-1910
IL	Schaumburg, Lex Elctrns.	708-330-2888
IL	Schaumburg, Marshall Inds.	312-490-0155
IL	Urbana, Bell Inds.	217-328-1077
IN	Ft. Wayne, Bell Inds.	219-424-3422
IN	Indianapolis, Bell Inds.	317-875-8200,317-299-5487
IN	Indianapolis, Lex Elctrns.	317-843-1050
IN	Indianapolis, Marshall Inds.	317-297-0483
IA	Cedar Rapids, Bell Inds.	319-395-0730
IA	Cedar Rapids, Lex Elctrns.	319-373-1417
KS	Lexena, Marshall Inds.	913-492-3121
KS	Overland Park, Lex Elctrns.	913-492-2922
MD	Columbia, Lex Elctrns.	301-596-7800
MD	Gaithersburg, Marshall Inds.	301-840-9450
MA	Andover, Bell Inds.	508-474-8880
MA	Teaksbury, Jaco Elctrns.	508-640-0010
MA	Wilmington, Bell Micro Products	508-658-0222
MA	Wilmington, Jaco Elctrns.	617-273-1860
MA	Wilmington, Lex Elctrns.	508-694-9100
MA	Wilmington, Marshall Inds.	617-658-0810
MI	Ann Arbor, Bell Inds.	313-971-9093
MI	Livonia, Lex Elctrns.	313-525-8100
MI	Livonia, LWC Distrs.	313-464-7700
MI	Livonia, Marshall Inds.	313-525-5850
MN	Eden Prairie, Lex Elctrns.	612-941-5280
MN	Plymouth, Marshall Inds.	612-559-2211
MO	Bridgeton, Marshall Inds.	314-291-4650
NH	Hudson, Bell Inds.	603-882-1133
NH	Manchester, Lex Elctrns.	603-625-2250
NJ	Fairfield, Marshall Inds.	201-882-0320
NJ	Mt. Laurel, Lex Elctrns.	609-274-7900
NJ	Mt. Laurel, Marshall Inds.	609-234-9100
NJ	Pine Brook, Lex Elctrns.	201-227-7880
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Farmingdale, Bell Inds.	516-752-9303
NY	Hauppauge, Lex Elctrns.	516-231-2500
NY	Hauppauge, Marshall Inds.	516-273-2424
NY	Johnson City, Marshall Inds.	607-798-1611
NY	Pittsford, Lex Elctrns.	716-383-8020
NY	Rochester, Marshall Inds.	716-235-7620
NC	Raleigh, Century Elctrns.	919-782-2116
NC	Raleigh, Lex Elctrns.	919-876-0000
NC	Raleigh, Marshall Inds.	919-878-9882
OH	Beachwood, Lex Elctrns.	216-464-2970
OH	Dayton, Bell Inds.	513-434-8231,513-435-8660
OH	Dayton, Lex Elctrns.	513-439-1800
OH	Dayton, Marshall Inds.	513-898-4480
OH	Solon, Marshall Inds.	216-248-1788
OH	Westerville, Marshall Inds.	614-891-7581
OK	Tulsa, Lex Elctrns.	918-665-0277
OK	Tulsa, Norvell Elctrns.	918-254-8606
OR	Beaverton, Almac Elctrns.	503-629-8090
OR	Beaverton, Marshall Inds.	503-644-5050
OR	Lake Oswego, Bell Inds.	503-635-6500
PA	Horsham, Lex Elctrns.	215-441-0600
PA	Norristown, Century Elctrn. Comps.	215-631-5400
PA	Pittsburg, Lex Elctrns.	412-963-6807
PA	Pittsburgh, Marshall Inds.	412-963-0441
TX	Austin, Marshall Inds.	512-837-1991
TX	Austin, Norvell Elctrns.	512-837-5555
TX	Carrollton, Marshall Inds.	214-233-5200
TX	Dallas, Lex Elctrns.	214-247-6300
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Lex Elctrns.	713-977-5383
TX	Houston, Marshall Inds.	713-895-9200
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Richardson, Bell Inds.	214-690-0466
UT	Salt Lake City, Bell Inds.	801-255-2477
UT	Salt Lake City, Marshall Inds.	801-485-1551
WA	Bellevue, Almac Elctrns.	206-643-9992
WA	Bothell, Marshall Inds.	206-747-9100
WA	Redmond, Bell Inds.	206-867-5410
WA	Spokane, Almac Elctrns.	509-924-9500
WI	New Berlin, Lex Elctrns.	414-784-9451
WI	Waukesha, Bell Inds.	414-547-8879
WI	Waukesha, Marshall Inds.	414-797-8400
Can	Brampton, Ont., Zentronics	416-451-9600
Can	Montreal, Que., Zentronics	514-737-9700
Can	Richmond, B.C., Zentronics	604-273-5575
Can	Saskatoon, Saskatchewan, Zentronics	306-955-2202
Can	Winnipeg, Mani., Zentronics	204-694-1957

COMPUTER SYSTEM ASSOCS., 7564 Trade St., San Diego, CA 92121, Tel: 619-566-3911, TELEX: 333693, FAX: 619-566-0581; Empl.: 15; *Sls. Mgr.:* Bill Reed; *Dist. Mgr.:* Bill Reed

COMPUTER SYSTEM PRODUCTS, 14305 21st Ave. N., Minneapolis, MN 55447, Tel: 612-476-6866, 800-422-2537, FAX: 612-476-6966; Empl.: 50; *Sls. Mgr.:* Mick Maher; *Dist. Mgr.:* Tom Quanbeck

COMPUTER SYSTEMS TECHNICAL SUPPORT, 4015 E. Leaverton Ct., Anaheim, CA 92807, Tel: 714-632-1300, FAX: 714-632-1937; FSC No.: 9J740; Empl.: 13; *Sls. Mgr.:* Reuven Arad

COMPUTERWARE, INC., 8480-I Tyco Rd., Vienna, VA 22182-2266, Tel: 703-821-8200, FAX: 703-821-1746; Empl.: 18; *Sls. Mgr.:* John Dargo

COMPUTERWISE, 302 N. Winchester, Olathe, KS 66062, Tel: 913-829-0600, FAX: 913-829-0810; Empl.: 27; *Sls. Mgr.:* William W. Brown; *Dist. Mgr.:* William W. Brown

COMPUTROL:AN AEG CO., 239 Ethan Allen Hwy., Ridgefield, CT 06877, Tel: 203-431-2000, TELEX: 643358, FAX: 203-431-2090; Empl.: 45; *Sls. Mgr.:* C. R. Wolfe

COMPUTRON DISPLAY SYSTEMS, Xcel Corporation, 845 Bonnie Lane, Elk Grove Village, IL 60007, Tel: 708-952-8800, FAX: 708-952-0832; FSC No.: 07126; Empl.: 300; *Sls. Mgr.:* R. Van Horn; *Dist. Mgr.:* Kathy Privett **B•1057**

COMSPEC DIGITAL PRODUCTS INC., 2313 W. Sam Houston Pkwy. N.S. 145, Houston, TX 77043, Tel: 713-461-4487, FAX: 713-461-8846; Empl.: 15; *Sls. Mgr.:* T. A. Paine; *Dist. Mgr.:* T. A. Paine

COMSTRON A DIV. OF AEROFLEX, 35 S. Service Road, Plainview, NY 11803, Tel: 516-752-2351, TWX: 310-497-3525, FAX: 516-694-6771; Empl.: 120; *Sls. Mgr.:* William J. Meditz

COMTECH MICROWAVE CORP., Comtech Corp., 63 Oser Ave., Hauppauge, NY 11788, Tel: 516-435-4646, TELEX: 221-234 CMTCH; FSC No.: 31196; *Sls. Mgr.:* J. Tardi

COM-2, INC., 1556 Woodland Dr., Saline, MI 48176, Tel: 313-429-9027, FAX: 313-429-1902; Empl.: 70; *Sls. Mgr.:* Robert Green

COMUS INTERNATIONAL, 263 Hillside Ave., Nutley, NJ 07110, Tel: 201-667-6200, FAX: 201-667-6837; *Sls. Mgr.:* Gene Moran **B•1668**

Local Sales Offices & Reps

CA	Milpitas, Maxim Elect. Sls. Co.	408-946-6001
CA	Newport Beach, Forbes-Pacific	714-722-6174
IL	Mundelein, Dynamic Elctrns. Co.	708-566-8350
MA	Andover, Grassi Assocs.	508-475-3418
MN	Savage, Comps. & Controls	612-890-3002
NJ	Westfield, John Abruzzo	201-233-4321
PA	Furlong, Avenir, Inc.	215-348-8290
TN	Murfreesboro, Control Comps.	615-895-5175
Can	Dawn Mills, Ontario, Control Comps.	416-447-2128

CONAP, INC., 1405 Buffalo St., Olean, NY 14760, Tel: 716-372-9650, FAX: 716-372-1594; Empl.: 135

CONAX BUFFALO CORPORATION, 2300 Walden Ave., Buffalo, NY 14225, Tel: 716-684-4500, FAX: 716-684-7433; FSC No.: 03688; Empl.: 190; *Sls. Mgr.:* R.C. Paluch

CONCORD ELECTRONICS CORPORATION, 30 Great Jones St., New York, NY 10012, Tel: 1-212-777-6571, TWX: 710-581-4930, FAX: 1-212-995-0161; FSC No.: MFR 18310; Empl.: 225; *Sls. Mgr.:* Josie Wheaton **C•1324-1325, 1595**

Local Distributors

AL	Huntsville, Century Fasteners	205-883-5344
AZ	Tucson, PSN Distrbn.	602-623-9800
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Mission Hills, Coast Air	818-898-2288
CA	San Jose, Bisco	408-996-8420
CO	Denver, CSID/Integrated	303-292-5538
CT	Danbury, Heilind	208-797-8600
DE	New Castle, Electronics Exchange	302-322-5401
FL	Sanford, Electronic Fasteners	407-321-4000
GA	Norcross, Atlanta Hardware Specialty	404-449-3000
HI	AIEA, Newark Elctrns.	808-487-8951
ID	Coeurd' Alene, A-I Consolidated	208-765-3280
IL	Franklin Park, Bisco	312-451-1230
IN	Indianapolis, Mar Elctrns.	317-633-6699
IA	Cedar Rapids, Dee Elctrns.	319-365-7551
KS	Wichita, RSC Elex	216-267-5213
KY	Bowling Green, Crescent Elctrns.	502-842-2444
LA	New Orleans, Radio Pts.	504-581-5959
MD	Gaithersburg, MS Elctrns.	301-921-0200
MA	Billerica, MS Inserts	508-670-5600
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MN	New Brighton, Chris ELctrns.	612-631-2647
MS	Jackson, Newark Elctrns.	601-956-3834
MO	St. Charles, Finnegan Elctrns.	314-946-6201
NE	Omaha, Omaha Elctrns.	402-341-3440
NV	Reno, Richco	702-323-4939
NH	Nashua, Brevan	603-889-7230
NJ	Kenilworth, Federated Purchasers	201-272-0505
NM	Albuquerque, Electronic Pts.	505-293-6161
NY	Bohemia, Car-Lac	516-567-4200
NC	Raleigh, Century Elec. Comp.	919-782-2116
OH	Dayton, Stotts-Friedman	513-298-5555
OK	Tulsa, Altair	918-252-5781
OR	Beaverton, Comp. Resources	503-641-8488
PA	Philadelphia, PEI Genesis	215-673-0400
RI	Pawtucket, Major Edwards	401-725-7400
SC	Charleston, Wholesale Indl. Elex	803-577-6388
TN	Knoxville, Industrial Elect	615-573-7135
TX	Richardson, Aero Glen	214-234-0984
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
VT	Colchester, Hooker Elctrns.	802-864-0885
VA	Springfield, Southern Fasteners	703-922-8048
WA	Redmond, Olander	206-881-3488
WV	Beckley, State Elec.	304-256-2219
WI	Grafton, Lakeview Elex	414-377-8250
EXP	Taipei, Taiwan, Gold-Tek Elec. Co.	20-717-2302
Can	Mississauga, Ont., Rush Elctrns.	416-677-7280

The Condenser Products Corporation

FAX: 904-799-0221

CONDENSER PRODUCTS CORP., 2131 Broad St., Brooksville, FL 34609, Tel: 904-796-3561; FSC No.: 16727; Empl.: 30; *Sls. Mgr.:* David Bauerschmidt **A•1051**

Local Sales Offices & Reps

TX	Lewisville, Elctrn. Prod. Reps.	214-436-4772

CONDOR

FAX: 805-487-8911

CONDOR D.C. POWER SUPPLIES, INC., 2311 Statham Pkwy., Oxnard, CA 93033, Tel: 805-486-4565,; Empl.: 250; *Sls. Mgr.:* Michael F. Kirkowski, Exec. VP Mktg.; *Dist. Mgr.:* Deborah Perez **D•1680-1689**

Local Sales Offices & Reps

AL	Huntsville, Adams Elctrns.	205-882-2988
AL	Huntsville, The John Todd Co.	205-828-0808
AZ	Phoenix, Aztech-CPS Inc.	602-246-1097
AZ	Scottsdale, Aztech-CPS Inc.	602-991-6300
CA	Fremont, Telesis Sls. Grp.	415-657-8645
CA	Glendale, TKI Sls. Co.	818-546-5010

CA Milpitas, Telesis Sls. Grp. 408-946-7300
CA Pasadena, A-F Sls. Engrg. 800-696-3442
CA Westlake Vlg., Elkins & Assoc. 818-597-1075
CO Denver, AKI Entprs. 303-388-4488
CT Madison, Focus Elctrns. Sls. 203-245-4314
FL Altamonte Springs, Semtronic Assoc. 407-831-8233
GA Lilburn, Adams Elctrns. 404-925-9115
IL Schaumberg, Engrg. Prods. Assoc. 708-882-7640
IN Indianapolis, Current Elctrns. Mktg. 317-257-1861
IA Cedar Rapids, C.H. Horn & Assocs. 319-393-8703
IA Cedar Rapids, Lorenz Sls., Inc. 319-377-4666
KS Overland Park, Lorenz Sls., Inc. 913-469-1312
KS Wichita, DLE Elctrns. 316-683-6400
MD Lutherville, J. A. Dougherty Sls. 301-321-7890
MA Taunton, Focus Elctrns. Sls., Inc. 508-824-3840
MI Bloomfield Hills, ENCO Mktg., Inc. 313-338-8600
MN Edina, Engrg. Prods. 612-835-9022
MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO St. Louis, John G. Macke Co. 314-432-2830
MO St. Louis, Lorenz Sls., Inc. 314-997-4558
NE Lincoln, Lorenz Sls., Inc. 402-475-4660
NJ Marlton, BGR Assocs. 609-983-1020
NJ Medford, Comp. Consits. 609-654-5300
NY Pittsford, C. W. Beach Co. 716-586-3200
NY Yonkers, Sonkin Assocs. 914-968-8282
OH Gahanna, Manufacturers Direct Sales 614-476-3310
OR Beaverton, Eclipse Mktg. Grp. 503-642-1661
SC Lilburn, Adams Elctrns. 404-925-9115
TX Dallas, M Rep 214-484-5711
WA Redmond, Eclipse Mktg. Grp. 402-475-4660
Can Toronto, Ont., Duncan Instrs. 416-742-4448

Local Distributors

AL Huntsville, Allied Elctrns. 205-721-3500
AZ Phoenix, Aerospace S.W. 602-582-2779
CA Camarillo, Milgray 805-484-4055
CA Costa Mesa, FLW 714-751-7512
CA Fremont, FLW 415-651-6511
CA San Jose, Power & Data Tech. 408-629-3550
CA Santa Clara, Kent Elctrns. 408-727-9810
CO Broomfield, Future Elctrns. 303-421-0123
CT Milford, Milgray 203-878-5538
FL Ft. Lauderdale, Allied 305-973-7103
FL Orlando, Hammomd Elctrns. 305-841-1010
FL Winter Pk., Milgray 407-647-5747
GA Norcross, Milgray 404-446-9777
IL Chicago, Dalec Distrs. 312-283-0300
IL Palatine, Milgray 708-202-1900
IL Schaumberg, Bortech Sls. 708-882-7640
IN Indianapolis, Allied Elctrns. 317-875-0448
KS Overland Pk., Milgray 913-236-8800
MD Columbia, Vantage 301-720-5100
MD Marlow Hgts., Allied 301-423-0161
MD Wheaton, Brimberg Sls. 301-946-2670
MA Billerica, Allied Elctrns. 617-667-7921
MA Westborough, Future Elctrns. 508-366-2400
MI Ann Arbor, McNaughton-McKay 313-995-9515
MI Madison Heights, McNaughton-McKay 313-399-7500
MN Eden Prairie, Allied Elctrns. 612-829-7554
MN Edina, Bortech Sls. 612-835-9036
MN Minneapolis, Aerospace Comp. Prod. 612-884-4725
MO St. Louis, Future Elctrns. 314-469-6805
NJ Marlton, Milgray 609-983-5010
NJ Mt. Laurel, Allied Elctrns. 609-234-7769
NJ Mt. Laurel, Future Elctrns. 609-778-7600
NJ Parsippany, Milgray 201-335-1766
NY Elmsford, Kintronics 914-347-2530
NY Farmington, Milgray 516-391-9800
NY Mineola, Allied 516-248-2360
NY Rochester, Future Elctrns. 716-272-1120
NC Raleigh, Allied 919-876-5845
NC Raleigh, Milgray 919-790-8094
OH Cleveland, Milgray 216-447-1520
OR Portland, Eoff 503-222-9411
PA McKean, Advacom, Inc. 814-476-7774
PA Pittsburgh, Allied Elctrns. 412-367-4124
SC Greenville, Hammond Elctrns. 803-232-0872
TX Dallas, Cypress Elctrns. 214-869-1435
TX Fort Worth, Allied Elctrns. 817-336-5401
TX Richardson, Future Elctrns. 214-437-2437
UT Salt Lake City, Future Elctrns. 801-972-8489
UT Salt Lake City, Milgray 801-272-4999
WA Seattle, Allied 206-547-2827
WA Vancouver, Eoff 206-694-7504
Can Toronto, Ont., Duncan Inst. Ltd. 416-742-4448

CONDOR PACIFIC INDS., INC., 8053 Deering Ave., Canoga Park, CA 91304, Tel: 818-347-8331, TELEX: 65-1442, FAX: 818-713-0162; FSC No.: 24321; Empl.: 110

CONDOR SYSTEMS, INC., 2133 Branham Lane, San Jose, CA 95124, Tel: 408-371-9580, FAX: 408-371-9589; FSC No.: 62065; Empl.: 270; *Sls. Mgr.:* Dave Klinger; *Dist. Mgr.:* Ed Brown

CONDUCTIVE RUBBER TECHNOLOGY, INC., 22125 17th Ave. S.E. Ste. 117, Bothell, WA 98021, Tel: 206-486-8559, FAX: 206-487-0945; Empl.: 30; *Sls. Mgr.:* K. Grant

CONDUCTIVE SYSTEM, INC., R.D. No. 1, Box 1040, Rte. 5 South, Amsterdam, NY 12010, Tel: 518-843-5740, FAX: 518-843-5829; Empl.: 25; *Sls. Mgr.:* Eivind Johansen

CONFORMING MATRIX, Box 5126, Pt. Pl. Sta., Toledo, OH 43611, Tel: 419-729-3777, FAX: 419-729-3779; Empl.: 35

CONKLIN INSTRUMENT CORP., West Rd., P.O. Box 650, Pleasant Valley, NY 12569, Tel: 914-635-2136, FAX: 914-635-2510; Empl.: 110; *Sls. Mgr.:* James Taffer

CONNECT-AIR INTERNATIONAL, INC., 50 37th St. N.E., Auburn, WA 98002, Tel: 206-939-4880, FAX: 206-939-4882; Empl.: 50; *Sls. Mgr.:* Ron Jones

CONNECTICUT HARD RUBBER CO., See CHR Inds.

CONNECTICUT MICROWAVE CORP., 10 B Trackside Business Park, Cheshire,, CT 06410, Tel: 203-250-9678, FAX: 203-250-9688; FSC No.: 50974; Empl.: 15; *Sls. Mgr.:* Joseph W. Raines

CONNECTOR ACCESSORIES, INC., See Mueller Elec. Co.

FAX: 312-539-3825

CONNECTOR CORP., 6025 N. Keystone Ave., Chicago, IL 60646, Tel: 312-539-3108, TWX: 910-221-6059; *Sls. Mgr.:* Bill Anthony ..... **C•1326-1327**

CONNECTOR INDUSTRIES OF AMERICA DIV., Microdot Mfg., 10340 Julian Dr., Cincinnati, OH 45215, Tel: 513-772-3680; FSC No.: 32076; Empl.: 60; *Sls. Mgr.:* Bob Cain

Connectronics Corp.

FAX: 419-537-0007

CONNECTRONICS CORP., 2745 Avondale Ave., Toledo, OH 43607, Tel: 419-537-0020; FSC No.: 0LE36; Empl.: 15; *Sls. Mgr.:* Thomas L. Ricketts ..... **C•1328**

Local Sales Offices & Reps

OH Toledo, Connectronics 419-537-0020
OH Troy, S-Tek 513-339-5882

Local Distributors

MI Ann Arbor, S-TEK 313-572-0516

FAX: 708-851-5040

CONNOR-WINFIELD CORP., 1865 Selmarten Rd., Aurora, IL 60505-1335, Tel: 708-851-4722, TELEX: 270244; FSC No.: 5955; Empl.: 35; *Sls. Mgr.:* Tom Grabowski; *Dist. Mgr.:* John Hoag ..... **A•1324-1327**

Local Sales Offices & Reps

AL Huntsville, Dean Assocs. 205-880-8200
AZ Scottsdale, Spectrum Mktg. Assoc. 602-890-9000
CA Campbell, Shur Sls. 408-374-5577
CA San Clemente, ATA 714-661-9700
CA San Diego, ATA 619-792-6079
CO Denver, Spectrum Mktg. Assoc. 303-480-9991
CT Cheshire, Scientific Comps. 203-272-2963
FL Boca Raton, Perrott Assocs. 407-362-0191
FL Casselberry, Perrott Assocs. 407-830-0094
FL Clearwater Beach, Perrott Assocs. 813-443-5414
FL Melbourne, Perrott Assocs. 407-676-0305
ID Boise, Q.R. Crown 208-344-9588
IN Ft. Wayne, R.O. Whitesell 219-432-5591
IN Indianapolis, R.O. Whitesell 317-359-9283
IN Kokomo, R.O. Whitesell 317-457-9127
KY Versailles, R.O. Whitesell 606-873-1182
MD Cockeysville, Koebert Assocs. 301-493-8924
MA Needham Hgts., Kanan Technlgs. 617-449-7400
MI Grand Blanc, R.O. Whitesell 313-695-0770
MI Grand Rapids, R.O. Whitesell 616-942-5420
MI Southfield, R.O. Whitesell 313-352-5454
MI St. Joseph, R.O. Whitesell 616-983-7337
NC Charlotte, Quantum Mktg. 704-523-8822
NC Raleigh, Quantum Mktg. 919-846-5728
OH Cincinnati, R.O. Whitesell 513-521-2290
OH Cleveland, R.O.Whitesell 216-447-9020
OH Columbus, R. O. Whitesell 614-888-9396
OH Dayton, R.O.Whitesell ..... 513—298-9546
OR Portland, Q.R. Crown 503-620-8320
PA Glenside, Koebert Assocs. 215-887-2310
PA Pittsburgh, R.O. Whitesell 412-963-6161
TX Austin, Synergistic Sls. 512-346-2122
TX Houston, Synergistic Sls. 713-937-1990
TX Richardson, Synergistic Sls. 214-644-3500
WA Bellevue, Q.R. Crown 206-453-5100
WV Inwood, Koebert Assocs. 304-229-8401
WI Oconomowoc, Artmor Ltd. 414-367-8789
Can Scarborough, Ont., Cantronics Ltd. 416-297-8668

CONRAC DISPLAY PRODUCTS, INC., 1724 S. Mountain Ave., Duarte, CA 91010, Tel: 818-303-0095, TELEX: 67-0437, TWX: 910-584-5913, FAX: 818-303-5484; Empl.: 109; *Sls. Mgr.:* G.L. Ives, Dir. Mktg. & Sls.

Consolidated electronic wire & cable

FAX: 708-455-8979

CONSOLIDATED ELECTRONIC WIRE & CABLE, 11044 King St., Franklin Park, IL 60131-1412, Tel: 708-455-8830; FSC No.: 73612; Empl.: 97; *Sls. Mgr.:* Karl Rankin; *Dist. Mgr.:* Steve Boynton ..... **C•1726-1743**

Local Sales Offices & Reps

CT Glastonbury, Liberty Electro Mktg. 203-657-8023
AZ Phoenix, Mercury Engrg. Sls. 602-265-0344
CA Montrose, Signal Entprs. Inc. 818-957-0640
MA Topsfield, Liberty Electro Mktg. 508-887-6655
CO Boulder, The Stratford Grp. 303-530-3194
FL Casselberry, T.Squared Mktg. 407-699-9992
IL Franklin Pk., Con. Elec. Wire & Cable 708-455-8830
IL Highland Pk., Bransky Sls. 708-433-2375
IN Carmel, Frank E. Kahsar, Sls. Inc. 317-844-9353
IA Cedar Rapids, R. W. Kunz & Assocs. .. 319-396-5386
KS Prairie Village, R. W. Kunz & Assocs. .. 913-648-3535
MD Walkersville, Jadelectronic Assocs. 301-845-6036
MI Warren, Frank E. Kahsar 313-795-3530
MN Eden Prairie, PWC Inc. 612-934-1409
MO St. Louis, R. W. Kunz & Assocs. 314-966-4977
NY Buffalo, NRM Mktg. Group 716-634-4300
NY Woodside, Greater Metro Sls. 718-424-1911
OH Cincinnati, Frank E. Kansar Sls., Inc. .. 513-922-3133
OR Hillsboro, Doran Sls. Assocs., Inc. 503-640-4500
PA Birchrunville, Jadelectronic Assocs. 215-827-7122
TX Richardson, Barry Sls. Inc. 214-234-0255
WA Redmond, Doran Sls. Assocs., Inc. 206-885-1885
WI McQuon, E.A. Dickinson & Assocs. 414-241-9140

CONSOLINK, 600 S. Sunset, Longmont, CO 80501, Tel: 303-651-2642, FAX: 303-678-8360; Empl.: 25; *Sls. Mgr.:* Dan Zec

CONTACT, INC., 5 Elm Ave., Hudson, NH 03051, Tel: 603-883-7708, FAX: 603-883-6230; FSC No.: MO7015; Empl.: 11; *Sls. Mgr.:* R.Reid; *Dist. Mgr.:* R.Reid

CONTACT EAST, 335 Willow St. S., N. Andover, MA 01845, Tel: 508-682-2000, TELEX: 383088, FAX: 508-688-7829; *Sls. Mgr.:* Richard Sullivan

CONTAQ TECHNOLOGIES CORP., 15 Main St., Bristol, VT 05443, Tel: 802-453-3332, FAX: 802-453-4250; FSC No.: 6680 ..... **B•1889**

CONTEC MICROELECTRONICS USA, 2010 N. First Street, San Jose, CA 95131, Tel: 408-436-0340, FAX: 408-436-0206; Empl.: 50; *Sls. Mgr.:* Alan Yankoski

CONTINENTIAL DEVICE INDIA LIMITED, C-120 Naraina Industrial Area, New Delhi, India 110028, Tel: 536150-53 (4 lines), TELEX: 031-76209, TWX: 031-76230; FSC No.: I.J.; Empl.: 1100; *Sls. Mgr.:* Mr. P. Gulati, Gen. Mgr.

CONTINENTAL ELECTRONICS CORPORATION, P.O. Box 270879, Dallas, TX 75227, Tel: 214-381-7161, TELEX: 73-398, FAX: 214-381-4949; FSC No.: 52151; Empl.: 500

CONTINENTAL RESOURCES, Computer & Peripherals Div., 175 Middlesex Tpke., Bedford, MA 01730-1469, Tel: 617-275-0850, 800-937-4688, FAX: 617-275-6563; Empl.: 250; *Sls. Mgr.:* Mark Berling

CONTINENTAL RESOURCES, INC, Test Instruments Div., 175 Middlesex Tpke., Bedford, MA 01730, Tel: 617-275-0850, 800-937-4688, FAX: 617-275-2046; Empl.: 250

CONTINENTAL SPECIALTIES CORP., See Global Specialties Corp.

CONTINENTAL WIRE & CABLE, Gulton Rd., P. O. Box 1863, York, PA 17405, Tel: 717-792-2644, TELEX: 84-0437; Empl.: 250; *Sls. Mgr.:* Edward W. Holland III; *Dist. Mgr.:* Shirley A. Eisenhart

CONTOURS INC., 290 Pratt St., Meriden, CT 06450, Tel: 203-237-8331, FAX: 203-237-6353; FSC No.: 033501; *Sls. Mgr.:* Eugene D. Rodman

CONTROL CABLE, INC., 7261 Ambassador Rd., Baltimore, MD 21207, Tel: 301-298-4411, FAX: 301-265-1646; FSC No.: 510124759; Empl.: 90; *Sls. Mgr.:* Greg Jones; *Dist. Mgr.:* Greg Jones

CONTROL CONCEPTS CORP., Liebert Corp., P.O. Box 1380, Binghamton, NY 13902-1380, Tel: 607-724-2484, TELEX: 62224380, FAX: 607-722-8713; Empl.: 65; *Sls. Mgr.:* Pat Gillette, VP Sls.; *Dist. Mgr.:* Fred Zack

CONTROL DISPLAYS, INC., 3075 Advance Lane, P.O. Box 227, Colmar, PA 18915, Tel: 215-822-3383, FAX: 215-997-1232; FSC No.: 27878; Empl.: 75; *Sls. Mgr.:* L Rodrigue

CONTROL ELECTRONICS, Neurotech Corp., 139 Florida St., Farmingdale, NY 11735, Tel: 516-694-0125, FAX: 516-694-0133; FSC No.: 95924; Empl.: 35; *Sls. Mgr.:* Harold Goldstein; *Dist. Mgr.:* Barbara Kilroy

CONTROL ENGRG., INC., 190 Doty Circle, West Springfield, MA 01089, Tel: 413-781-1330, FAX: 413-732-3367; Empl.: 7; *Sls. Mgr.:* Mark Kimball

CONTROLEX, INC., 248 Francestown Tpke., New Boston, NH 03070, Tel: 603-487-5512, FAX: 603-487-2524; Empl.: 10; *Dist. Mgr.:* Patricia Butler

CONTROLEX/EANCO, See Fincor

CONTROL LASER CORP., 7503 Chancellor Dr., Orlando, FL 32809, Tel: 407-438-2500, TELEX: 514215; Empl.: 70; *Sls. Mgr.:* John Fitzgerald Sls. Mgr.

CONTROLLED ENVIRONMENTAL EQUIPMENT CORP., 3 Delta Drive, Westbrook, ME 04092, Tel: 207-854-9126, TELEX: 62903721, FAX: 207-854-4357; FSC No.: 25254; Empl.: 10; *Sls. Mgr.:* M. F. Peck

CONTROLLED POWER COMPANY

FAX: 313-528-0411

CONTROLLED POWER CO., 1955 Stephenson Hwy., Troy, MI 48083, Tel: 313-528-3700, 1-800-521-4792, TWX: 810-2323401; Empl.: 160; *Sls. Mgr.:* Reggie Peck ..... **D•2185-2189**

Local Sales Offices & Reps

AL	Homewood, Control Equip. & Sls.	205-945-8454
AK	Anchorage, Alaska Computer Environment	907-243-1429
CA	Foster City, Computer Support Sys.	415-572-9994
CA	Torrance, EDP ENV.	213-370-7446
CO	Denver, Computer Facility Components	303-778-8488
CO	Denver, Computer Facility Comps.	303-778-9131
CO	Denver, Innovative Tech.	603-624-4163
IL	Schaumburg, Protech	708-885-2040
MD	Towson, H. L. Frey Corp.	301-821-0058
MO	St.Louis, Rail Way Industry	314-966-3300
NM	Albuquerque, Sun Data Systems	505-272-1022
NC	Charlottte, Glen & Larson of Carolina	704-365-5917
OH	Westerville, Power Com Systems	614-890-1124
PA	Glenshaw, H.C. Johnson Agencies Inc.	412-487-1246
TN	Nashville, Jenkins & Associates	615-256-7606
TX	Richardson, Tubbesing Sales Corp.	214-234-3855
VA	Alexandria, ADAPT	703-684-6393
VA	Virginia Beach, Precision Environments	804-473-8767
Can	Againcourt, Ontario, Aircom Sales Inc.	416-293-3339
Can	Burnaby, BC, Datasphere Sales Ltd.	604-420-6040
Can	Calgary, AB, Datasphere Sales Ltd.	403-244-3666
Can	Dorval,PQ, Datasphere Sales Ltd.	514-631-7209
Can	Edmonton, AB, Datasphere Sales Ltd.	403-483-7979
Can	Halifax, NX, Datasphere Sales Ltd.	902-423-2246
Can	Mississauga, ON, Datasphere Sales Ltd.	416-278-5501
Can	N. Vancouver, B.C., Jerome & Francis Co. Ltd.	604-986-1286
Can	Nepan, On, Datasphere Sales Ltd.	613-723-2582
Can	Regina, SK, Datasphere Sales Ltd.	306-565-0421
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Can	Winnipeg, MB, Datasphere Sales Ltd.	204-943-7102

CONTROL LOGIC, See Hancock Electronics Corp.

CONTROL MICROSYSTEMS INC., 2049 Cohen St., St. Laurent, QC, Canada H4R 9Z7, Tel: 514-745-1270, FAX: 514-745-1610; Empl.: 25; *Sls. Mgr.:* Allan Erion; *Dist. Mgr.:* Scott McMeekin

CONTROL MODULE, 380 Enfield St., Enfield, CT 06082, Tel: 203-745-2433, TELEX: 643167, FAX: 203-741-6064; Empl.: 160; *Sls. Mgr.:* James W. Bianco

CONTROL PRODUCTS, INC., 280 Ridgedale Ave., E. Hanover, NJ 07936, Tel: 201-887-9400, FAX: 201-887-5083; FSC No.: 81901; Empl.: 62; *Sls. Mgr.:* H.M. Stuhler; *Dist. Mgr.:* H.M. Stuhler

CONTROL RESOURCES INC., SMART FAN DIV., POB 315, Harvard, MA 01451, Tel: 508-772-4043, FAX: 508-772-4142; Empl.: 7; *Sls. Mgr.:* James Quirk

CSI CONTROL SCIENCES INCORPORATED

FAX: 818-709-8546

CONTROL SCIENCES, INC., 9509 Vassar Ave., Chatsworth, CA 91311, Tel: 818-709-5510, TELEX: 4970496(CSI); FSC No.: 53317; Empl.: 20; *Sls. Mgr.:* Rhod Zimmerman ..... **D•1152-1157**

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CA	Luguna Niguel, Aktron Sls.	714-496-5057
CO	Broomfield, Hannah-Hill	303-460-0602
IN	Ft. Wayne, Naunas Sls. Co.	219-432-4792
MA	Salem, Forbes Engrg.	508-744-1693
MD	Annapolis, Homersmith Inc.	301-269-6493
MN	St. Paul, Northstar Motion & Control	612-770-5311
NY	E. Rochester, A & D Dvcs.	716-385-2778
NY	Victor, A & D Dvcs.	716-385-2778
NC	Jamestown, Homersmith, Inc.	919-883-3999
PA	Downington, Homersmith, Inc.	215-269-3637
PA	Media, Homersmith Inc.	215-543-2434
TX	Dallas, McDonald Assocs.	214-239-3293
Can	Nepean, Ont., Electrodesign, Ltd.	613-727-5220

CONTROLS UNLIMITED, INC., 4823 North Ridge Rd., Perry, OH 44081, Tel: 216-259-2500, FAX: 216-259-5015; Empl.: 45; *Sls. Mgr.:* Paul Adams

CTC

FAX: Fax 718-361-6386

CONTROL TECHNOLOGY CO., INC., 41-16 29th St., Long Island City, NY 11101, Tel: 718-361-2133; FSC No.: 14545; Empl.: 35; *Sls. Mgr.:* H. Cooper ... **D•2240-2241**

Local Sales Offices & Reps

Can Montreal, Que., Control Tech. Elctrns. CTC Canada 514-733-3279,FAX:514-733-2132

CONTROL TECHNOLOGY, INC., 7608 N. Hudson, Oklahoma City, OK 73116, Tel: 405-840-3163, FAX: 405-848-0489; *Sls. Mgr.:* Charles Weddington; *Dist. Mgr.:* Charles Weddington

CONVER CORP., 916 W. Maude Ave., Sunnyvale, CA 94086, Tel: 408-739-9111, TWX: 910-338-2036, ESYLNK: 62024309, FAX: 408-739-9116; Empl.: 40; *Sls. Mgr.:* Robert Lloyd; *Dist. Mgr.:* Sherri Kirkpatrick

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CONVERSION DEVICES, INC., 15 Jonathan Drive, Brockton, MA 02401, Tel: 508-559-0880; Empl.: 65; *Sls. Mgr.:* Wayne Carlson ..... **D•1690-1691**

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs., Inc.	407-724-0920
AZ	Phoenix, Howe & Howe, Sls.	602-264-7971
CA	Camarillo, The Tricamo Co.	805-388-0039
CA	Redwood City, Sales One	415-369-3677
CA	San Diego, The Tricamo Co.	619-689-1000
CO	Englewood, Odyssey 1	303-773-8176
CT	Fairfield, Bossaco	203-255-2326
FL	Melbourne, Saber Assocs., Inc.	407-724-0920
FL	Orlando, Saber Assocs., Inc.	407-724-0920
GA	Lawrenceville, Saber Assocs.	404-962-8740
IL	Elmhurst, Sector Engrg. Sls.	708-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-253-9221
KS	Overland, Atech	913-362-1200
MD	Ellicott City, VPI	301-461-2525
MA	Scituate, N.E.A.R.	617-545-6327
MI	Livonia, Electro Sls. Assocs.	313-421-7500
MN	Minneapolis, Sector Engrg. Sls.	612-378-2123
MO	St. Charles, Atech	314-949-9075
NJ	Paramus, Eltech Sls., Inc.	201-967-1309
NM	Albuquerque, H.E.R. Elctrns.	505-265-7893
NY	Liverpool, R & D Assocs.	315-457-0100
NC	Clayton, Saber Assocs.	407-724-0920
OH	Dayton, Electro Sls. Assocs.	513-426-5551
OK	Tulsa, D. J. Sls.	918-663-8155
OR	Portland, SPS Elctrns.	503-697-7768
PA	Dresher, CMS Mktg.	215-885-4424
PA	Pittsburgh, Electro Sls. Assocs.	412-322-9000
TX	Austin, D.J. Sls.	512-258-3002
TX	Dallas, D.J. Sls.	214-783-8876
UT	Salt Lake City, Odyssey 1	801-485-4728
WA	Redmond, SPS Elctrns.	206-794-0154
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280
Can	Mississauga, Ontario, Andy Baumen Assocs. Ltd.	416-828-2600

CONVERTER CONCEPTS, INC., Industrial Pkwy., Pardeeville, WI 53954, Tel: 608-429-2144, FAX: 608-429-9241; Empl.: 125; *Sls. Mgr.:* Rick Hartt ... **D•1692-1693**

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech	205-880-0592
CA	Hayward, Pacific Mktg.	415-887-1620
CA	Irvine, Groh Assocs.	714-837-9871
CA	San Diego, Groh Assocs.	619-673-4321
FL	Clearwater, Tech Rep	813-572-9900
CO	Denver, NOW Devices	303-758-4884
AZ	Phoenix, Shefler-Kahn Co., Inc.	602-257-9015
IL	Des Plaines, Consult Factory	608-429-2144
KS	Shawnee, Lowell Kanges & Assocs.	913-631-0517
MD	Cockeysville, Koebert Assocs.	301-560-1926
MA	Chelmsford, Interstate Sls. Assocs.	617-256-2287
MI	Livonia, Electro Mktg.	313-421-7590
MI	Muskegon, Electro Mktg.	616-798-1912
MN	Minneapolis, Holmgren Assoc.	612-574-9983
GA	Norcross, Electro-Mech	404-447-6478
MO	St. Louis, Lowell Kangas & Assocs.	314-821-4050
NY	Rochester, APEX Assoc.	716-272-7040
OH	Cleveland, Electro Mktg.	216-582-0075
OH	Vandalia, Electro Mktg.	513-890-8322
PA	Glenside, Koebert Assoc.	215-887-2310
PA	Pittsburgh, JFCO	412-823-5400
TX	Houston, Scientific Sls. Co.	713-645-6218
TX	Richardson, Scientific Sls. Co.	214-231-6541
UT	Salt Lake City, Consult Factory	608-429-2144
WA	Kirkland, Northwest Comp. Sls.	206-828-2104
WV	Inwood, Koebert Assocs.	304-229-8401
WI	Sullivan, Consult Factory Inc.	608-429-2144
Can	Rexdale, Valtine Mktg.	416-851-0335
Can	Vancouver, BC, Davetek Mktg.	604-430-3680

Local Distributors

CA	San Jose, Delta Lu Research	408-403-0490
Can	Rexdale, Valtme Mktg.	416-851-0355

CONVERTER POWER, INC., 123 Brimbal Ave., Beverly, MA 01915, Tel: 508-927-8158, FAX: 508-922-9466; *Sls. Mgr.:* Barry Essig

COOKE VACUUM PRODS., INC., 13 Merritt St, Norwalk, CT 06854, Tel: 203-853-9500, FAX: 203-838-9553; Empl.: 45; *Sls. Mgr.:* Louis W. Genuario

THE COOL-AMP CONDUCTO-LUBE CO., 15834 Upper Boones Ferry Rd., Lake Oswego, OR 97035, Tel: 503-624-6426, FAX: 503-624-6436; FSC No.: 31628; Empl.: 7; *Sls. Mgr.:* Marian Bomber

COONER WIRE CO., 9186 Independence Ave., Chatsworth, CA 91311, Tel: 818-882-8311, TELEX: 353734 Cooner Wire UD, FAX: 818-709-8281; *Sls. Mgr.:* Steven W. Smith

COOPER INDUSTRIES/BELDEN DIV., P.O. Box 1980, Richmond, IN 47375, Tel: 317-983-5200, 800-BELDEN-1, TWX: 810-345-1393, FAX: 317-983-5294; Empl.: 3500; *Sls. Mgr.:* Rick Schneidewind, Dir. OEM Sls.; *Dist. Mgr.:* Mike Murphy, Dir. of Dom. Sls.

COOPER TOOLS, PO Box 30100, Raleigh, NC 27622, Tel: 919-781-7200, TELEX: 579497

CO-ORD SWITCH DIV., See LVC Inds., Inc.

COORS CERAMICS CO., Electronic Products Group, 17750 W. 32nd Ave., Golden, CO 80401, Tel: 303-277-4592, FAX: 303-277-4779; Empl.: 1700

COPAL (USA), INC., 2291 205th St, Ste. 105, Torrance, CA 90501, Tel: 213-618-0225, FAX: 213-618-9984; *Sls. Mgr.:* Hugh Namekawa

CORBY INDUSTRIES, INC., 1501 E. Pennsylvania St, Allentown, PA 18103, Tel: 215-433-1412, FAX: 215-435-1963; Empl.: 31; *Sls. Mgr.:* Sharon Cain; *Dist. Mgr.:* Sharon Cain

CORCOM, INC., 1600 Winchester Rd., Libertyville, IL 60048, Tel: 708-680-7400, FAX: 708-680-8169; FSC No.: 05245; Empl.: 800; *Sls. Mgr.:* George Mitchell, VP; *Dist. Mgr.:* Ken Bons ..... **A•1610-1611; C•1330-1331**

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CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, Westrep	619-566-6580
CO	Westminster, Straube Assocs.	303-426-0890
CT	Madison, Conti-Younger Assocs.	203-245-1136
GA	Norcross, Robert O. Whitesell	404-449-9190
ID	Boise, Jas J. Backer Co.	208-343-9831
IL	Itasca, Beta Technlg. Sls. Inc.	708-250-9586
IN	Ft. Wayne, Robert O. Whitesell	219-432-5591
IN	Indianapolis, Robert O. Whitesell	317-876-9000
IN	Kokomo, Robert O. Whitesell	317-457-9127
KS	Overland Pk., Spectrum Sls.	913-648-6811
KY	Versailles, Robert O. Whitesell	606-873-1182
MA	Burlington, Conti-Younger Assocs.	617-273-1582
MI	Grand Rapids, Robert O. Whitesell	616-942-5420
MI	Southfield, Robert O. Whitesell	313-352-5454
MI	St. Joseph, Robert O. Whitesell	616-983-7337
MN	Edina, Mel Foster Co.	612-941-9790
MO	Florissant, Spectrum Sls.	314-921-1313
MO	Hazelwood, Spectrum Sls.	314-731-5151
NJ	Englewood, MOS Mktg.	201-569-2071
NM	Albuquerque, Rontek, Inc.	505-299-4124
NY	Great Neck, MOS Mktg.	516-487-3966
NY	Skaneateles, Empire Tech Sls.	315-685-5703
NC	Raleigh, Zucker Assoc.	919-782-8433
OH	Cincinnati, Robert O. Whitesell	513-521-2290
OH	Cleveland, Robert O. Whitesell	216-447-9020
OH	Columbus, Robert O. Whitesell	614-888-9396
OH	Dayton, Robert O. Whitesell	513-298-9546
OR	Beaverton, Jas. J. Backer Co.	503-627-0775
PA	Pittsburgh, Robert O. Whitesell	412-963-6161
PA	Trevose, Professional Svc. Assoc.	215-245-0513
TN	Knoxville, Robert O. Whitesell	615-694-9476
TX	Austin, K & H Sls.	512-339-7950
TX	Plano, K & H Sls.	214-423-6520
UT	Salt Lake City, Straube Assocs.	801-263-2640
WA	Seattle, Jas. J. Backer Co.	206-285-1300
WI	Milwaukee, Beta Technlg. Sls. Inc.	414-543-6609
Can	Ontario, R.N. Longman	416-670-8100

Local Distributors

AL	Huntsville, Pioneer	205-837-9300
AL	Huntsville, Marshall Inds.	205-881-9235
AZ	Phoenix, Marshall Inds.	602-496-0290
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CA	Calabasas, Lex	818-880-9686
CA	Chatsworth, Marshall Inds.	818-407-0101
CA	Gardena, Cal Switch	213-770-2330
CA	Irvine, LEX	714-863-0200
CA	Irvine, Marshall Ind.	714-458-5395
CA	Milpitas, Marshall Ind.	408-942-4600
CA	Sacramento, LEX	916-364-0222
CA	San Diego, Lex	619-495-0015
CA	San Diego, Marshall Ind.	619-578-9600
CA	San Jose, Lex	619-495-0015
CA	Sunnyvale, CAPSCO	408-734-3020
CO	Thornton, Marshall Ind.	303-451-8444
CT	Wallingford, Greene Shaw	203-265-3333
FL	Altamonte Springs, Marshall Inds.	407-767-8585
FL	Altamonte Springs, Pioneer	407-834-9090
FL	Deerfield Beach, Pioneer	305-771-7520
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Hammond Elctrns.	407-849-6060
FL	Tampa, Marshall Ind.	813-573-1399
GA	Norcross, Hammond	404-449-1996
GA	Norcross, Marshall Ind.	404-923-5750
ID	Boise, Radar Elec.	208-336-2227
IL	Addison, Pioneer/Chicago	708-495-9831
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Palatine, OHM Elctrns.	708-359-5500
IN	Indianapolis, Marshall	317-297-0483
IN	Indianapolis, Pioneer	317-573-0880
MD	Baltimore, Resco/Baltimore	301-529-0500
MD	Beltsville, Resco/Washington	301-937-9100
MD	Gaithersburg, Pioneer	301-921-0660
MA	Newton, Greene Shaw	617-969-8900
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Wilmington, Marshall Inds.	508-658-0810
MI	Grand Rapids, Pioneer	616-698-1800
MI	Livonia, Marshall Inds.	313-525-5820
MI	Livonia, Pioneer	313-525-1800
MN	Eden Prairie, Pioneer/Twin Cities	612-944-3355
MN	Minneapolis, Newark Elect	612-331-6350
MN	St. Paul, Gopher Elctrns.	612-483-3322
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Bellmawr, Mid Atlantic Elctrns. Corp.	609-931-5303
NJ	Fairfield, Marshall Inds.	201-882-0320
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Fairport, Pioneer	716-381-7070
NY	Hauppauge, Sager	516-348-1300
NY	Mt. Vernon, All American	914-699-2224
NY	Rochester, Lex	716-328-3230
NY	Rochester, Summit Distrs.	716-334-8110
NY	Woodbury, Pioneer	516-921-8700
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NC	Raleigh, Marshall Inds.	919-878-9882
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OH	Dayton, Pioneer	513-236-9900
OH	Solon, Marshall	216-248-1788
OR	Beaverton, Almac Elctrns.	503-629-8090
OR	Beaverton, Marshall Inds.	503-644-5050
OR	Portland, Radar	503-232-3404
PA	Horsham, Pioneer	215-674-4000
PA	Philadelphia, Sager	215-464-4336
PA	Pittsburgh, Pioneer	412-782-2300
TX	Austin, Marshall Inds.	512-837-1991
TX	Austin, Pioneer	512-835-4000
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TX	Dallas, Pioneer	214-386-7300
TX	Houston, Marshall Inds.	713-895-9200
TX	Houston, Pioneer	713-988-5555
UT	Salt Lake City, Marshall Inds.	801-485-1551
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CA	Valencia, C & N Assocs.	805-254-5844
CO	Littleton, Megatronix	303-730-6262
CT	Branford, Coakley, Boyd & Abbett	203-481-2218
FL	St. Petersburg, QXI Inc.	813-894-4556
KS	Overland Park, Electri-Rep	913-649-2168
MD	Gaithersburg, Naudain Assoc. Southern, Inc.	301-258-5040
MI	Madison Heights, Pine Sales, Inc.	313-589-0350
MN	Eden Praire, PWC Incorporated	612-934-1409
MO	St. Louis, Electra-Rep	314-993-4421
NJ	Leonia, Peter E. Schmitt Co., Inc.	201-944-2806
NC	Raleigh, Prime Comps., Inc.	919-850-9866
OH	Richfield, The Lyons Corp.	216-659-9224
OR	Portland, Northwest Mktg. Assoc.	503-620-0441
SC	Easly, RA Sls.	803-859-1859
TN	Chattanooga, Indl. Mktg. & Sls., Inc.	615-894-2219
TX	Richardson, Comp. Partners, Inc.	214-644-1288
UT	Salt Lake City, Charles Fields & Assocs.	801-531-6177
WI	Waukesha, Eagle Tech. Sls.	414-896-0633
PR	San Juan, P.R., E.T.S. Inc.	809-798-1300
Can	Mississauga, Ont., Source Elctrns.	416-676-0830

Local Distributors

AZ	Phoenix, Arizona Comps.	602-269-5655
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CA	Los Angeles, Bell Inds.	213-826-6778
CA	Milpitas, California Capacitor	408-262-6000
CA	Sunnyvale, Capsco Sls.	408-734-3020
CA	Tustin, Projections Unlimited	714-544-2700
CO	Aurora, Capstone Elctrns.	303-375-1300
CO	Denver, Integrated Elctrns. Corp.	303-292-5537
FL	Boca Raton, NRC Elctrns.	407-241-8600
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Chicago, Waldom Elctrns.	312-585-1212
IL	Palatine, OHM Elctrns.	708-359-5500
MA	Newton, The Greene-Shaw Co.	617-969-8900
MN	St. Paul, Shelley/Ragon	612-642-2828
NY	Central Islip, Semi Cap Elctrns.	516-582-4400

NY Hauppauge, JACO Elctrns. 516-273-5500
NY Mamaroneck, New Yorker Elctrns. 914-698-7600
NY Port Chester, Zeus Comps. 914-937-7400
NY Rome, Rome Elctrns. 315-337-5400
OH Cleveland, Pioneer-Standard 216-587-3600
PA No. Versailles, CMD Elctrns. 412-678-6020
TX Dallas, Hallmark Elctrns. 214-553-4300
TX Fort Worth, TTI, Inc. 817-740-9000
TX Houston, Sterling Elctrns. 713-627-9800
WI Milwaukee, Marsh Elctrns. 414-475-6000

CORNELL-DUBILIER ELCTRNS. (CORPORATE HEADQUARTERS), 1700 Route 23 North, Wayne, NJ 07470, Tel: 201-694-8600; Empl.: 1000; *Sls. Mgr.:* A. Cavuto ..... **A•1052-1053**

Local Sales Offices & Reps
CA San Diego, C & N Assocs. 619-279-0420
CA Valencia, C & N Assocs. 805-254-5844
CO Littleton, Megatronix 303-730-6262
CT Branford, Coakley, Boyd & Abbett 203-481-2218
FL St. Petersburg, QXI, Inc. 813-894-4556
KS Overland Park, Electri-Rep. 913-649-2168
MD Gaithersburg, Naudain Assoc. Southern, Inc. 301-258-5040
MI Madison Hgts., Pine Sls., Inc. 313-589-0350
MN Eden Prairie, PWC Inc. 612-934-1409
MO St. Louis, Electri-Rep 314-993-4421
NJ Leonia, Peter E. Schmitt Co., Inc. 201-944-2806
NC Raleigh, Prime Comps. Inc. 919-850-9866
OH Richfield, The Lyons Corp. 216-659-9224
OR Portland, Northwest Mktg. Assocs. 503-620-0441
SC Easly, RA Sls. 803-859-1859
TN Chattanooga, Indl. Mktg. & Sls., Inc. ... 615-894-2219
TX Richardson, Comps. Partners, Inc. 214-644-1288
UT Salt Lake City, Charles Fields & Assocs. 801-531-6177
WI Waukesha, Eagle Tech. Sls. 414-896-0633
PR San Juan, E.T.S. Inc. 809-798-1300
Can Mississauga, Ont., Source Elctrns. 416-676-0830

Local Distributors
AZ Phoenix, Arizona Comp. Co. 602-269-5655
CA Compton, Harper Sid 213-979-5090
CA Los Angeles, Bell Inds. 213-826-6778
CA Milpitas, California Capacitor 408-262-6000
CA Sunnyvale, Capsco Sls. 408-734-3020
CA Tustin, Projection Unlimited 714-544-2700
CO Aurora, Capstone Elctrns. 303-375-1300
CO Denver, Integrated Elctrns. Corp. 303-292-5537
FL Boca Raton, NRC Elctrns. 407-241-8600
IL Chicago, Newark Elctrns. 312-784-5100
IL Chicago, Waldom Elctrns. 312-585-1212
IL Palatine, OHM Elctrns. 708-359-5500
MA Newton, Greene-Shaw, Co. 617-969-8900
MN St. Paul, Shelley-Ragon 612-642-2828
NY Central Islip, Semicap Elctrns. Corp. ... 516-582-4400
NY Hauppauge, Jaco Elctrns., Inc. 516-273-5500
NY Mamaroneck, New Yorker Elctrns. 914-698-7600
NY Port Chester, Zeus Comps. 914-937-7400
NY Rome, Rome Elctrns. 315-337-5400
OH Cleveland, Pioneer-Standard 216-587-3600
PA N. Versailles, CMD Elctrns. 412-678-6020
TX Dallas, Hallmark Electronics 214-553-4300
TX Ft. Worth, TTI, Inc. 817-740-9000
TX Houston, Sterling Elctrns. 713-627-9800
WI Milwaukee, Marsh Elctrns. 414-475-6000

CORNELL MANUFACTURING, An Elgin Co., 25 Ramland Road, Orangeburg, NY 10962, Tel: 914-365-0400, FAX: 914-359-6809; Empl.: 50; *Sls. Mgr.:* Lou Schnur; *Dist. Mgr.:* Lou Schnur

CORNING GLASS WORKS, Materials Business, Main Plant, MP 21-3, Corning, NY 14831, Tel: 607-974-7149, TELEX: 932498, FAX: 607-974-7618; *Sls. Mgr.:* Paul Marx; *Dist. Mgr.:* Dennis Naylor

Local Distributors
CA Los Angeles, Leed Plastics Corp. 213-746-5984
CA Santa Clara, San Jose Delta Assocs., Inc. 408-727-1448
IL Addison, Circle Fabrication, Inc. 708-543-4440
NJ Palisades Pk., Morgan Matroc Inc. 201-947-8313
NJ Washington, Accuratus Ceramic Corp. 201-689-0880
OH Cincinnati, Astro Met Assocs., Inc. 513-772-1242
TX Houston, EGC Corp. 713-447-8611
WI Hubertus, Tech. Prods., Inc. 414-628-2768
Can Ontario, Johns Scientific 416-699-1731

CORNING INCORPORATED, Opto-Electronics Group, MP-RO-03, Corning, NY 14831, Tel: 607-974-7914, FAX: 607-974-4914; Empl.: 26,000

CORTEC, INC., 15672 Chemical La., Huntington Bch., CA 92649, Tel: 714-897-2529, FAX: 714-897-2170; Empl.: 35

CORTRON DIV., See ITW Cortron,Illinois Tool Works

CORTRON INC., 1 Aegean Dr., Methuen, MA 01844, Tel: 508-975-5445, FAX: 508-975-0357; Empl.: 75; *Sls. Mgr.:* Philip P. Bodoni ..... **B•1803**

CORVUS MICROWAVE INC., 6075 E. Molloy Rd., Syracuse, NY 13211-2100, Tel: 315-437-4400, FAX: 315-437-8095; FSC No.: 26058; Empl.: 35; *Sls. Mgr.:* Diane L. Conklin

COSMO CORPORATION, 3239 W. 14th St., Cleveland, OH 44109, Tel: 216-861-5594, FAX: 216-861-0416; Empl.: 350; *Sls. Mgr.:* B. Gordon

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FAX: 401-942-0920

COTO WABASH, Kearney National Corporation, 55 DuPont Drive, Providence, RI 02907, Tel: 401-943-2686; Empl.: 300; *Sls. Mgr.:* John E. Beigel, Dir. Mktg. & Sls.; *Dist. Mgr.:* David MacRae, Natl. Sls. Mgr. ..... **B•1441-1445**

Local Sales Offices & Reps
AL Owens Cross Rds., cmrCross Assocs. 205-883-5991
AZ Phoenix, Spectrum Mktg. Assocs., Inc. 602-890-9000
CA Newport Bch., Forbes Pacific Inc. 714-722-6174
CA Saratoga, Testco Inc. 408-253-1900
CO Denver, Spectrum Sls. 303-480-9991
DE Hunt Valley, Eagle Sls. Corp. 301-666-3930
DC Hunt Valley, Eagle Sls. Corp. 301-666-3930
FL Orlando, Standard Mktg. 407-856-4140
FL Sunrise, Standard Mktg. 305-749-5557
FL Tampa, Standard Mktg. 813-933-5833
IL Arlington Hgts., M.J. Petersen & Assocs. 708-577-8200
IN Ft. Wayne, M/S Sls. & Assocs. 219-436-3023
IN Greenwood, M/S Sls. & Assocs. 317-881-0110
IA Cedar Rapids, Midwest Tech. Sls. Inc. 319-393-5115
KS Goddard, Midwest Tech. Sls. Inc. 316-794-8565
KS Lenexa, Midwest Tech. Sls. Inc. 913-888-5100
MD Hunt Valley, Eagle Sls. Corp. 301-666-3930
MA Andover, Crawford Assocs. 508-470-2122
MN Roseville, TLC 612-483-2226
MO Earth City, Midwest Tech. Sls. Inc. 314-298-8787
NY Clifton Pk., Net Sls. 518-371-6864
NY Cortland, Net Sls. 607-756-6592
NY Great Neck, MOS Mktg. Assocs. 516-487-3966
NY Victor, Net Sls. 716-924-1844
NC Charlotte, Godwin Assocs. 704-549-8500
NC Raleigh, Godwin & Assoc. 919-878-8000
OR Oregon City, Halbar Pacific 503-656-3714
PA Trevose, Omega Elctrn. Sls. 215-244-4000
MA Swansea, Wm. Poisson & Assocs. 508-677-3655
TX Plano, Richmar Elctrns. 214-424-8388
TX Round Rock, Richmar Elctrns. 512-255-2551
UT Ogden, Spectrum Mktg. Assocs. Inc. .. 801-972-8552
WA Redmond, Halbar Pacific 206-882-0990
Can Pointe Claire, Que., A. R. Gray Assocs. 514-694-6378

Local Distributors
CA San Diego, Pyramid Elect. Supp. Inc. .. 619-271-5404
CA Santa Clara, Pyramid Elect. Supp. Inc. 408-727-9810
CA Santa Monica, Master Distrs. 213-452-1229
CA Saratoga, Testco Inc. 408-253-1900
CA Sunnyvale, Spirox 408-739-3334
CA Torrance, Pyramid Elect. Supp. Inc. ... 714-773-0781
CO Denver, Spectrum Distrbn. 303-480-9991
FL W. Melbourne, Astro Mktg. 407-727-8817
IL Bedsville, Voyager Elect. Corp. 708-860-1300
IL Elk Grove Village, Nu-Way Elect. Dist., Inc. 708-437-7120
MA Andover, Aved Elect. Inc. 508-688-3800
MA Sandwich, J.V. Elctrns. 508-833-0700
MN Fridley, Voyager Elect. Corp. 612-571-7766
NJ Oakland, Relay Specialties 201-337-1000
NY Buffalo, Summit Dist. 716-887-2800
NY Rochester, Masline Elect., Inc. 716-546-5373
OK Tulsa, Altair Co. 918-252-5781
CA Saratoga, Testco, Inc. 408-253-1900
PA Philadelphia, SHAP Elect. Co. 215-969-3300
TX Ft. Worth, Allied Elec. 817-595-3500
TX Austin, Altair Co. 512-837-4970
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
UT Ogden, Spectrum Mktg. Assocs., Inc. .. 801-972-8552
WA Redmond, Pyramid Elect. Supp., Inc. .. 206-883-7200

COTRONICS, 3379 Shore Pkwy., Brooklyn, NY 11235, Tel: 718-646-7996, FAX: 718-646-3028; Empl.: 15; *Sls. Mgr.:* Alan Marks

COUTANT LAMBDA LTD., Kingsley Ave., Ilfracombe, Devon, England EX34 8ES, Tel: (0271) 863781, TELEX: 46310, FAX: (0271)64894; Empl.: 330; *Sls. Mgr.:* Nigel Davies; *Dist. Mgr.:* Nigel Davies

COVER CRAFT CORP., See Amherst International Corp., Cover Craft Div.

COVID, INC., 2400 W. 10th Place, Tempe, AZ 85281, Tel: 602-966-2221, FAX: 602-966-6728; Empl.: 40; *Sls. Mgr.:* Suzanne Jones

COVOX, INC., 675 Conger St, Eugene, OR 97402, Tel: 503-342-1271, FAX: 503-342-1283; Empl.: 25; *Sls. Mgr.:* Larry Quateman

CPS, INC., 47341 Bayside Parkway, Fremont, CA 94538-6517, Tel: 415-657-6363, FAX: 415-657-7220; FSC No.: 31640; Empl.: 30; *Sls. Mgr.:* Clifford Gaw

CP TECHNOLOGY, INC., 21143 Christensen Drive, Cupertino, CA 95014, Tel: 408-996-8069, FAX: 408-986-8278; Empl.: 6

CRAFT DATA, INC., 27022 Cordero Lane, Mission Viejo, CA 92691, Tel: 714-582-8284, FAX: 714-248-2390; Empl.: 4

CRAIG SYSTEMS CORP., Eastern Technologies, Ltd., 10 Industrial Way, Amesbury, MA 01913-4848, Tel: 508-388-5662, TWX: 710-347-0590, FAX: 508-388-0845; FSC No.: 81902; Empl.: 150; *Sls. Mgr.:* Roger Chouinard

Cramer

FAX: 414-377-4028

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CA San Dimas, Dilectron 714-394-1356
CA Santa Clara, Fischer Assocs. 408-733-7350
CO Monument, Sunbird Inds. 303-481-2900
CT Bethany, The Reps. Corp. 203-393-0024
IL Palatine, Somers-Stanton 312-994-1108
IN Frankfort, C-S Elctrn. Sls. 317-659-1874
KS Overland Park, Q D C Inds. 913-341-2214
MA Wellesley, The Reps. Corp. 617-237-6476
MI Jackson, Norwood-Scroggs 517-750-1170
MN Eden Prairie, Hanna Lind 612-942-8554
NY Fulton, Carl Truax, Inc. 315-592-7184
NC Kernersville, Wallace Elctrns. Sls. 919-996-2742
TX Richardson, Barry Sls., Inc. 214-234-0255

CRAMER CO., 139 Mill Rock Road East, Old Saybrook, CT 06475, Tel: 800-247-6784, FAX: 203-388-9831; Empl.: 210; *Sls. Mgr.:* Joe Lenzo; *Dist. Mgr.:* E. Latourette

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CREARE INC., Etna Rd., P.O. Box 71, Hanover, NH 03755, Tel: 603-643-3800, FAX: 603-643-4657; FSC No.: 8A287; Empl.: 100

CREATIVE AUTOMATION CO., 11641 Pendleton St, Sun Valley, CA 91352, Tel: 818-767-6220, FAX: 818-767-0123; Empl.: 25; *Sls. Mgr.:* John Lee, Jr.

CREATIVE MICRO SYSTEMS, 3822 Cerritos Ave., Los Alamitos, CA 90720, Tel: 213-493-2484, FAX: 213-493-3553; Empl.: 15; *Sls. Mgr.:* Margaret E. Prossen

CRESTRONICS DIV., APPLIED ELECTRO TECHNLG., See STI-Crestronics Div.

CRISSMAN MANUFACTURING CO., 11004 Bakley St, Huntley, IL 60142, Tel: 708-669-3995, FAX: 708-699-5168

CRITERION INSTRS., LTD., 30 Progress Ave., Scarborough, Ont., CAN M1P4W8, Tel: 416-299-6666, FAX: 416-299-8398; Empl.: 16 ..... **D•1238-1239, 1694**

Local Sales Offices & Reps

IL	Chicago, Rock Sls. Inc.	708-351-9903
MI	Troy, Satullo Assocs. Inc.	313-585-4811
NC	Selma, Shalltronix Corp.	919-965-6346
OH	Cleveland, Abitec, Inc.	216-531-9122
PA	Abitec, Inc.	216-531-9122
TX	Lewisville, E.P.R.	214-436-4772
Can	Calgary, AI, Landel Controls	403-250-3553
Can	Montreal, Que., Projean Inst.	514-273-8331
Can	Richmond, B.C., John McMillan	604-273-1747
Can	Saskatchewan, Landel Controls	403-250-3553

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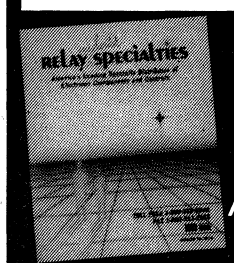

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CA	Santa Fe Springs, Bell Inds.	213-826-3975
CA	Gardena, CAL Switch	213-770-2330
CA	Pleasanton, Moulthrop Sls., Inc.	415-463-0450
CA	Sun Valley, Richey Western Elctrns.	714-895-0060
CA	Valencia, C & N Assocs., Inc.	805-254-5844
CO	Englewood, Quorum 3	303-799-8100
CT	Branford, Coakley, Boyd & Abbett	203-481-2218
FL	Ft. Lauderdale, Panamtech	305-587-3769
FL	Oviedo, Panamtech	407-679-5506
GA	Lawrenceville, Southeast Tech. Grp.	404-979-2055
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Chicago, Waldom Elctrns.	312-585-1212
IL	Rolling Meadows, Sumer, Inc.	708-991-8500
IN	Indianapolis, Leslie M. Devoe Co.	317-842-3245
IA	Cedar Rapids, Lorenz Sls., Inc.	319-377-4666
KS	Merriam, Lorenz Sls., Inc.	913-384-6556
KS	Wichita, Lorenz Sls.	316-721-0500
MA	Framingham, Coakley, Boyd, & Abbett, Inc.	508-820-0800
MA	Hingham, Sager Elctrl. Supp.	617-749-6700
MI	Grand Haven, Hilltronics, Inc.	616-847-1010
MI	Royal Oak, Hilltronics, Inc.	313-435-0920
MN	Minneapolis, Electric Comp. Sls., Inc.	612-933-2594
MS	Meridian, Southeast Tech. Grp.	601-485-7055
MO	St. Louis, Lorenz Sls., Inc.	314-997-4558
NE	Lincoln, Lorenz Sls., Inc.	402-475-4660
NJ	Englewood Cliffs, Ed Glass Assocs.	201-592-0200
NY	E. Rochester, Empire Tech. Assocs.,Inc.	716-381-8500
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Skaneateles, Empire Tech. Assoc.	315-685-5703
NC	Charlotte, RG Sls. Co., Inc.	704-531-0096
OH	Cleveland, Arthur H. Baier Co.	216-461-6161
OH	Dayton, Arthur H. Baier Co.	513-276-4128
OH	Dayton, Stotts Friedman Co.	513-298-5555
OH	West Chester, Arthur H. Baier	513-779-2395
OH	Worthington, Arthur H. Baier Co.	614-764-1144
OK	Tulsa, DJ Sls. & Assocs.	918-663-8155
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
PA	Narberth, Bresson Assocs.	215-664-6460
PA	Philadelphia, PEI/Genesis	215-673-0400
PA	Pittsburgh, Arthur H. Baier	412-367-7799
TX	Austin, D.J. Sls & Assocs.	512-258-3002
TX	Dallas, DJ Sls. & Assocs.	214-783-8876
TX	Dallas, Hall-Mark Elctrns.	214-343-5000
UT	Salt Lake City, Quorum 3	801-943-9227
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
WA	Spokane, Eclipse Mktg. Grp.	509-922-3972
WI	Brookfield, Sumer, Inc.	414-784-6641
Can	Pickering, Ont., McHugh Elctrns.	416-831-4773
Can	Vancouver, B.C., Arwin Tech. Sls.	604-980-4557

CR MAGNETICS, INC. (FORMERLY CURRENT RING CO., INC.), 304 Axminster Dr., Fenton, MO 63026, Tel: 314-343-8518, FAX: 314-343-5119; Empl.: 5 ..... **A•2194**

Local Sales Offices & Reps

MO	Fenton, CR Magnetics, Inc.	314-343-8518

Local Distributors

MO	St. Louis, ISL Corp.	314-423-3141,800-325-8653

CROMPTON METERMASTER INC., 2507 W. Erie Dr., Tempe, AZ 85282, Tel: 602-431-0015, FAX: 602-431-1836; *Sls. Mgr.:* Steve Alexander

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CROSSPOINT, Div. of Info-Lite Corp., 422 Cliff St., Fairview, NJ 07022, Tel: 201-941-4455, FAX: 201-941-4919; Empl.: 13; *Sls. Mgr.:* Joseph M. Cartelli ... **B•1673**

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Local Sales Offices & Reps

AZ	Scottsdale, FLEXTEC	602-585-3353
CA	San Ramon, C. F. M. Sls.	415-735-3601
CO	Denver, Ralph R. Pence & Assocs.	303-778-0484
FL	Lakeland, Munday Sls. Co.	813-858-5606
GA	Atlanta, Levine Lectronics	404-446-9326
IN	Indianapolis, Emsco Sls. & Engrg. Co.	317-251-7074
IA	Bettendorf, Custom Controls Ltd.	319-355-4787
MA	Beverly, Electro-Kinetics	508-921-1560
MA	Wellesley, Electro Kinetics	617-235-9415
MN	Albertville, J & B Assocs.	612-497-4660
MS	Jackson, Doby Assocs.	601-981-1138
MO	St. Louis, Control Tech. Sls. II, Inc.	314-469-6004
NY	Fairport, Tac Sls.	716-377-2250
NY	Plainview, Motion Control Sls.	516-756-5656
OH	Cincinnati, Bob Gilbert & Assocs.	513-574-1932
PA	Horsham, Jacobsen & Assocs.	215-674-2937
TX	Dallas, Blackburn & Assoc.	214-750-8484
UT	Salt Lake City, Advanced Control Equip.	801-485-0305
WA	Redmond, S.E.A., Inc.	206-883-4999
WA	Vancouver, Sea Inc.	206-573-5161
Can	Downsview, Ont., Tienkay Inc.	416-665-9546
Can	Longueuil, Que., Decofer	514-651-0285

Local Distributors

CA	Los Angeles, Master Distr.	213-452-1229
CA	San Carlos, Western Comp. Sls. N.	415-594-1222
CO	Colorado Springs, Summit Fasteners & Elec. Hdwe.	303-593-7700
FL	Davie, M.P. Assocs.	305-370-1317
FL	Lakeland, A. A. Elec.	813-665-6941
GA	Smyrna, Waffles Elec.	404-433-8377
IL	Chicago, Excel Elec.	312-421-7220
IL	Chicago, MC Master-Carr	312-834-9600
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Ft. Wayne, Bell Inds.	219-423-3422
IN	Indianapolis, Bell Inds.	317-634-8202
IN	Indianapolis, Control Des. Supp.	317-788-4559
IN	Indianapolis, Vonnegut Indl. Prods.	317-899-8800/8877
IA	Bettendorf, Custom Controls Ltd.	319-335-4787
MA	Norwell, Electro-Mechanical Distr.	617-826-9714
MI	Comstock Park, Mor Elec.	616-784-1121
MI	Grand Rapids, S-F Electronics	616-459-0216
MI	Royal Oak, George Instr. Co.	313-280-1111
MI	Saginaw, Fischer-Flack	517-752-4181
MN	St. Paul, Powermation	612-645-0781
NE	Omaha, Lakeland Engrg.	402-734-2600
NJ	Edison, Howman Applied Control Prods.	201-797-3313
NJ	Fair Lawn, Relay Specialties	201-797-3313
NC	Asheville, Electric Supply Co.	704-255-8899
NC	Gastonia, J.M.T. Elctrn. Supp.	704-867-4401
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cincinatti, Hughes-Peters.	513-351-2000
OH	Cleveland, Reserve Motion Control Sys.	216-826-0290
OH	Columbus, Hughes-Peters.	614-294-5351
OH	Dayton, Duellman Elctrns.	513-461-5010
OK	Tulsa, Radio Inc.	918-587-9123
PA	Allentown, P. A. Peters.	215-434-5237
SC	Greenville, Holder Elec. Supp.	803-271-7111
TX	Ft. Worth, Swieco.	817-335-6521
WA	Kent, Motors & Controls Corp.	206-872-8010
WA	Seattle, Eicher-Richards Co.	206-523-7888
WI	Waukesha, Powermation	414-542-2868
Can	St. Hubert, Que., Decofer	514-678-2252
Can	Willowdale, Ont., PS Comps.	416-498-0214

CROVEN CRYSTALS, 500 Beech St., Whitby, ON, Canada L1N 5S5, Tel: 416-668-3324, FAX: 416-668-5003; FSC No.: 00809; Empl.: 250; *Sls. Mgr.:* R. McCormick

CROZIER METROLOGY LAB, 529 N. Wolf Rd., Wheeling, IL 60090, Tel: 708-520-9085, FAX: 708-520-9150; Empl.: 5; *Sls. Mgr.:* Richard D. Crozier

CRYDOM COMPANY

FAX: 213-865-3318

CRYDOM COMPANY, P.O. Box 3699, Lakewood, CA 90711-3699, Tel: 213-865-3536, TWX: 910-250-5756; Empl.: 365; *Sls. Mgr.:* James L. Jensen; *Dist. Mgr.:* James L. Jensen ..... **A•2086-2092; B•1450-1455**

CRYOMAGNETICS, INC., 739 Emory Valley Rd., Oak Ridge, TN 37830, Tel: 615-482-9551, TELEX: 883 945, FAX: 615-483-1253; *Sls. Mgr.:* D. Michael Coffey

CRYSTAL ENGINEERING CORP., 1119 Los Olivos, Los Osos, CA 93402, Tel: 805-528-2155, 800-444-1850, FAX: 805-528-3113; Empl.: 10; *Sls. Mgr.:* Wayne Hamari; *Dist. Mgr.:* Wayne Hamari

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CSB/TAIWAN KOBE BATTERY CO., LTD., 3201 Alta Mere, Ft. Worth, TX 76116, Tel: 817-732-2258, FAX: 817-732-2019; *Sls. Mgr.:* Gregg Hubbard ..... **D•1437**

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IL Palatine, Technlg. Sls., Inc. 708-991-6600
IN Granger, Wolff Sls., Inc. 219-272-4388
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NC Raleigh, Electro Mech 919-790-9300
OH Lima, T.C. Co. 419-226-6952
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CA San Diego, Tauber Elctrns. 619-274-7242
FL Tampa, Micro Precision 813-854-2061
GA Doraville, Lighting Plastic Suppliers ... 404-448-9373
GA Smyrna, ERC Parts, Inc. 404-352-1626
TX Dallas, Sabayrae Power 214-637-5052

CSD INDUSTRIES, INC., dba C Enterprises , 310-110 Via Vera Cruz, San Marcos, CA 92069, Tel: 619-744-8182, 800-334-3815, 800-423-3345, TELEX: 6502969639MCI, FAX: 619-744-1659; Empl.: 37; *Sls. Mgr.:* Steve Rosoff, VP Sls.; *Dist. Mgr.:* Steve Yamasaki

C-S ELECTRONIC SALES, INC., 259 E. Walnut St., Frankfort, IN 46041, Tel: 317-659-1874, FAX: 317-659-4185; Empl.: 4

CSI Capacitors

FAX: 619-743-5094

CSI CAPACITORS, CSI Technologies, 810 Rancheros Dr., San Marcos, CA 92069, Tel: 619-747-4000, TELEX: 697832; FSC No.: 10026; Empl.: 50 .... **A•1055**

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MA Canton, New England Elctrn. Sls. 617-828-4835
NM Albuquerque, Cleveland Entprs. 505-265-7893
NY Cazenovia, S. T. Woolard 315-655-8145
OH Dayton, K. W. Elctrn. Sls. 513-890-2150
OR Tigard, Components West 503-684-1671
PA Allison Pk., KW Elctrn. Sls. 412-487-4300
SC Pickens, S.T. Woolard 803-878-3830
VA Lynchburg, ST/Woolard 804-528-5421
WA Redmond, Components West 206-885-5880
Can Richmond, BC, Macom Agencies 604-271-2661

CSTS, 4015 E. Leaverton Ct., Anaheim, CA 92807-1610, Tel: 714-632-1300, FAX: 714-632-1937; Empl.: 14

C-TEK INC., 4 Railroad Ave., Wakefield, MA 01880, Tel: 617-246-1720, FAX: 617-246-2905; Empl.: 15; *Sls. Mgr.:* John Vanaman; *Dist. Mgr.:* John Vanaman

CTI ELECTRONICS, 200 Benton Street, Stratford, CT 06497, Tel: 203-386-9779, TWX: 710-465-6349, FAX: 203-378-4986; Empl.: 19 ..... **D•1085**

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GA Marietta, Minerva Automation, Inc. 404-565-4528
MN Burnsville, TECHREP 612-891-4841
NH Manchester, Northeast Comps. 603-267-7702
NY New Hartford, PDQ Assocs. 315-793-3666
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AZ Phoenix, Compass Mktg. & Sls., Inc. 602-996-0635, FAX:602-996-0586
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CA Calabasas, Centaur Corp. 818-704-1655, FAX:818-704-7479
CA Irvine, Centaur Corp. 714-261-2123, FAX:714-261-2905
CA Los Altos, Ewing-Foley, Inc. 415-941-4525, FAX:415-941-5109
CA San Diego, Centaur Corp. 619-278-4950, FAX:619-278-0649
CO Denver, ELCOM, Inc. 303-337-2300, FAX:303-745-0462
CT Brookfield, CTS Corp. 203-740-9755, FAX:203-740-9747
CT Yalesville, CompRep Assocs. Inc. 203-269-1145, FAX:203-269-2819
FL Boca Raton, R.O. Whitesell & Assocs. 407-393-6193,FAX:407-393-6072
FL Longwood, R.O. Whitesell & Assocs. 407-682-6662,FAX:407-682-7038
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GA Norcross, R.O. Whitesell & Associates 404-449-9190,FAX:404-449-9197
IL Northbrook, Dolin Sls. Co., Inc. 708-498-6770, FAX:708-498-4885
IN Huntington, Elctrn. Reps., Inc. 219-356-3513, FAX:219-356-0337
IN Indianapolis, Elctrn. Reps., Inc. 317-894-1414, FAX:317-894-1216
IN Kokomo, R.O. Whitesell & Assocs. 317-457-9127
IA Cedar Rapids, Seltec Sls. Corp. 319-364-7660, FAX:319-364-7906
KS Olathe, Advanced Tech. Sls., Inc. 913-782-8702, FAX:913-782-8641
MD Lutherville, DGR, Inc. 301-583-1360, FAX:301-825-5579
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MN Minneapolis, S & R Comp. Sls., Inc. 612-559-3090, FAX:612-559-3153
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NM Albuquerque, Compass Mktg. & Sls., Inc. 505-344-9990,FAX:505-345-4848
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NC Raleigh, Zucker Assocs., Inc. 919-782-8433, FAX:919-782-8476
OH Columbus, Baehr, Greenleaf & Assocs., Inc. 614-847-0220,FAX:614-847-0233
OH Dayton, Baehr, Greenleaf & Assocs., Inc. 513-439-0724,FAX:513-439-0387
OH Westlake, Baehr, Greenleaf & Assocs., Inc. 216-892-1770,FAX:216-892-1771
OR Tigard, Vantage Corp. 503-620-3280, FAX:503-684-0676
PA Trevose, P.S.A. Inc. 215-245-0513, FAX:215-245-4817
PA Warrendale, Baehr, Greenleaf & Assocs. 412-934-3088,FAX:412-934-3990
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TX Austin, Southern States Mktg., Inc. 512-835-5822, FAX:512-835-1404
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TX Richardson, Southern States Mktg., Inc. 214-238-7500,FAX:214-231-7662
UT Murray, ELCOM, Inc. 801-262-2400, FAX:801-262-2583
WA Bellevue, Vantage Corp. 206-455-3460, FAX:206-455-9419
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CTS CORPORATION, Microelectronics business unit., 9210 Science Center Dr., New Hope, MN 55428, Tel: 612-533-3533, FAX: 612-533-3037; FSC No.: 16512; Empl.: 300; *Sls. Mgr.:* Steve Otto

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CTS CORP.,ELECTROCOMPONENTS BUSINESS UNIT (FORMERLY ELKHART DIV.), 1142 W. Beardsley Ave., Elkhart, IN 46514, Tel: 219-295-3575, FAX: 219-295-3580 ..... **B•1676-1677; D•1030**

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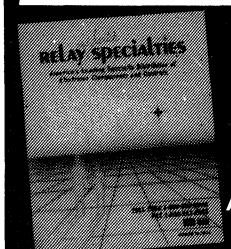

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CUBIT, Div. of Proteus Industries. Inc., 340 Pioneer Way, Mountain View, CA 94041, Tel: 415-962-8237, FAX: 415-965-9355; Empl.: 30; *Sls. Mgr.:* Jon Heiner

CUESTA SYSTEMS CORPORATION, 3440 Roberto Ct., San Luis Obispo, CA 93401, Tel: 805-541-4160, 800-332-3440, TELEX: 4949381 CUESTA; *Sls. Mgr.:* Dee Libin

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NJ	Newfoundland, Hosica Labs.	201-697-6111
NY	Great Neck, The Instr. Mart	516-487-7430
OR	Beaverton, Norvac Elctrns.	503-644-1052

CUNO, INC., Process Filtration Products, 400 Research Pkwy., Meriden, CT 06450, Tel: 203-237-5541, TELEX: 221083; Empl.: 700; *Sls. Mgr.:* Martin Mahard

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CURTIS INSTRUMENTS, INC., 200 Kisco Ave., Mt. Kisco, NY 10549, Tel: 914-666-2971, TWX: 710-571-2163; FSC No.: 18530; Empl.: 115; *Sls. Mgr.:* Jim Story ..... **D•1132**

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FL	Longwood, NSL Assocs.	407-629-5226
GA	L & D, Inc.	404-395-7079
IL	La Grange Park, Bierhaus Sls.	312-751-8088
MD	Advanced Tech. Sls.	301-323-3140
MA	Brookline, Harman Assocs.	617-232-6687
MN	Minnetonka, S.J. Collins & Assoc.	612-933-7661
MO	Acorn Elctrns.	314-421-1751
NY	Smith Tech. Sls.	716-223-5656
NY	Manhasset, WinCor Elctrn. Sls. Corp.	516-627-9474
OH	Chagrin Falls, T.E. Murphy Co.	513-692-8713
PA	W. Reeves Assocs.	215-356-7500
TX	Lektron	214-416-4585
WA	Seattle, Evergreen Mktg.	206-485-8063

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TX	Carrollton, Lektron	817-464-7784

CUSTOM BOBBIN WINDINGS, A & K Corporation, P.O. Box 2369, Zanesville, OH 43702-2369, Tel: 614-452-6973, FAX: 614-452-4156; Empl.: 16

CUSTOM CABLE CORP., 242 Butler St., Westbury, NY 11590, Tel: 516-334-3600, TELEX: 269301, FAX: 516-334-3989; Empl.: 20; *Sls. Mgr.:* J. Michelman; *Dist. Mgr.:* D. Pollack

CUSTOM COILS INC., Box 338, Alcester, SD 57001, Tel: 605-934-2460, FAX: 605-934-2440; FSC No.: 34808; Empl.: 75; *Sls. Mgr.:* Randy Larson ..... **A•2197**

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CO	Grand Junction, Krebill Comp. Sls.	303-243-8220
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CUSTOM CONNECTOR, 1738 E. 30th St., Cleveland, OH 44114, Tel: 216-241-1679, FAX: 216-241-1734; Empl.: 24; *Sls. Mgr.:* Larry Weider

CUSTOM CONTROL SENSORS, INC., 21111 Plummer Street, Chatsworth, CA 91313-2516, Tel: 818-341-4610, FAX: 818-709-0426; Empl.: 350; *Sls. Mgr.:* Charles Ritner

CUSTOM ELECTRONICS, Browne St., Oneonta, NY 13820, Tel: 607-432-3880, FAX: 607-432-3913; FSC No.: 23280; Empl.: 130; *Sls. Mgr.:* D. Hathaway

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CO	Englewood, Purdy Co. Assoc.	303-790-2211
CT	Guilford, Tynik, Inc.	203-453-1613
FL	Tampa, Standard Mktg.	813-933-5833
GA	Norcross, Lamons Sls.	404-242-2610
IL	Park Ridge, G. Mcl. Cole Co.	312-692-6040
IN	Greenfield, France Entprs.	317-462-6098
IN	Greenwood, Liberty Sls.	317-888-8396
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MD	Newton, Greene-Shaw Co.	617-969-8900
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MO	Kansas City, Ruffolo & Assocs.	816-471-5701
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TX	Dallas, Erickson Sls. Inc.	214-739-5833
WA	Bellevue, Eltech	206-643-4330
Can	Rexdale, True North Tech. Ltd.	416-744-2233

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CA	Santa Ana, BDS Elctrns., Inc.	714-662-1050
CA	Santa Ana, El-Com/Cabletek	714-432-6630
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DE	Wilimington, Wholesale Elctrns., Inc.	302-652-3222
FL	Stuart, Microwave Comps., Inc.	407-286-4455
IL	Crystal Lake, Sub-Sem Inc.	312-459-4139
IL	Wheeling, Hawk Elctrns., Inc.	312-459-4030
IN	Indianapolis, Bell Inds.	317-634-8202
MD	Beltsville, Petricko Sls., Inc.	301-937-4960
MD	Gaithersburg, Axis Elctrns., Inc.	301-840-9640
MA	Milford, Car-Lac Elctrns.	617-478-7797
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Norwood, Emtel Elctrns.	617-769-9500
MI	St. Clair Shores, Spemco	313-771-2700
MN	New Brighton, Chris Elctrns.	612-631-2647
MN	Thief River Falls, Digi-Key Corp.	800-346-5144
NJ	Roselle, Lectron Inds.	201-245-5858
NJ	Voorhees Township, PAR-TEC Comps. Co.	609-795-4884
NY	Amherst, Standard Elctrns.	716-691-3801
NY	Baldwinsville, Scibetta Distrs.	315-622-3993
NY	Bohemia, Car-Lac Elctrns.	800-645-1192
NY	Farmingdale, Pride Elctrns.	516-293-4020
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Englewood, Argent Inds., Inc.	513-836-8633
OH	Solon, Reh-Electra	216-248-1636
PA	Bristol, AIM Elctrns.	215-785-3500
TX	Carrollton, Connec Tek, Inc.	214-245-1266
TX	Mansfield, Edison Elctrns.	817-473-3322
WA	Redmond, Pyramid Elctrns.	206-883-7200
WA	Seattle, Preibe Elctrns.	206-575-1050

CYBERPAK CO., 251 S. Frontage Rd., Ste. 23, Burr Ridge, IL 60521, Tel: 708-654-3999, FAX: 708-654-4027; Empl.: 5; *Sls. Mgr.:* R. Weinbrenner

CYBER SYS., INC., 2570 E. Cerritos Ave, Anaheim, CA 92806, Tel: 714-722-2051, 714-634-2800, FAX: 714-937-1955; Empl.: 35

CYBRID INCORPORATED, 10 Woodcrest Drive, Woodcliff Lake, NJ 07675, Tel: 201-307-0426, FAX: 201-391-7112; Empl.: 9

CYCLO-TRONICS, INC., 1345 N. Old Rand Rd., Wauconda, IL 60084, Tel: 708-526-0800, FAX: 708-526-0803; Empl.: 10

THE CYLIX CORPORATION, 2637 Townsgate Rd., Ste. 200, Westlake Vl., CA 91361, Tel: 805-379-3155, FAX: 805-379-4551; FSC No.: 59; Empl.: 15; *Sls. Mgr.:* William J. Purcell; *Dist. Mgr.:* Peter Norman

CYPRESS MAGNETICS, INC., 8751 1/2 Industrial Lane, Rancho Cucamonga, CA 91730, Tel: 714-987-3570, FAX: 714-980-2009; FSC No.: 59791; Empl.: 15; *Sls. Mgr.:* Robert C. Greenwood

CYTEC CORP.

FAX: 716-381-0475

CYTEC CORP., 2555 Baird Road, Penfield, NY 14526, Tel: 716-381-4740, 800-346-3117; Empl.: 20; *Sls. Mgr.:* Harry Turner ..... **D•1240**

Local Sales Offices & Reps

OR	Portland, Westcon, Inc.	503-283-0132
WA	Kent, Westcon, Inc.	206-824-8922

DABURN

FAX: 201-768-9642

DABURN ELECTRONICS & CABLE CORP., 225 Pegasus Ave., Northvale, NJ 07647, Tel: 201-768-5400; FSC No.: 25706; *Sls. Mgr.:* Ed Rothenstein ..... **C•1745-1751**

Local Sales Offices & Reps

AZ	Tucson, Clemick & Assocs.	602-749-4003
CA	Mountain View, Bridge Mktg.	415-965-8045
CA	Newport Beach, SPA Elctrns.	714-863-1193
CO	Denver, Mountain Reps	303-623-0972
FL	Tampa, SRT	813-884-4805
IL	Elgin, Markar Sls.	708-888-2207
IN	Indianapolis, STB & Assocs.	317-844-9227
LA	Kenner, Assoc. Mktg. Grp.	504-443-5072
MD	Bel Air, Freedman Malta Assocs.	301-879-3848
MA	No. Scituate, W. A. Hendrickson	617-545-0652
MN	Minneapolis, R. K. Sls.	612-571-1001
MO	Blue Springs, KKB & Co.	816-229-0001
MO	St. Louis, KKB & Co.	314-647-2400
NJ	Whippany, Robert Smith Assocs.	201-540-0204
NY	E. Syracuse, Liberty Elec.	315-437-8100
NY	Plainview, Robt. Smith Assocs.	516-681-3155
PA	Pittsburgh, Catalzst Sls.	412-733-5450
OR	Hillsboro, Turn-A-Round Sls.	503-640-4641
PA	King of Prussia, Freedman-Malta	215-337-9211
TX	Ft.Worth, Reynolds Assoc.	817-429-8207
WA	Kirkland, Turn-A-Round Sls.	206-822-4634
WI	Menomonee Falls, Voss-Dent Assocs.	414-781-0555
Can	Markham, Ont., Avotronics Ltd.	416-475-2024

Local Distributors

CA	Milpitas, Zack Elctrns.	408-942-5432
CA	San Carlos, Logan Elctrns.	415-594-0700
CA	San Diego, Shanks & Wright	619-239-0176
CT	New Haven, Hatry	203-787-5921
CT	West Hartford, Signal Ctr.	203-233-8551
FL	Miami, Small Parts	305-751-0856
GA	Atlanta, ACK Radio Supp.	404-351-6340
IA	Marion, Brenneman & Assoc.	319-377-6394
LA	Harahan, Elctrn. Parts & Supp.	504-734-0641
MD	Gaithersburg, M S Elctrns.	301-921-0200
MA	Needham, YDI Electronics	617-449-1005
MA	Woburn, Pacer	617-935-8330
NJ	Beachwood, Berkley Indl.	201-341-9366
NJ	Cranford, GSI Elctrns.	201-272-6400
NJ	Kenilworth, Federated Purchaser	201-272-0505
NJ	Moorestown, Marlac	908-234-4200
NY	Albany, E. E. Taylor	518-438-7811
NY	Buffalo, Summit Elctrns.	716-887-2800
NY	Hauppauge, Broadline	516-231-4100
NY	Rochester, Simcona	716-328-3230
PA	Allentown, Federated Purchaser	215-437-4481
PA	Philadelphia, AC Radio	215-462-9379
WA	Seattle, Westlake Elctrns.	206-622-6600
WI	Fond Du Lac, Fedco	414-922-6490
Can	Markham, Ont., Arma	416-475-2024

DADEN ASSOCIATES, 23011 Moulton Pkwy., Ste. A12, Laguna Hills, CA 92653, Tel: 714-770-1522, TWX: 910-596-1324, FAX: 714-472-0805; FSC No.: 57032; Empl.: 49; *Sls. Mgr.:* Dennis Hook

DAEDAL, Sandyhill Road, Harrison City, PA 15636, Tel: 412-744-4451, FAX: 412-744-7626; *Sls. Mgr.:* R. Mitchell; *Dist. Mgr.:* R. Mitchell

DAGE-MTI, 701-N. Roeske Ave., Michigan City, IN 46360, Tel: 219-872-5514, ESYLNK: 532521, FAX: 219-872-5559; Empl.: 51; *Sls. Mgr.:* Paul Thomas

DAGE PRECISION INDUSTRIES, INC., 46701 Fremont Blvd., Fremont, CA 94538, Tel: 415-683-3930, TELEX: 4990512, FAX: 415-683-3935; Empl.: 10; *Sls. Mgr.:* Joseph M. Tosta

DAHLSTROM OF CANADA LTD., 7 Copeland Street, Toronto, Ontario, Canada M4G 37E, Tel: 416-421-5900, FAX: 414-421-3728; Empl.: 44

DAICO INDUSTRIES, INC., 2453 East Del Amo Blvd., Compton, CA 90220, Tel: 213-631-1143, FAX: 213-631-8078; FSC No.: 28983; Empl.: 200; *Sls. Mgr.:* Kevin Townsend; *Dist. Mgr.:* Diane Felando

DAIDO CORP., Sumtak Electronics Division

DAITRON, INC., 7150 S.W. Hampton, Suite 130, Tigard, OR 97223, Tel: 503-620-2879, TELEX: 910-240-4863, FAX: 503-620-2942; Empl.: 10; *Dist. Mgr.:* Karen Sempert

DALE ELECTRONICS, INC., Columbus Div., 1122 23rd Street, Columbus, NE 68601-3647, Tel: 402-563-6506, FAX: 402-563-6418; FSC No.: 91637; Empl.: 2800; *Sls. Mgr.:* Darrell Smejkal; *Dist. Mgr.:* Jon Trabert ..... **A•1194-1200, 1352-1355, 1886-1908, 2032-2037, 2198-2199; B•1046-1048, 1839-1841; C•1335**

Local Sales Offices & Reps

AL	Huntsville, JWL Assocs.	205-883-1712
AZ	Tempe, Dale Elctrns. Sls.	602-967-7874
CA	Fremont, Telesis Sls. Grp.	415-713-7300
CA	Redwood City, J. S. Heaton Co.	415-367-9000
CA	San Diego, Vishay EC Sls. Office	619-690-5112
CA	Tustin, Vishay EC Sls. Office	714-544-7024
CO	Colorado Springs, Vishay EC Rocky Mountains	719-593-7529
CO	Grand Junction, Vishay EC Rocky Mtns.	303-241-0150
CO	Loveland, Vishay EC Rocky Mountains	303-667-7500
CT	Riverside, Howard C. Jappe, Co.	914-937-4845
FL	Altamonte Springs, Semtronic Assocs.,Inc.	407-831-8233
FL	Clearwater, Semtronic Assocs.,Inc.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assocs.,Inc.	305-731-2484
GA	Roswell, JWL Assocs.	404-993-0100
IL	Skokie, Indl. Reps.	708-967-8430
IN	Fort Wayne, Scott Elctrns.	219-489-5690
IN	Indianapolis, Scott Elctrns.	317-841-0010
KS	Olathe, Tech. Sls. Assocs.	913-829-2800
MD	Glen Burnie, Tri-Mark	410-761-6000
MA	Wakefield, Howard C. Jappe Co.	617-245-9359
MI	Plymouth, Jay Mktg. Assocs.	313-459-1200
MN	Bloomington, Industrial Reps., Inc.	612-854-8027
NJ	Flanders, K & R Engrg.	201-584-5235
NY	East Rochester, L-Mar Assocs.,Inc.	716-381-9100
MO	Ferguson, Tech. Sls. Assocs.	314-521-2044
NC	Charlotte, JWL Assocs.	704-541-5750
NC	Raleigh, JWL Assocs.	919-787-4826
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Dayton, Scott Elctrns., Inc.	513-294-0539
OH	Westerville, Scott Elctrns.	614-882-6100
OR	Beaverton, LD Elctrns.	503-684-8221
PA	Horsham, TMI	215-441-4300
TX	Dallas, E. F. Aymond Co.	214-349-4014
TX	Houston, E. F. Aymond Co.	713-943-3149
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Brookfield, Indl. Reps.	414-789-9393

Local Distributors

AL	Huntsville, Hamilton/Avnet	205-837-7210
AL	Huntsville, Pioneer Technlgs.	205-837-9300
AZ	Chandler, Hamilton/Avnet	602-961-6400
AZ	Chandler, Hamilton/Avnet	602-961-6613
AZ	Phoenix, Sterling Elctrns.	602-437-5565
AZ	Tempe, Acacia Elctrns.	602-894-2874
AZ	Tempe, Shelley-Ragon, Inc.	602-894-2058
AZ	Tempe, T.T.I. Inc.	602-431-1191
CA	Chatsworth, Shelley-Ragon, Inc.	818-998-3333
CA	Costa Mesa, Hamilton Electro Sls.	714-754-6030
CA	Culver City, Hamilton/Avnet	213-558-2111
CA	Fremont, Acacia	415-623-7500
CA	Gardena, Hamilton Electro Sls.	213-217-6750
CA	Gardena, Hamilton/Avnet	213-217-6700
CA	Inglewood, Newark Elctrns.	213-671-7377
CA	Irvine, Acacia Elctrns.	213-971-2428
CA	Milpitas, T. T. I., Inc.	408-946-5577
CA	Mission Hills, T.T.I,Inc.	818-891-8885
CA	Roseville, Hamilton/Avnet	916-920-3150
CA	San Diego, Acacia Elctrns.	619-597-0577
CA	San Diego, Hamilton/Avnet	619-571-7536
CA	San Diego, Shelley-Ragon, Inc.	619-453-7133
CA	San Diego, T.T.I., Inc.	619-748-2025
CA	San Jose, Shelley-Ragon, Inc.	408-432-0600
CA	Santa Ana, T.T.I., Inc.	714-641-9393

CA Sunnyvale, Hamilton/Avnet 408-743-3358
CA Woodland Hills, Hamilton/Avnet 818-594-8224
CO Commerce City, Waco Elctrns. 303-289-4743
CO Denver, Newark Elctrns. 303-757-8531
CO Denver, T.T.I. Inc. 303-429-6806
CO Englewood, Hamilton/Avnet 303-799-7815
CO Englewood, Shelley-Ragon, Inc. 303-762-0670
CO Lakewood, Acacia/Deanco Elctrns. ... 303-232-2882
CT Danbury, Hamilton/Avnet 203-797-2854
CT Norwalk, Pioneer Std. 203-853-1515
CT Wallingford, Sterling Elctrns. 203-265-9535
CT Wallingford, T.T.I., Inc. 203-284-7474
FL Altamonte Springs, Pioneer Technlgs. 407-834-9090
FL Deerfield Beach, Pioneer Technlgs. ... 305-428-8877
FL Ft. Lauderdale, Hamilton/Avnet 305-971-2900
FL Orlando, T.T.I., Inc. 407-859-1000
FL St. Petersburg, Hamilton/Avnet 813-573-3930
FL Tampa, Reptron Elctrns. 813-854-2351
FL Tampa, Shelley-Ragon, Inc. 813-623-6560
FL Winter Park, Hamilton/Avnet 407-628-3888
GA Duluth, Hamilton/Avnet 404-447-7523
GA Norcross, Pioneer Technlgs. 404-448-1711
GA Norcross, T.T.I., Inc. 404-662-0911
IL Addison, Pioneer Standard 312-495-9680
IL Bensenville, Hamilton/Avnet 708-860-7780
IL Chicago, Newark Elctrns. 312-784-5100
IL Elk Grove Village, Bell Ind. 708-640-1910
IL Glendale Heights, Shelley-Ragon, Inc. 708-529-9977
IL Palatine, Ohm Elctrns. 708-359-5500
IN Carmel, Hamilton/Avnet 317-844-9333
IN Ft. Wayne, Bell Ind.,Graham Div. 219-423-3422
IN Indianapolis, Bell Ind., Graham Div. 317-875-8200
IN Indianapolis, Pioneer Std. 317-573-0880
IA Cedar Rapids, Dee Elctrns. 319-365-7551
IA Cedar Rapids, Hamilton/Avnet 319-362-4757
IA Cedar Rapids, Shelley Ragon, Inc 319-373-0525
KS Lenexa, Hamilton/Avnet 913-888-8900
KY Lexington, Hamilton/Avnet 606-259-1475
MD Baltimore, RESCO 410-931-8200
MD Beltsville, RESCO 301-937-9100
MD Columbia, Hamilton/Avnet 410-995-3526
MD Columbia, T. T. I, Inc. 410-995-1331
MD Gaithersburg, Pioneer Technlgs. 301-921-0660
MA Billerica, Mayer Co. 617-229-2255
MA Chelmsford, Shelley-Ragon, Inc. 508-250-9666
MA Lexington, Pioneer Std. 617-861-9200
MA Peabody, Hamilton/Avnet 508-532-9861
MA Springfield, C & D Elctrns. 413-781-1776
MA Wilmington, T.T.I. Inc. 508-658-4700
MA Woburn, Sterling Elctrns. 617-938-6200
MI Grand Rapids, Pioneer Std. 616-698-1800
MI Grand Rapids, S-F Elctrn. Supp. 616-459-0216
MI Grandville, Hamilton/Avnet 616-531-0345
MI Livonia, Pioneer Std. 313-525-1800
MI Livonia, R-S Elctrns. 313-525-1155
MI Livonia, Reptron Elctrns. 313-525-2700
MI Novi, Hamilton/Avnet 313-347-4270
MI Oak Pk., Newark Elctrns. 313-967-1570
MA Springfield, C & D Electronics, Inc. 413-781-1776
MN Eden Prairie, Pioneer-Std. 612-944-3355
MN Minneapolis, Newark Elctrns. 612-331-6350
MN Minnetonka, Hamilton/Avnet 612-932-0674
MN Minnetonka, T.T.I., Inc. 612-933-8555
MN St. Paul, Shelley-Ragon, Inc. 612-642-2828
MO Chesterfield, Hamilton/Avnet 314-537-4265
MO Independence, Shelley-Ragon, Inc. 816-254-3410
MO Hazelwood, Shelley-Ragon, Inc. 314-895-1515
NJ Cherry Hill, Hamilton/Avnet 609-424-0117
NJ Cranford, G.S.I. Elec. 201-272-6400
NJ Fairfield, Hamilton/Avnet 201-575-3490
NJ Fairfield, Pioneer-Standard 201-575-3510
NJ Kenilworth, Federated Purchaser 201-272-0505
NJ Mount Laurel, T.T.I., Inc. 609-234-6400
NM Albuquerque, Hamilton/Avnet 505-345-0001
NY Binghampton, Pioneer Std. 607-722-9300
NY Bohemia, March Elctrns. 516-563-6000
NY Buffalo, Summit Distr. 716-887-2800
NY Endwell, A.S.I. Elctrns. 607-754-3823
NY Fairport, Pioneer Std. 716-381-7070
NY Farmingdale, Command Elctrns. 516-293-1212
NY Hauppauge, Fairmont 516-231-3313
NY Hauppauge, Hamilton/Avnet 516-231-9800
NY Medford, L.I., Shelley-Ragon, Inc. 516-447-2000
NY Rochester, Hamilton/Avnet 716-272-2704
NY Rome, Rome Elctrns. 315-337-5400
NY Ronkonkoma, T.T.I., Inc. 516-737-2000
NY Syracuse, Hamilton/Avnet 315-437-2641
NY Valley Stream, L.I., L&S Elctrns. 516-561-2474
NY Woodbury, Pioneer Std. 516-921-8700
NC Charlotte, T.T.I., Inc. 704-522-0277
NC Durham, Pioneer Technlgs. 919-544-5400
NC Raleigh, Hamilton/Avnet 919-878-0819
NC Raleigh, RESCO 919-781-5700
OH Cleveland, Pioneer Standard 216-587-3600
OH Columbus, Hamilton/Avnet 614-882-7004
OH Dayton, Bell Inds. 513-435-8660
OH Dayton, Bell Inds., Military Div. 513-434-8231
OH Dayton, Hamilton/Avnet 513-439-6730
OH Dayton, Hamilton/Avnet 513-439-6700
OH Dayton, Pioneer Standard 513-236-9900
OH Dayton, Stotts-Friedman Co. 513-298-5555
OH Solon, Hamilton/Avnet 216-349-5100
OH Valley View, Newark Elctrns. 216-447-8860
OH Worthington, T.T.I. Inc. 614-848-5770
OK Tulsa, Hamilton/Avnet 918-252-7297
OK Tulsa, Radio, Inc. 918-587-9123
OK Tulsa, Sterling Elctrns. 918-663-2410
OR Beaverton, Acacia Electronics 503-646-3377
OR Beaverton, Hamilton/Avnet 503-526-6209
OR Portland, Radar Elec. 503-232-3404
PA Horsham, Pioneer Technlgs. 215-674-4000
PA Mars, Hamilton/Avnet 412-281-4151
PA McKean, Advacom 814-476-7774
PA Pittsburgh, Pioneer Std. 412-782-2300
PA Trevose, Almo Elctrns. 215-953-2800
PA York, E.C.I., Inc. 717-846-5334
TX Austin, Hamilton/Avnet 512-837-8911
TX Austin, Pioneer-Standard 512-835-4000
TX Austin, Sterling Elctrns. 512-836-1341
TX Carrollton, Sterling Electronics 214-243-1600
TX Dallas, Hamilton/Avnet 214-308-8111
TX Dallas, Pioneer Std. 214-386-7300
TX Ft. Worth, T.T.I., Inc. 817-595-3100
TX Ft. Worth, T.T.I., Inc. 817-831-8300
TX Ft. Worth, T.T.I.,Inc. 817-847-6666
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Newark Elctrns. 713-783-1629
TX Houston, Pioneer Std. 713-495-4700
TX Houston, Sterling Elctrns. 713-627-9800
TX Stafford, Hamilton/Avnet 713-274-9336
UT Salt Lake City, Hamilton/Avnet 801-974-9649
WA Redmond, Acacia Elctrns. 206-881-5566
WA Redmond, Hamilton/Avnet 206-867-0149
WA Redmond, Shelley-Ragon Inc. 206-883-2220
WA Redmond, T.T.I. Inc. 206-882-0291
WA Seattle, Radar Elec. 206-282-2511
WI Milwaukee, Marsh Elctrns. 414-475-6000

DALE ELECTRONICS, INC., El Paso Div., P.O. Box 26728, El Paso, TX 79926-6728, Tel: 915-592-3253; FSC No.: 91637; Empl.: 272; *Sls. Mgr.:* Bill Buchanan; *Dist. Mgr.:* Jon Trabert ..... **B•1839-1841**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE ELECTRONICS, INC., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701-2242, Tel: 402-371-0080; FSC No.: 91637; Empl.: 1200; *Sls. Mgr.:* Eldon Engel; *Dist. Mgr.:* Jon Trabert ..... **A•1891-1899**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE ELECTRONICS, INC., Tempe Div., 1155 W. 23rd St., Tempe, AZ 85282-1883, Tel: 602-967-7874; FSC No.: 22929; Empl.: 139; *Sls. Mgr.:* Mike Brown; *Dist. Mgr.:* Jon Trabert ..... **A•1352-1355, 2032-2035**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE ELECTRONICS, INC., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078-0180, Tel: 605-665-9301; FSC No.: 09969; Empl.: 400; *Sls. Mgr.:* John Elliot; *Dist. Mgr.:* Jon Trabert ..... **A•1194-1196, 1198-1199, 2198; C•1334-1335**

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE WESTERN THERMISTOR DIVISION, See Dale Norfolk Division

DALLAS SEMICONDUCTOR, 4401 South Beltwood Pkwy., Dallas, TX 75067, Tel: 214-450-0400, FAX: 214-450-0470; Empl.: 720; *Sls. Mgr.:* John Mattis ..... **A•1529-1531**

Local Sales Offices & Reps
AL Huntsville, Glen White & Assocs. 205-882-6751
AZ Scottsdale, Haas & Assocs. 602-998-7195
AR Tusla, West Assocs. 918-665-3465
CA San Diego, Harvey King, Inc. 619-587-9300
CA Santa Clara, I Squared 408-988-3400
CO Wheat Ridge, Waugaman Assoc. 303-423-1020
CT Wallingford, Technology Sls. Inc. 203-269-8853
FL Ft. Lauderdale, Semtronic Assoc., Inc. 305-731-2484
GA Norcross, Glen White & Assocs. 404-441-1447
IL Rolling Meadows, Sumer, Inc. 708-991-8500
IN Indianapolis, Elctrn. Sls. & Eng. 317-849-4260
IA Cedar Rapids, Cahill, Schmitz & Howe 319-377-8219
KS Stanley, West Assocs. 913-897-6366
MA Woburn, Mill-Bern Assocs. 617-932-3311
MI Livonia, Geisting & Assocs. 313-478-8106
MN St. Paul, Cahill, Schmitz & Cahill 612-646-7217
MO St. Louis, Technical Sls. Assoc. 314-521-2044
NJ Haddonfield, Sunday O'Brien Inc. 609-429-4013
NJ Mt. Laurel, S-J Assocs. 609-866-1234
NY Rockville Centre, S-J Assocs. 516-536-4242
NC Huntersville, Glen & White Assoc. 704-875-3777
NC Raleigh, H & A Sls. 919-846-0082
OH Cincinnati, Geisting & Assocs. 513-385-1105
OK Tusla, West Assocs. 918-665-3465
OR Beaverton, Western Tech. Sls. 503-644-8860
TN Gray, Glen White & Assoc. 615-477-8850
TX Houston, West Assocs. 713-621-5983
UT Salt Lake City, Waugaman Assocs. ... 801-261-0802
VA Falls Church, S-J Chesapeake 703-533-2233
WA Bellevue, Western Tech. Sls. 206-641-3900
WA Spokane, Western Tech. Sls. 509-922-7600
WI Brookfield, Sumer, Inc. 414-784-6641
Can Kanata, Electro-Source Inc. 613-592-3214

Local Distributors
AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AZ Phoenix, Hall-Mark Elctrns. 602-437-1200
CA Irvine, Insight Elctrns. 714-727-2111
CO Wheat Ridge, Added Value Elect. Dist. 303-422-1701
CT Wallingford, Sterling Elctrns. 203-265-9535
FL Winter Park, Milgray-Elctrns. 407-647-5747
GA Duluth, Hall-Mark Elctrns. 404-623-4400
IL Arlington Heights, Milgray Elctrns. 708-253-1212
IN Indianapolis, Added Value Elect. Dist. 317-872-4910
IA Cedar Rapids, Added Value Elect. Dist. 319-363-0221
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
MA Wilmington, Milgray Elctrns. 508-657-5900
MI Livonia, Hall-Mark Elctrns. 313-462-1205
MN Minneapolis, Sterling Elctrns. 612-831-2666
NJ Marlton, Milgray Elctrns. 609-983-5010
NY Farmingdale, Milgray Elctrns. 516-391-3000
NC Raleigh, Hall-Mark Elctrns. 919-872-0712
OH Solon, Hall-Mark Elctrns. 216-349-4632
OK Tusla, Sterling Elctrns. 918-663-2410
OR Beaverton, Anthem Elctrns. 503-643-1114
TX Richardson, Anthem Elctrns. 214-238-1700
UT Salt Lake City, Anthem Elctrns. 801-973-8555
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Almac Elctrns. 206-643-9992
Can Ville St. Laurent, Que., ITT Multicomponents 514-335-7697

DALSA INC., 605 McMurray Road, Waterloo, Ont., Canada N2V 2E9, Tel: 519-886-6000, FAX: 519-886-8023; *Sls. Mgr.:* Dan Blacklock

DANCER COMMUNICATIONS, INC., 162 Saxer Ave., Media, PA 19064-2334, Tel: 215-543-8066, FAX: 215-543-2151; *Sls. Mgr.:* Barbara Gordon

Local Sales Offices & Reps
CO Littleton, Base Technlgs. Co. 303-979-3392

Local Distributors
WI Milwaukee, Nuvisco, Inc. 414-445-9206

D & B POWER, INC.

FAX: 516-586-5952

D & B POWER, INC., 204 N. Fehr Way, P.O. Box 40M, Bayshore, NY 11706, Tel: 516-586-5955; FSC No.: 54337; Empl.: 25; *Sls. Mgr.:* Gordon Best; *Dist. Mgr.:* Dan Hall ..... **D•1698-1699**

Local Sales Offices & Reps
CA Pasadena, Electro Mecha. Instrs. 818-795-7193
MD Hunt Valley, Eagle Sls. 301-666-3930
CA Santa Clara, Veer Mktg. 408-986-1610

D & P MFG. INC., 32 Hamilton St., Chalfont, PA 18914, Tel: 215-997-1200, FAX: 215-997-1200; Empl.: 7

DMC DANIELS MANUFACTURING CORPORATION

FAX: 407-855-6884

DANIELS MANUFACTURING CORP., 526 Thorpe Rd., Orlando, FL 32824, Tel: 407-855-6161, TELEX: 564321; FSC No.: 11851; Empl.: 180; *Sls. Mgr.:* Don Malinovsky; *Dist. Mgr.:* Don Malinovsky ..... **C•1703**

Local Sales Offices & Reps
CA El Toro, DMC Western Reg. 714-588-8090

DAN-L INC., 229 Laurel Rd., E. Northport, NY 11731, Tel: 516-757-8000; FSC No.: 28327; Empl.: 22

DANMAR INDS., 11952 Challenger Court, Moorpark, CA 93021, Tel: 1-805-529-3788,1-800-666-6268, FAX: 805-529-3837; FSC No.: 31690; Empl.: 10; *Sls. Mgr.:* Mukund Patel

DANTEL, 2991 N. Argyle Ave., Fresno, CA 93727, Tel: 209-292-1111, TELEX: 35-5457, FAX: 209-292-9355; FSC No.: 56960; Empl.: 205; *Sls. Mgr.:* Bob Long

DANTRONICS, INC., 3175 Hafner Ct, St. Paul, MN 55126, Tel: 612-484-2108; Empl.: 22

DARE ELECTRONICS, INC., 3245 S. County Rd., 25A, Troy, OH 45373, Tel: 513-335-0031; FSC No.: 55901; Empl.: 20; *Sls. Mgr.:* Paul J. Gilmore

DATA, INC., 7702 Emerald Ave., Box 2071, Ft. Collins, CO 80525, Tel: 303-493-1222; Empl.: 3; *Sls. Mgr.:* Sharon Shilling; *Dist. Mgr.:* Sharon Shilling

D.A.T.A. BUSINESS PUBLISHING, Information Handling Services, 15 Inverness Way East, P.O. Box 6510, Englewood, CO 80155-6510, Tel: 303-799-0381, TELEX: 530606; Empl.: 30; *Sls. Mgr.:* Tom Littman; *Dist. Mgr.:* Ray Coakes

DATA CHECK CORPORATION, 9918 Via Pasar, San Diego, CA 92126, Tel: 619-578-0101, FAX: 619-578-9215; FSC No.: 55792; Empl.: 45; *Sls. Mgr.:* Bill Acosta

DATACHRON INC., 1150 E. Stanford Court, Anaheim, CA 92805, Tel: 714-385-1705, FAX: 714-978-2514; FSC No.: 56259; Empl.: 19; *Sls. Mgr.:* Clyde Davis

DATA CIRCUITS, COMPUTER LOGICS LTD., 6380 Viscount Rd., Mississauga, Ont., Canada L4V 1H3, Tel: 416-672-3833, TELEX: 416-672-3869; Empl.: 80; *Sls. Mgr.:* Rick Way; *Dist. Mgr.:* Rick Way

DATACOM, INC., Box 278, Ft. Walton Beach, FL 32549, Tel: 904-244-6121, FAX: 904-244-6344; FSC No.: 32365; Empl.: 50

DATACON, INC., Interconnect Sub-Systems, 60 Blanchard Rd., Burlington, MA 01803, Tel: 617-273-5800, FAX: 617-273-4809; Empl.: 350; *Dist. Mgr.:* Lonise M. Evelyn

DATACUBE, INC., 4 Dearborn Rd., Peabody, MA 01960, Tel: 508-535-6644, TELEX: 6817540, FAX: 508-535-5643; Empl.: 130; *Sls. Mgr.:* Denny Maher

FAX: 201-773-9672

DATA DELAY DEVICES, 3 Mount Prospect Ave., Clifton, NJ 07013-1915, Tel: 201-773-2299 ..... **A•1532-1548**

Local Sales Offices & Reps
AL Huntsville, Hughes Assocs. 205-533-9108
AZ Phoenix, Tech Sls., Inc. 602-246-1614
AR R-Squared 713-820-3210
CA Mission Viejo, Jay Mktg. Assocs. 714-768-7519
CA Mountain View, Weseloh/Swanson & Assocs. 415-961-0565
CT Dynamic Sls., Inc. 617-272-5676
DE Jack McCoy Assocs. 215-363-0350
FL Pensacola, Hughes Assocs.,Inc. 904-433-1787
GA Norcross, Hughes Assocs., Inc. 404-662-1587
IN J. M. Finnegan & Co. 216-238-5905
KY J. M. Finnegan & Co. 216-238-5905
LA R-Squared 713-820-3210
ME Dynamic Sls., Inc. 617-272-5676
MA Burlington, Dynamic Sls., Inc. 617-272-5676
MI Grand Rapids, Jim Finnegan & Co. ... 616-245-4621
MS Corinth, Hughes Assocs., Inc. 601-287-2915
NH Dynamic Sls., Inc. 617-272-5676
NJ Medford, Jack McCoy Assocs. 609-953-0770
NY Pittsford, James E. Zimmmerman Sls. 716-381-3186
NC Raleigh, Hughes Assocs., Inc. 919-467-7029
OH Dayton, Jim Finnegan & Co. 513-890-8322
OK R-Squared 713-820-3210
PA Downingtown, Jack McCoy, Inc. 215-363-0350
PA Pittsburgh, Jim Finnegan & Co. 412-823-5400
RI Dynamic Sls., Inc. 617-272-5676
SC Hughes Assocs., Inc. 919-467-7029
TN Morristown, Hughes Assocs., Inc. 615-587-2433
TX Houston, R-Squared 713-820-3210
VT Dynamic Sls., Inc. 617-272-5676
VA Jim Finnegan & Co. 216-238-5905
Can Ont., Source Elctrns. 416-676-0830

Local Distributors
CA Sunnyvale, Target Elctrns. 408-734-5611
TX Dallas, Omni Pro 214-233-0500

DATA-DESIGN LABS., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730, Tel: 714-987-2511; Empl.: 1200

DATA DEVICE CORP., See ILC Data Device Corp.

FAX: 213-640-7639

DATA DISPLAY PRODUCTS, 445 So. Douglas St., El Segundo, CA 90245-4630, Tel: 213-640-0442, 800-421-6815; FSC No.: 15513; Empl.: 40; *Sls. Mgr.:* Anthony Toniolo; *Dist. Mgr.:* Anthony Toniolo ..... **B•1142-1144**

DATA ENGINEERING, INC., 2515 N. State Rd. 7 Ste. 207, Margate, FL 33063-3206, Tel: 305-971-0400; *Sls. Mgr.:* Mario M. Martinez

DATA ENVIRONMENT, INC., Box 91511, Beaverton, OR 97291, Tel: 503-643-4292

DATA INSTRUMENTS, INC., 100 Discovery Way, Acton, MA 01720, Tel: 508-264-9550, TELEX: 200081, FAX: 508-263-0630; Empl.: 300; *Sls. Mgr.:* Ernest C. Lutfy ..... **B•1891**

Local Sales Offices & Reps
AL Huntsville, FLW Southeast, Inc. 205-536-6207
AL Mobile, FLW S.W. 205-990-8989
AZ Scottsdale, Williams Assocs. 602-494-0790
CA Laguna Hills, Elotek Sys., Inc. 714-830-4856
CA Santa Clara, Johnson Assoc. 408-984-4626
CO Highlands Ranch, Valcomp Elctrns., Inc. 303-791-0330
FL Orlando, FLW Southeast, Inc. 407-894-9671
GA Marietta, FLW Southeast, Inc. 404-424-1731
IL Bridgeview, Finn & Conway, Inc. 708-599-0103
IA Cedar Rapids, Delltron Co. 319-393-0075
MD Forest Hill, Dick Pfeffer 301-557-9167
MA Acton, Data Instrs., Inc. 617-264-9550
MA Acton, Dave Hannon 617-264-9550
MI Sterling Hgts., Geotronix, Inc. 313-254-0520
MO Florissant, Delltron Co. 314-839-0033
MO Kansas City, Delltron Co. 816-436-6445
NM Albuquerque, Williams Assocs. 505-255-1638
NY Albany, Expert Indl. Sys., Inc. 518-869-3355
NY Buffalo, Expert Indl. Sys., Inc. 716-827-1111
NY Rochester, Expert Indl. Sys., Inc. 716-323-1305
NY Syracuse, Expert Indl. Sys., Inc. 315-455-2469
NC Charlotte, Emco, Inc. 704-372-8281
OH Richfield, Geotronix, Inc. 216-659-6100
OH Trotwood, Geotronix Inc. 513-854-5939
OK Oklahoma City, Bauman Instr. Corp. .. 405-631-8080
OK Tulsa, Bauman Instr. Corp. 918-492-8086
PA Allison Park, Geotronix, Inc. 412-487-1770
PA Richboro, Technical Dvcs. Inc. 215-953-1595
TN Memphis, FLW Southeast, Inc. 901-345-3563
TX Grand Prairie, Collingsystems, Corp. .. 214-647-3569
TX Houston, Collinsystems, Corp. 713-464-9460
WA Redmond, S.E.A. Sls. 206-883-4999
WA Vancouver, S.E.A. Sls. 206-573-5161
WI Brookfield, Finn & Conway Inc. 414-784-3300
Can Richmond, BC, Maxwell Morton Assocs. 604-273-1337
Can Woodbridge, Ont., Technel Engrg. Inc. 416-851-4244

Local Distributors
CA Milpitas, A. Biederman, Inc. 408-435-0209
CO Lafayette, Big Horn Instrmn. 303-665-4054
CT Meriden, Meriden Cooper 203-237-8448
GA Norcross, AA Elec. Inc. 404-449-8670
IN Indianapolis, C & E Sls., Inc. 317-844-9799
MD Baltimore, Bevier 301-242-8800
MA Billerica, Tanyx Meas. Inc. 508-671-0183
MI Taylor, North Cen. Engrg., Inc. 313-942-0900
MN St. Paul, Power/mation 612-645-0781
MS Jackson, B&B Controls 601-354-0405
MO St. Louis, ISL Corp. 314-423-3141
NJ Newark, Norman Bragar Co., Inc. 201-344-1100
NY Buffalo, KOM Lamb Inc. 716-874-3530
NC Charlotte, EMCO 704-372-8281
OH Cincinnati, J.N. Fauver Co., Inc. 513-891-8400
OH Twinsburg, The Stanley M. Proctor Co. 216-425-7814
OR Portland, Branom Instr. 503-283-2555
TX Dallas, Butler and Land 214-343-8800
TX Sugar Land, Alpha Process Sls. 713-240-4505
UT Salt Lake City, Rust Automation Equip. 801-486-9865
VA Richmond, Meter Metrics Div., Fidus Corp. 804-275-1431
WA Seattle, Branom Instr. 206-762-6050
WI Waukesha, Power/mation 414-542-2868
Can Don Mills, Ont., Intertechnology, Inc. ... 416-445-5500
Can Montreal, Que., Emaco(Canada) Ltd./Ltee 514-331-0551

DATA I/O CORP., 10525 Willows Rd. N.E., Redmond, WA 98073-9746, Tel: 206-881-6444, TELEX: 15-2167; Empl.: 550

DATAK CORP., 55 Freeport Blvd., No. 23, Sparks, NV 89431, Tel: 702-359-7474, FAX: 702-359-7494; *Sls. Mgr.:* Barry Brown ..... **C•1583, 1685**

Local Sales Offices & Reps
AL Huntsville, DHR Mktg., Inc. 205-722-0440
CA Foster City, Polach & Bensinger 415-578-8200
CA Gardena, Ungar Sls. Assocs. 213-532-6837
CT Lebanon, Adams McGregor Sales 203-537-5737
FL Hollywood, Mel Yarish & Assoc. 305-985-5605
GA Duluth, DHR Mktg., Inc. 404-564-0529
IL Sugar Grove, Manx Co. 708-466-4200
IN Indianapolis, Current Elec. Mktg. 317-257-3858
KS Overland Park, M.I.N.K. Associates 913-341-8309
MD Silver Spring, Mid-Atlantic Sls. 301-593-7749
MI Grand Blanc, Inter-Comm, Inc. 313-695-0665
MO Bridgeton, M.I.N.K. Assocs. 314-291-5454
NC Raleigh, DHR Mktg., Inc. 919-829-1970
OH Chagrin Falls, L.W. Bennett & Assoc. .. 216-247-2174
OR Portland, Jos. V. Belusko 503-222-4279
PA Philadelphia, Instrmn. Specialties 215-742-0898
RI Coventry, Adams McGregor 401-726-1300
SC Greenville, DHR Marketing Inc. 803-235-3594
TN Nashville, DHR Marketing Inc. 615-331-2745
TX Dallas, J & J Sls. Co. 214-328-9739
VA Charlottesville, Mid Atlantic Sales 804-973-8099
Can Montreal, Cantronics Ltd./Cantronics Intl. Ltd. 514-848-7132
Can Scarborough, Ont., Cantronics Ltd./Cantronics Intl. Ltd. 416-297-8668,FAX:416-297-0107

Local Distributors
AL Birmingham, ACK Radio Supply Co. .. 205-322-0588
AZ Phoenix, Dalis Elctrns. 602-275-2885
AZ Scottsdale, D.C. Elctrns. 602-945-7736
CA Canoga Pk., Sandys Elctrns. 818-346-8353
CA Milpitas, Zack Elctrns. 408-942-5432
CA San Jose, Quement Elctrns. 408-998-5900
CA Sunnyvale, Fry's Elctrns. 408-733-1770
CA Thousand Oaks, Pace Elctrns. 805-497-7515
CA Van Nuys, All Elctrns. 818-333-8009
CO Denver, Fistell Micro 303-393-6000
CT Greenwich, Wise Comps. 203-531-4880
DE New Castle, Electronics Exch. 302-322-5401
FL Miami, Elctrn. Equip. 305-871-3500
FL Orlando, Orlando Frame & Art 305-898-6271
GA Atlanta, Ack Radio Supply 404-351-6340
ID Boise, Kimball Elctrns. 208-232-2201
IL Berwyn, B-B & W, Inc. 312-749-1710
IL Mt. Prospect, Tri-State Elec. 312-255-0600
IL Niles, Joseph Elec. 312-297-4200
IL S. Holland, Union Elctrns. 708-333-4100
IN Ft. Wayne, Warren Radio 219-426-5344
KY Louisville, Peerless Elec. 502-637-7674
LA Lafayette, Ralph's 318-233-0105
MD Aberdeen, Harco Elctrns. 301-838-7990
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MA Needham, You-Do-It Elctrns. 617-449-1005
MA Norwood, Gerber Elec. 617-769-6000
MI Flint, Shand Elctrns. 313-743-8940
MI Livonia, Norwest Elctrns. 313-261-4551
MN Minneapolis, AEI/Acme Elctrn Parts. .. 612-338-4754
MO Kansas City, Elctrn. Supp. 816-931-0250
MO St. Louis, Gateway Elec. 314-427-6116
MO St. Louis, Van Sickle 314-621-5000
NE Lincoln, Scott Elec. Supp. 402-466-8221
NV Las Vegas, Hurley Elec. 702-384-5666
NV Reno, Elect. Distr. Co. 702-323-2766
NJ Greenbrook, Greenbrook Elctrns. 201-968-3500
NJ Kenilworth, Federated Purchasers, Inc. 201-272-0505
NM La Cruces, Elctrn. Parts Co. 505-523-4578
NY Buffalo, Summit Distr. 716-887-2800
NY Hauppauge, Broadline Elctrns. 516-231-4100
NY Plainview, Kelvin Elctrns. 516-349-7620
NY Rochester, Summit Elec. 716-334-8110
OH Warren, REM Elctrns. Supply 216-373-1300

OK	Oklahoma City, Radio Supp.	405-232-6127
PA	Harrisburg, Cumberland Elctrns.	717-233-5883
PA	Braddock, Leff Elctrns.	412-351-5000
PA	Philadelphia, A.C. Radio	215-462-9379
PA	Reading, Barbey Elctrns.	215-376-7451
RI	Pawtucket, Jabbour Electronic Supply	401-728-4600
RI	Providence, W. Dandreta & Co.	401-861-2800
SC	Charleston, Wholesale Inds. Elctrns.	803-722-2634
TN	Memphis, W & W Distbg.	901-527-4627
TX	Houston, Elctrn. Parts Outlet	713-784-0140
TX	Richardson, Off The Shelf Comps.	214-238-0808
UT	Salt Lake City, Kimball Elec.	801-328-2075
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
VA	Annadale, Arcade Elctrns.	703-256-4610
VA	Norfolk, Priest Elctrns.	804-855-0105
WA	Seattle, Radar Elec. Co., Inc.	206-282-2511
WI	Milwaukee, Indl. Elctrns.	414-276-1212
WI	Wausau, Electronics Inc.	715-845-4671

DATAKEY, INC., 407 W. Travelers Trail, Burnsville, MN 55337, Tel: 612-890-6850, FAX: 612-890-2726; FSC No.: 7025; Empl.: 44; *Sls. Mgr.:* Jerry Korsbon

DATALUX

FAX: 703-662-1682

DATALUX CORP., 2836 Cessna Dr., Winchester, VA 22601, Tel: 703-662-1500; Empl.: 25; *Sls. Mgr.:* R.H. Twyford ..... **B•1804**

Local Sales Offices & Reps

CA	San Jose, Peter Luiten	408-496-8578
IL	Buffalo Grove, Key Mktg.	708-459-6900
MA	Brookline, Technlg. Prods.	617-731-0858
NY	Hauppauge, Sticom	516-366-4221
TX	Richardson, R. F. Kimball	241-231-3447
WA	Renton, Jensen Sls.	206-277-2772

Local Distributors

IL	Wheeling, Hawk Elctrns., Inc.	718-459-4030
NY	Elmsford, Kintronics, Inc.	914-347-2530

DATAMEDIA CORPORATION, 11 Trafalgar Square, Nashua, NH 03063, Tel: 603-886-1570; Empl.: 300; *Sls. Mgr.:* Dan Caldwell

DATAMEGA INC.

FAX: 708-860-3672

DATA MEGA INC., Mega Data, 790 Maple Lane, Bensenville, IL 60106, Tel: 708-860-6501 ..... **D•1087-1089**

DATA POWER, See Beaver Labs

DATAPROBE, 170 Coolidge Ave., Englewood, NJ 07631, Tel: 201-569-6464, TELEX: 200679-PROB-UR, FAX: 201-894-0939; Empl.: 30; *Sls. Mgr.:* D. Weiss; *Dist. Mgr.:* S. Weiss

DATAPRODUCTS CORPORATION, 6200 Canoga Ave., Woodland Hills, CA 91367-2499, Tel: 818-888-4014, TELEX: 67-4734, FAX: 818-887-4789; Empl.: 3500; *Sls. Mgr.:* Paul Depa; *Dist. Mgr.:* John Thorse

DATAPRODUCTS NEW ENGLAND, INC., 50 Barnes Park North, Wallingford, CT 06492, Tel: 203-265-7151, FAX: 203-265-7801; FSC No.: 96238; Empl.: 300; *Sls. Mgr.:* Robert Griffith

DATAQ INSTRUMENTS, INC., 825 Sweitzer Ave., Akron, OH 44311, Tel: 216-434-4284 , 800-553-9006, TELEX: 6502817028, FAX: 216-434-5551

DATA RACE, INC., 11550 IM-10 West, Ste. 395, San Antonio, TX 78230, Tel: 512-558-1900, FAX: 512-558-1929; Empl.: 50; *Sls. Mgr.:* Garrick C. Colwell

DATARAM CORP., P. O. Box 7528, Princeton, NJ 08543-7528, Tel: 609-799-0071, 800-822-0071, TWX: 510-685-2542, FAX: 609-799-6734; Empl.: 120; *Sls. Mgr.:* Carl Anderson, Sls. V.P.

DATA RAY

FAX: 303-451-1143

DATA RAY CORP., 12300 Pecos, Westminster, CO 80234, Tel: 1-800-926-5556, 303-451-1300; Empl.: 100; *Sls. Mgr.:* A. Woodley ..... **B•1050-1053**

Local Sales Offices & Reps

CA	Seal Bch., Texel	213-596-9411
OR	Beaverton, Olson Tech. Sls.	503-643-9488
WA	Bellevue, Olson Tech. Sls.	206-883-7792
Can	Vancouver, Olsen Tech. Sls.	604-980-5801

DATA SET CABLE CO., INC., 748 Danbury Rd., Ridgefield, CT 06877, Tel: 203-438-9684, TWX: 710-467-0668, FAX: 203-431-4657; Empl.: 70; *Sls. Mgr.:* T. Busch

DATASOUTH COMPUTER CORP., 4216 Stuart Andrew, P.O. Box 240947, Charlotte, NC 28217, Tel: 704-523-8500, TELEX: 6843018, FAX: 704-523-9298; Empl.: 140; *Dist. Mgr.:* Ann Vetas, National Accounts Mgr.

DATA SPECIALTIES, INC., See Zebra Technologies Corp.

DATA TECH, DIV. OF PENRIL CORP., See Moisture Register Products Div., Aqua Measure Instrument Co.

DATA TECHNOLOGY, INC., 4 Gill St., Woburn, MA 01811, Tel: 617-935-8820, FAX: 617-935-9656; Empl.: 45; *Sls. Mgr.:* L. Rizzo

DATATRAN CORP., 355 Yuma St., Denver, CO 80223, Tel: 303-778-0870, FAX: 303-778-0877; Empl.: 17; *Sls. Mgr.:* Cindi L. Kemper; *Dist. Mgr.:* Cindi L. Kemper

DATA TRANSLATION, INC., 100 Locke Dr., Marlboro, MA 01752, Tel: 508-481-3700, TELEX: 951646, FAX: 617-481-8620; FSC No.: 61867; Empl.: 270; *Sls. Mgr.:* Pam Nelson; *Dist. Mgr.:* Lori Dustin

DATATRONICS, INC., 28151 Highway 74, Romoland, CA 92380, Tel: 714-928-7700, FAX: 714-928-7701

For all States not listed, please contact factory in Romoland,CA 714-928-7700 For all states not listed, please contact factory in Romoland, CA 714-928-7700

DATATRONIC SYSTEMS CORP., Computer Sciences Div., Bx 44128 EEM/NMR, Panorama City, CA 91412-0128, Tel: 818-988-5290; Empl.: 150

DATAWARE ELECTRONICS INC., 8227 44th Ave. West, Mukilteo, WA 98275, Tel: 206-742-8577, FAX: 206-742-8900

DATAWRAP, INC., 37 Water St., Wakefield, MA 01880, Tel: 617-246-5757, FAX: 617-246-5758; Empl.: 16; *Sls. Mgr.:* Tony Lockwood

Local Sales Offices & Reps

FL	Melbourne, R REP	407-242-9800
NY	Great Neck (East), F & F Metro	516-482-4080
OH	Mount Orab, Benjenn Engrg.	513-444-3175
NY	Syracuse (West), Labtronics	315-455-7314

DA-TECH CORP., 141 Railroad Drive, Ivyland, PA 18974, Tel: 215-322-9410, FAX: 215-322-9730; Empl.: 110; *Sls. Mgr.:* Bradford W. Bentz

DATEL

FAX: 508-339-6356

DATEL, INC., 11 Cabot Blvd., Mansfield, MA 02048-1194, Tel: 508-339-3000, TELEX: 174388; Empl.: 550; *Sls. Mgr.:* A. Risley ..... **D•1158-1162**

Local Sales Offices & Reps

AL	Huntsville, Hughes Assocs. Inc.	205-533-9108
AZ	Phoenix, Tech. Sls.	602-246-1614
CA	San Diego, Bestronics of San Diego	619-693-1111
CA	Santa Clara, W. J. Electrns.	408-982-9222
CO	Denver, Elcom, Inc.	303-337-2300
CT	Hamden, Datcom	203-288-7005
CA	La Mirada, Select Elctrns.	213-921-5159
FL	Largo, Q-Rep	813-397-8431
GA	Norcross, Hughes Assocs. Inc.	404-662-1587
IL	Inverness, Carvel Engrg. & Sls.	708-934-9600
IN	Indianapolis, Wilson Tech. Sales	317-872-2513
KS	Lenexa, Midtec Assocs.	913-541-0505
MD	Burtonsville, Chesapeake Technlg., Inc.	301-236-0530
MA	Waltham, Datcom	617-891-4600
MI	W. Bloomfield, Infinity, Inc.	313-932-1179
MN	Edina, Mel Foster Tech. Sls., Inc.	612-941-9790
MS	Corinth, Hughes Assocs., Inc.	601-287-2915
MO	St. Louis, Midtec Assocs.	314-275-8666
NJ	Haddenfield, G. L. Williams Assocs.	609-428-6060
NY	Clark Mills, KLM-Garner	315-853-6126
NY	Elmont, Crane & Egert	516-872-0800
NC	Cary, Hughes Assocs., Inc.	919-467-7029
OH	Cincinnati, Arthur Baier Co.	513-779-2395
OH	Cleveland, Arthur Baier Co.	216-461-6161
OH	Columbus, Arthur Baier Co.	614-764-1144
OH	Dayton, Arthur Baier Co.	513-276-4128
PA	Pittsburgh, Arthur Baier Co.	412-367-7799
TN	Knoxville, Hughes Assocs, Inc.	615-558-0283
TX	Carrollton, Tech. Mktg., Inc.	214-387-3601
TX	Houston, Technical Mktg, Inc.	713-783-4497
TX	Round Rock, Technical Mktg, Inc	512-244-2291
UT	Murray, Elcom, Inc.	801-262-2400
WA	Bellevue, Advanced Power Comps.	206-747-9127
WA	Seattle, Advanced Power Comps.	206-527-7945
WA	Spokane, Advanced Power Comps.	206-928-7959
WA	Vancouver, Advanced Power Comps.	206-896-4239
WI	New Berlin, Carvel Engrg. & Sls.	414-784-7007
Can	Calgary, Alb., Future Elctrns.	403-250-5550
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DATRICON, Scientific Technologies, Inc., 31069 Genstar Rd., Hayward, CA 94544, Tel: 415-471-9717, FAX: 415-471-9752; Empl.: 42

DATRON INSTRUMENTS, A Wavetek Company, Hurricane Way, Norwich, England, United Kingdom NR6 6JB, Tel: 603-404824, TELEX: 851975173, FAX: 603-483670

DATRON SYSTEMS, INC., 200 West Los Angeles Ave., Simi Valley, CA 93065-1650, Tel: 805-584-1717, TWX: 910-494-2787, FAX: 805-526-0885; FSC No.: 32255; Empl.: 175; *Sls. Mgr.:* Chester Rowley

FAX: 714-533-6345

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CA	Santa Clara, Ward/Davis Assocs.	408-245-3700
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MD Columbia, Creative Mktg. Assocs. 301-880-4161
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KS Parker, S. W. Wollard 913-898-6552
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DENSITRON CORPORATION, Densitron International, 3425 W. Lomita Blvd., Torrance, CA 90505, Tel: 213-530-3530, TWX: 910-349-6200; FSC No.: 62483; Empl.: 42; *Sls. Mgr.:* Richard Driscoll; *Dist. Mgr.:* Richard Driscoll ..... **B•1055**

Local Sales Offices & Reps

AL Huntsville, E.M.A. 205-536-3044
AL Huntsville, Elctrn. Mktg., Inc. 205-837-7363
AZ Phoenix, Chaparral Elctrn., Inc. 602-996-5909
CA Irvine, Comp. Mktg. Assocs. 714-727-0688
CA Milpitas, Comp. Mktg. Assocs. (Telesis) 408-946-7300
CO Englewood, Comp. Sls. 303-779-8060
CT W. Hartford, Nova Assocs. (M-R Tech. Sls.) 203-521-2101
FL Margate, E.P.M. Corp. 305-977-0331
FL Orlando, EPM Corp. 407-425-6149
GA Acworth, E.A.B., Inc. 404-975-3660
IL Northbrook, H. Benjamin & Assoc. 312-272-2900
IN Ft. Wayne, R.L. Bontempo Assocs. 219-478-1057
IN Indianapolis, R.L. Bontempo Assocs. .. 317-299-6270
KS Lenexa, Midtech Assoc. 913-541-0505
MA Braintree, Nova Assocs. 617-848-9330
MI Southfield, R. C. Nordstrom & Co. 313-559-7373
MN Minneapolis, Electro-Serv 612-338-3475
MO St. Louis, Midtech Assocs. 314-275-8666
NY Marcellus, J. G. Welch Assocs. 315-673-1009
NY Patchogue, Optimum Sls. 516-758-0644
NY Rochester, J. G. Welch Assocs. 716-244-1100

NY Rochester, Mullahy-Welch Sls. 716-266-2798
NC Raleigh, C-Tech Sls. 919-782-8100
OH Auroa, Engrg. Mktg. Assocs. 216-562-6104
OH Centerville, Engrg. Mktg. Assocs. 513-433-2800
OH Worthington, Engrg. Mktg. Assocs. 614-436-9452
OK Tulsa, Delta Comp, Inc. 918-592-7711
PA Wynnewood, Metz-Benham Assocs., Inc. 215-896-7300
TX Seagoville, Delta Comp., Inc. 214-287-6333
UT Salt Lake City, Wasatau/Prorep Mktg. 801-268-3434
VA Sterling, Beacon-North 703-478-2480
WA Seattle, J. J. Assocs., Inc. 206-246-6619
Can Mississauga, Ont., IntelaTech 416-629-0082

DEPAC CORP., 201 Mill St., Rome, NY 13440, Tel: 315-339-1265; Empl.: 3

DERINGER MFG. CO., 1250 Townline Road, Mundelein, IL 60060, Tel: 708-566-4100, TWX: 910-685-4231; *Sls. Mgr.:* W. Johnston

DESIGNATRONICS, INC., See Automatic Coil Corp., Sub. Designatronics, Inc.

DESIGN AUTOMATION, INC., 809 Massachusetts Ave., Lexington, MA 02173-3992, Tel: 617-862-8998, FAX: 617-862-3769; FSC No.: 4D417; Empl.: 8

DESIGN COMPONENTS, INC., 1 Kenwood Circle, Franklin, MA 02038, Tel: 508-528-7300, 800-341-4811, FAX: 508-520-1424; Empl.: 60

DESIGN TECHNOLOGY, 1050-R Pioneer Way, El Cajon, CA 92020, Tel: 619-440-7666, FAX: 619-440-8048; FSC No.: 619-440-8048; Empl.: 50; *Sls. Mgr.:* Jeff Jonas; *Dist. Mgr.:* Sherry Golden

DESPATCH INDUSTRIES, 63 St. Anthony Parkway, P.O. Box 1320, Minneapolis, MN 55418, Tel: 612-781-5363, TELEX: 29-0704, TWX: 6288-5512; Empl.: 360; *Sls. Mgr.:* P. Olson

DETORONICS CORPORATION, 10660 E. Rush St, S. El Monte, CA 91733, Tel: 818-579-7130, TWX: 910-587-3436, FAX: 818-579-1936; FSC No.: 29867; Empl.: 45

DETROIT COIL CO., 2435 Hilton Rd., Ferndale, MI 48220, Tel: 313-398-5600, FAX: 313-398-0481; Empl.: 120; *Sls. Mgr.:* T. Dougherty ..... **B•1620**

Local Sales Offices & Reps
CT Bristol, M.L. Assocs. 203-589-2856
GA Decatur, Austin Brown Assocs. 404-370-7500
MA Wayland, M. L. Assocs. 508-358-5540
MI Ferndale, Detroit Coil Co. 313-398-5600
MN Little Canada, Assured Sls. 612-482-1309
NJ Morristown, Andrews & Andrews 201-569-8800
NY Glen Head, Andrews & Andrews 516-692-8686
PA Tamaqua, Loman Co. 609-796-0055
WA Kent, C. B. Parsons Co. 206-762-7373

DETROIT TESTING LABORATORY, INC., 7111 E. Eleven Mile, P.O. Box 869, Warren, MI 48090-0869, Tel: 313-754-9000, FAX: 313-754-9045; FSC No.: 0739; Empl.: 100

DEVAR, INC., 706 Bostwick Ave., Bridgeport, CT 06605, Tel: 203-368-6751, TELEX: 96-4234, FAX: 203-368-3747; Empl.: 80; *Sls. Mgr.:* T. W. Tomasko

DEVELCO, INC., 175 Nortech Pkwy., San Jose, CA 95134-2306, Tel: 408-945-6500, TWX: 910-339-9295, FAX: 408-945-6504; Empl.: 50; *Sls. Mgr.:* W. J. Baker

DEXTER RESEARCH CTR., INC., 7300 Huron River Dr., Dexter, MI 48130, Tel: 313-426-3921, TELEX: 757075 DEXTER RES UD; Empl.: 22; *Sls. Mgr.:* Robert Toth Jr.

DEXTER SCIENTIFIC, 308 Benham St., Palatka, FL 32177, Tel: 904-328-2450; Empl.: 1

DE YOUNG MFG., INC., 12920 N.E. 125th Way, Kirkland, WA 98034, Tel: 206-823-4798, FAX: 206-821-8633; FSC No.: 54937; Empl.: 70; *Sls. Mgr.:* Ted Johnson

DGH CORPORATION, P. O. Box 5638, Manchester, NH 03108, Tel: 603-622-0452, FAX: 603-622-0487; Empl.: 10

DH PRINT, DIV. OF DH TECHNOLOGY, Technical Research Park, Riverton, WY 82501, Tel: 307-856-4821, FAX: 307-856-0412; Empl.: 230; *Sls. Mgr.:* Rich Phillips; *Dist. Mgr.:* Rich Phillips

DIAGOSTIC INSTRUMENT CORP., 4 Copeland Dr., Box J, Ayer, MA 01432, Tel: 508-772-4572, FAX: 508-772-5210; Empl.: 125; *Sls. Mgr.:* Brad Barone

DIALIGHT CORPORATION, 1913 Atlantic Ave., Manasquan, NJ 08736, Tel: 908-223-9400, FAX: 908-223-8788; Empl.: 400; *Sls. Mgr.:* W. Moore ... **B•1145-1150**

Local Sales Offices & Reps
AL Huntsville, Cartwright & Bean 205-830-1540
AZ Phoenix, Shefler-Kahn Co. 602-581-0884
CA Los Angeles, Landa & Assocs. 213-879-0770
CA Pleasanton, Moulthrop Sls. 415-463-0450
CA Santa Ana, Landa & Assocs. 714-543-7805
CO Boulder, Comp. Prods. Sls. 303-530-2800
FL Ft. Lauderdale, Panamtech, Inc. 305-587-3769
FL Oviedo, Panamtech Inc. 407-679-5506
GA Norcross, Cartwright & Bean 404-368-0160
IN Indianapolis, Elctrn. Reps. 317-894-1414
IA Cedar Rapids, Lowell-Kangas & Assoc. 319-362-9290
KS Shawnee, Lowell Kangas & Assocs. .. 913-631-3515
LA Covington, Cartwright & Bean 504-892-1780
MA Chelmsford, John E. Boeing Co., Inc. .. 508-256-5800
MI Royal Oak, Hilltronics 313-435-0920
MN Minneapolis, Professional Sales For Ind. 612-944-8545
MS Jackson, Cartwright & Bean 601-981-1170
MO St. Louis, Lowell Kangas & Assocs. ... 314-821-4050
NY Liverpool, Gen-Tech 315-451-3480
NY Melville, Parallax 516-351-1000
NC Charlotte, Cartwright & Bean 704-536-0303
NC Raleigh, Cartwright & Bean 919-876-4130
OH Dayton, Baehr, Greenleaf & Assocs. .. 513-439-0724
OH Westlake, Baehr, Greenleaf & Assocs. 216-892-1770
OH Worthington, Baehr, Greenleaf & Assocs. 614-847-0220
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PA Broomall, L.D. Lowery 215-356-5300
PA Warrendale, Baehr, Greenleaf & Assocs. 412-934-3088
TN Knoxville, Cartwright & Bean 615-693-7450
TN Nashville, Cartwright & Bean 901-362-8345
TX Austin, Tesco 512-834-8374
TX Dallas, Tesco 214-553-1200
TX Houston, Tesco, Inc. 713-690-4909
VA Earlysville, L.D. Lowery, Inc. 804-973-6672
WA Redmond, Earl & Brown Assocs. 206-885-5064
Can Kirkland, PQ, Longman Sls., Inc. 514-694-3911
Can Mississauga, Ont., Longman Sls., Inc. 416-670-8100
Can Vancouver, B.C., Arwin Tech. Ltd. 604-980-4557

Local Distributors
AR Little Rock, Carlton Bates 501-562-9100
CA Garden Grove, Richey Impact, Inc. 714-895-0060
CA Gardena, California Switch 213-770-2330
CA Los Angeles, Bell Inds. 213-826-6778
CA Santa Clara, Cypress Elctrns. 408-980-8400
CO Denver, CSID 303-292-9594
FL Orlando, EMSCO 407-849-6362
FL Orlando, Hammond Elctrns. 407-849-6060
GA Norcross, Dow Elctrns. 404-448-4004
IL Chicago, Newark Elctrns. 312-784-5100
IL Palatine, Ohm Elctrns. 708-359-5500
IL Peoria, Klaus Radio, Inc. 309-691-4840
LA Lafayette, Ralph's of Lafayette 318-233-0105
LA New Orleans, Southern Radio 504-524-2343
MD Baltimore, Resco 301-931-8200
MA Hingham, Sager Elctrns. 617-749-6700
MA Norwood, Gerber Elctrns. 617-769-6000
MI Livonia, Chelsea Ind/RS Elec. 313-525-1155
MN St. Paul, Gopher Elctrns. 612-483-3322
MO Kansas City, Walters Indl. 816-531-7015
MO Maryland Hts., L Comp 314-291-6200
NJ Kenilworth, Federated Purchaser 908-272-0505
NY Buffalo, Summit Distrs. 716-887-2800
NY Elmsford, Ancar Elctrns. 914-592-7100
NY Hauppauge, Broadline Elctrns. 516-231-4100
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Melville, Arrow Elctrns. 516-391-1300
NC Raleigh, Southeastern Elctrns. 919-828-2311
OH Akron, Aesco Elctrns., Inc. 216-762-8818
OH Columbus, Hughes-Peters, Inc. 614-294-5351
OH Dayton, Stotts Friedman 513-298-5555
OH Warren, Rem Elctrn. Supp. 216-373-1300
OK Tulsa, Radio, Inc. 918-587-9123
PA Philadelphia, PEI/Genesis 215-673-0400
PA Reading, Barbey Elctrns. 215-376-7451
PA Trevose, Almo Elctrns. 215-953-2800
TX Dallas, Norvell Elec., Inc. 214-233-0020
TX Houston, Harrison Equip. Co. 713-879-2600
VA Charlottesville, Virginia Elctrns. 804-296-4184
WA Bellevue, Almac Elctrns. 206-643-9992
WI Milwaukee, Marsh Elctrns. 414-475-6000
Can Don Mills, Ont., Saynor Varah 714-895-0060
Can Edmonton, Alb., Cardinal Ind. Elec. 403-483-6266
Can Willowdale, Ont., Electro Sonic 416-494-1666

DIANACHART INC., 101 Round Hill Dr., Rockaway, NJ 07866, Tel: 201-625-2299, FAX: 201-625-2449; Empl.: 10; *Sls. Mgr.:* B. McWilliams

DI/AN CONTROLS, INC., 16 Jonathan Drive, Brockton, MA 02401, Tel: 508-599-8000, FAX: 508-599-8658; FSC No.: 06900; Empl.: 25; *Sls. Mgr.:* Raymond Stafford

DICKINSON USA INC., Dickinson Manufacturing Co. Ltd., 11324 Mukilteo Speedway, Lynnwood, WA 98037, Tel: 206-742-3677, 800-659-9768, In Canada 604-525-6444, FAX: 206-347-8502; Empl.: 30; *Sls. Mgr.:* Robert Farr

DIELECTRIC COMMUNICATIONS, General Signal, Tower Hill Rd., Raymond, ME 04071, Tel: 207-655-4555, 800-341-9678, TELEX: 710-229-6890, FAX: 207-655-4669; FSC No.: 08441; Empl.: 220; *Sls. Mgr.:* Rolf Olsen

DIELECTRIC LABS., Rte. 20 E., Cazenovia, NY 13035, Tel: 315-655-8710, TELEX: 882-691 Dielectric Labs., FAX: 315-655-8179; FSC No.: 55153; Empl.: 100; *Sls. Mgr.:* Gunter Vorlop

DIE-TECH INC., 295 Sipe Rd., RDI, York Haven, PA 17370, Tel: 717-938-6771, FAX: 717-938-6099 ..... **C•1347**

DIETERICH STANDARD, A Dover Industries Company, P.O. Box 9000, Boulder, CO 80301, Tel: 303-530-9600, FAX: 303-530-7064; Empl.: 105; *Sls. Mgr.:* Robert Heiser; *Dist. Mgr.:* Robert Heiser

DIETZ DESIGN, INC., 100 Electronics Pkwy., Belton, MO 64012, Tel: 816-331-4911, FAX: 816-331-4914; FSC No.: 93652; Empl.: 75; *Sls. Mgr.:* Chas. A. McMurray

DIGI-DATA CORP., 8580 Dorsey Run Rd., Jessup, MD 20794, Tel: 301-498-0200, TELEX: 87-580, FAX: 301-498-0771; Empl.: 40; *Sls. Mgr.:* Allen Grams

DIGI-KEY CORP., 701 Brooks Ave. South, Thief River Falls, MN 56701-0677, Tel: 218-681-6674, 1-800-344-4539, FAX: 218-681-3380

DIGITAL DATA SYSTEMS, 1551 N.W. 65 Ave., Ft. Lauderdale, FL 33313, Tel: 305-792-3290, TWX: 910-997-4751 (Digital), ESYLNK: 62756087, FAX: 305-581-13; FSC No.: 65136; Empl.: 20

DIGITAL DYNAMICS, INC., 5274 Scotts Valley Dr., Scotts Valley, CA 95066, Tel: 408-438-4444; FSC No.: (S.I.C. Code – 3823); Empl.: 15

DIGITAL EQUIP., One Iron Way, Marlborough, MA 01752

DIGITAL MOTOR, INC., 1075 N.W. Murray Rd., Ste. No. 255, Portland, OR 97229-5501, Tel: 503-629-9692, FAX: 503-690-9876; Empl.: 6

DIGITAL PRODUCTS, INC., 108 Water Street, Watertown, MA 02172, Tel: 617-924-1680, 800-243-2333, TELEX: 312345, FAX: 617-924-7814; Empl.: 100; *Dist. Mgr.:* Neil Peterson

DIGITAL RADIO CORP., 601 S. Pacific Coast Hwy., Redondo Beach, CA 90277, Tel: 213-316-4114, FAX: 213-543-1256; Empl.: 27; *Sls. Mgr.:* Arvin L. Perry

DIGITEC, 959 Cheney Ave., Marion, OH 43302, Tel: 614-387-3444, TELEX: 3775688; FSC No.: 16152; Empl.: 45; *Sls. Mgr.:* Bruce Poplin; *Dist. Mgr.:* Bruce Poplin

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FAX: 714-391-4558

DIGITRAN DIVISION, Xcel Corporation, 4290 E. Brickell St., Ontario, CA 91761, Tel: 714-391-4321; FSC No.: 07126; Empl.: 300; *Sls. Mgr.:* W. Miller; *Dist. Mgr.:* Kathy Simonds ..... **B•1680, 1805**

Local Distributors
AL Huntsville, Comp. Distrs. 205-883-7501
AL Huntsville, Powell Elec. 205-539-2731
AZ Tempe, Powell Elctrns. 602-967-7538
AR Little Rock, Comp. Distrs. 501-227-6278
CA Cerritos, El-Com 213-404-2961
CA Fullerton, Pyramid 714-773-0781, 213-691-0561
CA San Diego, El-Com 619-578-0900
CA San Jose, Powell Elctrns. 408-943-9020
CA Santa Clara, Pyramid Elec. 408-727-9810
CT Hamden, Impact Elctrns. 203-281-1331
FL Ft. Lauderdale, Comp. Distrs. 305-971-4950
FL Ft. Lauderdale, Powell Electr./Fla. 305-972-4300
GA Norcross, Comp. Distrs. 404-441-3320

IL Mt. Prospect, Magnuson Elctrns. 312-956-0700
IN Indianapolis, Graham Elec. 317-634-8202
MD Columbia, Powell Electr. 301-621-4070
MA Canton, Impact Sls. Co. 617-821-1500
MA West Borough, Powell Electrns. 617-336-6100
MI Livonia, Pioneer/Michigan 313-525-1800
MI St. Clair Shores, Specialties Mfg. 313-771-2700
MN St. Paul, Magnuson Elec. 612-227-8495
NJ Hasbrouck Hgts., Tory Sls. 201-288-5656
NY Rochester, Modutex Corp. 716-647-9700
NC Cary, Powell Elec. 919-467-1212
NC Raleigh, Comp. Distrs. 919-834-9465
PA Philadelphia, Powell Electr. 215-365-1900

DILL INSTRUMENTS INC., 436 W. Willard, Kalamazoo, MI 49005, Tel: 616-388-5708, FAX: 616-388-5704; Empl.: 10; *Sls. Mgr.:* Terry Simpson; *Dist. Mgr.:* Robert Boyle

DILLON, Weigh-Tronix, Inc., 1000 Armstrong Dr., Fairmont, MN 56031, Tel: 507-238-4461, TELEX: 756594, FAX: 507-238-4195; Empl.: 500; *Sls. Mgr.:* Randy Newlin; *Dist. Mgr.:* Tom Gallagher

DILOG, 1555 S. Sinclair St., Anaheim, CA 92806, Tel: 714-937-5700, 1-800-DILOG 32, TELEX: 6836051, FAX: 714-978-2420; FSC No.: 95-3205555; Empl.: 250; *Sls. Mgr.:* Dennis Edwards

DILWOL WIRE & CABLE INC., 435 Enfield Rd., Burlington, Ont., Canada L7T 2X5, Tel: 416-681-2343, FAX: 416-681-8440; *Sls. Mgr.:* J. R. Mattie

DIMCO-GRAY, 8200 S. Suburban Rd., Dayton, OH 45458, Tel: 513-433-7600, FAX: 513-433-0520; Empl.: 120; *Sls. Mgr.:* James L. Harl

DIMENSIONS UNLIMITED, INC., 1636 Gervais Ave., St. Paul, MN 55109, Tel: 612-770-5630, FAX: 612-770-0847; *Sls. Mgr.:* David Flod

DIODES INC., 9957 Canoga Ave., Chatsworth, CA 91311, Tel: 818-882-4920, 800-821-1178, FAX: 818-341-1736; FSC No.: 12060; Empl.: 55; *Sls. Mgr.:* Marvin Zidel; *Dist. Mgr.:* Sue Reinish ..... **A•2093**

Local Sales Offices & Reps
AL Huntsville, Hughes Assocs. 205-533-9108, FAX:205-533-4667
AZ Phoenix, Sanford Sls. 602-957-3570, FAX:602-955-2836
CA Los Angeles, Landa & Assoc. 213-879-0770, FAX:213-478-0190
CA Los Gatos, Norcal 408-356-7771
CA San Diego, Costal Elctrns. Sls. 619-459-4148, FAX:619-454-2611
CA Santa Ana, Landa & Assocs. 714-543-7805, FAX:714-543-1380
CO Denver, AKI Entprs. 303-388-4488
FL Maitland, Hughes Assocs. 407-629-5933
FL Tamaroc, Hughes Assocs. 305-720-1674
GA Norcross, Hughes Assocs. 404-662-1587, FAX:404-662-1561
IL Highland Park, Bransky Sls. 708-433-2375, FAX:708-433-2377
IL McHenry, Mesa 815-344-2820:FAX:815-344-2730
IN Indianapolis, Mktg. Engrs. Inc. 317-872-5665, FAX:317-872-5668
IA Cedar Rapids, KKB & Co. 319-373-1730, FAX:319-373-2019
KY Louisville, Mktg. Engrs. Inc. 502-267-7093, FAX:502-267-6533
MD Randallstown, Beacon North 301-655-2265
MA Needham Heights, The Newscott Co., Inc. 617-444-1923,FAX:617-449-4689
MI Farmington Hills, J.L. Montgomery Assoc. 313-489-0099,FAX:313-489-0189
MN St. Paul, Proud Inds. 612-646-9428, FAX:612-646-6109
MS Cornith, Hughes Assocs. 601-287-2915
MO Blue Springs, KKB & Co. 816-229-0001, FAX:816-228-1466
MO St. Louis, KKB & Co. 314-647-2400, FAX:314-647-3773
NJ Berkeley Heights, Cambridge Allen & Assoc. 201-464-0203,FAX:201-464-3030
NY Binghamton, Ontec Elctrn. Mkg., Inc. .. 607-724-5266
NY Forest Hills, Cambridge Allen & Assoc. 718-592-6361
NY Rochester, Ontec Elctrn. Mkg., Inc. 716-464-8636, FAX:716-464-0122
NY Syracuse, Ontec Elctrn. Mkg., Inc. 315-425-9800, FAX:315-478-6108
NY Wappingers Falls, Ontec Elctrn. Mkg., Inc. 914-462-7188,FAX:914-462-8706
NC Gary, Huges Assocs. 919-467-7029, FAX:919-481-9255
OH Dayton, J.C. Hofstetter Co. 513-296-1010, FAX:513-296-1274
OH Medina, J.C. Hofstetter Co. 216-241-4880, FAX:216-725-4471
OK Bethany, Design Mktg. 405-789-5911
OR Beaverton, Westmark Elctrns. Inc. 503-641-8780, FAX:503-641-8783
OR Tigard, Elctrns. Comps. Sls. 503-245-2342
PA Erie, J.C. Hofstetter Co. 412-356-7303
TN Hemitage, Hughes Assocs. 615-871-0908
TN Knoxville, Hughes Assocs. 615-558-0283
TX Austin, Design Mktg. 512-263-9151, FAX:512-263-3447
TX Dallas, Design Mktg. 214-480-8151, FAX:214-480-8214
TX Fort Worth, Design Mktg. 817-232-3155
TX Houston, Design Mktg. 713-550-3318, FAX:713-550-9114
UT Salt Lake City, Wasatch Reps. 801-268-3434, FAX:801-266-9021
VA Lynchburg, Jim Griffin 804-237-0598
VA Sterling, Beacon North 703-478-2480, FAX:703-435-7115
WA Bellevue, Westmark Elctrns. Inc. 206-454-1944, FAX:206-454-2488
WA Mercer Island, Elctrns. Comps. Sls. 206-232-9301
PR Caguas, Caribbean Elctrns. 809-746-9897, FAX:809-746-9441
Can Calgary, Cana Rep. Grp. Inc. 403-255-0294, FAX:403-255-4902
Can Montreal, Cana Rep Grp. Inc. 514-276-4477, FAX:514-276-3646
Can Surrey, Cana Rep Grp. Inc. 604-599-1232, FAX:604-599-3616
Can Willowdale, Cana Rep Grp. Inc. 416-250-6683, FAX:416-250-6684

DIONICS, 65 Rushmore St., Westbury, NY 11590, Tel: 516-997-7474, FAX: 516-997-7479; FSC No.: 50857; Empl.: 45; *Sls. Mgr.:* Ron Colino

DIO-REY, Div. of Info-Lite Corp., 422 Cliff St., Fairview, NJ 07022, Tel: 201-941-4455, FAX: 201-941-4919; Empl.: 13; *Sls. Mgr.:* Joseph M. Cartelli ..... **B•1058-1064**

DIRECT AID, 31332 Via Colinas, Ste. 102, Westlake Vl., CA 91362, Tel: 818-889-1013, 800-443-8080; *Sls. Mgr.:* Todd Smith; *Dist. Mgr.:* Todd Smith

DIRECT CONVERSION TECHNIQUE, INC., 1245 Fogest Ave. 12, Des Plaines, IL 60016, Tel: 708-827-2282, FAX: 708-827-2280; Empl.: 6; *Sls. Mgr.:* Thomas A. Ochal

DIRECT SOUND CORPORATION, 150 Fifth Ave., Suite 845, New York, NY 10011, Tel: 212-691-9050, FAX: 212-807-1598; Empl.: 3; *Sls. Mgr.:* A. Takayama ..... **B•1681; C•1349**

Local Sales Offices & Reps
NY New York, Dai-Ichi Shoji of America, Inc. 212-691-9050

DISC INSTRUMENTS, Honeywell, 102 E. Baker St., Costa Mesa, CA 92626, Tel: 714-433-0343, TWX: 910-595-1987, FAX: 714-432-7567; Empl.: 150

DISPLAY DEVICES, INC., P.O. Box 230677, Encinitas, CA 92023, Tel: 619-753-0113; FSC No.: 26107

DISPLAYS, INC., 31 Industrial Park Rd., Lewistown, PA 17044, Tel: 717-242-2541, FAX: 717-248-8680; Empl.: 65; *Sls. Mgr.:* Richard Crawford

DISPLAYTECH, INC., 2200 Central Ave., Boulder, CO 80301, Tel: 303-449-8933, FAX: 303-449-8934; Empl.: 26; *Sls. Mgr.:* Ann Perry; *Dist. Mgr.:* Ann Perry

DISPLAY TECHNOLOGIES, 1355 Holmes Rd., Elgin, IL 60123, Tel: 708-931-2100, FAX: 708-931-2120; Empl.: 220; *Sls. Mgr.:* Robert Valentine; *Dist. Mgr.:* Timothy Knutsen

DISTRIBUTED LOGIC CORP., See DILOG

DISTRIBUTED PROCESSING TECHNLG. CORP., 140 Candace Dr., Maitland, FL 32751, Tel: 407-830-5522, FAX: 407-260-5366; *Sls. Mgr.:* Steve Holler

DISTRIBUTOR & SPECIAL PRODUCTS, Thomson Consumer Electronics, Inc., 2000 Clements Bridge Rd., Deptford, NJ 08096, Tel: 609-853-2525, FAX: 609-853-2231; Empl.: 250; *Sls. Mgr.:* M.J. Cashen; *Dist. Mgr.:* R. McKinstry, R.M.

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DIVELBISS CORP., 9776 Mt. Gilead Road, Fredericktown, OH 43019, Tel: 614-694-9015, FAX: 614-694-9035; Empl.: 40; *Sls. Mgr.:* Terry Divelbiss; *Dist. Mgr.:* Tim Knaul, Rick Reed

DIVERSIFIED CASE CO., Ellis Ave., Off. 2, Whitesboro, NY 13492, Tel: 315-736-3028, FAX: 1-315-736-2049; Empl.: 75; *Sls. Mgr.:* Charlie Fisher

DIVERSIFIED ELECTRONICS, INC., P.O. Box 1140, Evansville, IN 47706-1140, Tel: 812-426-2806, FAX: 812-425-8930; Empl.: 55; *Sls. Mgr.:* John L. Smith

DIVERSIFIED OPTICAL PRODUCTS, INC., 282 Main St., Salem, NH 03079, Tel: 603-898-1880, TWX: 7103386747, ESYLNK: 62229740, FAX: 603-898-3970; FSC No.: IHT10; Empl.: 49; *Sls. Mgr.:* James A. Greene

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DJ INSTRUMENTS, INC., 18 Republic Rd., N. Billerca, MA 01862, Tel: 508-667-5301, FAX: 508-667-6804; FSC No.: 57747; Empl.: 30; *Sls. Mgr.:* David First

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MA S. Easton, Intek Sls. 508-238-9283
MN Golden Valley, J.H. Hanson Co. 612-377-4997
NJ Brielle, EMC Technologists 201-223-6699
OR Beaverton, Elctrns. Northwest Inc. 503-629-9241
PA Sewickley, Teplitz- Byrne Assocs. 412-741-3628
TX Richardson, Scientific Dvcs. 214-231-8106
WA Redmond, Elctrns. Northwest Inc. 206-883-1959
Can British Columbia, Asten Holdings 604-853-5724
Can Montreal, Tekron Comms. Inc. 514-335-0152

DORAN MANUFACTURING CO., 2834 Sidney Ave., Cincinnati, OH 45225, Tel: 513-681-5424, FAX: 513-681-5604; Empl.: 60; *Sls. Mgr.:* Jeff Stegman

DORMEYER INDS., A. F. Dormeyer Mfg. Co., Inc., 3418 N. Milwaukee, Chicago, IL 60641, Tel: 312-283-4000, FAX: 312-283-4927; Empl.: 250; *Sls. Mgr.:* R. Steinberg; *Dist. Mgr.:* Ken Harthun ..... **B•1621-1623**

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NY	Buffalo, Summit Distrs.	716-887-2800
NY	Mamaroneck, Logicomp Elctrns.	914-698-9332
NY	Rochester, Summit Distrs.	716-334-8110
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OH	Dayton, Stotts Friedman	513-298-5555
PA	Montgomeryville, Pyttronic Inds., Inc.	215-643-2850
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DOUGLAS ELECTRONICS, INC., 2777 Alvarado St., San Leandro, CA 94577, Tel: 510-483-8770, FAX: 510-483-6453; Empl.: 15

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CA	San Clemente, ATA Assocs.	714-661-9700
CO	Wheat Ridge, Trembly Assoc.	303-421-8900
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IL	Arlington Hgts., Thermek Inc.	708-577-6900
MA	Norwood, JMG, Inc.	617-762-5333
MN	St. Anthony, RCOM	612-788-3605
NV	Las Vegas, Trembly Assoc.	702-739-9770
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NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Roochester, J. G. Welch Assoc.	716-244-1100
NY	Syracuse, Mullahy/Welch	315-685-6280
OH	Cleveland, Geotronix Mktg. Assoc.	216-659-6100
OH	Trotwood, Geotronix, Inc.	513-252-6700
PA	Newtown, Total Control	215-860-5333
TX	Carrollton, High Point Sls.	214-446-0406
Can	Mont., Que., Solid State Engrg. Co.	514-481-3313

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CA	San Clemente, ATA Assocs.	714-661-9700
FL	Hollywood, MRO Elctrn. Distrs.	305-966-4847
FL	Orlando, Accurate Temperature Controls.	407-292-6800
IL	Palatine, Promark Sys.	708-806-0066
LA	New Orleans, Butler & Land	504-734-8888
MA	Middleboro, Glynn Elec.	508-947-4262
MN	Minneapolis, Control Design	612-721-1628
NC	Burlington, AC DC Elctrns.	919-226-0496
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OK	Tulsa, Butler & Land	918-665-7979
PA	Narberth, Power Modules	215-668-0664
PA	Yeadon, Y-L Prods.	215-583-2800
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TX	Houston, Butler & Land	713-896-0808

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CA	San Diego, Detomasi & Grupp Inc.	619-277-0178
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FL	Longwood, Southern Mktg. Assocs.	407-682-7317
GA	Marietta, Southern Mktg. Assocs.	404-565-0603
IL	Palatine, Wave Mktg.	708-934-8008
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MO	Maryland Hts., Dytec/South, Inc.	314-739-0665
KS	Lenexa, Dytec/South, inc.	913-888-0215
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MD	Ellicott City, VPI, Inc.	301-461-2525
MA	Chelmsford, Matrix Sls. Inc.	508-459-4000
MA	Lowell, Matrix Sls., Inc.	508-459-4000
MN	Bloomington, Bill Deming & Assocs.	612-888-5000
MO	Maryland Hgts., Dytec/South, Inc.	314-739-0665
NY	Hartsdale, Spectrum Sls. Inc.	914-472-8600
NY	Rochester, Lamb Comps., Inc.	716-272-7720
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OH	Dayton, Delta Sls.	513-435-9735
OH	Miamisburg, Elctrns. Comps.	513-866-3340
PA	Spring City, W. M. Assocs. Inc.	215-948-0505
TX	Garland, Carey, McMahill & Assoc.	214-681-1414
WA	Kirkland, Anzak Corp.	206-822-1510
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DUMONT/E & R ELECTRONICS, INC., 26 Fairfield Pl., W. Caldwell, NJ 07006, Tel: 201-575-8666, TELEX: 219236 DOLI-UR; FSC No.: 30669; Empl.: 30; *Sls. Mgr.:* Edward Petrasek

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GA	Atlanta, L. & D., Inc.	404-395-7079
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VA Capstone Elctrns. 800-388-2277
VA Deanco, Inc. 800-444-4603
VA Virginaia Elec. 804-296-4184
WA Kent, Components Resources 206-454-8866
WA Seattle, Acacia/Deanco Elctrns. 206-881-5566
WA Seattle, Bell Inds. 206-451-3883
WA Seattle, Capstone Elctrns. 800-388-2277
WI Milwaukee, Aero-Space Computer Supp. 800-231-4725
WI Milwaukee, Belford Inds. 800-323-1231
WI Milwaukee, Bell Inds. 414-547-8897
WI Milwaukee, Capstone Elctrns. 800-388-2277

DUPONT ELECTRO-OPTIC PRODUCTS, Dupont Electronics, P.O. Box 13625, Research Triangle Park, NC 27709, Tel: 1-800-888-LAN1, 919-481-5100, FAX: 919-481-0753; Empl.: 60; *Sls. Mgr.:* Glenn R. Constable

DUPREE, INC., 14395 Ramona Ave., Chino, CA 91710, Tel: 714-597-4889, FAX: 714-597-3043; Empl.: 65

DURACELL®

FAX: 203-791-3273

DURACELL INC.: OEM SALES & MARKETING, Berkshire Industrial Park, Bethel, CT 06801, Tel: 203-791-3274, TELEX: 6972165; Empl.: 8000; *Sls. Mgr.:* R. D'Alessandro ..... **D•1439-1443**

Local Sales Offices & Reps
CA Irvine, Duracell Inc. 714-476-1811
CT Southbury, Duracell Inc. 203-264-3935
IL Oak Brook, Duracell Inc. 708-954-2714

Local Distributors
CA Costa Mesa, Battery Specialties Inc. .. 714-755-0888
CA Mtn. View, Energy Sls. Inc. 415-969-0800
CA San Diego, Tauber Elctrns. Inc. 619-274-7242
CO Englewood, AVT, Inc. 303-798-1958
IL Downers Grove, Telecommunication Dvcs. 312-971-3460
MA Sharon, Adcour 617-784-8123
MN St. Paul, DC Battery Prods. 612-646-7478
NY Bohemia, Battery Assemblers, Inc. 516-567-8855
NY Commack, Bren Tronics Inc. 516-499-5155
NY Mt. Kisco, Multiplier Inds. Corp. 914-241-9510
NC Winston Salem, Progressive Technlgs., Inc. 919-761-1375
TX Stafford, Southwest Elctrns. Inc. 713-240-4000
WA Redmond, Energy Sls. Inc. 206-883-2343

DURAKOOL, INC., American Electronic Components, 1010 N. Main St., Elkhart, IN 46514, Tel: 219-264-1116, TELEX: 25-8482, FAX: 219-264-4681; Empl.: 230; *Sls. Mgr.:* Julian Wills ..... **B•1683**

Local Sales Offices & Reps
AZ Mesa, H-D Assocs., Inc. 602-784-2944
CA Canoga Parkk, C & W Comp. Sls. 818-700-2684
CA Sunnyvale, Pass Assocs. 408-735-9040
CO Littleton, Harthun Assocs. 303-795-5545
FL Clearwater, J. J. Galleher Co. 813-461-7706
GA Smyrna, Tech Controls, Inc. 404-333-9883
IN Mishawaka, Power Comps. of Midwest 219-256-6630
IA Davenport, Volco Co. 319-326-5233
KS Overland Park, R. Greene Co. 913-492-6886
MA Hingham, Hingham Bay Corp. 617-740-1900
MI Novi, Advanced Controls & Technlg. .. 313-349-0260
MN Minneapolis, Volco Co. 612-933-6631
MS Corinth, World Dists. 205-533-9108
MO St. Louis, R. Greene Co. 314-994-0222
NE Omaha, Volco Co. 402-346-2203
NY Buffalo, Niagara Elec. Sls. Co. 716-825-3100
NY Wantagh, DONY Tech. Sls. 516-826-5550
NC Pineville, Mel Sls. 704-541-5750
OH Parma, Orr Assocs. 216-871-1800
OR Portland, Branom Instr. Co. 503-283-2555
PA Narberth, Power Modules Inc. 215-668-0664
TX Dallas, Dawson & Assoc. 214-241-3843
UT Salt Lake City, Western Controls 801-292-5900
WA Bothell, Temco N.W. 206-481-6150

Local Distributors
CA Burlingame, Campbell & George 415-697-2965
IN Mishawaka, Power Comps. of Midwest 219-256-6630
PA Narberth, Power Modules 215-839-1331

DUREL CORPORATION, Affiliate of 3M & Rogers Corp., 645 W. 24th St., Tempe, AZ 85282, Tel: 602-731-6200, FAX: 602-731-6210

DURGIN & BROWNE, See Tridyne Process Systems, DBI Inds.

DUTEC, INC., 4801 James McDivitt, P.O. Box 964, Jackson, MI 49204-0964, Tel: 800-248-1632, FAX: 517-750-4740; *Sls. Mgr.:* Bruce Reynolds, Gen. Mgr.

DY-4 SYSTEMS INC., 21 Credit Union Way, Nepean, Ont., Canada K2H 9J4, Tel: 613-596-9911, TELEX: 0534111, FAX: 613-596-0574; Empl.: 280; *Sls. Mgr.:* Mitch Robinson

DYLON GRAPHITE COMPANY, Dylon Industries, Inc., 7700 Clinton Rd., Cleveland, OH 44144, Tel: 216-651-1300, FAX: 216-651-1777; Empl.: 45; *Sls. Mgr.:* L.C. Eucher

DYMEC INC., 8 Lowell Ave., Winchester, MA 01890, Tel: 617-729-7870, TELEX: Hank Diamond; Empl.: 50; *Sls. Mgr.:* Hank Diamond ..... **D•1241**

DYNACAST INC., 1401 Front Street, Yorktown Heights, NY 10598, Tel: 914-962-6300, TELEX: 6716096, FAX: 914-245-7185; Empl.: 150

DYNACIRCUITS INC., 11230 W. Addison, Franklin Park, IL 60131, Tel: 708-451-1700, FAX: 708-451-9266; Empl.: 300; *Sls. Mgr.:* Dennis A. Dworzak

DYNAGE/CONTROLS, INC., P.O. Box 95, 551 Third Avenue, Canistota, SD 57012, Tel: 605-296-3487, TELEX: 753243 (OAKLEAFINC), FAX: 605-296-3231; Empl.: 12; *Sls. Mgr.:* Sidney C. Oakleaf

DYNAGE Power

FAX: 605-296-3231

DYNAGE/POWER & MAGNETICS, Division Of Oakleaf, Inc., P.O. Box 95, 551 Third Avenue, Canistota, SD 57012, Tel: 605-296-3462/3487, TELEX: 753243 (OAKLEAFINC); FSC No.: 9Y852; Empl.: 25; *Sls. Mgr.:* Sidney C. Oakleaf ..... **A•2201-2204; D•1708-1710**

DYNALLOY, INC., 18662 MacArthur Blvd., Ste.103, Irvine, CA 92715, Tel: 714-476-1206, FAX: 714-476-3167; Empl.: 25

DYNALOY, INC., 7 Great Meadow La., Hanover, NJ 07936, Tel: 201-887-9270, FAX: 201-887-3678; FSC No.: 27908; Empl.: 19; *Sls. Mgr.:* Jay Parton

Local Sales Offices & Reps

CA	Westminster, Contronic Devices	714-897-2266
CO	Commerce City, WACO	303-289-4743
MA	Newbury Port, William MacDonald	617-465-2768
MA	Waltham, Etchomatic	617-893-2020
MN	Minneapolis, International Sls.	612-831-8423
EXP	South Orange, NJ, K.L. Intl.	201-762-8299

DYNAMIC AIR ENGRG., INC., 620 E. Dyer Rd., Santa Ana, CA 92705-5697, Tel: 714-540-1000, FAX: 714-545-9145; FSC No.: 4140-6105; *Sls. Mgr.:* Carl A. Grisier

DYNAMIC POWER SYSTEMS, Div. Onset International Corp., 12 Sunhill Road, Nesconset, NY 11767-2611, Tel: 516-361-6771, FAX: 516-361-6361; Empl.: 50; *Sls. Mgr.:* Michael Allen

DYNAMICS, Div. of Waugh Controls Corp., 9001 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-998-8281, TELEX: 69-6171, FAX: 818-407-1320; Empl.: 100; *Sls. Mgr.:* Tony Mastroianni

DYNAMICS RESEARCH CORP., Encoder Division, 60 Concord St., Wilmington, MA 01887-2193, Tel: 508-658-6100, FAX: 508-658-0522; Empl.: 125; *Sls. Mgr.:* Joe Portada

DYNAPAR, 1675 Delany Rd., Gurnee, IL 60031, Tel: 312-662-2666, TWX: 910-235-1865; Empl.: 150

DYNAPOWER CORPORATION, Box 3180, Farmington Hills, MI 48333, Tel: 313-553-4300, FAX: 313-553-9096,802-864-3782; Empl.: 75 ..... **D•1712-1713**

DYNAPOWER CORPORATION, Box 9210, S. Burlington, VT 05407, Tel: 802-860-7200, FAX: 802-864-3782; Empl.: 100; *Sls. Mgr.:* William E. Feil ..... **D•1712-1713**

DYNAROLL CORPORATION, 551 Fifth St., San Fernando, CA 91340, Tel: 818-837-3456, FAX: 818-837-3466; *Sls. Mgr.:* Roy Wilson; *Dist. Mgr.:* Molly Kosmak

DYNATECH COMPUTER COMPANY, 280 Bernardo Ave., P.O. Box 7400, Mountain View, CA 94039-7400, Tel: 415-964-7400, TWX: 910-379-6988, FAX: 415-969-3350; Empl.: 49; *Sls. Mgr.:* Chris Lynch; *Dist. Mgr.:* Anita Williams

DYNATECH COMPUTER POWER, INC., 5800 Butler Ln., Scotts Valley, CA 95066, Tel: 408-438-5760, TELEX: 887-247, FAX: 408-438-5793; FSC No.: 7045

DYNISCO, 4 Commerical St., Sharon, MA 02067, Tel: 617-784-8400, TELEX: 174-292, FAX: 617-784-2902; FSC No.: 15687; Empl.: 153; *Sls. Mgr.:* Warden B. Hunt

DYTRONICS CO., See Ryan Intl. Corp.

DZUS FASTENER, 425 Union Blvd., W. Islip, NY 11795, Tel: 516-669-6000, FAX: 516-669-0785; FSC No.: 72794; Empl.: 140; *Sls. Mgr.:* Stephen Meshover

EAGLE ELECTRIC MFG. CO. INC., 45-31 Court Square, Long Island City, NY 11101, Tel: 718-937-8000, FAX: 718-482-0160; Empl.: 3000; *Sls. Mgr.:* Joseph Mannarino; *Dist. Mgr.:* Bob Lofgren

EAGLE MAGNETIC COMPANY, INC., P.O. Box 24283, Indianapolis, IN 46224, Tel: 317-297-1030, FAX: 317-299-1323; Empl.: 44; *Sls. Mgr.:* Robert Jackson ..... **C•1689**

Local Sales Offices & Reps

FL	Jupiter, Cherry Assocs.	305-746-4591
FL	Oviedo, Lighthouse Mktg.	407-366-0073
GA	Roswell, Electro Comp. Sls.	404-992-2344
KS	Wichita, Lorenz Sls.	316-721-0500
ME	Bethel, Shain Assoc.	207-836-3200
MD	Hingham, Shain Assoc.	617-740-2334
MD	Kensington, Koebert Assoc.	301-493-8924
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
MO	St. Louis, Lorenz Sls.	314-997-5829
NE	Lincoln, Lorenz Sls.	402-475-4660
NH	Nashua, Shain Assoc.	603-881-4881
NY	Commack, R.C. Engrg.	516-543-3325
PA	Glenside, Koebert Assocs.	215-576-1329
WA	Kirkland, Northwest Comp. Sls.	206-828-2104
WA	Vancouver, Northwest Comps.	206-695-1331
WV	Inwood, Koebert Assoc.	304-229-8401

EAGLE-PICHER, Box 47, Joplin, MO 64801, Tel: 417-623-8000, TWX: 910-774-4508, FAX: 417-623-8000; Empl.: 700 ..... **D•1444-1450**

EAGLE-PICHER, P.O. Box 130, Bethel Road, Seneca, MO 64865, Tel: 417-776-2256, FAX: 417-776-2257; FSC No.: 3L498; Empl.: 400; *Sls. Mgr.:* H. M. York; *Dist. Mgr.:* H. M. York ..... **D•1444-1447**

Local Sales Offices & Reps

AL	Huntsville, L & D Inc.	205-837-1469
AR	Hot Springs, Automation Supp. Inc. (ASI)	501-767-5444
CA	San Jose, O'Donnell Assocs.-North	408-263-6500
CA	Torrance, O'Donnell Assoc.	213-539-9664
CO	Broomfield, Connors Co.	303-466-9628
CT	Bloomfield, Zaslow Sls. Co.	203-242-7781
FL	Longwood, NSL Assocs., Inc.	305-629-5226
GA	Atlanta, L & D Inc.	404-395-7079
IL	Downers Grove, Golten Assocs.	708-512-0093
KS	Overland Park, Spectrum Sls.	913-648-6811
MA	Westboro, Zaslow Sls. Co.	617-393-8150
MI	Livonia, Electro-Mktg. Grp., Inc.	313-421-7590
MN	Minneapolis, Ohlin Sls. Co.	612-929-6924
MO	Florissant, Spectrum Sls.	314-921-1313
NH	Londonderry, Zaslow Sls. Co.	603-432-8907
NY	Massapequa Pk., HC Assocs.	516-541-0262
NY	Morrisville, Naylor Elec. Co.	315-684-9620
NC	Raleigh, L & D Inc.	919-876-5301
OH	Dayton, Electro-Mktg. Grp., Inc.	513-890-8322
OH	Dayton, Lyons Corp.	513-278-0714
OR	Beaverton, Pacific Mktg. Spec.	503-641-9373
PA	Exton, Kiley Elec. Co.	215-363-8550
TX	Dallas, Rem Air Comps.	214-234-1069
VA	Richmond, L & D Inc.	804-359-0125
WA	Redmond, Pacific Mktg. Spec.	206-882-3144

Local Distributors

AK	Anchorage, Frigid North Co.	907-561-4633
AZ	Tempe, Lynntronics	602-433-0288
AR	Hot Springs, Automation Supp. Inc.	501-767-5444
CA	Anaheim, Carefree Unltd.	714-630-3433
CA	Mountain View, The Power Source	415-960-0700
CO	Denver, Hensley	303-455-3643
FL	Dunedin, Battery Powered Lighting & Sys.	813-734-9498
GA	Smyrna, Mark C. Pope Assocs.	404-435-2471
IN	Muncie, Sealed Energy	317-358-4749
KS	Wichita, RSC Elctrns.	316-267-5213
LA	New Orleans, William B. Allen	800-535-9593
MA	Hingham, Sager Elctrns.	617-749-6700
MN	Minneapolis, Ohlin Sls. Co.	612-929-6924
OH	Cincinnati, M & B Battery	513-385-5900
PA	Bensalem, Scotts Emergency Lighting	215-639-1777
TX	Austin, Wofford Elctrns.	512-339-1131
TX	Dallas, Wofford Elctrns.	214-320-0294
TX	Houston, Wofford Elctrns.	713-847-3583
UT	Salt Lake City, Standard Supp. Co.	801-846-3371
WA	Seattle, Radar Electric	206-282-2511
WI	Milwaukee, Battery Shop	414-384-5410
Can	Mississauga, Ont., Battery Tech.	416-670-7373
Can	New Westminster, B.C., Magnacharge Battery	604-525-0391

EAGLE SIGNAL CONTROLS:A MARK IV INDS. CO., 8004 Cameron Rd., Austin, TX 78753, Tel: 512-837-8300, FAX: 512-837-8486; Empl.: 3000; *Sls. Mgr.:* Patrick Short

EAGLE WICHITA

FAX: 316-942-5190

EAGLE WICHITA, P.O. Box 9446, Wichita, KS 67277, Tel: 316-942-5100 ..... **A•1666-1669**

Local Sales Offices & Reps

AZ	Mesa, Sedco	602-461-9069
MA	BrainTree, Lancer Assocs.	617-849-3083

EALING ELECTRO-OPTICS, New Englander Industrial Park, Holliston, MA 01746, Tel: 508-429-8370, 1-800-343-4912, FAX: 508-429-7893; *Sls. Mgr.:* Brian Gaynor

E & L INSTRUMENTS, Interplex Electronics, Inc., 70 Fulton Terrace, New Haven, CT 06512, Tel: 800-368-0880, FAX: 203-468-0060; Empl.: 70; *Sls. Mgr.:* Katina Boulais

EAO SWITCH CORP., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, Tel: 203-877-4577, TELEX: 96-4347, FAX: 203-877-3694; FSC No.: 61706; Empl.: 19; *Sls. Mgr.:* George T. Bracci ..... **B•1684-1685**

Local Sales Offices & Reps

AZ	Scottsdale, Luscombe Engrg. Co. of AZ	602-949-9333
CA	Los Gatos, Luscombe Engrg. Co. of S.F.	408-370-2020
CA	Montrose, Luscombe Engrg. Co. of L.A.	818-249-9000
CA	San Diego, Luscombe Engrg. Co. of S.D.	619-292-4323
CO	Longmont, Luscombe Engrg. Co. of CO	303-772-3342
CT	Bethel, Ray Perron & Co.	203-798-0261
CT	Waterbury, Ray Perron & Co., Inc.	203-756-9684
FL	Tampa, Florida Comp. sls.	813-873-3622
GA	Norcross, Mtn. Electro Mktg.	404-448-5594
IL	Arlington Hgts., Brainard-Nielsen Mktg., Inc.	708-437-2700
IN	Ft. Wayne, M/S Sls. & Assocs.	219-436-3023
IN	Greenwood, M/S Sls. & Assocs.	317-881-0110
IA	Cedar Rapids, Delltron Co., Inc.	319-393-0075
MD	Columbia, Delta III Assocs., Inc.	301-730-4700
MA	Needham, Ray Perron & Co., Inc.	800-225-4280, 617-449-6162
MI	Plymouth, Jay Mktg. Assocs., Inc.	313-459-1200
MN	Golden Valley, Highland Elctrn. Sls.	612-546-2123
MO	Florissant, Delltron Co., Inc.	314-839-0033
MO	Gladstone, Delltron Co., Inc.	816-436-6445
NM	Albuquerque, Luscombe Engrg. Co.	505-888-0333
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NY	Rochester, Apex Assocs., Inc.	716-272-7040
NC	Raleigh, C-Tech Sls., Inc.	919-782-8100
OR	Lake Oswego, Luscombe Engrg. Northwest	503-636-6664
PA	Horsham, Jacobsen Assocs.	215-674-2937
PA	Pittsburgh, R. W. Kneip	412-823-0169
TX	Dallas, Glidden Electro Equip. Co	214-341-0610
TX	Houston, Glidden Electro Equip. Co.	713-681-1415
UT	Midvale, Luscombe Engrg. Co.	801-565-9885
WA	Bellevue, Luscombe Engrg. N.W.	206-223-1541
WI	Mequon, Badgerep	414-241-9200

Local Distributors

AZ	Phoenix, Minarik Elec.	602-233-3000
AZ	Scottsdale, Electronic Supp.	1-800-622-3726
CA	Anaheim, Minarik Elec. Co.	714-994-2251
CA	Fremont, KEA Elctrns.	415-651-2600
CA	Gardena, California Switch & Sig.	213-770-2330
CA	Glendale, Minarik Elec. Co.	818-507-6500
CA	Riverside, Electronic Supp.	714-683-7300
CA	S. San Francisco, Bell Elctrl. Supp.	415-589-7055
CA	Salinas, Bell Elctrl. Supp.	408-758-6110

CA San Diego, Electronic Supp. 619-693-8222
CA San Diego, Minarik Elec. Co. 619-560-6632
CA San Jose, Electronic Supp. 408-453-3770
CA Santa Clara, Bell Elctrl. Supp. 408-727-2355
CA Santa Clara, Minarik Elec. Co. 408-727-0575
CA Sunnyvale, Target Elctrns., Inc. 408-733-0384
CO Commerce City, Minarik Elec. Co. 303-289-5800
CO Denver, CSID, Inc. 303-292-9594
CT Wallingford, Sager Elec. Supp. co. 203-265-4600
FL Lakeland, Wes-Garde/Switch Controls, Inc. 813-644-7564
FL Orlando, Sager Elctrns. 407-240-3114
FL Oviedo, Dixie Sls. 407-365-5211
FL Pompano Beach, Control Design Supp., Inc. 305-782-1331
GA Atlanta, Motion Elctrns. 404-455-8262
IL Crystal Lake, Sub-Sem, Inc. 815-459-4139
IL Elk Grove, Martec Assoc. 708-956-8090
IL Rosemont, Advent Elctrns., Inc. 708-297-6200
IL Schaumburg, Marsh Elctrns. 708-240-9290
IL Schaumburg, Minarik Elec. Co. 708-885-9337
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Mar Elctrns. 317-633-6699
IA Cedar Rapids, Advent Elctrns., Inc. 319-363-0221
KS Wichita, Radio, Inc. 316-264-2798
KY Louisville, Peerless Elctrns. 502-637-7674
LA Baton Rouge, Menard Elctrns. 504-355-0323
LA New Orleans, Menard Elctrns. 504-734-8445
ME W. Buxton, Nelson & Wright 207-929-8238
MD Columbia, Sager Elctrns. 301-995-6580
MD Gaithersburg, Axis Elctrns. 301-840-9640, 800-492-3190
MD Jessup, Treeko Sls. 301-792-0112
MA Canton, Richey Impact Elctrns. 617-821-1500
MA Hingham, Sager Elec. Supp. Co. 617-749-6700
MA N. Billerica, Minarik Elec. Co. 508-663-0740
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Grand Rapids, R. M. Elctrns. Co. 616-531-9300
MI St. Claire Shores, SPEMCO Switches 313-771-2700
MN Fridley, Voyager Elctrns. 612-571-7766
MN Minneapolis, Electronic Ctr., Inc. 612-378-2442
MO St. Louis, Beckwith, Inc. 314-343-6463
NH Salem, Sager Elec. Supp. Co. 603-898-1348
NJ Cranford, Garden State Indl. Elctrns., Inc. 201-272-6400
NY Bohemia, Key Comps., Inc. 516-567-7500
NY Buffalo, Summit Distrs., Inc. 716-887-2800
NY Hauppauge, Sager Elctrl. Supp. 516-348-1300
NY New York, Martin-Audio/Video 212-541-5900
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rochester, Summit Elctrns., Inc. 716-334-8110
NY Woodside, Switches Unlimited 718-478-5000
NC Charlotte, Dixie Elctrns. 704-377-4348
NC Charlotte, Elctrns. Mktg. Corp. 704-394-6195
NC Raleigh, Sager Service Plus 919-850-9550
NC Winston-Salem, Kirkman Elctrns., Inc. 919-722-9131,800-334-8688
OH Columbus, Electronics Mktg. Corp. 614-299-4161
OH Highland Hgts., Electronics Mktg. Corp. 216-442-3441
OK Tulsa, Radio, Inc. 918-587-9123
OR Portland, Minarik Elc. Co. 503-253-3402
PA Harrisburg, Ad-Tech Elctrns. 717-561-9905
PA Mars, Sager Elctrns. 412-772-2233
PA McKean, Advacom 814-476-7774
PA Norristown, Kimberly-James Co. 215-666-7286
PA Philadelphia, Sager Elctrns. 215-464-4336
PA Pittsburgh, Grant Indl. Controls, Inc. 412-787-9770
PA Wayne, Peak Elctrns. Corp. 215-293-9000
SC Columbia, Dixie Elctrns. 803-779-5332
TX Houston, Minarik Elec. Co. 713-748-0808
TX Irving, Harper S.I.D. 214-621-0500
TX Irving, Minarik Elec. Co. 214-402-8188
WA Redmond, Minarik Elec. Co. 206-885-0832
TX San Antonio, Minarik Elec. Co. 512-822-7097
WA Seattle, Platt Elec. 206-624-4083
WI Milwaukee, Marsh Elctrns. Corp. 414-475-6000

E-A-R SPECIALTY COMPOSITES, Cabot Safety Corp., 7911 Zionsville Rd., Indianapolis, IN 46268, Tel: 317-872-1111, TWX: 810-341-3412; *Sls. Mgr.:* Greg R. Handy

EASCO/K D TOOLS, See Hunter Tools, Easco/K D Tools

EASI FILE CORPORATION, 6 Wrigley St., Irvine, CA 92718, Tel: 714-855-4121, FAX: 714-380-0561; Empl.: 10; *Sls. Mgr.:* Jean A. James

EAST CONTROLS, 6851 Church St., Hanover Park, IL 60103, Tel: 708-837-7709, TELEX: 708-837-6235; Empl.: 1

EASTERN AIR DEVICES, INC., 1 Progress Dr., Dover, NH 03820, Tel: 603-742-3330, FAX: 603-742-9080; Empl.: 150 ..... **B•1254**

Local Sales Offices & Reps

CA Glendale, Electric Motor Engr. 818-502-1866
CA San Jose, Motion Sys. 408-246-0641
CO Boulder, R. G. Entprs. 303-447-9211
FL Winter Park, HHP Assocs. 407-740-0320
KS Shawnee Mission, LSC Co. 913-362-2121
MN Edina, Jay Borman Sls. 612-922-5525
NH Dover, Eastern Air Dvs. 603-742-3330
NJ Ridgefield, Rical Assocs. 201-945-5250
NY Rochester, Elcom Sls. 716-385-1400
NY Syracuse, ELCOM Sls. 315-685-8245
NC Charlotte, Jake Rudisill Assocs. 704-377-6901
OH Cincinnati, KCH Co. 513-931-1686
OR Portland, D.A. Sullivan Co. 503-292-2448
PA Paoli, ETC Sales 215-296-3527
TX Dallas, D.J. Sls. Co. 214-783-8876
TX Richardson, D.J. Sls. 214-783-8876
WI Racine, KMG Sls., Inc. 414-639-9005

Local Distributors

CT Hartford, Bearings, Inc. 203-249-1691
CT No. Haven, Bearings, Inc. 203-288-2201
CT Waterbury, Bearings, Inc. 203-755-3151
ME Auburn, Bearings, Inc. 207-784-3769
ME Bangor, Bearings, Inc. 207-947-6583
MA Avon, Bearings, Inc. 508-584-9200
MA W. Springfield, Bearings, Inc. 413-739-4701
MA Wakefield, Bearings, Inc. 617-246-3906
MA Worcester, Bearings, Inc. 617-852-1050
NH Berlin, Bearings, Inc. 603-752-6001
NH Dover, Bearings, Inc. 603-749-2121
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EG & G FREQUENCY PRODUCTS INC., EG & G Inc., 4914 Gray Rd., Cincinnati, OH 45232, Tel: 513-542-5555, FAX: 513-542-5146; FSC No.: 58997; Empl.: 163; *Sls. Mgr.:* C. Fithen, Sls. Engr.

EG&G GAMMA SCIENTIFIC, Div. of EG&G Inc., 8581 Aero Drive, San Diego, CA 92123, Tel: 619-279-8034, TELEX: 697938, FAX: 619-576-9286; Empl.: 50; *Sls. Mgr.:* Robert Ruff

EG&G GEOMETRICS, Div. of EG&G Inc., 395 Java Dr., Sunnyvale, CA 94089, Tel: 408-734-4616, TELEX: 357-435, FAX: 408-745-6131; FSC No.: 34314; *Dist. Mgr.:* Doug Crice

EG & G JUDSON, 221 Commerce Dr., Montgomeryville, PA 18936, Tel: 215-368-6900, TELEX: 846120, ESYLNK: 62820476, FAX: 215-362-6107; Empl.: 65; *Sls. Mgr.:* Andrew Allen

EG&G OPTOELECTRONICS, EG&G Canada Ltd., 22001 Dumberry Road, Vaudreuil, Quebec, Canada J7V 8P7, Tel: 514-424-3300, TELEX: 05-823646, FAX: 514-424-3411

EG & G POWER SYSTEMS, INC., 1330 E. Cypress St., Covina, CA 91724, Tel: 818-967-9521, TWX: 910-584-1320, FAX: 818-967-3151; Empl.: 490; *Sls. Mgr.:* Dave Adams ..... **D•1714-1715**

Local Sales Offices & Reps

AZ Scottsdale, Faser-Tech Sls. 602-948-4404
CO Littleton, LangeSales 303-795-3600
FL Deland, World Sls. Dev. 904-228-2727
FL Orlando, Truex Assocs. 305-859-2160
MD Columbia, Avtek 301-740-5100
MA Dover, George Urban Assoc. 617-329-4068
NY Endwell, Tri-Tech Elctrns., Inc. 607-754-1094
PA Broomall, Robert J. Sapanosa 215-353-7267
TN Nashville, MIL-SPEC Sls. 615-367-2427

EG&G RETICON, Div. of EG&G, 345 Potrero Ave., Sunnyvale, CA 94086-4197, Tel: 408-738-4266, FAX: 408-738-6979; *Sls. Mgr.:* John Skurla

EG & G ROTRON, Custom Div., Hasbrouck La., Woodstock, NY 12498, Tel: 914-679-5201, FAX: 914-679-7080; FSC No.: 82877; *Sls. Mgr.:* Mike Lyon; *Dist. Mgr.:* Mary Fellows

EG&G ROTRON, Industrial Division, North Street, Saugerties, NY 12477, Tel: 914-246-3401, TELEX: 981511, FAX: 914-246-3802; FSC No.: 551496; Empl.: 55; *Sls. Mgr.:* Jay Jarboe; *Dist. Mgr.:* Jay Jarboe

EG & G VACTEC, 10900 Page Blvd., St. Louis, MO 63132, Tel: 314-423-4900, TWX: 910-764-0811, FAX: 314-423-3956; Empl.: 250; *Sls. Mgr.:* D. Hartley; *Dist. Mgr.:* D. Hartley ..... **B•1319**

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FL Orlando, EAB Assocs. 305-898-7444
IL Highland Park, T. B. Hunter Assocs. 312-433-7000
IN Fort Wayne, Scott Elctrns. 219-484-7865
IN Indianapolis, Scott Elctrns. 317-841-0010
MD Laurel, R. W. Mitscher Co. 301-498-6090
MA Norwood, MacInnis Co. 617-762-8090
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MN Eden Prairie, Rockmore Sls. 612-941-1390
MO St. Louis, Acron Elctrns. 314-421-1751
PA Newtown Sq., W. Reeves Assoc. 215-356-7500
NY Pittsford, C. W. Beach Co. 716-586-3200
NY Syracuse, C. W. Beach Co. 315-446-9587
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. 216-473-5050
OH Dayton, Scott Elctrns. 513-294-0539
OH Westerville, Scott Elctrns. 614-882-6100
TX Richardson, Interactive Comps. 214-669-2277
VA Shipman, R. W. Mitscher Co. 804-263-5154

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FL Orlando, Nico 305-898-7444
IL Chicago, Newark Elctrns. 312-638-4411
IL Elgin, Allied Elctrns. 312-697-8200
CA Mission Viejo, Opto Plus Inc. 714-380-8654
TX Richardson, Altair 214-231-5166
TX Fort Worth, Allied Elctrns. 817-336-5401

EG & G WAKEFIELD ENGINEERING, 60 Audubon Rd., Wakefield, MA 01880, Tel: 617-245-5900, FAX: 617-246-0874; Empl.: 250; *Sls. Mgr.:* Frank Casdia; *Dist. Mgr.:* Harry Dorian ..... **C•1614**

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AZ Phoenix, Sanford Sls. 602-957-3570
CA Los Altos, Recht Assocs. 415-964-6321
CA San Diego, Mesa Elctrns. 619-278-8021
CO Denver, Donohue Sls. 303-455-1719
FL Tampa, Over & Over Inc. 813-626-9100
GA Norcross, Over & Over, Inc. 404-449-6205
IL Rolling Meadows, Sumer, Inc. 708-991-8500
IA Cedar Rapids, C. H. Horn Assocs. 319-393-8703
MI Farmington Hills, Luebbe Sls. 313-489-8828
MN Mendota Heights, G-II Sls. 612-454-3086
MO Chesterfield, Weisler & Assocs., Inc. 314-537-0010
NY Commack, ERA, Inc. 516-543-0510
NY E. Rochester, Tri Tech Elctrns. 716-385-6500
NY Fayetteville, Tri Tech Elctrns. 315-446-2881
NC Charlotte, Over & Over, Inc. 704-542-9111
OH Cincinnati, Luebbe Sls. Co. 513-530-0600
OH Dayton, Luebbe Sls. Co. 513-294-0426
OH Westlake, Luebbe Sls. Co. 216-899-0071
OR Tigard, RTS Inc. 503-244-4123
PA Narbeth, Bresson Assocs. 215-664-6460
TX Austin, Milco Mktg. 512-835-5359
TX Houston, Milco Mktg. 713-469-5156
TX Plano, Milco Mktg. 214-578-1996
WA Vashon, RTS Inc. 206-285-1363
WI Brookfield, Sumer, Inc. 414-784-6641

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CA Fountain Valley, Comp. Center 714-979-0433
CA Los Angeles, Newark 213-664-5561
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CA Santa Ana, Elcom 213-404-2961
CA Santa Clara, Comps. Ctr. 408-988-3751
MN St. Paul, Shelly Ragon 612-642-2828
CA Sunnyvale, Bell 408-734-8570
CO Denver, Newark 303-757-3351
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FL Ft. Lauderdale, Newark 305-587-2372
FL Lake Mary, Elctrn. Fasteners 407-321-4000
FL Miami, Elctrn. Equip. 305-526-6000
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IN Carmel, Altex 317-848-1323
IN Indianapolis, Newark 317-844-0047
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KS Overland Park, Newark 913-677-0727
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
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MA Winchester, WDI/Rush Inds. 617-729-5800
MA Woburn, Newark 617-935-8350
MI Ann Arbor, Wedemeyer 313-665-8611
MI Livonia, RS Elec. 313-525-1155
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MO St. Louis, Newark 314-298-2505
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NJ Pennsauken, Newark 609-663-9490
NJ Springfield, Route Elec. 201-379-7710
NM Albuquerque, Bell 505-292-2700
NY Buffalo, Summit 716-887-2800
NY Farmingdale, Semispecialists 516-293-2710
MI Madison Hgts., Galco 313-542-9090
NY Suffern, Nobel Elec. 914-357-4500
NC Raleigh, Southeastern Elctrns. 919-828-2311
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PA Pittsburgh, Newark 412-787-7740
RI Walpole, Newark 401-943-3340
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TX Garland, Newark 214-494-5911
TX Houston, Altair 713-462-3029
TX McKinney, Prime 214-542-7915
VA Arlington, Newark 703-522-7552
VA Charlottesville, Virginia Elec. 804-296-4184
WA Bellevue, Newark 206-641-9800
WI Milwaukee, Newark 414-453-9100
WI Waukesha, Bell 414-547-8879

EGIS CORPORATION, 655 Plum Tree Rd., Barrington Hills, IL 60010, Tel: 708-639-1555, FAX: 708-639-8710; Empl.: 6

EH ELECTRONICS, INC., See Wavetek San Diego, Inc., Tel. 619-279-2200

EHRHORN TECHNOLOGICAL OPERS., INC., 4975. North 30th St., Colorado Springs, Colorado 80919, Tel: 719-260-1191, FAX: 719-260-0395; FSC No.: 1106; Empl.: 75; *Sls. Mgr.:* Tim Coutts; *Dist. Mgr.:* Tim Coutts

EI & S, Prime Technology Inc., Twin Lakes Rd., P.O. Box 185, North Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092, FAX: 203-481-8937; FSC No.: 14908; Empl.: 60; *Sls. Mgr.:* R. A. Boisseau ..... **B•1462-1463**

Local Sales Offices & Reps

CA Canoga Pk., C & W Comps. Sls. 818-700-2684
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CA Haywood, Pacific Mktg. Inc. 415-887-1620, 415-887-7595
CA Newbury Pk., Interconn Tech. Mktg. 805-499-4024
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FL Lakeland, Munday Sls. .. 813-858-5606,818-858-7257
IL Arlington Hgts., Mertons Assoc. 314-993-6600
IL Arlington Hgts., MB Sls. 708-392-9499
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MO St. Louis, Mertens Co. .. 314-993-6600,314-993-6630
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NJ Englewood Cliffs, Masin-Esco, Inc. 201-569-8868, 201-569-8871
NY Albany, Lynn Assocs. ... 518-459-1239,518-459-4810
NY Hauppauge, Masin-Esco, Inc. 516-273-3500, 516-273-3516
OH Westlake, Advanced Technlg. Assocs. 216-835-5050,216-835-3599
TX The Colony, Juliana Co. 214-625-1075
PA Malvern, Stitzer Assocs. 215-664-5500, 215-664-5503
PA Gibsonia, Lynn Assocs. 412-443-3670, 412-443-3166
WA Seattle, Datacom Assoc. 206-285-2525
Can St. Laurent,PQ, Electronique Versatech 514-335-3833

Local Distributors

AZ Phoenix, Keystone Electro Sls. 602-995-3005
CA San Jose, Spectra Elctrns. 408-452-1590
CA Canoga Pk., Acort Inds. 818-700-2991
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MA Billerica, A. W. Mayer Co. 508-229-2255
MA Newton, The Greene-Shaw Co. 617-969-8900
NJ Oakland, Relay Specialties 201-337-1000

FAX: 401-738-7154

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CA	Mission Hills, The Pentagon Co.	818-894-0299
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CT	W. Simsbury, Electrotechnika, Inc.	203-658-6762
FL	Tampa, Std. Mktg. Inc.	813-933-5833
FL	W. Melbourne, Std. Mktg. Inc.	305-725-7073
IL	Wheaton, CS Tech. Sls.	312-653-8126
MA	Needham, Kanan Assoc.	617-449-7400
MA	Waltham, Newport Tech. Sls.	617-890-7255
MD	Norwell, M.J. Sls. & Engrg. Inc.	617-982-8776
MI	Livonia, Wenner & Assocs.	313-591-7955
MN	Minneapolis, Electro-Serv Co.	612-338-3475
NC	New Hill, Tom Santel	919-362-4091
NJ	Kenvil, Comps. for Elctrns.	201-927-6662
NJ	Red Bank, Varrelman Corman	201-219-0088
OH	Mansfield, Rich Tech. Sls.	419-756-1953
SC	Mauldin, Carl Hart Assoc.	803-288-2023
TN	Chattanooga, Stetco, Inc.	615-899-6831
TX	Missouri City, Intercon Sls.	713-499-4163
VA	Front Royal, Eltron Sls. Ltd.	703-635-7201

EIKONIX, 15 Wiggins Avenue, Bedford, MA 01730, Tel: 617-276-7161, TELEX: 951231, FAX: 617-276-5063; Empl.: 175; *Sls. Mgr.:* Jim LLoyd

E.I.L. INSTRUMENTS, INC., 10 Loveton Circle, Sparks, MD 21152, Tel: 301-771-4800, TELEX: 87797, FAX: 301-771-4629; Empl.: 500; *Sls. Mgr.:* Keith D. Hadley

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EI NORTH AMERICA, 435 E. 79th St., New York, NY 10021, Tel: 212-517-5622, FAX: 212-517-5516; *Sls. Mgr.:* Judy Simons; *Dist. Mgr.:* Adam Goodman

EIP MICROWAVE, INC., 1589 Centre Pointe Dr., Milpitas, CA 95035, Tel: 408-945-1477, FAX: 408-945-0977; FSC No.: 34257; Empl.: 100; *Sls. Mgr.:* Rick Bush

EITEL MFG., 33208 Paseo Cerveza, Ste. G, San Juan Capistrano, CA 92675, Tel: 714-240-3933; Empl.: 6; *Sls. Mgr.:* H. Mengel

ELAN DIGITAL SYSTEMS, Div. of Elan Digital Sys. Ltd., 538 Valley Way, Milpitas, CA 95035, Tel: 800-541-ELAN, 408-946-8495, FAX: 408-946-0351; Empl.: 3 ..... **A•1724**

Local Sales Offices & Reps

CA	Milpitas, Elan	408-946-8495

ELAN TECHNICAL CORP., 35 Kings Highway East, Fairfield, CT 06430, Tel: 203-335-2115, FAX: 203-335-2723

ELANTEC, INC., 1996 Tarob Ct., Milpitas, CA 95035, Tel: 408-945-1323, 800-821-7429, FAX: 408-945-9305; FSC No.: 64762; Empl.: 106; *Sls. Mgr.:* Ralph Granchelli; *Dist. Mgr.:* John Charette

ELASTOMERIC TECHNOLOGIES, INC.

FAX: 215-672-4633

ELASTOMERIC TECHNOLOGIES, INC., 2940 Turnpike Dr., Hatboro, PA 19040, Tel: 215-672-0787, 215-672-4741, TWX: 387-236; FSC No.: 64914; *Sls. Mgr.:* George Glatts ..... **C•1357**

Local Sales Offices & Reps

AL	Huntsville, Remco/Huntsville	205-533-3763
AZ	Scottsdale, TC Elctrn. Sls., Inc.	602-994-5153
CA	Orange, Libratronix	714-871-1513
CA	San Jose, W I N	408-559-8118
CO	Monument, Sunbird Inds.	719-481-2900
FL	Ft. Lauderdale, Synergistic Tech. Inc.	305-791-8255
FL	Melbourne, Synergistic Tech. Inc.	407-242-9661
FL	Odessa, Synergistic Tech.	813-920-5814
GA	Lilburn, Remco/Atlanta	404-447-6937
IL	Des Plaines, Lincoln, Hodges	708-297-3810
IN	Ft. Wayne, Outman Sls.	219-489-7699
KS	Wichita, Baka Corp.	316-682-8411
MD	Gaithersburg, Carwithen	301-921-9545
MA	Needham, Comp. Technlg., Inc.	617-449-8490
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	Bloomington, Northmark Assocs.	612-854-9299
MO	St. John, Baka Corp.	314-878-4224
NJ	Hasbrouck Hgts., Comp-Tech	201-288-7400
NY	Pittsford, Franklin Sls. Corp.	716-248-8251
NC	Raleigh, C-Tech Sls. Co.	919-782-8100
OH	Cleveland, Arthur Baier Co.	216-461-6161
OR	Tigard, L. D. Elctrns.	503-684-8221
PA	Hatboro, A.Q.S. Electro	215-674-3562
PA	Pittsburg, Arthur Baier Co.	412-367-7799
TX	Dallas, M-Rep	214-484-5711
TX	Houston, M-REP	713-271-5635
UT	Ogden, Sunbird Inds., Inc.	801-479-7151
WA	Snohomish, L. D. Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Janesville, Lincoln,Hodges	608-754-4214

ELCO CORP., Electronic Connector Div., Huntingdon Ind'l. Park, Huntingdon, PA 16652, Tel: 814-643-0700, FAX: 814-643-0426; Empl.: 500; *Sls. Mgr.:* W. J. Graef; *Dist. Mgr.:* W.J. Graef

U.S. ELCO INC., 2930 Scott Blvd., Santa Clara, CA 95054, Tel: 1-800-888-ELCO, FAX: 408-980-9754; *Sls. Mgr.:* Douglas Hemingway

EL-COM CABLETEK, 22612 Albares, Mission Viejo, CA 92691, Tel: 714-432-6630

ELCOM INDUSTRIES, INC., 10268 Bach Blvd., St. Louis, MO 63132, Tel: 314-429-3100, FAX: 314-429-9706; Empl.: 25; *Sls. Mgr.:* Thomas C. Noel

ELCOM SYSTEMS, INC., 932 Clint Moore Rd., Boca Raton, FL 33487, Tel: 407-994-1774, FAX: 407-994-1770; FSC No.: 32424; Empl.: 8; *Sls. Mgr.:* D. Pollachek ..... **A•1747**

ELCON INSTRUMENTS, INC., 135-137-139 Gibralter Street, Annapolis, MD 21401, Tel: 301-280-6686, FAX: 301-263-5790; Empl.: 5; *Sls. Mgr.:* Paolo Landrini

ELCON PRODUCTS INTERNATIONAL COMPANY, 42700 Lawrence Place, Fremont, CA 94538, Tel: 415-490-4200, FAX: 415-490-3740; FSC No.: 85901; Empl.: 33; *Sls. Mgr.:* Shirlee Gendreau (inside Sls. Mgr.)

ELDRE CORPORATION, 1500 Jefferson Rd., Rochester, NY 14623, Tel: 716-427-7280, FAX: 716-272-0018; FSC No.: 19648; Empl.: 220; *Sls. Mgr.:* James N. Fitzpatrick

Local Sales Offices & Reps

AL	Huntsville, Elctrns. Mktg. Assocs.	205-880-8050
AZ	Scottsdale, Fred Board Assocs.	602-994-9388
CA	Carlsbad, Prime Source Comps.	619-434-1297
CA	Los Gatos, Norwest Elctrns.	408-395-1190
CO	Wheat Ridge, Waugaman Assocs.	303-423-1020
FL	Tampa, APM Assocs.	813-886-2457
GA	Atlanta, Electronic Mktg. Assocs.	404-448-1215
IN	Indianapolis, Mohrfield Mktg.	317-546-6969
MD	Towson, Arbotek Assocs.	301-825-0775
MA	Brookline, Harman Assocs.	617-232-6687
MO	St. Louis, Cadon Techn. Sls.	314-645-8670
NJ	Haddonfield, Tritek Sls.	609-429-1551
NY	Rochester, ELDRE Corp.	716-427-7280
NY	Yonkers, Sonkin Assocs.	914-968-8282
NC	Raleigh, Electronic Mktg. Assocs.	919-847-8800
NY	Syracuse, Leonard D. Allen, Inc.	315-437-8387
OH	Centerville, Omega Sls.	513-434-5507
UT	Salt Lake City, Waugaman Assocs./Utah	801-261-0802
SC	Greenville, Elctrns. Mktg. Assocs.	803-233-4637
Can	St. Laurent, Que., Componetics, Ltd.	514-331-9930
WA	Redmond, Electronic Mktg. Grp.	206-882-0962

ELECSYS,INC., Div. of C & C Jetronic, 320 Wall St., Princeton, NJ 08540, Tel: 609-921-2726, TELEX: 4971717, FAX: 609-921-7971; Empl.: 1; *Sls. Mgr.:* C. Jerry Chiang

ELECTRA-SSEMBLY, Lancer Chemical, 80 Cutter St. - Box 30, Warren, RI 02885, Tel: 401-245-5493

ELECTRA-TEC, Impert Industries, Inc., 557 W. M-89, Otsego, MI 49078, Tel: 800-225-3532, 616-694-2058, FAX: 616-694-5880; FSC No.: 4J966; Empl.: 20; *Sls. Mgr.:* William Robinson ..... **C•1033**

ELECTRICAL INDUSTRIES CORP., 691 Central Ave., Murray Hill, NJ 07974, Tel: 908-464-3200, FAX: 908-464-7619; FSC No.: 20093; Empl.: 300; *Sls. Mgr.:* D.V. Wilson

ELECTRICAL INSTRUMENT SERVICE, 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717, FAX: 914-699-9410; FSC No.: 32590;16034A; Empl.: 35 ..... **D•1322-1323**

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	602-494-0790
CO	Commerce City, Williams Assocs.	303-289-5647
IL	Lincolnwood, Saffro & Assocs.	708-677-9722
LA	Metairie, Data Mktg. Assocs.	504-833-3655
MA	Lexington, Zieco	617-861-8300
MI	Southfield, Comtel Instrs. Co.	313-358-2505
MN	Minneapolis, Hei-Lite Sls.	612-550-0506
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Mount Vernon, Elctrl. Instr. Svc.	914-699-9717
OH	Cleveland, Comtel Instrs. Co.	216-442-8080
OH	Columbus, Comtel Instrs. Co.	614-876-8305
OH	Dayton, Comtel Instrs. Co.	513-426-5310
OK	Tulsa, Data Mktg. Assocs.	918-494-2711
PA	Pittsburgh, Comtel Instrs. Co.	412-922-5720
TX	Austin, Data Mktg. Assocs.	512-338-4701
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-954-5020
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
WI	Lake Mills, Saffro & Assocs.	1-800-327-0312
Can	Beaconsfield, Que., Mesurina Ltee/Ltd.	514-630-5990

ELECTRICAL INSULATION SUPPLIERS, INC., 300 N. Mannheim Road, Hillside, IL 60162, Tel: 708-574-5400, FAX: 708-547-7538; Empl.: 450; *Sls. Mgr.:* Robert Gannon

ELECTRICAL STANDARDS DIV., E.S.R.S., Inc., 7337 Greenbush, N. Hollywood, CA 91605, Tel: 818-765-4224; Empl.: 6

ELECTRIC DEVICE, PO Box 337, Canfield, OH 44406, Tel: 216-533-1111, FAX: 216-533-2639

ELECTRIC INDICATOR COMPANY INC., 272 Main Ave., Norwalk, CT 06851, Tel: 203-847-5861, FAX: 203-846-3933; FSC No.: 73693; Empl.: 60

ELECTRIC MOTOR ENGINEERING, 23362 Madero, Suite C, Mission Viejo, CA 92691, Tel: 714-583-9802, FAX: 714-583-9785; Empl.: 5; *Sls. Mgr.:* Jerry Kibler; *Dist. Mgr.:* Frank Buday

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ELECTRIC SWITCHES, INC., 2478 Fletcher Dr., Los Angeles, CA 90039, Tel: 213-660-1310, TWX: 910-321-2971; Empl.: 42; *Sls. Mgr.:* Louis Lim ..... **B•1780-1781**

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ELECTRIC TACHOMETER, 68th & Upland Sts., Philadelphia, PA 19142, Tel: 215-726-7723, FAX: 215-724-3582; FSC No.: 20049; Empl.: 50; *Sls. Mgr.:* F. M. Porter

ELECTRIC TIME COMPANY, INC., P.O. Box 466, Medfield, MA 02052, Tel: 508-359-4396, FAX: 508-359-4482; FSC No.: 6645; Empl.: 10

ELECTRO ASSEMBLIES CORP., 425 Huehl Rd., Bldg. 17, Northbrook, IL 60062-2319, Tel: 708-498-6520, FAX: 708-272-2915; FSC No.: 09250; Empl.: 60; *Sls. Mgr.:* Greg Andrews

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NJ	Medford, Champion Elctrn. Sls., Inc.	609-983-0932
OH	Beachwood, Elctrn. Salesmasters Inc.	216-831-9555

Local Distributors

AZ	Phoenix, Lynntronics	602-433-0288
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GA	Marietta, Engrd. Assemblies & Comps. Corp.	404-951-8935
IL	Morton Grove, Power Pak	708-966-6000
MA	Sharon, Adcour, Inc.	617-784-8123
MI	Ann Arbor, Wedemeyer Elctrns. Supp. Co.	313-665-8611
NJ	Teterboro, Engrd. Assemblies Corp.	201-288-4477
NY	Penn Yan, Advacom Technlg., Inc.	315-536-2221
NC	Raleigh, Engrd. Assemblies Corp.	919-790-9700
OR	Beaverton, Micro Power	503-626-7086
PA	McKean, Advacom, Inc.	814-476-7774
TX	Houston, K Power Elctrns.	713-783-2288
TX	Stafford, Southwest Elctrns. Inc.	713-240-4000
WA	Redmond, Priebe Elctrns.	206-881-2363
Can	Brampton, Innovative Power Pak	416-791-2132
Can	Calgary, Alberta, Electro-Sonic, Inc.	403-255-9550
Can	Don Mills, Ont., Saynor Varah Inc.	416-445-2340
Can	Quebec, Saynor-Varah	514-630-7470
Can	Richmond, BC, Electro Sonic, Inc.	604-273-2911
Can	Victoria, BC, Pacific Coast Elctrns. Ltd.	604-385-5111

ELECTROCOM INDUSTRIES, 1105 N. Ironwood Dr., S. Bend, IN 46615, Tel: 219-232-2743; FSC No.: 27114; *Sls. Mgr.:* B. Jaffe

ELECTRODATA, INC., 23020 Miles Rd., Bedford Heights, OH 44128, Tel: 216-663-3333, TWX: 810-427-2280, FAX: 216-663-0507; FSC No.: 34-1173465; Empl.: 15; *Sls. Mgr.:* Anthony Cardone; *Dist. Mgr.:* Anthony Cardone

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ELECTRODYNAMICS, INC., A Talley Inds. Co., 1200 Hicks Rd., Rolling Meadows, IL 60008, Tel: 708-259-0740; FSC No.: 10236; Empl.: 200; *Sls. Mgr.:* Frank Rafferty ..... **D•1134**

Local Sales Offices & Reps

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CA	Alhambra, M. W. Riedel & Co.	213-283-7694
CO	Denver, West High-Tech, JV	303-477-8180
CT	Old Saybrook, FJS Assocs.	203-388-5374
FL	Altamonte Spgs., Quantum Sls.	407-788-0550
IL	Collinsville, Magna Engrg. Sls.	618-345-5583
IA	Cedar Rapids, J.R. Sales Engrg.	319-393-2232
KS	Wichita, Magna Engrg. Sls.	316-744-0851
MD	Severna Park, Delmarva Engrg. Assocs., Ltd.	301-647-8007
MA	Burlington, FJS Assocs.	617-273-5959
NJ	Basking Ridge, Churchill Assocs.	201-204-0744
NY	E. Rochester, Noeth Honsinger Assocs.	716-381-4430
NY	Larchmont, Hingston Walsh Assocs., Inc.	914-834-5781
OR	Tigard, ElTech, Inc.	503-684-3458
PA	Norristown, Rivco January Inc.	215-631-1414
TX	Roanoke, CMR	817-379-6540
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ELECTRO-DYN ELECTRONICS, 1201-19th St., Niagara Falls, NY 14301, Tel: 716-284-8747, FAX: 716-284-9112; *Sls. Mgr.:* H. Emes

THE ELECTRODYNE COMPANY, INC., 4188 Taylor Rd., Batavia, OH 45013, Tel: 513-732-2822, TELEX: 241 463, FAX: 513-732-6953

ELECTROFILM, 27727 Avenue Scott, P.O. Box 55669, Valencia, CA 91355, Tel: 805-257-2240, TELEX: 65-1438; FSC No.: 85932; Empl.: 95; *Sls. Mgr.:* Richard W. Pearson

ELECTRO-FILMS

FAX: 401-738-4389

ELECTRO-FILMS, INC., 111 Gilbane St., Warwick Central Indl. Pk., Warwick, RI 02886, Tel: 401-738-9150, TWX: 710-382-0405; FSC No.: 57252; Empl.: 275; *Sls. Mgr.:* Jean Madden .. **A•1748, 1910-1912; C•1680-1681**

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AL	Huntsville, BCI, Inc.	205-539-4411
CA	San Jose, NES Assocs.	408-437-9300
CA	Santa Ana, Weatherman Assocs.	714-544-1304
CA	Sunnyvale, NES Assocs.	408-738-3259
CO	Ft. Collins, Rep Sls.	303-226-1504
FL	Apopka, Micro Mktg., Inc.	407-889-2022
GA	Chamblee, BCI, Inc.	404-455-0405
IL	Palatine, M & S Sls.	708-934-1200
IN	Ft. Wayne, Corrao Marsh	219-482-2725
IN	Greenfield, Corrao Marsh, Inc.	317-462-4446
MA	Bedford, Vector Assocs.	617-271-0000
MN	Minneapolis, Ferrian Sls.	612-721-8915
NM	Albuquerque, Western High Tech. Mktg.	505-884-2256
NY	Clifton Park, Empire Technlg., Inc.	518-371-2480
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OH	Cincinnati, Arthur Baier Co.	513-779-9011
OH	Cleveland, Arthur Baier Co.	216-461-6161
OH	Columbus, Arthur Baier Co.	614-764-1157
OH	Dayton, Arthur Baier Co.	513-276-5486
OK	Broken Arrow, Merlin Elctrns.	918-251-2084
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OR	Portland, Demarest Assocs., Inc.	503-297-7327
PA	Pittsburg, Arthur Baier Co.	412-367-7799
TX	Ft. Worth, Merlin Elctrns.,	817-429-4420
TX	Missouri City, Jackson Arnold Assocs.	713-261-0798
VA	Ashland, Glasscock Assocs.	804-798-2125
WA	Seattle, Demarest Assocs.	206-523-3210
Can	Montreal, Que., Solid State Engr. Co.	514-481-3313

ELECTRO FORCE CORP., 727 Oakstone Way, Anaheim, CA 92806, Tel: 714-774-3666; Empl.: 4

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ELECTROID CO., Div.of Valcor Engrg. Corp., 45 Fadem Rd., Springfield, NJ 07081, Tel: 201-467-8100, TELEX: 139241, FAX: 201-467-5656; Empl.: 100; *Sls. Mgr.:* E.D. Lazorchak; *Dist. Mgr.:* H.R. Roche

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ELECTRO INDUSTRIES, Div. E.I. Elctrns., Inc., 1800 Shames Drive, Westbury, NY 11590, Tel: 516-334-0870, TELEX: 4948652 ELECTRO, FAX: 516-338-4741; Empl.: 40; *Sls. Mgr.:* S. Kagan

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ELECTRO INSULATION CORP./REMTEK CORP., 3921 Ventura Drive, Arlington Hgts., IL 60004, Tel: 708-632-1020, FAX: 708-632-1089; Empl.: 25; *Sls. Mgr.:* Mike Kamperschroer; *Dist. Mgr.:* Mike Kamperschroer

ELECTROL CO., 321 Dewey St., P.O. Box 29, York, PA 17405, Tel: 717-848-1722, FAX: 717-848-4514; Empl.: 30; *Sls. Mgr.:* Debra Dudley; *Dist. Mgr.:* Debra Dudley

ELECTROL, Hamlin, Inc., 612 East Lake St, Lake Mills, WI 53551, Tel: 414-648-3000; Empl.: 450; *Sls. Mgr.:* Mike Bucher

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ELECTRO MAGNETIC PROCESSES, INC., 9616 Owensmouth Ave., Chatsworth, CA 91311-4858, Tel: 818-882-6333, TELEX: 499 2240 EMP UI; FSC No.: 51290; Empl.: 100

ELECTROMATIC CONTROLS CORP., 2495 Pembroke Road, Hoffman Estates, IL 60195-2010, Tel: 708-882-5757, TWX: 910-222-3452; FSC No.: 75203; Empl.: 400; *Sls. Mgr.:* Mike Meurer; *Dist. Mgr.:* Mike Meurer

ELECTRO MAZE AIR FILTERS, 5936 Don Way, Carmichael, CA 95608, Tel: 916-485-4079, FAX: 916-485-7925; Empl.: 7

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FAX: 201-997-9208

ELECTROMECH, INC., 528 Elm Street, Kearny, NJ 07032, Tel: 201-997-0950; Empl.: 40; *Sls. Mgr.:* Solomon Ezra ..... **A•2208-2209; D•1717**

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NJ	Kearny, Electromech, Inc.	201-997-0950

ELECTRO MECHANICAL SYSTEMS, INC., 801 W. Bradley Ave., Champaign, IL 61820, Tel: 217-359-7125, FAX: 217-359-2075; Empl.: 26; *Sls. Mgr.:* Julie L Redman

ELECTRO-MECHANISMS, INC., 2745 E. Huntington Dr., Duarte, CA 91010, Tel: 818-359-2535, FAX: 818-303-2189; FSC No.: 52592; Empl.: 27 ..... **B•1624-1625**

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CA	San Carlos, Hickey Indl. Sls.	415-594-9978
OH	Dayton, Harvey Teplitz	513-898-5282

ELECTRO-MECH CO., 707 Hathaway Dr., Colorado Springs, CO 80915, Tel: 719-597-1620, FAX: 719-597-1628

ELECTRO-MECH COMPONENTS, INC., 1826 N. Floradale Ave., South El Monte, CA 91733-3689, Tel: 818-442-7180, FAX: 818-350-8070; FSC No.: 07150; Empl.: 25; *Sls. Mgr.:* Terry Trumbull; *Dist. Mgr.:* Terry Trumbull ..... **B•1686-1687**

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CA	San Diego, Qualtronics	619-695-0118
CA	Santa Clara, Engrg. Assocs.	408-988-5001
CO	Denver, Franklin Sls.	303-722-8824
FL	Orlando, Publicover	407-898-9361
IL	Chicago, IRI	312-967-8430
MD	Baltimore, Callas Elctrns., Inc.	301-744-7711
MA	Needham Hgts., Todino Engrg.	617-444-7925
MI	Livonia, Leading Edge Sls.	313-478-6700
MN	Minneapolis, D. A. Case Assocs.	612-831-6777
NJ	Medford, Comp. Consits.	609-654-5300
NY	Mamaroneck, Bassin Tech.	914-698-9332
NY	Orchard Pk, SHR	716-662-0589
OH	Cincinnati, KCH Co.	513-931-1686
OR	Hillsboro, Doran Sls.	503-640-4500
TX	Richardson, McCoy Assocs.	214-864-1838
WA	Redmond, Doran Sls.	206-885-1885

Local Distributors

CA	Los Angeles, Elec. Switches	213-660-1310
CA	Los Angeles, Master Distrs.	213-452-1229
NY	Buffalo, Genesee Ind. Elec.	716-873-9661
NY	Mamaroneck, Logicomp Elctrns.	800-431-2625

ELECTRO-METRICS, INCORPORATED, A Penril Corp., 100 Church St, Amsterdam, NY 12010, Tel: 518-843-2600, TWX: 710-446-4798, FAX: 518-843-2812; FSC No.: 18581; Empl.: 80; *Sls. Mgr.:* Vito L Greco

ELECTRO NATIONAL CORP., P.O. Box 402 Matthews Ave., Canton, MS 39046, Tel: 601-859-5511, TWX: 810-990-0938, FAX: 601-859-5518; FSC No.: M-54208; Empl.: 40; *Sls. Mgr.:* Patsy Hicks

ELECTRONETICS, INC., Paine Field Bldg 335, Everett, WA 98204, Tel: 206-355-1855; Empl.: 10

ELECTRONIC APPLICATIONS CO., 4918 Santa Anita Ave., PO Box 4308, El Monte, CA 91734, Tel: 818-442-3212, FAX: 818-442-6873; Empl.: 70; *Sls. Mgr.:* Harvey Smith

ELECTRONIC ASSOCIATES, INC., 185 Monmouth Pkwy, W. Long Branch, NJ 07764, Tel: 201-229-1100, FAX: 201-229-1329; Empl.: 400; *Sls. Mgr.:* Mark H. Ellsworth

ELECTRONIC COIL CORP., 125 Old Iron Ore Rd, Bloomfield, CT 06002, Tel: 203-243-5233, FAX: 203-243-5233; Empl.: 8; *Sls. Mgr.:* Raymond Gorski, Jr.

ELECTRONIC COMPONENTS & MATLS. DIV., GTE Products Corp., 816 Lexington Ave., Warren, PA 16365, Tel: 814-723-2000, FAX: 814-723-2446; *Sls. Mgr.:* Robert Scalise

ELECTRONIC COMPONENTS GROUPE, INC.

FAX: 612-375-1905

ELECTRONIC COMPONENTS GROUPE, Stein Industries, Inc., 26 North 5th Street, Minneapolis, MN 55403, Tel: 612-375-9639, 800-677-8719; *Sls. Mgr.:* Rick Hampton; *Dist. Mgr.:* Rick Hampton ..... **B•1689-1693**

Local Sales Offices & Reps

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AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Irvine, Groh Assocs.	714-837-9871
CA	San Diego, Groh Assocs.	619-673-4321
CA	Santa Clara, Cindel/Penmark	408-988-8331
FL	Melbourne, Phoenix Comps.	407-723-4414
GA	Norcross, Cartwright & Bean, Inc./GA Div.	404-368-0160
IL	Palatine, Golbeck Milota Assoc.	708-639-3424
IN	Indianapolis, STB & Assocs., Inc.	317-844-9227
KS	Overland Pk., Electri-Rep	913-649-2168
LA	Covington, Cartwright & Bean, Inc.	504-892-1780
MA	Amherst, Bennetron	603-880-7008
MI	Ypsilanti, Tech Rep	313-572-1950
MD	Glen Burnie, Macrotech Assoc.	301-766-1111
MN	Oakdale, Complete Sls.	612-731-2923
MS	Jackson, Cartwright & Bean, Inc.	601-981-1170
MO	St. Louis, Electri-Rep	314-993-4421
NH	Amherst, Bennetron	603-880-7008
NY	Islip, Cogent Technlg. Assoc., Inc.	516-277-7101
NY	Syracuse, PiTronics	315-455-7346
NC	Charlotte, Cartwright & Bean, Inc.	704-536-0303
NC	Raleigh, Cartwright & Bean, Inc.	919-876-4130
OH	Centerville, Components Inc.	513-436-0255
OH	Cleveland, Components, Inc.	216-243-9200
OR	Hillsboro, Turn-Around Sls.	503-640-4641
TN	Knoxville, Cartwright & Bean	605-693-7450
TN	Memphis, Cartwright & Bean, Inc.	901-362-8345
TX	Dallas, Rem Air Comps. Corp.	214-234-1069
WA	Kirkland, Turn-Around Sls.	206-822-4634
WI	Madison, Golbeck Milota Assocs.	608-222-7037

Local Distributors

AL	Huntsville, C.D.I.	205-883-7501
AZ	Phoenix, Beswitched	602-275-4805
AR	Little Rock, C.D.I.	501-227-6278
CA	Hollywood, Yale Elec.	213-465-3186
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	San Carlos, Logan Elec.	415-594-0700
CA	San Diego, Sigma Elctrns.	619-565-7000
CA	Santa Ana, El-Com, Inc.	714-432-6630
CA	Santa Ana, Sigma Elctrn.	714-558-8600
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Target Elctrns.	408-734-5611
CA	Yorba Linda, Target Elctrns.	714-692-1630
CO	Englewood, CDI	303-799-4916
CO	Littleton, Indelco	303-795-3431
CT	Norwalk, Cobra Comps.	203-847-6442
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Melbourne, C.D.I.	305-724-9910
GA	Norcross, C.D.I.	404-441-3320
IL	Bensenville, Voyager Elctrns.	708-860-1300
IA	Cedar Rapids, Dee Elctrns.	319-365-7551
KS	Wichita, Radio Inc.	316-264-2798
MD	Beltsville, PSI	301-937-4960
MD	Columbia, D. K. Elctrns.	301-995-1950
MD	Elk Ridge, Interconnect Elect.	301-621-5424
MI	Grand Rapids, Calder Elctrns.	616-698-7400
MA	Nashua, Brevan Elctrns.	603-889-7230
MA	Salem, Diamond Elctrns.	603-894-4420
MN	Fridley, Voyager Elctrns.	612-571-7766
MN	New Brighton, Chris Elctrns.	612-631-2647
MO	Florrissant, Delltron Co., Inc.	314-839-0033
NJ	W. Berlin, G.C.I.	609-768-6767
NY	Rochester, CAM-RPC	716-427-9999
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Woodside, Switches Unlimited	800-221-0487
NC	Raleigh, C.D.I.	919-834-9465
OH	Cleveland, CAM-RPC	216-461-4700
OH	Columbus, CAM-RPC	614-888-7777
OH	Dayton, CAM-RPC	513-898-1111
OK	Oklahoma City, Radio Inc.	405-789-0741
OK	Tulsa, Radio Inc.	918-587-9123
OR	Beaverton, Comp. Resources	503-641-8488
OR	Portland, Radar Elec.	503-232-3404
PA	Pittsburgh, CAM-RPC	412-963-6202
TX	Austin, Wofford Elctrns.	512-339-1131
TX	Dallas, C.D.I.	214-644-0373
TX	Dallas, Off-the-Shelf Comps.	214-247-0052
TX	Dallas, Wofford Elctrns.	214-320-0294
TX	Houston, Wofford Elctrns.	713-847-3593
TX	Richardson, Off-the-Shelf Comps.	214-238-0808
WA	Kent, Comp. Resources	206-454-8666
WA	Seattle, Radar Elec. Co., Inc.	206-282-2511
WA	Spokane, Radar Elec.	509-747-3053
WI	Milwaukee, Progressive Image	414-321-4722

FAX: 908-452-0524

ELECTRONIC CONCEPTS, INC., Box 1278, Eatontown, NJ 07724, Tel: 908-542-7880, TELEX: 7107226661; FSC No.: 50558; Empl.: 240; *Sls. Mgr.:* Philip N. Lepore ..... **A•1058-1063**

Local Sales Offices & Reps

AZ	Tempe, Piper Sls. Co.	602-949-0048
CA	La Mirada, Select Elctrns.	714-739-8891
CO	Englewood, TMC	303-770-8995
IL	Wheaton, Elctrn. Concepts, Inc.	312-668-8747
MN	Minneapolis, Components Grp.	612-374-1250
MO	Grandview, Harris-Hanson Co.	816-763-6200
NJ	Eatontown, Elctrn. Concepts, Inc.	908-542-7880
NM	Albuquerque, Piper Sls. Co.	505-883-9090
MO	St. Louis, Harris-Hanson Co.	314-432-3611

Local Distributors

NJ	Clifton, Elcon Sls.	201-546-5022

ECD

FAX: 503-659-4422

ELECTRONIC CONTROLS DESIGN, 4287-A SE International Way, Milwaukie, OR 97222, Tel: 503-659-6100; Empl.: 100; *Sls. Mgr.:* Steven Glass ..... **D•1169**

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ELECTRONIC DESIGN ENGINEERING, 1820 Temescal Av., Norco, CA 91760, Tel: 714-735-1761; Empl.: 3

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FAX: 617-268-6754

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Local Sales Offices & Reps

AL	Huntsville, Jim Springer	205-883-4163
AZ	Tempe, Mesa Tech.	602-279-5243
CA	All of CA, F.L.W.	800-339-6030
CO	Englewood, R. A. Mayes Co.	303-761-9447
FL	Orlando, Gentry Assocs.	407-859-7450
FL	Tampa, Gentry Elec. & Instr.	813-886-0720
IL	Arlington Heights, Berndt Assoc.	708-632-0900
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Overland Park, Ramsey Assocs.	913-541-1007
MA	Boston, Elctrn. Dev. Corp.	617-268-9696
MA	Needham, Addelco Corp.	617-444-4754
MI	Hazel Park, Tiby Co.	313-547-3550
MN	Minneapolis, The Mark Co.	612-933-3026
MO	Chesterfield, Ramsey Assocs.	314-532-9386
NJ	Union, Friedman Assocs.	201-964-6200
NM	Albuquerque, Mesa Technlg.	505-883-8833
NY	Victor, SAN WAL Technlg.	716-924-1950
NC	Raleigh, Lee Assocs.	919-848-8818
OH	Cleveland, Tiby Co.	216-371-5335
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Hatboro, Rhodes Technlg.	215-672-3336
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Can	Mississauga, Ont., Omnitronix Ltd.	416-828-6221

ELECTRONIC DEVELOPMENT LABS., See EDL Inc.

ELECTRONIC DEVICES, INC., 21 Gray Oaks Ave., Yonkers, NY 10710, Tel: 914-965-4400, TELEX: 681-8047, FAX: 914-965-5531; Empl.: 200; *Sls. Mgr.:* Paul Dengler; *Dist. Mgr.:* Paul Dengler ..... **A•2094**

Local Sales Offices & Reps

AZ	Tempe, Cantec Sls.	602-345-1276
CA	Northridge, Myco Sls.	818-886-7101
CA	San Jose, Nelson Elctrn. Sls., Inc.	408-437-9300
CO	Golden, Dossett Elctrn. Mktg. Inc.	303-278-4620
FL	Melbourne, Kennedy Assocs.	407-676-6875
IN	Carmel, Berndt Assocs.	317-844-0114
MA	Sharon, Cummings Assocs.	617-784-5600
MI	Livonia, Amtech	313-474-8300
MN	Brooklyn Ctr., Lydon Assoc.	612-535-6526
MO	St. Louis, Rep-tronics Inc.	314-997-4707
NY	Patchogue, Optimum Sls. Co.	516-758-0644
NY	Victor, Net Sls.	716-924-1844
NC	Raleigh, B.T. Funderburk Inc.	919-846-2373
OH	Cleveland, Versatron	216-581-0090
OR	Portland, Index, Inc.	503-297-3364
PA	Pipersville, Yax Assocs.	215-776-2100
TX	Dallas, Kruvand Assocs. Inc.	214-437-3355
WI	Mequon, Stumm Sls.	414-241-8414
Can	Montreal, Que., Elcom GMB Inc.	514-668-3361

Local Distributors

AL	Huntsville, Comp. Dists.	205-883-7501
CA	San Jose, Compass	408-432-7575
CA	Costa Mesa, Orange Cty. Comps.	714-979-3597
CO	Englewood, Comp. Distrs.	303-799-4916
CT	Greenwich, Wise Comps.	203-531-4880
FL	Melbourne, Comp. Dists.	305-724-9910
GA	Norcross, Comp. Dists.	404-449-9508
IL	Chicago, E M D	312-577-0067
IN	Indianapolis, Gateway Megatech	317-844-3906
KY	Louisville, Peerless Elctrn. Equip.	502-637-7674
MA	Billerica, Mayer Elctrns. Inc.	617-229-2255
MI	Grand Rapids, SF Elctrns.	616-459-0216
MN	Minneapolis, Bergquist Co.	612-835-2322
MO	St. Louis, Ric-Tronics	314-576-9816
NJ	Fairfield, Verdura Sls. Co.	201-227-0414
NY	Albany, Edwin Taylor Co.	518-438-7811
NM	Albuquerque, Walker Radio	505-247-2288
NY	Buffalo, Summit Dists.	716-334-8110
NY	Elmsford, Multmetrics	914-347-3666
NC	Raleigh, Comp. Distrs.	919-787-2116
OH	Willoughby, Gateway Megatech	216-953-0333
OK	Tulsa, Quality Comps.	918-664-8812
OR	Portland, Radar Elec. Co.	503-232-3404
TX	Houston, Jaco/QC	713-240-2255
PA	Pittsburgh, Advacom	814-476-7774
VA	Roanoke, Peoples Elctrns.	703-342-8933
WA	Seattle, Radar Elec.	206-282-2511
WI	Racine, Badger Elctrns.	414-637-1256
Can	Ontario, Westburne	613-737-5570

ELECTRONIC DISPLAYS, INC., 780 Creel Dr., Wood Dale, IL 60191, Tel: 708-860-5838, FAX: 708-860-0502

ELECTRONIC ENCLOSURES, Div. Wyle Laboratories, 225 South Aviation Blvd., El Segundo, CA 90245, Tel: 213-643-8181, FAX: 213-643-8565; FSC No.: 09097; Empl.: 230; *Sls. Mgr.:* Robert Sproul ..... **C•1030-1032**

Local Sales Offices & Reps

AL	Huntsville, FLW Southeast	205-990-8989
AZ	Phoenix, Mercury Engrg. Sls.	602-265-0344
CA	Campbell, Carlson & Assocs.	408-370-1284
CA	El Segundo, Wyle Labs.;Elctrn. Encl.	213-643-8181
CA	San Diego, McKinley Elctrn. Sls.	619-271-7221
FL	Casselberry, T-Squared Mktg.	407-699-9992
FL	Ft. Lauderdale, T-Squared Mktg.	305-735-3246
GA	Marietta, FLW Southeast	404-424-1731
IL	Arlington Heigts, Coombs Assoc.	708-439-9810
MD	Upperco, Imigtron Sls. Co.	301-374-5600
MA	Needham Heights, Todino Engrg. Sls. Inc.	617-444-7925
MI	Jackson, Norwood Scroggs Co.	517-750-1170
NJ	Pennsauken, Wyle Labs.;Elctrn. Encl.	609-665-6810
NY	Sanquoit, JBR Engrg. Inc.	315-737-9432
OH	Galion, J. R. Bright Agy.	419-468-3787
TX	Ft. Worth, Zonk Engrg. Co.	214-238-7651
TX	Houston, Zonk Engrg. Co.	713-579-7777
TX	Richardson, Zonk Engrg. Co.	214-238-7651
WI	Milwaulkee, Coombs Assoc.	414-351-6123

ELECTRONIC ENGRG. CO. OF CAL., See EECO

EEM/ELECTRONIC ENGINEERS MASTER, 645 Stewart Ave., Garden City, NY 11530, Tel: 516-227-1300, FAX: 516-227-1901

ELECTRONIC ESSENTIALS, 60-20 34th Avenue, Woodside, NY 11377, Tel: 718-898-8300, TELEX: 384-873, ESYLNK: 6275-6172, FAX: 718-899-7995; Empl.: 49

ELECTRONIC FILM CAPACITORS, INC., 41 Interstate Lane, Waterbury, CT 06705, Tel: 203-755-5629, FAX: 203-755-0659; Empl.: 65; *Sls. Mgr.:* A. Jewel Quinn; *Dist. Mgr.:* A. Jewel Quinn

ELECTRONIC HARDWARE, 320 Broad Hollow Rd., Farmingdale, NY 11735, Tel: 516-752-1950, FAX: 516-752-1971; Empl.: 110; *Sls. Mgr.:* June Franke

ELECTRONIC INDUSTRIES ASSOC., 2001 Pennsylvania Ave. NW, Washington, DC 20006, Tel: 202-457-4900, FAX: 202-457-4985

ELECTRONIC INNOVATIONS CORP., 3107 W. Hampden Ave., Englewood, CO 80110, Tel: 303-789-0424, FAX: 303-789-0809; Empl.: 4

ELECTRONIC MEASUREMENTS INC.

FAX: 908-922-9334

ELECTRONIC MEASUREMENTS, 405 Essex Rd., Neptune, NJ 07753, Tel: 908-922-9300, TELEX: 132-424; FSC No.: 89022; Empl.: 250; *Sls. Mgr.:* Charles Lehmann ..... **D•1718-1727**

Local Sales Offices & Reps

AZ	Phoenix, Sci. Devices	602-957-0401
CA	Huntington Beach, Sci. Devices	714-840-3501
CA	San Diego, Sci. Devices	619-573-0157
CA	San Jose, Sci. Devices	408-554-0455
CO	Broomfield, Sci. Devices	303-469-5145
GA	Marietta, Elctrn. Measurements	404-427-8660
IL	Chicago, Comtel	312-539-4838
IN	Indianapolis, Comtel	317-253-1681
IA	Cedar Rapids, Comtel	319-377-9434
MA	Winchester, FJS Assoc.	617-729-3135
MI	Southfield, Comtel	313-358-2510
MN	Wayzata, Comtel	612-476-1551
NM	Albuquerque, Sci. Devices	505-883-3668
NY	Syracuse, T-Squared	315-463-0355
OH	Dayton, WKM Assoc.	513-434-7500
PA	Pittsburgh, WKM Assoc.	412-892-2953
PA	Plymouth Meeting, Electronic Mktg. Assocs.	215-828-7400
TX	Houston, AccuData	713-580-2451
WA	Redmond, Sci. Dvcs.	206-885-0004
WI	New Berlin, Comtel	414-544-6042

ELECTRONIC MODULES, INC., 10410 Vista Park Rd., Dallas, TX 75238-1687, Tel: 214-340-6789; Empl.: 40-50; *Sls. Mgr.:* Leo Rios; *Dist. Mgr.:* Paul Stolar

ELECTRONIC NAVIGATION INDUSTRIES, See ENI, Inc.

ELECTRONIC PRECISION COMPONENTS CORPORATION, 519 South 5th Ave., Mt. Vernon, NY 10550-4430, Tel: 914-664-2333, FAX: 914-664-4729; FSC No.: 59131; Empl.: 8; *Sls. Mgr.:* Don Edwards ... **A•1670**

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FAX: 617-661-2989

ELECTRONIC PRECISION TECHNOLOGY INC., 126 Jackson St., Cambridge, MA 02140, Tel: 617-661-2454; Empl.: 4; *Sls. Mgr.:* Werner Christ ... **C•1359-1361**

Local Sales Offices & Reps

AL	Huntsville, McKay Smith Assocs.	205-539-8000, FAX:205-539-2472
AZ	Mesa, McDonald Kerr Technlg. Assocs.	602-833-7734,FAX:602-834-8339
CA	Campbell, PCA Mktg. & Sls. Engrg.	408-559-2866, FAX:408-559-8277
CA	Dana Point, P C A	714-493-9822, FAX:714-240-1894
FL	Orlando, McKay Smith Assocs.	407-423-4353, FAX:407-841-8554
FL	Pinellas Pk., P & M Mktg. Assocs.	813-546-4175, FAX:813-544-3826
GA	Tucker, McKay Smith Assocs.	404-496-9913, FAX:404-496-5743
IN	Fishers, Carter, McCormic & Peirce Inc.	317-842-9277,FAX:317-577-2741
MD	Randallstown, Chesepeak Indl. Mktg.	301-653-0476,FAX:301-653-4675
MA	Concord, Noyes Assoc.	508-369-0425, FAX:508-371-2931
MI	Farmington Hills, Carter, McCormic & Pierce Inc.	313-477-7700,FAX:313-477-4149
NC	Raleigh, McKay Smith Assocs.	919-847-2277, FAX:919-847-0956
OH	Englewood, Carter, McCormic & Peirce Inc.	513-836-0951,FAX:513-836-2358
OH	Parma, Carter,McCormic & Peirce Inc.	216-398-0400,FAX:216-398-0766
PA	Pittsburgh, Carter, McCormic & Peirce Inc.	412-826-3800,FAX:412-826-3800
TX	Plano, Connector Specs.	214-517-3660, FAX:214-517-1207

Local Distributors

CA	Costa Mesa, Eric Elctrns.	714-751-1185, FAX:619-236-9910
CA	San Jose, Eric Elctrns.	408-432-1111, FAX:408-433-0570
CA	Santa Anna, Elcom Cabletek	714-432-6630, FAX:714-556-0468
CA	Sunnyvale, PSC ...	800-654-1518,FAX:408-737-0502
MD	Beltsville, PSC/Petricko Sls.	800-333-5292, FAX:301-937-5299
MD	Gaithersburg, Axis Elctrns.	800-368-2815, FAX:301-840-9299
MA	Ashland, Quality Components	508-881-6504, FAX:508-881-1704
TX	Arlington, Bell Comp. Sls. Inc.	817-461-5303
Can	Mississagua, Ont., R. Theta	416-890-0221, FAX:416-890-1628

ELECTRONIC PRODUCTS MAGAZINE, 645 Stewart Avenue, Garden City, NY 11530, Tel: 516-227-1300, FAX: 516-227-1444

ELECTRONIC RESEARCH CO., 7618 Wedd St, Overland Park, KS 66204, Tel: 913-631-6700, TWX: 910-749-6477; FSC No.: 13571; Empl.: 60; *Sls. Mgr.:* Charles Ditzler

ELECTRONIC RESOURCES INC., 568 Weddell Dr., No. 8, Sunnyvale, CA 94089, Tel: 408-745-1420, FAX: 408-745-0533; Empl.: 6; *Dist. Mgr.:* Cari Ikya

THE ELECTRONICS GROUP, INC., 2828 Interstate St, Charlotte, NC 28208, Tel: 704-391-9500, FAX: 704-597-9500 Ext. 20; Empl.: 30; *Sls. Mgr.:* Doug Mckenzie

ELECTRONIC SOLUTIONS, A Unit of Zero Corp., 6790 Flanders Dr., San Diego, CA 92121, Tel: 619-452-9333, TELEX: 910-335-1169, FAX: 619-452-9464; Empl.: 150

ELECTRONIC SPACE SYSTEMS CORP., Old Powder Mill Rd., Concord, MA 01742, Tel: 508-369-7200, TELEX: 923480 ESSCO WCRD, FAX: 508-369-7641; FSC No.: 15175; Empl.: 150; *Sls. Mgr.:* Susan M. Cuevas

ELECTRONIC SPECIALISTS, 171 South Main St, Natick, MA 01760, Tel: 508-655-1532, 800-225-4876, TELEX: 955-329 ATTN: ESP; Empl.: 42; *Sls. Mgr.:* Frank Brown

FAX: 206-573-4635

ELECTRONIC SPECIALTY CORP., 14511 N.E. 13th Ave., Vancouver, WA 98665, Tel: 206-574-5000; FSC No.: 98927; Empl.: 100; *Sls. Mgr.:* Leon Fuller ..... **B•1467, 1626**

Local Sales Offices & Reps

CA	Anaheim, Gabriel & Assocs.	714-666-0660
CA	San Jose, Westron Assocs.	408-997-7332
CO	Longmont, Tri Tec Sls.	303-440-7862
GA	Atlanta, &	404-395-7079
IA	Des Moines, SPS Assocs. Ltd.	515-225-0607
KS	Olathe, SPS Assocs. Ltd.	913-764-4460
MD	Baltimore, Eastern Comps.	301-788-7050
MD	Gaithersburg, Eastern Comp.	215-825-8610
MA	Lexington, Hathaway Elctrns.	617-861-7010
MN	Hopkins, The Kits Co.	612-933-1888
MN	Stillwater, The Kits Co.	612-439-8088
MO	Earth City, SPS Assocs. Ltd.	314-291-0520
NE	Panama, SPS Assocs. Ltd.	913-764-4460
NJ	Ft. Lee, Neptune Elctrns. Co.	201-461-2789
NM	Albuquerque, Tri Tec Sls.	505-293-3730
NY	Glen Head, Neptune Elctrns. Co.	516-349-1600
NC	Raleigh, Eastern Comp.	919-787-3416
NC	Raleigh, L & D Inc.	919-876-5301
OH	Cleveland, Components Inc.	216-243-9200
OR	Beaverton, Earl & Brown Co., Inc.	503-643-5500
PA	West Conshohocken, Eastern Comp.	215-825-8610
TX	Dallas, Barry Sls.	214-234-0255
TX	Houston, Barry Sls. Inc.	713-784-5860
TX	Richardson, Barry Sls. Inc.	612-439-8088
VA	Annandale, Eastern Comp.	703-354-0723
WA	Redmond, Earl & Brown Co., Inc.	206-885-5064

EP/ELECTRONICS PRODUCTS, 645 Stewart Ave., Garden City, NY 11530, Tel: 516-227-1300, TELEX: 516-227-1901

ELECTRONICS REPRESENTATIVE ASSOC., 20 E. Huron St., Chicago, IL 60611, Tel: 312-649-1333, FAX: 312-649-9509

ELECTRONICS RESEARCH ASSOCIATES INC., West Hill Rd., Winsted, CT 06098, Tel: 203-379-2731, TWX: 710-449-6464, FAX: 203-379-8861; FSC No.: 28564; Empl.: 200; *Sls. Mgr.:* Phillip J. Brown

ELECTRONIC SYS. & PROGRAMMING, See Augat/ES)sP, Inc.

ELECTRONIC SYSTEMS DIVISION, Boeing Defense & Space Grp., P.O. Box 3999, M/S 9/F-UA, Seattle, WA 98124-2499, Tel: 206-657-7474, TELEX: 329430, FAX: 206-657-9874; FSC No.: 81205; Empl.: 4,000; *Sls. Mgr.:* R.F. Priebe

ELECTRONICS SYSTEMS, INC., P.O. Box 5013, Sioux Falls, SD 57117, Tel: 605-338-6868, FAX: 605-338-5061; Empl.: 98; *Sls. Mgr.:* Leo Reynolds

ELECTRONICS TEST CENTRE, Alberta Research Council, 250 Karl Clark Road, Edmonton, AB, Canada T6N 1E4, Tel: 403-450-5370, TELEX: 0372147, FAX: 403-462-7285; Empl.: 16; *Sls. Mgr.:* Chris Talliss

ELECTRONIC TELE-COMMUNICATIONS, INC., 3620 Clearview Parkway, Atlanta, GA 30340-2178, Tel: 404-455-4890, FAX: 404-455-7972; Empl.: 145; *Sls. Mgr.:* Doug Altman; *Dist. Mgr.:* Doug Altman

ELECTRONIC TESTING & CONSULTING, Rt 4 Box 933, Decatur, TX 76234, Tel: 817-627-2929; Empl.: 2

ELECTRONIC TRANSFORMER CORP., P.O. Box 188, Totowa, NJ 07511, Tel: 201-942-2222, FAX: 201-942-9014; FSC No.: 72149; Empl.: 130; *Sls. Mgr.:* Dan Rovine

ELEC-TRON, INC., 2050 Northern St., Wichita, KS 67216, Tel: 316-522-3401, FAX: 316-524-6767; Empl.: 65; *Sls. Mgr.:* Gary Beddow

ELECTRON PRODUCTS, 5367 Third St., Irwindale, CA 91706, Tel: 818-960-2299, ESYLNK: 910-333-9810, FAX: 818-814-4434; FSC No.: 99515; Empl.: 65; *Sls. Mgr.:* Cliff Sailor; *Dist. Mgr.:* Ann Meunier

FAX: 714-250-0958

ELECTRO-NUMERICS, INC., 1811 Reynolds, Irvine, CA 92714, Tel: 714-250-1501; FSC No.: 51666; Empl.: 16; *Sls. Mgr.:* Ro Shultz ..... **D•1344**

Local Distributors

IL	Chicago, Dalec Distrs.	312-283-0300
CA	Costa Mesa, FLW, Inc.	714-751-7512
GA	Atlanta, FLW S.E., Inc.	404-424-1731
MI	Detroit, RAM Meter, Inc.	313-398-6767
NY	Syracuse, W.E.I., Inc.	315-437-4281

ELECTRO OPTICAL INDUSTRIES INC., 859 Ward Drive, Santa Barbara, CA 93111, Tel: 805-964-6701 (ext. 280), TELEX: 65-8427 EOIND SNC, FAX: 805-967-8590; Empl.: 130

ELECTRO-PACIFIC, 5770 Thornwood Dr., Goleta, CA 93117, Tel: 805-964-0751; FSC No.: 29853; Empl.: 60; *Sls. Mgr.:* T. Calhoun

ELECTRO PHYSICS CO., INC., 3009 Central Ave., Waukegan, IL 60085, Tel: 708-249-5801; Empl.: 6; *Sls. Mgr.:* Abe Siegelman

ELECTROPHYSICS CORP., 48 Spruce St., Nutley, NJ 07110, Tel: 201-667-0170; Empl.: 25; *Sls. Mgr.:* Frank J. Vallese

ELECTRO PREP INC. & N-E-D CABLE, 14 Kendrick Rd, Unit 3, Wareham Ind. Park, Wareham, MA, MA 02571, Tel: 508-291-2880, FAX: 568-291-2882; Empl.: 10; *Sls. Mgr.:* R. M. Sullivan

ELECTRORACK PRODUCTS CO., 1443 S. Sunkist St., Anaheim, CA 92806, Tel: 714-776-5420, FAX: 714-776-9683; FSC No.: 26073; Empl.: 50; *Sls. Mgr.:* Chris Allen

ELECTRO RENT CORP., 6060 Sepulveda Blvd., Van Nuys, CA 91411, Tel: 818-787-2100, FAX: 818-786-4224; Empl.: 480; *Sls. Mgr.:* Gary Phillips

ELECTRO-SCIENCE LABS., INC., 416 E. Church Rd., Po Box 1533, King of Prussia, PA 19406-1533, Tel: 215-272-8000, TELEX: 83-4788, FAX: 215-272-6759; Empl.: 120

ELECTRO SCIENTIFIC INDUSTRIES, INC. (ESI), 13900 N.W. Science Pk. Dr., Portland, OR 97229, Tel: 503-641-4141, TELEX: 474-2064; FSC No.: 11837; Empl.: 600; *Sls. Mgr.:* Dick Donaca, Sys.

FAX: 215-682-2133

ELECTRO SPACE FABRICATORS, 300 W. High St., P.O. BOX 67, Topton, PA 19562-0067, Tel: 215-682-7181; Empl.: 205; *Sls. Mgr.:* T. Roth ..... **C•1034-1037**

Local Sales Offices & Reps

CA	Campbell, Shursales	408-374-5577
CA	Irvine, Vale Assocs.	714-551-4004, 4821
FL	Melbourne, Winter Assocs.	305-254-6556
FL	Vero Beach, S.E. Pro. Sls.	407-778-0454
GA	Norcross, Benchmark Tech. Sls.	404-448-2854
IL	Northbrook, Howard Benjamin Assocs.	312-272-2900
MD	Monkton, Imagitron Sls. Co.	800-638-3592
MD	Upperco, Imagitron Sls. Co.	800-638-3592
MA	Needham Heights, TESCO	617-444-7925
NJ	Boonton, Winter Assocs.	201-334-3434
NY	Buffalo, Promark Elctrns., Inc.	716-877-6300
NY	Morrisville, Promark Elctrns., Inc.	315-662-3310
OH	Galion, James R. Bright	419-468-3787
PA	Huntingdon Valley, OMEGA Elctrn. Sls., Inc.	215-947-4135
TX	Dallas, Dynamark	214-437-3333

Local Distributors

CA	Irvine, McGillis Inds.	714-551-4004
CA	Redwood City, HdB Elctrns.	415-368-1388
MD	Columbia, DK Elctrns.	301-995-1950
NY	Baldwin, Accessories for Elctrns.	516-546-1751

ELECTROSPACE SYSTEMS, INC., P. O. Box 831359, Richardson, TX 75083-1359, Tel: 214-470-2137, TELEX: 163590 ESIUT, TWX: 910-867-4768, FAX: 214-470-2466; FSC No.: 33875; Empl.: 1283; *Sls. Mgr.:* John E. Cochran, Dir. Bus Dev.

ELECTRO STANDARDS LAB., INC., Data Communications Products Div., 36 Western Industrial Dr., Cranston, RI 02921, Tel: 401-943-1164, FAX: 401-946-5790; Empl.: 25; *Sls. Mgr.:* R. B. Sepe; *Dist. Mgr.:* R. B. Sepe

ELECTROSTATIC CONSULTING ASSOCS., 556 Lowell Rd., P.O. Box 552, Groton, MA 01450, Tel: 508-448-5583, FAX: 508-448-5583; Empl.: 5; *Sls. Mgr.:* Paul Malinaric

ELECTROSTATICS, 7718 Clairemont Mesa Blvd., San Diego, CA 92111, Tel: 619-279-1414, FAX: 619-279-1126; FSC No.: 34538; Empl.: 10

ELECTRO-SUPPORT SYSTEMS, 43445 Business Park Dr., Temecula, CA 92390, Tel: 714-676-2751, FAX: 714-694-0097; FSC No.: 66760; Empl.: 37; *Sls. Mgr.:* Don Pretot

ELECTROSWITCH, Unit of Electro Switch Corp., 180 King Ave., Weymouth, MA 02188, Tel: 617-335-5200, FAX: 617-335-4253; FSC No.: 82121; Empl.: 290; *Sls. Mgr.:* W. M. Mello ..... **B•1694**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Irvine, Vale Elctrns.	714-551-4004
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Vale Elctrns.	619-693-0113
CA	San Diego, Wiley Co.	619-453-9018
CA	San Ramon, W. Nott & Co.	415-820-8102
CO	Boulder, Comp. Prods. Sls.	303-530-2800
FL	Apopka, Floritronics	407-886-4818
GA	Albany, Holman-Gillespie	912-883-5565
GA	Atlanta, Holman-Gillespie	404-992-8820
IL	Elk Grove Village, Electroswitch	708-593-2225
IA	Bettendorf, Weisler & Assocs.	319-355-5911
MD	Baltimore, Eastern Comps. Sls.	301-788-7050
MD	Gaithersburg, Naudain Assocs.-Southern	301-258-5040
MA	Weymouth, Electroswitch	617-340-0066
MI	Grand Haven, Hilltronics, Inc.	616-847-1010
MI	Royal Oak, Hilltronics	313-435-0920
MN	Roseville, Pro Tech Power Sls., Inc.	612-483-0409
MO	Chesterfield, Weisler & Assocs.	314-537-0010
MO	Kansas City, Weisler & Assocs.	816-421-1679
NH	Salem, Sales Engrg. Co.	603-893-5521
NJ	Fairfield, Electroswitch	201-227-6559
NJ	Marlton, Naudain Assocs.	609-983-5300
NY	Buffalo, Upstate Engrg.	716-632-0011
NY	Johnson City, Upstate Engrg.	607-729-0827
NY	Rochester, Upstate Engrg. Sls.	716-225-2383
NY	Utica, Upstate Engrg. Sls.	315-797-6721
NC	Raleigh, L.G. White Southern	919-872-6049
NC	Winston-Salem, L.G. White Southern	919-725-3612
OH	Medina, Rockford Controls OH, Inc.	216-725-3705
OR	Beaverton, Luscombe Engrg.	503-636-6664
PA	Pittsburgh, R. F. Clark	412-242-9500
PA	W. Conshohocken, Eastern Comps.	215-825-8610
SC	Greenville, L.G. White Southern	803-271-0630
WA	Olympia, Alster Comm.	206-754-7965
TX	Plano, Brice Co.	214-442-9808
TX	Stafford, Brice Co.	713-240-1788
VA	Ashland, L.G. White Southern	804-752-7055
WA	Bellevue, Luscombe Engrg.	206-223-1541
WA	Kent, C.B. Parsons & Co.	206-762-7373
WI	Wauwatosa, Larsen Assocs.	414-258-0529

Local Distributors

CA	Los Angeles, Electric Switches	213-660-1310
FL	Ft. Lauderdale, Peerless Radio Corp. of Fla.	305-973-4141
GA	Atlanta, Georgia Control Ctr.	404-876-8833
IL	Bridgeview, Midco Comp. Sls.	312-599-7777
MN	St. Paul, K. D. I.	612-645-7717
NC	Raleigh, Wholesale Elctrns.	919-878-9400
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WA	Seattle, Branom Instr. Co.	206-762-6050

Local Distributors

CA	Glendale, Instr. Meter Specialties	818-243-0416
CA	Livermore, Std. Meter Lab	415-449-0220
CA	S. Pasadena, Dae Instr. & Svc., Inc.	213-942-8843
LA	Harahan, Indl. Instrs. Works	504-733-8355
MD	Sparks, E.I.L. Instrs.	301-771-4800
NJ	Belleville, Miscorp	201-751-1190
PA	Norristown, Kimberly-James	215-666-7286
TX	Beaumont, Straughn Elctrns.	409-838-4563
TX	Houston, American Analog	713-941-7265
TX	Houston, Meters & Instrs.	713-644-1631
WA	Seattle, Branom Instr. Co.	206-762-6050
WI	Milwaukee, E-M Instrs.	414-272-7799

EMS

FAX: 714-838-2967

E.M.S., Div. of Sandberg Industries, 14251 Chambers Rd., Tustin, CA 92680, Tel: 714-669-9473; Empl.: 125; *Sls. Mgr.:* Duane Halverson, VP Sls.; *Dist. Mgr.:* Bruce Flemming ..... **C•1682**

E M S DEVELOPMENT CORP., 100 Sea La., Farmingdale, NY 11735, Tel: 516-293-7900, FAX: 516-694-1093; FSC No.: 51435; Empl.: 100

ET
Emulation Technology, inc.

FAX: 408-982-0664

EMULATION TECHNOLOGY, INC., 2344 Walsh Ave., Bldg. F, Santa Clara, CA 95051, Tel: 408-982-0660, TELEX: 981866; Empl.: 18; *Sls. Mgr.:* Joseph J. Bagliere, Jr. ..... **C•1358**

Local Distributors

CO	Denver, Alliance Elctrns. CO	303-433-1648
MI	Bloomfield Hills, Mackellar Assocs.	313-335-4440
NJ	Union, Meridian Supply Co.	201-687-6220
TX	Allen, Prime Distributing Co.	214-231-0170
TX	Richardson, Off The Shelf Comps., Inc.	214-238-0808

ENCLOSURE CORP., 2900 Wharton Rd., Bristol, PA 19007, Tel: 215-785-2900, FAX: 215-785-2960; FSC No.: 32360; Empl.: 75; *Sls. Mgr.:* Gene Goldner

ENCODER DIV., LITTON SYSTEMS, INC., See Litton Encoder Div.

ENCODER PRODUCTS, 1601 B Dover Rd.-Hwy.2, Sandpoint, ID 83864, Tel: 208-263-8541, FAX: 208-263-0541; Empl.: 100; *Sls. Mgr.:* Jim Burcham; *Dist. Mgr.:* Jim Burcham

ENCORE ELECTRONICS, INC., 4400 Route 50, Saratoga Springs, NY 12866, Tel: 518-584-5354, FAX: 518-584-5963; Empl.: 20

ENDEVCO CORPORATION, Allied Signal Aerospace Co., 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675, Tel: 714-493-8181, TELEX: 68-5608, TWX: 910-596-1415, FAX: 714-661-7231; FSC No.: 95411; Empl.: 400; *Sls. Mgr.:* D. McMahon

ENDICOTT COIL CO., INC., 24 Charlotte St., Binghamton, NY 13905, Tel: 607-797-1263, FAX: 607-797-0151; Empl.: 110; *Sls. Mgr.:* Thomas E. Frank

ERG™ Endicott Research Group, Inc.

FAX: 607-754-9255

ENDICOTT RESEARCH GROUP, 2601 Wayne St., P.O. Box 269, Endicott, NY 13760, Tel: 607-754-9187; FSC No.: 63312; Empl.: 120 ... **B•1066-1067, 1151; D•1740-1741**

Local Sales Offices & Reps

AZ	Phoenix, Finn-Pat Co., Inc.	602-954-0301
CA	Saratoga, Testco	408-253-1900
CO	Littleton, MRC	303-794-4684
CT	Bloomfield, Sands Co./Sir Assocs.	203-243-9343
FL	Maitland, EIR, Inc.	407-660-9600
GA	Atlanta, Wallace Electronics	800-334-3518
IL	Elk Grove Village, Carlson Elctrn. Sls.	708-956-8240
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-378-1450
MA	Westford, SIR Assocs.	617-692-2500
MI	West Bloomfield, Granneman & Mize	317-849-2000
MN	Minneapolis, OEM Prods.	612-831-7373
NC	Kernersville, Wallace Electronics	919-996-2742
OH	Dayton, Elctrn. Sls. & Technlg.	513-433-2800
PA	King of Prussia, Freedman-Malta Assocs.	215-337-9211
UT	Salt Lake City, MRC	303-794-4684
WA	Bellevue, Testco	206-454-7422
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790
Can	Toronto, Ont., Norgay Entprs., Ltd.	416-259-9663

ENEGREN ELECTRONICS, INC., 15605-C S. Keeler Terr., Olathe, KS 66062, Tel: 913-782-4720, FAX: 913-782-4752; Empl.: 7; *Sls. Mgr.:* Floyd Enegren ..... **A•2210**

ENERCO, INC., 9615 W. Marginal Way S., Seattle, WA 98108, Tel: 206-762-1422; Empl.: 5; *Sls. Mgr.:* Lee Rabie

ENERGY

FAX: 301-699-8107

ENERGY, LTD., 4714 Upshur Street, Bladensburg, MD 20710, Tel: 301-699-1144; Empl.: 10 ..... **D•2194**

Local Sales Offices & Reps

MD	Bladensburg, Energy, Ltd.	301-699-1144

Local Distributors

MD	Bladensburg, Energy, Ltd.	301-699-1144

ENERGY SYSTEMS, 12004 NE 95th St., No. 840, Vancouver, WA 98682, Tel: 206-896-8310, FAX: 206-896-8457; Empl.: 25 ..... **D•1247**

ENGINEERED ASSEMBLIES & COMPONENTS CORP., 380 North St., Teterboro, NJ 07608, Tel: 201-288-4477, 800-447-5639, FAX: 201-288-1515; Empl.: 100; *Sls. Mgr.:* John Deleodice; *Dist. Mgr.:* P. Teen ..... **D•1452-1455**

Local Sales Offices & Reps

FL	Orlando, Engrd. Assemblies & Comp. Corp.	407-291-6710
GA	Atlanta, Engrd. Assemblies & Comp. Corp.	404-525-0676
MA	Boston, Engrd. Assemblies & Comp. Corp.	407-291-6710
NC	Raleigh, Engrd. Assemblies & Comp. Corp.	919-790-9700

ENGINEERED COMPONENTS CO., P. O. Box 8121, San Luis Obispo, CA 93403-8121, Tel: 805-544-3800, FAX: 805-544-8091; FSC No.: 32440; Empl.: 193

ENGINEERED MAGNETICS, INC., 18435 Susana Rd., Rancho Dominguez, CA 90221, Tel: 213-635-9555, TWX: 910-325-6208, FAX: 213-631-0313; FSC No.: 06509; Empl.: 200; *Sls. Mgr.:* S. Miller

ENGINEERING DESIGN & SLS., One E.D.S. Way, Danville, VA 24541, Tel: 804-792-6405, FAX: 804-792-6415; Empl.: 75; *Sls. Mgr.:* Mark Gignac

ENGLER INSTRUMENTS OPERATION, See Stemco Instruments, Colt Inds.

ENI, DIV. OF ASTEC AMERICA, INC., 100 Highpower Road, Rochester, NY 14623, Tel: 716-427-8300, FAX: 716-427-7839; Empl.: 390

ENM COMPANY, 5617 Northwest Highway, Chicago, IL 60646, Tel: 312-775-8400, TELEX: 25-4068, FAX: 312-775-5968; Empl.: 100ò; *Sls. Mgr.:* Lee Bryant

ENNOVATION OF WISCONSIN, INC., 806 Elm St.-P.O. Box 258, Watertown, WI 53094, Tel: 414-261-2996, FAX: 414-261-3432; Empl.: 5; *Sls. Mgr.:* Enno Knief; *Dist. Mgr.:* Enno Knief

ENPROTECH CORP., 445 West Michigan Ave., Kalamazoo, MI 49007, Tel: 616-381-0665, FAX: 616-381-9810; Empl.: 125

ENSIGN CORP., 7960 S. Madison Street, Burr Ridge, IL 60521, Tel: 708-325-9343, FAX: 708-789-3206; Empl.: 150; *Sls. Mgr.:* D. Brent Ensign

ENTECH CORPORATION, 17A Herman Drive, Simsbury, CT 06070, Tel: 203-658-2740, 203-651-9557, FAX: 203-658-2740

ENTECH SYSTEMS, INC., 17B Herman Dr., Simsbury, CT 06070, Tel: 203-651-9557, FAX: 203-658-2740; *Sls. Mgr.:* A. D. Jorczak

ENTERPRISE SYSTEMS CORP., PO Box 698, Dover, NH 03820, Tel: 603-742-7363, FAX: 603-742-9284; FSC No.: 79543; Empl.: 5; *Sls. Mgr.:* George Perrine

ENTRA CORPORATION, 8651 Castle Park Drive, Indianapolis, IN 46256, Tel: 317-849-8270, FAX: 317-849-7041; Empl.: 75; *Sls. Mgr.:* F. Paul McDonald

Entran

FAX: 201-227-6865

ENTRAN DEVICES, 10 Washington Ave., Fairfield, NJ 07004, Tel: 201-227-1002, 800-635-0650, TELEX: 130-361; *Sls. Mgr.:* Robert L. Morrell ..... **B•1892-1901**

Local Sales Offices & Reps

AZ	Phoenix, J. Smith & Assocs.	602-267-0981
CA	Long Beach, Saber Entprs.	213-595-5646
CA	Mtn. View, Saber Entprs.	415-968-0427
CA	San Diego, Saber Entprs.	619-271-1523
CO	Colorado Springs, J. Smith & Assoc.	719-597-5343
CT	Wallingford, Pond Tech. Sls.	203-284-1500,
FL	Indian Rocks Bch., PAR Assocs.	813-596-8841
GA	Atlanta, PAR Assocs.	404-391-9117
IL	Woodstock, TMI Inc.	815-385-2212
ME	North Windham, Pond Tech. Sls.	207-892-9629
MA	Waltham, Pond Tech. Sls.	617-890-5535,
MI	St. Clair Shores, Stress Analysis Svcs.	313-776-9734

MN Eden Prairie, TMI Inc. 612-934-8665
NJ Budd Lake, Measurements, Inc. 201-770-1281
NM Albuquerque, J. Smith & Assocs. 505-345-6501,
NY Clarence, Trott Elctrns./E.I.L. 716-634-8500
NY Pittsford, Trott Elctrns./E.I.L. 716-586-8251
NC Charlotte, PAR Assocs. 704-535-9858
OH Bellbrook, Stress Analysis Svcs. 513-848-8215
OH Cincinnati, Stress Analysis Svs. 513-521-3967
OH Maumee, Stress Analysis Svs. 419-893-4591
OH Medina, Stress Analysis Svc. 216-725-7733
PA Exton, Measurements, Inc. 215-524-0310
PA Murrysville, Stress Analysis 412-733-1766
TX Dallas, Pace Tech. Sls. 214-368-0135
VA Fredericksburg, Measurements, Inc. ... 703-373-5520
WA Renton, Westech 206-271-5490
WI Oregon, TMI Inc. 608-835-5527
Can Ontario, Intertechnology 416-445-5500

ENTRELEC DIV/GEC ALSTHOM INTERNATIONAL, INC., 1950 Hurd Drive, Irving, TX 75038, Tel: 214-550-9025, FAX: 214-550-9215; Empl.: 50; *Sls. Mgr.:* F. D. Leynaert

ENVIRONMENTAL CONTAINER SYS., INC., See ECS Composites

ENVIRONMENTAL STRESS SYSTEMS, INC., 16310 N. Morris Rd., Sonora, CA 95370, Tel: 209-928-4900, FAX: 209-928-1117; *Sls. Mgr.:* Gino DiBartolomeo; *Dist. Mgr.:* Gino DiBartolomeo ..... **D•1200**

Local Sales Offices & Reps
AZ Chandler, Blackhart Assocs. 602-893-3488
CA San Jose, Microwave Meas. 415-846-0377
FL Ft. Lauderdale, Sun Elctrn. Sys. 305-587-5577
NY Stony Brook, L.I., Gama Metro 516-751-2072
PA North Wales, Scientific Dvcs. 215-699-7707
TX Dallas, Textec 214-233-1928
EXP Santa Cruz, CA, Step Elctrns. 408-423-8722

ENVIRONMENTAL TELESIS & CONTROLS, P.O. Box 180206, Austin, TX 78718, Tel: 512-835-0330, TWX: 910-350-5536, FAX: 512-832-1775; Empl.: 12; *Sls. Mgr.:* Sharon Grimm

ENVIROPLAN, 3 Becker Farm Rd., Roseland, NJ 07068, Tel: 201-994-2300, FAX: 201-994-5100; Empl.: 50; *Sls. Mgr.:* Robert Mullowney

EOG, INC., OMX, INC., 10947 Golden West Drive, Hunt Valley, MD 21030, Tel: 301-785-3000, FAX: 301-771-5814; FSC No.: 17521; Empl.: 130; *Sls. Mgr.:* Arthur C. Rutledge, Jr.; *Dist. Mgr.:* Arthur C. Rutledge, Jr.

EPC IDENTIFICATION SYS., 505 Martin Ave., Rohnert Park, CA 94928, Tel: 707-585-8811, TWX: 910-3382-311, FAX: 707-585-8688; FSC No.: 67041; Empl.: 16; *Sls. Mgr.:* William Bolster; *Dist. Mgr.:* William Bolster

EPCO PRODUCTS INC., P.O. Box N. Cottage St., Wallkill, NY 12589, Tel: 914-895-2033, FAX: 914-895-2279; Empl.: 45; *Sls. Mgr.:* Mark Giegel

E.P.D./GENERAL POWER CORP., 1045 So. East Street, Anaheim, CA 92805-8508, Tel: 714-520-0881, 1-800-343-1813, TELEX: 678870 ATTN:EPD, FAX: 714-491-8644; Empl.: 150; *Sls. Mgr.:* Don Royer,Sls. Dir.; *Dist. Mgr.:* Connie Kouri ..... **D•1069**

Local Distributors
CA Santa Ana, Micro D 800-642-7631
IL Des Moines, United Stationers 800-323-1783
MN Edina, Radix 800-328-3004
NY Buffalo, Ingram Software 800-828-7250
NY Melville, Arrow Elctrns. 516-391-1847
NY Plainview, Global Computers 516-752-2299
TX Dallas, Hall-Mark Elctrns. 214-343-5000
TX Ft. Worth, Allied Elctrns. 817-336-5401

EPD ELECTRONICS, INC., 16921 S. Western Ave.-Bldg. 300, Gardena, CA 90247, Tel: 213-515-4996, TELEX: 691-738, FAX: 213-515-5011; Empl.: 6 ..... **D•1742**

Local Sales Offices & Reps
IA Burlington, JS Ridge Entprs., Inc. 319-754-8745
NJ Bricktown, Bryan Elctrn. Sls. Co. 201-840-8487
OR Portland, Dale G. Weber Co. 503-234-0686
TN White House, Apple Sls. & Mktg. 615-672-4498

EPE TECHNOLOGIES, INC., Subsidiary of Merlin Gerin, 1660 Scenic Avenue, Costa Mesa, CA 92626, Tel: 714-557-1636, FAX: 714-957-1103; Empl.: 350; *Sls. Mgr.:* Joe T. Amos, Jr.; *Dist. Mgr.:* Todd Hunter

EPH ENGINEERING ASSOCIATES, INC., 31 E. 400 S., Orem, UT 84058, Tel: 801-226-1383, FAX: 801-226-1437

EPIC, INC., 150 Nassau St., New York, NY 10038, Tel: 212-349-2470, FAX: 212-406-2508; Empl.: 8; *Sls. Mgr.:* Marge Couteau

EPIC RESINS, General Fiberglass Supply, Inc., 1415 Ellis St., Waukesha, WI 53186, Tel: 414-521-2255, FAX: 414-521-1320; Empl.: 20; *Sls. Mgr.:* Daniel Veenhuis

EPM CORPORATION, 8866 Kelso Dr., Baltimore, MD 21221, Tel: 301-686-7800, TELEX: 87569, FAX: 301-686-4662; Empl.: 75

EPOXY TECHNOLOGY, INC., 14 Fortune Dr., Billerica, MA 01821, Tel: 508-667-3805, 800-227-2201, TELEX: 94-7140, FAX: 508-663-9782; FSC No.: 33246; Empl.: 24

EPSCO INCORPORATED, 1115 Hilltop Dr., Unit A2, Itasca, IL 60143-1120, Tel: 708-250-0410, FAX: 708-250-0521; FSC No.: 53003; Empl.: 8; *Sls. Mgr.:* Wendie Amerena ..... **D•1743**

Local Distributors
AZ Phoenix, Fisher Sci. 602-995-1556
AR Little Rock, Carlton-Bates Co. 501-562-9100
CA San Francisco, Delray Distr. 415-861-6318
CO Denver, Sargent-Welch 303-399-8220
FL Mirimar, Aero Quality Sls. 305-432-2288
IL Carpentersville, Frank Fryer Co. 708-426-6731
IL Elmhurst, McMaster-Carr Supp. 312-834-9600
IN East Chicago, Acro Elctrns. Corp. 219-397-8681
KY Louisville, Peerless Elctrn. Equip. 502-637-7674
LA Lafayette, Ralph's Inc. 318-233-0105
MD Rockville, Capital Radio Whlsrs. 301-881-2270
MA Woburn, Rainin Instr. 617-935-3050
MI Farmington Hills, Motion Control Corp. 313-478-1640
MN Eden Prairie, Allied Elctrns. 612-829-7554
NJ Bridgeport, VWR Scientific 609-467-2600
NM Albuquerque, Walker Elec. Supp. 505-883-2992
NY Syracuse, Stewart Smith 315-437-7836
OH Warren, Rem Elctrns. Supp. 216-373-1300
PA Pittsburgh, Allied Elctrns. 412-367-4124
RI Providence, A & J Distrs., Inc. 401-421-0991
SC Charleston, Wholesale Inds. Elec. 803-722-2634
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Houston, Angie Elctrns. 713-659-8686
WA Kent, Fisher Scientific 206-872-0330
WI Milwaukee, Industrial Elctrns. Supp. ... 414-276-1212

EPSILON-LAMBDA ELCTRNS. CORP., 427 Stevens St., Geneva, IL 60134, Tel: 708-232-9611, TELEX: 708-232-9613; Empl.: 20; *Sls. Mgr.:* R. Knox

EPSON AMERICA, INC./OEM DIV., 20770 Madrona Ave., Torrance, CA 90503, Tel: 213-534-4500, FAX: 213-534-4449; Empl.: 900; *Sls. Mgr.:* John R. Confrey

EPSON

FAX: 213-782-5320

EPSON AMERICA INC., Component Sales Dept., 20770 Madrona Ave., Torrance, CA 90503, Tel: 213-787-6300; *Sls. Mgr.:* Hideo Akiyama; *Dist. Mgr.:* Craig Dyer ..... **A•1358-1363**

Local Sales Offices & Reps
AL Madison, Concord Comp Reps 205-772-8883, FAX:205-772-8262
AZ Scottsdale, Fred Board Assocs. 602-994-9388, FAX:602-994-9477
AZ Tucson, Fred Board Assocs. 602-299-1508, FAX:602-797-1683
CA Cupertino, Costar, Inc. 408-446-9339, FAX:408-446-4885
CA Encinitas, Bager Elctrns. Inc. 619-944-4108, FAX:619-632-8810
CA Woodland Hills, Bager Elctrns.Inc. 818-712-0011, FAX:818-712-0160
CO Broomfield, Western Region Mktg. 303-469-8088, FAX:303-469-8585
CO Colorado Springs, Western Region Mktg. 719-548-8282,FAX:719-548-0462
FL Casselberry, Dyne-A-Mark 407-831-2822, FAX:407-834-4524
FL Clearwater, Dyne-A-Mark 813-441-4702, FAX:813-447-4120
FL Ft. Lauderdale, Dyne-A-Mark 305-771-6501, FAX:305-772-0114
GA Norcross, Concord Comp. Reps 404-416-9597, FAX:404-441-0790
IL Itasca, LTD Technlgs. 708-773-2900, FAX:708-773-0358
IN Indianapolis, C.C. Electro Sls. 317-921-5000, FAX:317-921-5005
KS Shawnee Mission, Microtronics, Inc. 913-262-1444, FAX:913-262-1445
MD Ellicott City, Technlg. Sls. Assocs. 301-461-7802, FAX:301-461-7888
MA Needham Heights, Rosen Assocs. Inc. 617-449-4700,FAX:617-449-5245
MA Needham Heights, Rosen Assocs., Inc. 714-957-3367,FAX:714-546-2654
MN Eden Prairie, Electromark 612-944-5850, FAX:612-944-5855
NJ Parlin, JMR Sls; Inc. 201-525-8000, FAX:201-525-8805
NY Pittsford, Elcom Sls., Inc. 716-385-1400, FAX:716-248-8531
NY Skaneateles, Elcom Sls., Inc. 315-685-8967, FAX:315-685-6273
NY Wading River, Niktronics 516-929-4671, FAX:516-929-1683
NC Raleigh, WLA Assocs. 919-231-9939, FAX:919-231-9949
OH Sheffield, J.D. Babb 216-934-4454, FAX:216-934-4454
OR Tigard, Matrex Sls. 503-245-8080, FAX:503-246-1848
PA Trevose, Omega Sls. 215-244-4000, FAX:215-244-4104
TX Austin, Component Technlg. Sls. 512-250-2450, FAX:512-288-7328
TX Dallas, Component Technlg. Sls. 214-783-8831, FAX:214-783-4801
TX Houston, Component Technlg. Sls. 713-961-1262, FAX:713-462-9906
UT Salt Lake City, Western Region Mktg. 801-268-9768,FAX:801-268-9796
WA Bellevue, Matrex Sls. 206-643-0363, FAX:206-746-3672
WI Milwaukee, LTD Technlgs. 414-774-1000, FAX:414-774-0593

Local Distributors
AL Bell Inds., Inc. 205-837-1074,FAX:205-830-5598
AZ Tempe, Bell Inds., Inc. 602-966-7800, FAX:602-967-6584
CA Agoura Hills, Bell Inds., Inc. 818-706-2608, FAX:818-991-7695
CA Cypress, Bell Inds., Inc. 714-895-7801, FAX:714-891-4570
CA Irvine, IEC Irvine ... 714-837-9960,FAX:714-837-8308
CA Los Angeles, Bell Inds., Inc. 213-826-6778, FAX:213-447-3265
CA Orange, Orange Electro Mechanical ... 714-937-0714, FAX:714-937-0916
CA Rocklin, Bell Inds., Inc. 916-652-0414, FAX:916-652-0403
CA Sacramento, Integrated Elctrns. (IEC) 916-363-6030,FAX:916-362-6926
CA San Diego, Bell Inds., Inc. 619-268-1277, FAX:619-268-3733
CA San Jose, IEC San Jose 408-435-1000, FAX:408-435-8709
CA Santa Fe Springs, Cable & Comps./CCD 213-921-3611,FAX:213-921-9385
CA Santa Fe Springs, Corporate Warehouse 213-921-3611,FAX:213-921-9385
CA Santa Fe Springs, Just-In-Time 213-921-3611, FAX:213-404-0732
CA Sunnyvale, Bell Inds., Inc. 408-734-8570, FAX:408-734-8875
CO Denver, Integrated Elctrns. (IEC) 303-292-5537, FAX:303-292-0114
CO Wheatridge, Bell Inds., Inc. 303-424-1985 FAX:303-424-0932
CT Cronin Elctrns., Inc. 203-265-3134
CT Wallingford, Bell Inds., Inc. 203-269-6801 FAX:203-269-6527
CT Wallingford, Greene-Shaw Co. Inc. 203-265-3333 FAX:203-265-3583
FL Altamonte Springs, Bell Inds., Inc. 407-339-0078 FAX:407-339-0135
FL Ft. Lauderdale, Bell Inds., Inc. 305-421-1997
FL Melbourne, Greene-Shaw Co. Inc. 407-951-3636 FAX:407-951-3637
FL Tampa, Bell Inds., Inc. 813-541-4434
GA Norcross, Bell Inds., Inc. 404-662-0923 FAX:404-449-6907
IL Bensenville, Voyager Elctrns. 708-860-1300 FAX:708-860-1577
IL Elk Grove Village, Bell Inds., Inc. 708-640-1910 FAX:708-640-0474
IL Hoffman Estates, IEC IL (Hoffman Estates) 708-843-2040,FAX:708-843-2327
IL Urbana, Bell Inds., Inc. 217-328-1077 FAX:217-328-1144
IN Ft. Wayne, Bell Inds., Inc. 219-423-3423 FAX:219-424-2437
IN Indianapolis, Bell Inds., Inc. 317-875-8200 FAX:317-875-8211

IN Indianapolis, Custom Svc. Elect. 317-879-9119, FAX:317-879-9136
IN Indianapolis, Just-In-Time 317-299-5487, FAX:317-293-8256
IN Indianapolis, Mar Elctrns. 317-633-6699, FAX:317-633-6687
IA Bell Inds., Inc. 319-395-0730,FAX:319-875-8219
KS Olathe, ECS Inc. ... 913-782-7787,FAX:913-782-6991
MD Jessup, Bell Inds., Inc. 301-953-2566, FAX:301-953-0039
MA Andover, Bell Inds., Inc. 508-474-8880, FAX:508-474-8902
MA Needham, Cronin Elctrns., Inc. 617-449-5000, FAX:617-444-8395
MI Wixon, Bell Inds., Inc. 313-347-6633, FAX:313-347-3356
MN Bell Inds., Inc. 612-941-1493,FAX:612-938-7410
MN Fridley, Voyager Elctrns. Corp. 612-571-7766, FAX:612-571-9519
MO Bell Inds., Inc. 314-647-2355,FAX:317-875-8219
NH Golfstown, Key Comps. 603-626-1717, FAX:603-626-1720
NJ East Brunswick, Bell Inds., Inc. 201-613-0200, FAX:201-613-9689
NJ Hopelawn, Dove Elctrns. 201-324-7830, FAX:201-442-6789
NM Albuquerque, Bell Inds., Inc. 505-292-2700, FAX:505-275-2819
NY Bohemia, Key Comps. 516-567-7500, FAX:516-576-2920
NY Stony Brook, Dove Elctrns. 516-689-7733, FAX:516-689-7362
NC Bell Inds., Inc. 919-821-4041,FAX:919-821-4953
NC Raleigh, Greene-Shaw Co. Inc. 919-954-7138, FAX:919-954-7139
OH Dayton, Bell Inds., Inc. (Industrial) 513-435-8660, FAX:513-435-6765
OH Dayton, Bell Inds., Inc. (Military) 513-434-8231, FAX:513-434-8103
OR Beaverton, IEC Beaverton (OR) 503-641-1690, FAX:503-646-3737
OR Lake Oswego, Bell Inds., Inc. 503-635-6500, FAX:503-635-4095
PA Trevose, Bell Inds., Inc. 215-953-2899, FAX:215-364-4928
SC Bell Inds., Inc. 800-322-7908,FAX:407-339-0139
TN Bell Inds., Inc. 615-367-4400,FAX:407-339-0139
TX Austin, Norvell Austin 512-837-5555, FAX:512-837-3729
TX Austin, Omni Pro Elctrns. 512-794-9200, FAX:512-338-9576
TX Dallas, Norvell Elctrns., Inc. 214-233-0020, FAX:214-490-7245
TX Dallas, Omni Pro Elctrns. 214-233-0500, FAX:217-385-7508
TX Houston, Norvell Houston 713-462-1666, FAX:713-462-3210
TX Richardson, Bell Inds., Inc. 214-690-0466, FAX:214-690-0822
UT Midvale, Bell Inds., Inc. 801-255-9611, FAX:801-255-2477
UT West Valley City, IEC Utah (Salt Lake) 801-977-9750,FAX:801-975-1207
WA Bell Inds., Inc. 206-867-5410,FAX:206-867-5159
WA Bellevue (WA), IEC Bellevue (MA) 206-455-2727, FAX:206-453-2963
WI Waukesha, Bell Inds., Inc. 414-547-8879, FAX:414-547-6547

EQUIPMENT REMARKETING COMPANY, Boston Financial & Equity Corporation, 20 Overland Street, Boston, MA 02215, Tel: 617-267-8600, FAX: 617-267-2370

EQUIPTO, 225 S. Highland Ave., Aurora, IL 60506, Tel: 708-859-1000, 800-323-0801, TWX: 910-232-0845, FAX: 708-859-3255; Empl.: 300; *Sls. Mgr.:* Tom Nilles; *Dist. Mgr.:* Jerry Reidy

EQUIPTO ELECTRONICS CORP., 351 Woodlawn Ave., Aurora, IL 60506, Tel: 708-897-4691, FAX: 708-897-5314; FSC No.: 14002;Multiple; Empl.: 100; *Sls. Mgr.:* Kent Jarnig ..... **C•1044-1049**

ERA POLY-PLANAR DIV., See Poly-Planar, Inc.

ERASER CO., Box 4961, Syracuse, NY 13221, Tel: 315-454-3237, TELEX: 93-7442, FAX: 315-454-3090; Empl.: 45; *Sls. Mgr.:* Linda S. Cahill

ERC, See Electronic Research Co.

ERCONA, 979 North Ocean Ave., Patchogue, NY 11772, Tel: 516-758-0700, FAX: 516-758-0422; Empl.: 10; *Sls. Mgr.:* G. Moore; *Dist. Mgr.:* L. Mills

ERCON INCORPORATED, 26 Emerson Road, Waltham, MA 02154, Tel: 617-899-1497, FAX: 617-899-2650; *Sls. Mgr.:* Dennis Ehrreich

ERGOTRON, INC., 3450 Yankee Dr., Eagan, MN 55122, Tel: 612-452-8135, TELEX: 4310015, FAX: 612-452-8346; Empl.: 32; *Sls. Mgr.:* Harry C. Sweere

ERICSSON

FAX: 214-680-1059

ERICSSON COMPONENTS, INC., 403 International Parkway, Richardson, TX 75081, Tel: 214-480-8300, TELEX: 735389 ERICS RCHN ..... **D•1744-1748**

Local Sales Offices & Reps

AL Huntsville, The Novus Grp.,Inc. 205-534-0044
AZ Phoenix, CPS Assocs., Inc. 602-246-1097
CA Cupertino, PEI Assocs. Inc. 408-253-1960
CA Garden Grove, Elsco Elctrns. 714-891-4621
CA Grass Valley, Unitronics, Inc. 916-268-1737
CA San Diego, Elsco Elctrns. 619-292-1771
CO Denver, NOW Dvcs. 303-758-4884
CT Greenwich, Ericsson Comps. Inc. 203-625-7300
CT Woodbury, Power Factor & Assocs. ... 203-264-9812
FL Boynton Bch., Burke Assoc., Inc. 407-364-8203
FL Largo, Burke Assoc. Inc. 813-536-4335
FL Oldsmar, Burke Assoc. Inc. 813-786-8105
FL Winter Springs, Burke Assoc. Inc. 407-699-1888
GA Norcross, The Novus Grp., Inc. 404-263-0320
IL Elk Grove Village, Carlson Elctrns. Sls. 708-956-8240
IA Cedar Rapids, Carlson Elec. Sls. Assoc. 319-378-1450
MA Whitinsville, Power Factor & Assoc. ... 508-234-6415
MN Richfield, Clay Rep. Co. 612-861-2191
NJ Marlton, Naudain Assocs., Inc. 609-983-5300
NJ Parlin, JMR Sls., Inc. 201-525-8000
NY Fayetteville, H.C. Johnson 315-637-1143
NY Rochester, H.C. Johnson 716-586-0777
NY Wading River, Niktronics 516-929-4671
NC Cary, The Novus Grp., Inc. 919-460-7771
OH Cleveland, RK Comp. Sls., Inc. 216-642-9312
PA Glenshaw, H. C. Johnson 412-487-1246
TX Dallas, Dynamark 214-437-3333
VA Herndon, Stinson Assocs. 703-620-1331
WA Chattaroy, EMG-Elec. Mktg. Grp. 509-238-6476
WA Redmond, EMG-Elec. Mktg. Grp. 206-882-0962
WA Vancouver, EMG Elec. Mktg. Grp. 206-254-4572
WI Milwaukee, Carlson Elctrns., Sls. 414-476-2790
Can Markham, Ont., Deskin Sls. 416-475-1412

ERICSON MANUFACTURING CO., 4215 Hamann Pkwy., Willoughby, OH 44094, Tel: 216-951-8000, TELEX: 98-5390, FAX: 216-951-1867; Empl.: 110; *Sls. Mgr.:* Keith E. Wigman

ERIE TECHN. PRODS., See Murata Erie No. Amer., Inc.

ERNI COMPONENTS, 520 Southlake Blvd., Richmond, VA 23236, Tel: 804-794-6367, FAX: 804-379-2109; Empl.: 700; *Sls. Mgr.:* Thomas Noack

ESCAP PRODUCTS, 36 Central Ave., Hauppauge, NY 11788, Tel: 516-234-3900, FAX: 516-234-3986; *Sls. Mgr.:* Dave Hall

ESC ELECTRONICS CORPORATION

FAX: 201-947-0406

ESC ELECTRONICS CORP., 534 Bergen Blvd., Palisades Pk., NJ 07650, Tel: 201-947-0400; Empl.: 120 ..... **A•1558-1571, 1671, 2211**

Local Sales Offices & Reps

AL Huntsville, Murcota Corp. 205-539-8476
AZ Mesa, Sedco Sls. 602-461-9069
CA Newbury Pk., Westaironics 805-499-9844
CA Santa Clara, Rodgers Assocs. 408-984-8110
CO Denver, Donohue Sls. Co. 303-455-1719
FL Palm Harbor, Sigma Tech. Assocs. ... 813-789-5522
IL Elk Grove, Carlson Elctrn. Sls. Co. ... 312-956-8240
NJ Kenvil, Comps. for Elctrns., Inc. 201-927-6662
IA Cedar Rapids, Carlson Elctrn. Sls. Co. 319-378-1450
KS Lenexa, Midwest Tech. Sls. 913-888-5100
MA Taunton, Sutton Associates 508-366-2102
MI Livonia, Electro-Mktg. Grp., Inc. 313-421-7590
MI Muskegon, Electro-Mktg. Grp. Inc. 616-798-1912
MN Minneapolis, R-J, Inc. 612-866-3661
MO Earth City, Midwest Tech. Sls. 314-298-8787
NC Winston-Salem, Murcota Corp. 919-722-9445
OH Dayton, Electro-Mktg. Grp. Inc. 513-890-8322
OH No. Royalton, Electro-Mktg. Grp. Inc. .. 216-582-0075
OR Beaverton, Ravencraft 503-646-9261
PA Ft. Washington, Simon Mktg. Consits. 215-628-3394
TX Plano, Zeus Engrg. 214-423-2027
VA Reston, Tytronics Tech. Sls. 703-620-4600
WI Milwaukee, Carlson Elctrn. Sls. Co. 414-476-2790
EXP NJ, Palisades Pk., ESC Elctrns. Corp. 201-947-0400
Can Toronto, Ont., CEA Assocs. 416-231-9717

ESE, 142 Sierra St., El Segundo, CA 90245, Tel: 213-322-2136; FSC No.: 58525; Empl.: 25; *Sls. Mgr.:* R. Mayers; *Dist. Mgr.:* R. Mayers ..... **D•1135**

Local Distributors

AL Birmingham, Midwest 0 205-942-8585
AZ Phoenix, Midwest 602-220-9440
CA Burbank, Midwest 818-954-0150
CA Hollywood, Shoreline 213-461-9800
DC Washington, Bradley Broadcast 301-948-0650
DC Washington, Midwest 301-577-4903
FL Miami, Midwest 305-592-5355
FL Ocala, Broadcast Gen. Store 904-622-9058
GA Atlanta, Midwest 404-449-0900
HI Honolulu, Midwest 808-521-4644
IL Chicago, Midwest 312-981-1107
IN Richmond, Allied 317-962-8596
IA Davenport, Video Midwest 319-322-1525
KY Edgewood, Midwest 606-331-8990
LA New Orleans, MZB/Gray 504-733-7265
MD Baltimore, Midwest 301-484-0131
MI Detroit, Midwest 313-350-3038
MN Minneapolis, Video Midwest 612-831-2248
MO St. Louis, Midwest 314-569-2240
NJ Cherry Hill, Landy 609-424-4660
NM Los Lunas, Dyma 505-865-6700
NY NYC, Midwest 212-473-6262
NY So. Glens Falls, N.E. Broadcast Labs 518-793-2181
NC Charlotte, Midwest 704-399-6336
PA Philadelphia, Pierce Phelps 215-879-7236
PA Pittsburgh, Midwest 412-364-6780
TN Nashville, Midwest 615-255-2801
TX Dallas, Midwest 214-929-6400
TX Houston, MZB/Gray 713-782-8611
VA Richmond, Midwest 804-426-8434
WA Tacoma, Broadcast Supp. West 800-426-8434
WI Milwaukee, Roscor 414-527-4200
Can Toronto, Allied Broadcast 416-731-3697

ESICO/TRITON, Triton Industries Inc., Box 247, Deep River, CT 06417, Tel: 203-526-5361, TELEX: 955439, FAX: 203-526-9524; FSC No.: 54195; *Sls. Mgr.:* Robert W. Mead

E-SQUARED TECHNOLOGY CORP., 4475 Dupont Ct 69, Ventura, CA 93003, Tel: 805-644-9544, FAX: 805-644-9584; Empl.: 19; *Sls. Mgr.:* Larry D. Emery

ESS, INC., 16310 No. Morris Rd., Sonora, CA 95370, Tel: 209-928-4900, FAX: 209-928-1117

ESTERLINE ANGUS INSTRUMENT CORP., Box 24000, Indianapolis, IN 46224, Tel: 317-244-7611, TELEX: 027-419, FAX: 317-247-4749; FSC No.: 72264; Empl.: 200; *Sls. Mgr.:* Thurman Teets, NTL. Sls. Mgr.

E-SYSTEMS, Greenville Div., P.O. Box 6056, Greenville, TX 75403-6056, Tel: 903-455-3450, FAX: 903-457-4413; *Sls. Mgr.:* C. L. Byrom

E-SYSTEMS, Melpar Div., 7700 Arlington Blvd., Falls Church, VA 22046, Tel: 703-560-5000, TELEX: 89-9494, TWX: 710-831-9802, FAX: 703-280-4627; Empl.: 2400

E-SYSTEMS, See Memcor-Truohm, Inc.

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FAX: 708-647-7494

E-T-A CIRCUIT BREAKERS, 7400 N. Croname Rd., Chicago, IL 60648, Tel: 708-647-8303; FSC No.: 06402; Empl.: 30; *Sls. Mgr.:* John J. Palsir ..... **B•1361-1364**

Local Sales Offices & Reps

AL	Huntsville, Macro Mktg.	205-883-9630
AZ	Tucson, Clemick & Assoc.	602-749-4003
CA	Los Angeles, Sierra-Pacific Eng.	714-731-3411
CA	San Francisco, Ross Mktg.	408-988-8111
CO	Denver, Candal, Inc.	303-935-7128
CT	East Haven, Eagle Assocs.	203-467-6542
FL	Winter Springs, Sunland Assocs.	407-365-9533
GA	Atlanta, Macro Mktg.	404-662-5580
IN	Ft. Wayne, Needler Sls. Co.	219-447-2123
IN	Indianapolis, Needler Sls. Co.	317-255-8056
KS	Kansas City, Midtec Assoc.	913-541-0505
MA	Boston, Eagle Assocs.	617-444-3446
MI	Grand Haven, Hilltronics, Inc.	616-847-1010
MI	Royal Oak, Hilltronics, Inc.	313-435-0920
MN	Minneapolis, PWC, Inc.	612-934-1409
MO	St. Louis, Midtec Assoc.	314-275-8666
NY	Islandia, Schmitt Inds.	516-582-5888
NY	Rochester, Lamb Comps.	716-272-7720
NC	Raleigh, Godwin Assocs.	919-878-8000
OH	Cleveland, Del Steffen & Assoc.	216-461-8333
OH	Columbus, Del Steffen & Assoc.	419-884-2313
OH	Dayton, Del Steffen & Assoc.	513-293-3145
OR	Portland, Eltech	503-684-3458
PA	Philadelphia, Jacobsen Assoc.	215-674-2937
PA	Pittsburgh, Del Steffen & Assoc.	412-276-7366
TX	Dallas, Delta Comps.	214-287-6333
UT	Salt Lake City, Frank Merchant	801-277-3775
VA	Sterling, Beacon North Inc.	703-478—2480
WA	Seattle, Eltech	206-643-4330
WI	Milwaukee, Star Engineering	414-645-3680

ET&T CORPORATION, 300A Redhill Ave., 5-A03, Costa Mesa, CA 92626, Tel: 714-557-2703, TELEX: 678352; Empl.: 4000; *Sls. Mgr.:* B.A. Mylar Rao

ETA POWER, See JETA Power Systems

ETI SYSTEMS

FAX: 619-757-2305

ETI SYSTEMS, Polaris Indl. Entprs., 215 Via Del Norte, Oceanside, CA 92054, Tel: 619-757-7770; FSC No.: 952 762672; *Sls. Mgr.:* Bill Tice; *Dist. Mgr.:* Liane Glover ..... **A•2040-2041; B•1256-1260; D•1136**

Local Distributors

AZ	Phoenix, Allied Elctrns.	602-437-9080
CA	Fremont, Allied Elctrns.	415-770-0590
CA	S. San Francisco, Allied Elctrns.	415-952-9599
CA	San Diego	619-279-2550
CA	San Diego, Allied Elctrns.	619-279-2550
CA	Torrance, Allied Elctrns.	213-373-8828
CO	Englewood, Allied Elctrns.	303-790-1664
CT	Cheshire, Allied Elctrns.	203-272-7730
FL	Pompano Beach, Allied Elctrns.	305-978-3008
GA	Atlanta, Motion Elctrns.,Inc.	404-455-8262
GA	Norcross, Allied Elctrns.	404-446-8595
IL	Lisle, Components, Inc.	312-852-7707
IL	Wood Dale, Allied Elctrns.	708-860-0007
MD	Columbia, Allied Elctrns.	301-381-1560
MA	Billerica, Allied Elctrns.	508-667-7921
NY	Mineola, Allied Elctrns.	516-248-2360
NC	Raleigh, Allied Elctrns.	919-876-5845
OK	Tulsa, Allied Elctrns.	918-664-0844
PA	Newton Square, QDI	215-359-1000
PA	Pittsburgh, Allied Elctrns.	412-367-4124
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Humble, Allied Elctrns.	713-446-8005
VA	Virginia Bch., Allied Elctrns.	804-363-8662
WA	Seattle, Allied Elctrns.	206547-2827
WI	New Berlin, Allied Elctrns.	414-796-1280
WI	Oshkosh, Electronic Inds.	414-235-4233

ETM ELECTROMATIC INC, 35451 Dumbarton Ct., Newark, CA 94560, Tel: 415-797-1100, FAX: 415-797-4358; Empl.: 85; *Sls. Mgr.:* Kenneth F. Lillis

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FAX: 704-283-7170

ETRI, INC., 1503 Rocky River Rd., North, Monroe, NC 28110, Tel: 704-289-5423; *Sls. Mgr.:* Peter Pignetti ..... **B•1261; C•1615-1620**

Local Sales Offices & Reps

CA	Irvine, Groh Assocs.	714-837-9871
CA	San Diego, Bestronics	619-693-1111
CO	Boulder, Comp. Prods. Sls.	303-530-2800
IL	Des Plaines, Lincoln, Hodges & Assocs.	312-297-3810
KS	Overland Pk., Spectrum Sls.	913-648-6811
MI	Farmington Hills, Tritech Sls., Inc.	313-553-3370
MI	Kalamazoo, Tritech Sls., Inc.	616-382-5570
MN	Minneapolis, Milt Westlund Assocs.	612-866-5002
MO	Hazelwood, Spectrum Sls.	314-731-5151
NH	Salem, Sls. Engrg. Co.	603-893-5521
NY	Port Washington, Ashtec, Inc.	516-767-0336
OH	Cincinnati, Makin & Assocs., Inc.	513-871-2424
OH	Columbus, Makin & Assocs., Inc.	614-848-5454
OH	Solon, Makin & Assocs., Inc.	216-248-7370
WI	Janesville, Antek/Lincoln Hodges & Assocs.	608-754-4214
Can	Mississauga, Ont., R-Theta	416-890-0221

Local Distributors

AZ	Tempe, Acacia/Deanco	602-894-2874
AZ	Tempe, Harper, S.I.D.	602-967-1464
CA	Alhambra, Harper, S.I.D.	213-979-5090
CA	Fountain Valley, Components Ctr.	714-979-0433
CA	Irvine, Acacia/Deanco	714-660-0834
CA	San Diego, Acacia/Deanco	619-565-4365
CA	San Diego, Harper, S.I.D.	619-578-2500
CA	San Jose, Harper, S.I.D.	408-943-9490
CA	Santa Clara, Comp. Ctr., Inc.	408-988-3751
CA	Sunnyvale, Acacia/Deanco	408-745-7200
CO	Lakewood, Acacia/Deanco	303-232-2882
CT	Milford, Jaco Elctrns., Inc.	203-874-0006
CT	Milford, Milgray Elctrns.	203-878-5538
FL	Altamonte Springs, Pioneer Elctrns.	305-834-9090
FL	Deerfield Beach, Pioneer Elctrns.	305-428-8877
FL	Winter Park, Milgray Elctrns.	407-647-5747
GA	Norcross, Milgray Elctrns.	404-446-9777
IL	Bensenville, Milgray Elctrns.	312-350-0490
IL	Bensenville, Voyager Elctrns.	312-860-1300
IL	Palatine, OHM Elctrns.	312-359-5500
IN	Indianapolis, Advent Elctrns.	317-872-4910
KS	Overland Park, Milgray Elctrns.	913-236-8800
MD	Columbia, Milgray Elctrns.	301-621-8169
MD	Gaithersburg, MS Elctrns.	301-921-0200
MA	Wilmington, Jaco Elctrns., Inc.	617-273-1860
MA	Wilmington, MilGray Elctrns.	508-657-5900
MI	Grand Rapids, Calder Elctrns.	616-698-7400
MN	Minneapolis, Stark Elctrns.	612-332-1325
NH	Hudson, Bell Inds.	603-882-1133
NJ	Marlton, Milgray Elctrns.	609-983-5010
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Rochester, Milgray Elctrns.	716-235-0830
NY	Rochester, Summit Elctrns.	716-334-8110
OH	Cleveland, Milgray Elctrns.	216-447-1520
OK	Tulsa, Norvell Elctrns.	918-254-8606
OR	Beaverton, Acacia/Deanco	503-646-3377
PA	Allentown, P.A. Peters	215-434-5237
PA	Montgomeryville, Pyttronics Inds.	215-643-2850
TX	Austin, Norvell Elctrns.	512-837-5555
TX	Dallas, Milgray Elctrns.	214-248-1603
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Irving, Harper, S.I.D.	214-621-0500
UT	Midvale, Bell Inds.	801-255-9611
VA	Charlottesville, Virginia Elctrn. Comps.	804-296-4184
WI	Milwaukee, Indl. Elctrns.	414-276-1212
Can	Mississauga, Ont., R-Theta	416-890-0221
Can	Vancouver B.C., Intek Elctrns.	604-324-6831

EUBANKS ENGINEERING, 950 E. Royal Oaks Dr., Monrovia, CA 91016, Tel: 818-357-7011, TELEX: 675403, FAX: 818-357-4718; Empl.: 90; *Sls. Mgr.:* James Reed

EURO-DIP, See Preci-Dip

EURO QUARZ GMBH, See Raltron Electronics Corp.

EVANS ELECTRONICS, Box 5055, Berkeley, CA 94705, Tel: 415-653-3083

EVAPORATED COATINGS, INC., 2365 Maryland Rd., Willow Grove, PA 19090, Tel: 215-659-3080, FAX: 215-659-1275; Empl.: 31; *Sls. Mgr.:* Stephen L. Schaffer

EVENTIDE, INC., One Alsan Way, Little Ferry, NJ 07643, Tel: 201-641-1200, 800-446-7878, TWX: 710-991-8715; Empl.: 53; *Sls. Mgr.:* Gil Griffith; *Dist. Mgr.:* Gil Griffith

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EVEREADY BATTERY CO. INC., Checkerboard Square, St. Louis, MO 63164, Tel: 314-982-2000 ..... **D•1456-1457**

Local Sales Offices & Reps

CA	Irvine	714-753-0588
GA	Duluth	404-279-0228
IL	Lisle	708-964-8668
MO	St. Louis	314-982-2000
NJ	Saddle Brook	201-845-5400
OH	Independence	216-447-1127
TX	Dallas	214-241-9100

EVEREST ELECTRONIC EQUIPMENT, 2683 Hamilton Mill Rd., Buford, GA 30518, Tel: 404-932-2900, FAX: 404-932-5473; Empl.: 240; *Sls. Mgr.:* Barry Holman; *Dist. Mgr.:* Barry Holman ..... **C•1050**

Local Sales Offices & Reps

CA	Anaheim, Everest Elctrn. Equip., Inc.	714-634-2200
FL	Longwood, Warren Peripherals	407-830-5100
GA	Buford, Everest Elctrns.	404-932-2900
IL	Elmhurst, First Rep Co.	708-530-2450
NJ	Union, Stearns Assoc.	201-686-2980
OH	Aurora, Meta Tech. Sls.	216-562-8772
PA	Mendenhall, Clark H. Bach & Assocs.	215-388-7903
TX	Plano, Digital Elctrn. Sys.	214-423-6056

Local Distributors

AZ	Phoenix, R Squared	602-966-1255
CA	Santa Monica, SE Technlg.	213-458-9866
CO	Englewood, R Squared	303-799-9292
FL	Stuart, Total Tec Sys.	407-220-9929
IL	Hoffman Estates, Datalink, Inc.	708-822-1244
KS	Overland Park, R Squared	800-937-3478
MD	Gaithersburg, Total Tec Sys.	301-590-9304
MA	Wakefield, Total Tec Sys.	617-246-5525
MI	ADA, Cranel, Inc.	616-676-2258
MN	Minneapolis, Datalink, Inc.	612-944-3462
NJ	Edison, Total Tec Sys.	908-906-6500
NY	Fairport, Applied Digital Sys.	716-377-7000
OH	Worthington, Cranel, Inc.	614-433-0045
VA	McLean, Applied Digital Sys.	703-749-7711

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FAX: 714-634-1369

EVEREST ELECTRONIC EQUIPMENT, INC., 2100 E. Orangewood Avenue, Anaheim, CA 92806, Tel: 714-634-2200; Empl.: 200; *Sls. Mgr.:* Barry Holman; *Dist. Mgr.:* Barry Holman ..... **C•1050**

Local Sales Offices & Reps

GA	Buford(Atlanta), Everest Elctrns.	404-932-2900
IL	Elmhurst, First Rep Co.	312-520-2450
OH	Aurora, Meta Tech. Sls., Inc.	216-562-8772
PA	Mendenhall, Clark Bach & Assocs.	215-388-7903
TX	Plano, Digital Elctrns. Sys.	214-423-6056

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OH Worthington, Cranel, Inc. 614-433-0045
PA Emmaus, Cita Technlgs., Inc. 215-965-3552

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EVERETT/CHARLES TEST EQUIPMENT, INC., 2887 N. Towne Ave., Pomona, CA 91767, Tel: 714-621-9511, FAX: 714-626-4540; Empl.: 110; *Sls. Mgr.:* Raymond Berggren

EVERLIGHT - USA, 614 W. Alosta Ave., Ste. 303, Glendora, CA 91740, Tel: 213-697-5067, FAX: 213-690-8067; *Sls. Mgr.:* John Cox; *Dist. Mgr.:* John Cox

EVI, INC., 7138 Columbia Gateway Dr., Columbia, MD 21046, Tel: 301-290-9550, FAX: 301-381-5687; Empl.: 20

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EWALD INSTRUMENTS CORP., Rte. 341 R, Kent, CT 06757, Tel: 203-927-3278, FAX: 203-927-3031

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CO Denver, AKI Entprs. 303-388-4488
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GA Atlanta, Rakes Engrg. & Mktg. 404-447-6937
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IA Cedar Rapids, Pattison Sls. 319-395-9866
KS Prairie Village, Clyde Logsdon & Assoc. 913-381-3833
MD Gaithersburg, Deltatronics 301-253-0615
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PA Chestnut Hill, Deltatronics, Inc. 215-248-0294
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PA Youngwood, Pro-Mark 412-925-1905
TX Dallas, Rem Air Comps. 214-234-1069
VA Powhatan, Deltatronics Inc. 703-492-9027
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EXATRON AUTOMATIC TEST EQUIP., 2842 Aiello Dr., San Jose, CA 95111, Tel: 408-629-7600, 800-EXA-TRON, TELEX: 172-090, FAX: 408-629-2832; Empl.: 24; *Sls. Mgr.:* Chris Barrett

EXCEL SPECIALTY CORP., 6335 N. Broadway, Chicago, IL 60660, Tel: 312-262-4781, FAX: 312-262-1330; Empl.: 50

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EXCEL TECHNOLOGY INTL. CORP., 5-4 Stryker La., Belle Mead, NJ 08502, Tel: 908-874-4747, ESYLNK: 908-874-3278; *Sls. Mgr.:* Michi Chen ..... **B•1069-1072**

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EXIDE CORPORATION, 645 Penn St., Reading, PA 19601, Tel: 215-378-0500, TWX: 510-651-5288, FAX: 215-378-0345; Empl.: 2200

EXPRESS TEST CORP., 1161 D San Antonio Rd., Mountain View, CA 94043, Tel: 415-968-8818, TELEX: 4942091, FAX: 415-968-0649; *Sls. Mgr.:* Frank S. Gavin

EXSELECT ENGINEERING LTD., 355 Rayette Rd., Concord, Ont., Canada LK42G2, Tel: 416-738-4077, FAX: 416-738-6604; Empl.: 28

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EXTRUSION TECHNOLOGY, INC., 82 Trim Way, Randolph, MA 02368, Tel: 617-963-7200, FAX: 617-963-7203; Empl.: 50; *Sls. Mgr.:* Matt Travers ..... **C•1051**

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CA Arcadia, E-Z-Hook 818-446-6175

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FAX: 818-443-5594

FABRICAST, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733, Tel: 818-443-3247; FSC No.: 13345 ..... **B•1262-1267**

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F/R Fair-Rite Products Corp.

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FAIR-RITE PRODS., PO Box J, Wallkill, NY 12589, Tel: 914-895-2055; FSC No.: 34899; Empl.: 200ò; *Sls. Mgr.:* B. G. Tolen ..... **A•1284**

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MN Chanhassen, Dexter M.M.D. 612-934-4635, FAX:612-934-5806
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MA Salem, Forbes Engrg. Sls. 508-744-1693, FAX:508-741-0427

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FL Clearwater, Newark Elctrns. 813-443-0661
GA Norcross, Newark Elctrns. 404-448-1300
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IN Indianapolis, Bell Inds. 317-875-8200
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FERRANTI-PACKARD, See F-P Electronics

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FAX: 516-752-7976

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FIBEROPTICS TECHNOLOGY, INC., Quassett Rd., Pomfret, CT 06258, Tel: 203-928-0443, 800-433-5248, FAX: 203-928-7664, 800-543-2558

FIBEROPTIC SYSTEMS, INC., 4680-B E. Los Angeles Ave., Simi Valley, CA 93063, Tel: 805-583-2088, FAX: 805-583-4018; Empl.: 30; *Sls. Mgr.:* Richard Lockett

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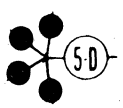

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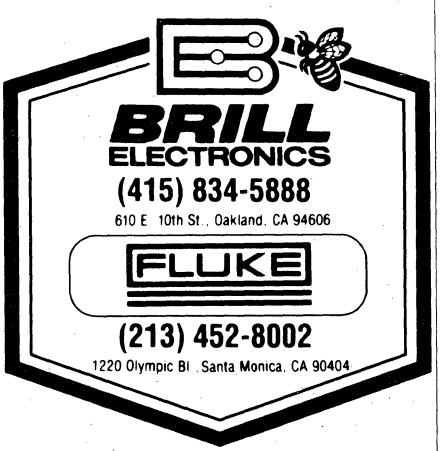

FILTER PRODUCTS, Rockwell International, 2990 Airway Ave., Costa Mesa, CA 92626, Tel: 714-641-5311, TELEX: 685532(COLLINS CSMA), FAX: 714-641-5320; FSC No.: 2X491; Empl.: 60; *Sls. Mgr.:* Bob Johnson

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IN	Greenwood, Valentine & Assocs.	317-888-2260, FAX:317-881-4904
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MN	Minneapolis, Electro-Tec Assocs.	612-853-0242, FAX:612-854-8601
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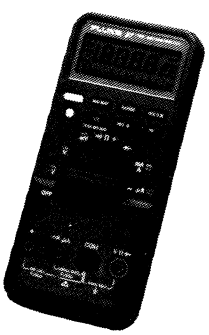

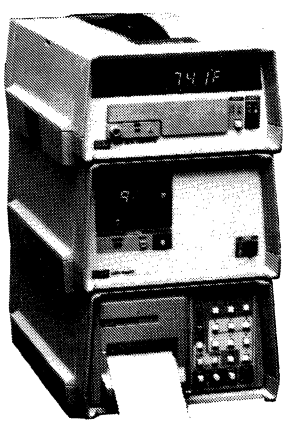

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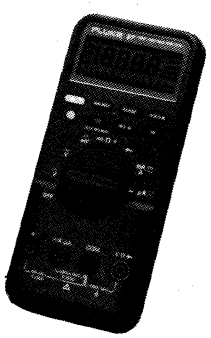

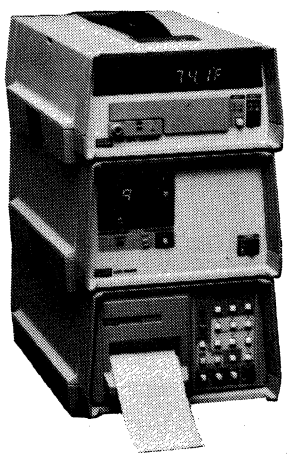

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WI	Cedarburg, Bransky Sls.	414-377-6837
Can	British Columbia, Davetek Mktg.	604-430-3680
Can	Ontario, Canadian Mktg. Tech.	416-612-0900

Local Distributors

AL	Huntsville, Marshall Inds.	205-881-9235
AZ	Phoenix, Marshall Inds.	602-496-0290
CA	Agoura Hills, Western Micro	818-707-0377
CA	Buena Pk., Cypress Elctrns.	714-521-5230
CA	Camarillo, Milgray Elctrns.	805-484-4055
CA	Chatsworth, Marshall Inds.	818-407-4150
CA	Costa Mesa, Eric Elctrns.	714-751-1185
CA	El Monte, Marshall Inds.	818-307-6000
CA	Irvine, Kensington Elctrns.	714-588-0575
CA	Irvine, Marshall Inds.	714-458-5394
CA	Irvine, Milgray Elctrns.	714-753-1282
CA	Milpitas, Marshall Inds.	408-942-4600
CA	Orange, Western Micro	714-637-0200
CA	Rancho Cordova, Marshall Inds.	916-635-9700
CA	Sacramento, Integrated Elctrns.	916-363-6030
CA	San Diego, Cypress Elctrns.	619-535-0011
CA	San Diego, Marshall Inds.	619-578-9606
CA	San Diego, Western Micro	619-453-8430
CA	San Jose, Compass Comps.	408-432-7575
CA	San Jose, Eric Elctrns.	408-432-1111
CA	Santa Clara, Cypress Elctrns.	408-980-8400
CA	Saratoga, Western Micro	408-725-1660
CO	Denver, CSIO	303-292-9594
CO	Englewood, Cypress Elctrns.	303-792-5829
CO	Littleton, Indelco	303-795-3431
CO	Thornton, Marshall Inds.	303-451-8444
CT	Milford, Milgray Elctrns.	203-878-5538
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Winter Pk., Milgray Elctrns.	407-647-5747
FL	Altamonte Springs, Marshall Inds.	407-767-8585
FL	Altamonte Springs, Vantage Comps.	407-682-1199
FL	Ft. Lauderdale, Marshall Inds.	407-977-4880
GA	Norcross, Marshall Inds.	404-923-5750
GA	Norcross, Milgray Elctrns.	404-446-9777
IL	Arlington Hgts., Milgray Elctrns.	708-350-0490
IL	Carol Stream, Lectro Comps.	708-690-0520
IL	Chicago, Milgray Elctrns.	708-784-5100
IL	Indianapolis, Marshall Inds.	317-297-0483
IL	Schaumburg, Marshall Inds.	312-490-0755
IL	Wheeling, Hawk Elctrns.	708-459-4030
IN	Indianapolis, Custom Svc. Elctrns.	317-879-9119
IN	Indianapolis, RS Elctrns.	317-253-9065
KS	Lenexa, Marshall Inds.	913-492-3121
KS	Overland Pk., Milgray Elctrns.	913-236-8800
ME	Gray, Longhill Electro	207-657-2183
MD	Columbia, Milgray Elctrns.	301-621-8169
MD	Columbia, Vantage Comps.	301-720-5100
MD	Silver Springs, Marshall Inds.	301-622-1110
MA	Andover, Vantage Comps.	508-687-3900
MA	Burlington, Western Micro	508-273-2800
MA	Hopkinton, Interface Elctrns.	508-435-6858
MA	Middleboro, Glynn Elctrns	508-947-4262
MA	Westwood, Semad Sys.	508-329-7373
MA	Wilmington, Marshall Inds.	617-658-0810
MA	Wilmington, Milgray Elctrns.	617-657-5900
MI	Flint, RS Elctrns.	313-742-5000
MI	Grand Rapids, RS Elctrns.	616-241-3483
MI	Livonia, Marshall Inds.	313-525-5850
MI	Livonia, RS Elctrns.	313-525-1155
MN	Minneapolis, Bergquist Co.	612-835-2322
MN	Plymouth, Marshall Inds.	612-559-2255
MO	Bridgeton, Marshall Inds.	314-291-4650
MO	Maryland Hgts., RS Elctrns.	314-997-7709
NE	Omaha, Radio Equip.	402-341-7700
NJ	Clifton, Vantage Comps.	201-777-4100
NJ	Fairfield, Marshall Inds.	201-882-0169
NJ	Fairfield, Western Micro	201-882-4999
NJ	Marlton, Milgray Elctrns.	609-983-5010
NJ	Mt. Laurel, Marshall Inds.	609-778-8720
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Hauppauge, Marshall Inds.	516-273-1515
NY	Johnson City, Marshall Inds.	607-729-4351
NY	Penn Yan, Advacom	716-751-1185
NY	Pittsford, Milgray Elctrns.	716-381-9700
NY	Rochester, Marshall Inds.	716-235-7620
NY	Smithtown, Vantage Comps.	516-543-2000
NC	Charlotte, Control Design Supp.	704-588-4410
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Dayton, Marshall Inds.	513-898-4480
OH	Maumee, RS Elctrns.	419-893-0721
OH	Solon, Marshall Inds.	216-248-1788
OH	Solon, Repco Elctrns.	216-248-8900
OR	Beaverton, Integrated Elctrns.	503-641-1690
OR	Beaverton, Marshall Inds.	503-643-5555
OR	Beaverton, Western Micro	503-629-2082
PA	McKean, Advacom	814-476-7774
PA	Pittsburgh, Marshall Inds.	412-788-0441
TX	Austin, Marshall Inds.	512-837-1991
TX	Carrollton, Marshall Inds.	214-233-5200
TX	Dallas, Milgray Elctrns.	214-248-1603
TX	Dallas, Western Micro	214-416-0103
TX	El Paso, Marshall Inds.	915-593-0706
TX	Houston, Marshall Inds.	713-895-9200
TX	Irving, Cypress Elctrns.	214-255-0065
UT	Salt Lake City, Marshall Inds.	801-266-2428
UT	Salt Lake City, Marshall Inds.	801-485-1551
UT	Salt Lake City, Milgray Elctrns.	801-272-4999
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Bothell, Marshall Inds.	206-486-5747
WA	Redmond, Western Micro	206-881-6737
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Racine, Badger Elctrns.	414-637-1256
WI	Waukesha, Hawk Elctrns.	414-547-4457
WI	Waukesha, Marshall Inds.	414-797-8400
Can	Burnaby, B.C., ITT Multi Comp.	604-291-8866
Can	Burnaby, B.C., Semad Sys.	604-420-9889
Can	Calgary, Future	403-235-5325
Can	Calgary, Alb., Semad Sys.	403-252-5664
Can	Concord, Ont., ITT Multi Comp.	416-736-1144
Can	Downsview, Future Elctrns.	416-638-4771
Can	Edmonton, Future Elctrns.	403-438-2858
Can	Markham, Ont., Matrix Tech.	416-477-4442
Can	Markham, Ont., Semad Sys.	416-475-8500
Can	Ontario, Marshall Inds.	416-458-8046
Can	Ottawa, Future Elctrns.	613-820-8313
Can	Ottawa, Ont., Semad Sys.	613-727-8325
Can	Pointe Claire, Future Elctrns.	514-694-7710
Can	Pointe Claire, Marshall Inds.	514-683-9440
Can	Pointe Claire, Semad Sys.	514-694-0860
Can	Vancouver, Future Elctrns.	604-294-1166
Can	Willowdale, Ont., Milgray Elctrns.	416-756-4481

FUJITSU MICROELECTRONICS INC., Integrated Circuits Division, 3545 North First St., San Jose, CA 95134, Tel: 408-922-9000, TWX: 910-338-0190, FAX: 408-432-9044; Empl.: 1000; *Sls. Mgr.:* Rich Christopher, Sr. VP & GM; *Dist. Mgr.:* Clyde Brewer, Dir. Distr. Sls. ..... **D•1091-1096**

Local Sales Offices & Reps

AL	Huntsville, The Novus Grp.	205-534-0044
AZ	Scottsdale, Aztech Comp. Sls., Inc.	602-991-6300
CA	Cupertino, Fujitsu Microelctrns.	408-996-1600
CA	Irvine, Fujitsu Microelctrns.	714-724-8777
CA	Newport Beach, Infinity Sls., Inc.	714-833-0300
CA	Roseville, Norcomp	916-782-8070
CA	San Diego, Harvey King, Inc.	619-587-9300
CA	Santa Clara, Norcomp	408-727-7707
CO	Boulder, Front Range Mktg.	303-443-4780
CT	Waterbury, Conntech Sls., Inc.	203-754-2823
FL	Altamonte Springs, Semtronic Assocs., Inc.	407-831-8233
FL	Clearwater, Semtronic Assoc., Inc.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assoc., Inc.	305-731-2484

GA	Norcoss, Fujitsu Microelctrns.	404-449-8539
GA	Norcross, The Novus Grp.	404-263-0320
ID	Boise, Cascade Comps.	208-343-9886
IL	Itasca, Beta Technlg.	708-256-9586
IL	Itasca, Fujitsu Microelctrns.	708-250-8580
IN	Carmel, Fred Dorsey & Assocs.	317-844-4842
IA	Cedar Rapids, Electromec Sls.	319-362-6413
MD	Towson, Arbotek Assocs.	301-825-0775
MA	Newton Center, Fujitsu Microelctrns.	617-964-7080
MA	Woburn, Mil-Bern Assocs.	617-932-3311
MI	Grosse Point Park, Greiner Assocs., Inc.	313-499-0188
MN	Burnsville, Electromec Sls.	612-894-8200
MN	Eagan, Fujitsu Microelctrns.	612-454-0323
NJ	Marlton, BGR Assocs.	609-983-1020
NJ	Fairfield, Tech Applications & Mktg.	201-575-4130
NJ	Mt. Laurel, Fujitsu Microelctrns.	609-727-9700
NY	Hauppauge, Fujitsu Microelctrns.	516-361-6565
NY	Manlius, Quality Comps.	315-682-8885
NY	Rochester, Quality Comps.	716-342-7229
NY	Buffalo, Quality Comps.	716-837-5430
NC	Cary, The Novus Grp.	919-460-7771
OH	Morrow, Spectrum ESD	513-899-3260
OH	Novelty, Spectrum ESD	216-338-5226
OR	Beaverton, L-Squared Ltd.	503-629-8555
OR	Lake Oswego, Fujitsu Microelctrns.	503-684-4545
TX	Carrollton, Technical Mktg., Inc.	214-387-3601
TX	Dallas, Fujitsu Microelctrns.	214-233-9394
TX	Houston, Technical Mktg., Inc.	713-783-4497
TX	Round Rock, Technical Mktg., Inc.	512-244-2291
VA	Charlottesville, Arbotek Assocs.	804-971-5736
WA	Kirkland, L-Squared Ltd.	206-827-8555
WI	Milwaukee, Beta Technlg.	414-543-6609
Intl	Guadalajara, Jal., PanAmtek	36-303029
Intl	Mexico, D.F., PanAmtek	5-586-8443
PR	Hato Rey, Semtronic Assocs.	809-766-0700
Can	Ontario, Pipe Thompson Ltd.	613-258-4067
Can	Ontario, Pipe Thompson Ltd.	416-236-2355

FURMAN SOUND, INC., 30 Rich St., Greenbrae, CA 94904, Tel: 415-927-1225, TELEX: 425900, FAX: 415-927-4548; FSC No.: 5830; Empl.: 44; *Sls. Mgr.:* Joe Desmond; *Dist. Mgr.:* Joe Desmond

FURNAS ELEC., 1000 Mckee Street, Batavia, IL 60510, Tel: 708-879-6000, TELEX: 72-0458; Empl.: 1,500; *Sls. Mgr.:* Paul P. Welch

FURY PRODUCTS, INC, 4626 Eucalyptus Ave., Chino, CA 91710, Tel: 714-597-7861, FAX: 714-597-2284; FSC No.: CAGE OJTXO; Empl.: 200; *Sls. Mgr.:* Dan Fury

Distributor

FAX: 818-786-8222

FUSES UNLIMITED, D.E.I., 16216 Raymer St., Van Nuys, CA 91406, Tel: 818-786-8111; Empl.: 35; *Dist. Mgr.:* Pat White ..... **B•1366**

FUSION INC., 4658 E. 355th. St., Willoughby, OH 44094, Tel: 216-946-3300, FAX: 216-942-9083; Empl.: 85; *Sls. Mgr.:* Raymond C. Yuhasz

FUTABA CORPORATION OF AMERICA, Electronic Components Div., 711 East State Pkwy., Schaumburg, IL 60173, Tel: 708-884-1444, FAX: 708-884-1635; Empl.: 50; *Sls. Mgr.:* Bill Lichtner; *Dist. Mgr.:* Bill Lichtner

FUTURETECH, 525 Auburn St., Auburndale, MA 02166, Tel: 617-965-3834, TWX: 510-600-6663, FAX: 617-332-4760; Empl.: 2

F. W. CAPACITORS INC., 98 Toledo Rd.Hwy. 301 South, Florence, SC 29504-0636, Tel: 803-662-4728, TELEX: 220 883 TAUR, FAX: 803-667-6142; FSC No.: 58368; Empl.: 15; *Sls. Mgr.:* Joseph A. (Jay) Falcone Jr.

GABRIEL ELECTRONICS, Box 70, Scarborough Indl. Pk., Scarborough, ME 04074, Tel: 207-883-5161, FAX: 207-883-4469; Empl.: 225; *Sls. Mgr.:* D. B. Crisman

GAGE APPLIED SCIENCES INC., 2695 Paulus Rd., St. Laurent, Que., Canada H4S 1E9, Tel: 514-337-6893, FAX: 514-337-8411; Empl.: 4; *Sls. Mgr.:* Mark Diamond; *Dist. Mgr.:* Stanley M. Diamond

GALILEO ELECTRO-OPTICS CORP., Galileo Park, P.O. Box 550, Sturbridge, MA 01566, Tel: 508-347-9191, TELEX: 4999014; FSC No.: 28719; Empl.: 450

GALIL MOTION CONTROL, INC., 575 Maude Court, Sunnyvale, CA 94086, Tel: 408 746-2300, FAX: 408 746-2315; Empl.: 13; *Sls. Mgr.:* Lisa Wade

GAMMA-F CORP., Electromagnetic Sciences, Inc., 3051 Fujita St., Torrance, CA 90505, Tel: 213-539-6704, TELEX: ITT 429694, FAX: 213-539-7463; FSC No.: (CAGE) 50478; Empl.: 70; *Sls. Mgr.:* Manfred Stupnik

Local Sales Offices & Reps

CA	Mountain View, Disman-Bakner	415-969-3010
NH	Merrimack, Callahan Assocs.	603-424-5700
NJ	Totowa, Tech Mktg. Assocs.	201-812-0356

FAX: 904-677-3039

GAMMA HIGH VOLTAGE RESCH. INC., 1096 N. U.S. Hwy, No. 1, Ormond Beach, FL 32174, Tel: 904-677-7070; Empl.: 15 ..... **D•1758-1761**

Local Sales Offices & Reps

CA	Nevada City, Le Rep	916-477-5753
CA	Pasadena, A-F Sls. Engrg.	213-681-5631
NY	Smithtown, T&K Sls.	516-724-3546
NM	Albuquerque, Cleveland Entprs.	505-265-7893

GANDALF DATA INC., Gandalf Technologies Inc., 1020 S. Noel Ave., Wheeling, IL 60090, Tel: 708-541-6060, 800-GANDALF, FAX: 708-541-6803; Empl.: 200; *Sls. Mgr.:* Kerry Hawkins

GANDALF TECHNOLOGIES, INC, See Gandalf Data, Inc.

GAP INSTRUMENT CORP., 40 Oser Ave., Hauppauge, NY 11788, Tel: 516-273-0909, FAX: 516-273-0948; FSC No.: 00607; Empl.: 50

GARDINER SOLDER CO., Div. of Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, IL 60632, Tel: 312-847-0100, FAX: 312-847-2314; Empl.: 100; *Sls. Mgr.:* Robert Nesnidal; *Dist. Mgr.:* Robert Nesnidal

GAR ENTERPRISES DBA KGS ELECTRONICS, 2029 N. Lincoln Ave., Pasadena, CA 91103, Tel: 818-798-0785, FAX: 818-798-1466; FSC No.: 16017; Empl.: 60; *Sls. Mgr.:* Nathan Sugimoto

GARNER GLASS CO., 177 S. Indian Hill Blvd., Claremont, CA 91711, Tel: 714-624-5071, FAX: 714-624-7212; FSC No.: 53101; Empl.: 50; *Sls. Mgr.:* Joseph C. Hyatt

GARRY ELECTRONICS AN LPL CO., 9 Queen Anne Ct., Langhorne, PA 19047, Tel: 215-949-2300, FAX: 215-943-8742; Empl.: 100; *Sls. Mgr.:* Kate Simpson; *Dist. Mgr.:* Joan Feevish

GASKET DYNAMICS, INC., 14 King St, P.O. Box 45, Mt. Holly, NJ 08060, Tel: 609-261-8100, 800-541-2500, 215-922-6046, FAX: 609-261-7300; Empl.: 19; *Sls. Mgr.:* Edward Rosenthal; *Dist. Mgr.:* Robert LaVigne

GASKET INTERNATIONAL INC., 49 Ackerman St, Bloomfield, NJ 07003, Tel: 201-338-6814; Empl.: 5; *Sls. Mgr.:* Russell L. Steinman

GATES, GEO. W., & CO., INC., 1209 Hempstead Tpke., Franklin Sq., NY 11010, Tel: 516-352-2904; Empl.: 6; *Sls. Mgr.:* T. E. Schulz, Jr

Gates Energy Products

FAX: 904-462-4726

GATES ENERGY PRODUCTS, INC., P.O. Box 861, Gainesville, FL 32602, Tel: 904-462-3911, TWX: 810-836-8500; Empl.: 3300; *Sls. Mgr.:* C. W. Garstang; *Dist. Mgr.:* K. Sparks ..... **D•1458-1465**

Local Sales Offices & Reps

CA	Brea	714-529-2117
CT	Meriden	203-238-6812
GA	Atlanta	404-446-8090
IL	Itasca	708-250-0989

Local Distributors

CA	Los Angeles, Battery Specialties	213-437-1809
CA	San Jose, Rose Elctrns.	408-943-0200
GA	Marietta, Engrd. Assemblies	404-951-8935
IL	Chicago, Joseph Elctrns.	312-297-4200
IL	Chicago, Power-Pak, Inc.	312-966-6000
IL	Downers Grove, T.D.I. Batteries	708-971-3460
IL	Lisle, JaBro Batteries	708-964-9358
MA	Boston, Adcour	617-784-8123
MN	St. Paul, Shelley-Ragon	800-328-9427
NJ	Teterboro, Engrd. Assemblies	201-288-4477
NC	Raleigh, Engrd. Assemblies	800-950-9111
OH	Columbus, Promark	614-876-8885
OR	Beaverton, Micro Power Elctrns.	503-626-7086
TX	Houston, Kent Elctrns.	713-780-7770
TX	Houston, Southwest Elctrns.	713-240-4000
Can	Burnaby, B.C., Enercell Technglis. Inc.	604-435-3666
Can	Ottawa, Ont., Cantee Sys. Ltd.	613-725-3704

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GAVITT WIRE & CABLE, 20 Central St, Brookfield, MA 01506, Tel: 508-867-6476, FAX: 508-867-5126; Empl.: 75

GAYNOR ELECTRIC CO., 135 South Main St, P.O. Box 316, Thomaston, CT 06787-0316, Tel: 203-283-4388, FAX: 203-283-4107; Empl.: 50; *Sls. Mgr.:* Robert Heche; *Dist. Mgr.:* Robert Heche

GBC, INC., Lamp Division, P.O. Box 2205, Ocean, NJ 07712, Tel: 908-774-8502, FAX: 908-774-8041; Empl.: 25; *Sls. Mgr.:* W. Savage

G.C. INDUSTRIES, INC., 8967 Oso Ave., Unit C, Chatsworth, CA 91311, Tel: 818-882-7852, TELEX: 497 4262, TWX: GCINDUI, ESYLNK: 62656449, FAX: 818-709-7341; Empl.: 12; *Sls. Mgr.:* Ramesh Chand; *Dist. Mgr.:* Ramesh Chand

GC INTERNATIONAL INC., P.O. Box 851198, Richardson, TX 75085-1198, Tel: 214-234-3240, FAX: 214-234-2563; Empl.: 16; *Sls. Mgr.:* Paul McInnish ..... **A•1207**

Local Sales Offices & Reps

AL	Huntsville, R.O. Whitesell & Assocs.	205-883-5110
AL	Huntsville, R.O. Whitesell and Assoc.	205-883-5110
CA	San Jose, Loroco Sls.	408-436-8770
FL	Deerfield Beach, R.O. Whitesell and Assoc.	305-429-0802
GA	Norcross, R.O. Whitesell and Assoc.	404-449-9190
IL	Arlington Ht., KMA Sls.	708-398-5300
IN	Fort Wayne, R.O. Whitesell and Assoc.	219-432-5591
IN	Indianapolis, R.O. Whitesell and Assoc.	317-876-9000
IN	Kokomo, R.O. Whitesell	317-457-9127
KY	Versailles, R.O. Whitesell Assoc.	606-873-1182
MA	Holliston, Promerge Sls.	508-429-3188
MI	Grand Blanc, R.O. Whitesell and Assoc.	313-695-0770
MI	Grand Rapids, R.O. Whitesell and Assoc.	616-942-5420
MI	Southfield, R.O. Whitesell and Assoc.	313-352-5454
MI	St. Joseph, R.O. Whitesell and Assoc.	616-983-7337
MO	St. Louis, The John G. Macke Co.	314-432-2830
NC	Greensboro, R.O. Whitesell and Assoc.	919-273-1945
NC	Wake Forest, R.O. Whitesell and Assoc.	919-556-8448
OH	Cincinnati, R.O. Whitesell and Assocs.	513-528-5644
OH	Cleveland, R.O. Whitesell and Assoc.	216-447-9020
OH	Columbus, R.O. Whitesell and Assoc.	614-888-9396
OH	Dayton, R.O. Whitesell and Assoc.	513-298-9546
PA	Broomall, Lowery Assoc.	215-356-5300
PA	Exton, Wright Rep Co.	215-594-9654
PA	Pittsburgh, R.O. Whitesell and Assoc.	412-963-6161
RI	Westerly, Promerge Sls.	401-348-1037
TN	Knoxville, R.O. Whitesell and Assoc.	615-694-9476
TX	Austin, Ion Assoc.	512-794-9006
TX	Brownsville, R.O. Whitesell and Assoc.	512-542-1718
TX	Grand Prairie, Ion Assoc.	214-647-8225
TX	Houston, Ion Assoc.	713-537-7717
TX	Richardson, GC Intl.	214-234-3240
WI	Milwaukee, KMA Sls.	414-259-1771

Local Distributors

CT	Danbury, Pilgrim Elctrns.	203-792-7274
RI	Westerly, Promege Sls.	401-348-1037

GC-THORSEN, 1801 Morgan St, P.O. Box 1209, Rockford, IL 61105-1209, Tel: 815-968-9661, FAX: 815-968-9731; Empl.: 260; *Sls. Mgr.:* Alan Walter, VP Mktg.; *Dist. Mgr.:* Vito Giovingo

GEC-MARCONI ELECTRONIC SYSTEMS CORP., 164 Totowa Rd., P.O.Box 975, Wayne, NJ 07474-0975, Tel: 201-633-6000, FAX: 201-633-6167; FSC No.: 0D0D0; Empl.: 2030; *Sls. Mgr.:* M. G. Gordon, VP

GECO, 145 Penn St, Millheim, PA 16854, Tel: 814-349-5555, FAX: 814-349-5657; Empl.: 20

GE FANUC AUTOMATION NORTH AMERICA INC., P.O. Box 8106, Charlottesville, VA 22906, Tel: 804-978-5000, 800-648-2001, FAX: 804-978-5205

FAX: 507-263-5987

GEMINI INC., 103 Mensing Way, Cannon Falls, MN 55009, Tel: 507-263-3957, 800-533-3631; *Sls. Mgr.:* Jim Weinel ..... **C•1054-1055**

Local Sales Offices & Reps

AR	Taylor, Gemini Inc.	512-352-5027
CA	Santa Clara, Ross Mktg. Assoc.	408-988-8111
CA	Upland, Gemini Inc.	714-920-3442
FL	Orlando, Gemini Inc.	404-299-3330
IL	Palatine, JRS Assocs.	708-991-6626
IN	Noblesville, R & D Elctrns.	317-849-2026
IA	Cannon Falls, Gemini Inc.	800-533-3631
KS	Lenexa, Gemini Inc.	913-492-8267
MA	Brookline, Harman Assocs.	617-232-6687
MI	Dearborn, Pitcher-Poulin, Inc.	315-582-5450
MN	Cannon Falls, Gemini Inc.	507-263-3957
NY	Endwell, Reagan Compar Inc.	607-754-2171
NC	Kernersville, Wallace ELctrns. Sls.	800-334-3518
OH	Cincinnati, Bob Gilbert & Assocs.	513-574-1932
PA	Plymouth Meeting, Gemini Inc.	215-825-6736
TX	Carrolltown, Multi Line	214-242-9093
TX	Taylor, Gemini, Inc.	512-352-5207
WI	Wauwatosa, Larsen Assocs.	414-258-0529

GEMS SENSORS DIVISION, Div. of IMO Industries Inc., Cowles Rd, Plainville, CT 06062-1198, Tel: 203-677-1311, TELEX: 99-306, FAX: 203-747-4244; FSC No.: 04034; Empl.: 233; *Sls. Mgr.:* M. W. Brown; *Dist. Mgr.:* M. W. Brown

Local Sales Offices & Reps

CA	Sante Fe Springs, IMO Inds. Inc.	213-868-2268
CT	Rocky Hill, IMO Inds. Inc.	203-563-3737
GA	Atlanta, IMO Inds.Inc.	404-261-7063
OH	Cleveland, IMO Inds. Inc.	216-333-1805
Can	Mississauga, Ont., IMO Inds. (Canada) Inc.	416-678-6141

GEN/COMP INC., 6 Algonquin Rd., Canton, MA 02021, Tel: 617-828-2008; *Sls. Mgr.:* G. Nutter

GENERAL AUTOMATIC CORP., See E-Tron Corp.

GENERAL AUTOMATION, A Div. of 769442 Ont. Ltd., RR No. 4 McMullen Rd., Kemptville, Ont., Canada KOG 1JO, Tel: 613-724-1993, FAX: 613-258-4701; FSC No.: 1429-1592; Empl.: 4-6; *Sls. Mgr.:* Bruce Murison

GENERAL CABLE CO., Fiber Optics Div., 1 Cragwood Rd., S. Plainfield, NJ 07080, Tel: 201-769-3200, TELEX: 642892; *Sls. Mgr.:* Pieter deBruijn

GENERAL CABLE CO., 250 Overton Dr., Kenly, NC 27542, Tel: 919-284-5144, FAX: 919-284-5148; *Sls. Mgr.:* Dee Stinnette

GENERAL CABLE CO., Guardian Prods. Div., 411 West Putnam Ave., Greenwich, CT 06830, Tel: 800-243-8020, 203-661-0100, FAX: 203-661-4366; *Dist. Mgr.:* Mr. E.A. Luciano ..... **C•1753**

Local Sales Offices & Reps

AZ	Phoenix, Verlin Cink	602-997-4568
CA	Commerce, Michel Brothers	213-887-9383
CO	Denver, Trilogy Mktg.	303-989-0378
FL	Orlando, Hytech Sls.	407-578-3667
GA	Atlanta, Cenco	404-446-1787
IL	Niles, Bensdorf & Johnson	708-647-8512
MD	Gaithersburg, Mitchell Sls.	301-670-0022
MA	Braintree, Century Cable Sls.	617-843-5100
MN	Minneapolis, Rouser Sls.	612-544-3145
MS	Pearl, GS & G Sls. Assoc.	601-932-3720
MO	St. Louis, Jones Electl. Sls.	314-428-5665
NJ	Bridgeton, Harvey Assocs.	609-451-8785
OR	Portland, Pacific Western Agcy.	503-227-5555
TN	Memphis, J. C. Woollums & Assoc.	901-323-0024
TX	Dallas, Brenner Sls.	214-247-4545
WA	Seattle, Pacific Western Agcy.	206-763-1802

GENERAL CHEMICAL CORPORATION, 400 Nichols Road, Pittsburg, CA 94565, Tel: 415-685-1450, FAX: 415-458-9271

GENERAL CONTROLS, INC., 2350 Brickvale Ave., Elk Grove Village, IL 60007, Tel: 312-595-2152, FAX: 312-595-2271

GENERAL DEVICES
Electronic Hardware Manufacturers

FAX: 317-898-2917

GENERAL DEVICES CO., INC., Box 39100, Indianapolis, IN 46239-9632, Tel: 317-897-7000; Empl.: 250; *Sls. Mgr.:* Jack Bradford; *Dist. Mgr.:* Dan McCauley ..... **C•1056**

Local Sales Offices & Reps

AL	Huntsville, Dixie Tech. Mktg., Inc.	205-539-1485
AZ	Phoenix, Snyder Engrg.	602-279-2010
CA	Canoga Park, Groh Assocs.	818-884-9550
CA	Irvine, Groh Assoc.	714-837-9871
CA	North Hollywood, Groh Assocs.	818-509-9111
CA	Poway, Groh Assocs.	619-673-4321
CA	San Jose, Arnold Tech. Sls.	408-954-0400
CA	West Covina, Groh Assocs.	818-337-7831
CO	Broomfield, Summitwest Mktg.	303-460-9600
CT	Branford, Coakley, Boyd & Abbett	203-481-2218
FL	Deerfield Beach, J. Krutek & Assoc.	305-427-4202
FL	Maitland, J. Krutek & Assoc.	305-628-4837
GA	Duluth, Dixie Tech. Mktg., Inc.	404-381-5592
IL	Northbrook, Howard Benjamin	708-272-2900
IN	Fishers, R & D Elctrns., Inc.	317-849-2026
IA	Cedar Rapids, Thomas Dowell & Assocs.	319-364-3880
KS	Overland Pk., Thomas Dowell & Assocs.	913-599-1100
MD	Towson, Arbotek, Inc.	301-825-0775
MA	Framingham, Coakley, Boyd & Abbett	508-820-0800
MA	West Bridgewater, Coakley, Boyd & Abbett	508-559-6700
MI	Royal Oak, Hilltronics, Inc.	313-435-0920
MN	South St. Paul, Northport Engrg.	612-457-8000
MS	Dixie Tech. Mktg.	404-381-5592
MO	St. Louis, Thomas Dowell & Assocs.	314-849-4234
NJ	Mountainside, Henry G. Ritcher, Inc.	201-233-4615
NY	Fayetteville, Henry G. Ritcher, Inc.	315-637-6713
NC	Raleigh, Dixie Tech. Mktg., Inc.	919-781-7004
OH	Burton, Electronic Comps.,Inc.	216-834-0011
OH	Cleveland, Electronic Comps., Inc.	216-331-5330
OH	Columbus, Electronic Comps.,Inc.	614-231-2318
OH	Dayton, Electronic Comps., Inc.	513-866-3340
OK	Tulsa, Advance Tech. Sls.	918-664-0482
TN	Tazwell, Dixie Tech. Mktg., Inc.	615-626-6009
TX	Austin, Advance Tech. Sls.	512-467-9209
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	El Paso, ATS-Alexander Entprs.	915-591-3142
TX	Houston, Advance Tech. Sls.	713-440-3888
WA	Olympia, Bergford & Assocs.	206-866-2001
Can	Kanata, Ontario, Birde Mktg.,Inc.	613-592-5411
Can	Markham, Ontario, Birde Mktg.,Inc.	416-477-7722
Can	Saint Laurent, Quebec, Birde Mktg.,Inc.	514-335-4050

Local Distributors

AZ	Tempe, Acacia/Deanco	602-894-2874
CA	Irvine, Acacia/Deanco	714-660-0834
CA	San Diego, Acacia/Deanco	619-565-4365
IL	Chicago, Newark Elctrns.	312-784-5100
MA	Westborough, In-Stock Products Co.	508-870-5750
MO	Maryland Heights, French Gerleman Elec. Co.	314-569-3122
NY	Bohemia, Car-Lac Elctrns.	516-567-4200
Can	Markham,Ontario, Birde Mktg.,Inc.	416-477-7722

GENERAL DIGITAL CORP., 198 Freshwater Blvd., Enfield, CT 06082, Tel: 203-741-7171, FAX: 203-741-7071; Empl.: 50

GENERAL ELECTRIC CO., Accessory Equipment Plant, 1285 Boston Ave., Bldg. 25BE, Bridgeport, CT 06602, Tel: 203-382-3023, FAX: 203-382-2739; Empl.: 250; *Sls. Mgr.:* J. M. Collins

GENERAL ELEC. CO., Electromaterials Dept., 1350 South Second Street, Coshocton, OH 43812, Tel: 614-622-5310, TELEX: 810-255-2921; Empl.: 600; *Sls. Mgr.:* D.E. Allen

GENERAL ELECTRIC CO., Instrument Prods. Section, See Yokogawa Corp. of America

GE MICROELECTRONICS CENTER, GE Aerospace, P.O. Box 13049, Research Triangle Park, NC 27709, Tel: 919-549-3100, FAX: 919-549-3598; FSC No.: 1HL38; Empl.: 400; *Sls. Mgr.:* Donald B. Dickerman, Jr.

GENERAL ELECTRIC CO., RELAY OPERATION, See Genicom Corp.

GENERAL ELECTRIC MATERIALS TECHNOLOGY, 6161 Lincoln Ave., Suite 12B, Buena Park, CA 90620, Tel: 714-761-5684, FAX: 714-761-8257; Empl.: 12; *Sls. Mgr.:* Jerry Wang; *Dist. Mgr.:* George Olenczuk

GENERAL FIBER OPTICS, INC., 98 Commerce Rd., Cedar Grove, NJ 07009, Tel: 201-239-3400, FAX: 201-239-4258; *Sls. Mgr.:* Hugh Felger

GENERAL HARDWARE MFG., 80 White St., New York, NY 10013, Tel: 212-431-6100, FAX: 212-431-6499; *Sls. Mgr.:* Tom McGannon

GENERAL INDUSTRIES, Taylor & Olive St., Elyria, OH 44035, Tel: 216-323-3136, FAX: 216-323-4017; Empl.: 1000

GENERAL INSTRUMENT, Govt. Systems, 600 W. John St, C. S. 710, Hicksville, NY 11802-0709, Tel: 516-933-3000, TELEX: 311512, TWX: 510-221-1865, FAX: 516-933-3432; Empl.: 548; *Sls. Mgr.:* T.Turco/J.Zielezienski

GENERAL INSTRUMENT, Power Semiconductor Div., 600 W. John St., Hicksville, NY 11802, Tel: 516-933-3333, FAX: 516-933-3881; *Sls. Mgr.:* Tony Solla, Natl. Sls. Mgr.; *Dist. Mgr.:* Robert Graziano

GENERAL LASER, INC., 7950 E. Redfield Rd., Scottsdale, AZ 85260, Tel: 602-991-0674, FAX: 602-991-1462

GENERAL MANUFACTURING, 724 Ruberta Ave., Glendale, CA 91201, Tel: 818-243-2069; FSC No.: 10454

GENERAL MIRCOCIRCUITS, 780 Boston Rd., Billerica, MA 01821, Tel: 508-663-9101, FAX: 508-663-9132; Empl.: 25; *Sls. Mgr.:* Michael Lioz

FAX: 516-226-8966

GENERAL MICROWAVE CORPORATION, 5500 New Horizons Blvd., Amityville, NY 11701, Tel: 516-226-8900, TELEX: 310-287-780; FSC No.: 11332; Empl.: 200 ..... **A•1749; D•1251**

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
CA	Los Angeles, RF Assocs.	213-478-1586
CA	Palo Alto, RF Assocs. North	415-494-3331
FL	Apopka, Saber Assocs.	800-432-6288
FL	Melbourne, Saber Assocs.	800-432-6288
IL	Mt. Prospect, Cain Forlaw	708-253-3578
MA	Billerica, Microwave Mktg. Specialists	508-667-1440
NJ	West Orange, EF Tech. Sls.	201-731-7203
NY	Plainview, EF Tech. Sls.	516-942-7400
NY	Rochester, TCS (Technical Comp. Sls.)	716-342-2406
NC	Clayton, Saber Assocs.	800-327-0853
OH	Worthington, Cain Forlaw	614-436-3004
TX	Dallas, Cain & Co.	214-247-3901

GENERAL NUMERIC CORPORATION, 390 Kent Avenue, Elk Grove Village, IL 60007, Tel: 708-640-1595, TELEX: 210036, FAX: 708-228-5490; Empl.: 125; *Sls. Mgr.:* James Scott

GENERAL POWER CORPORATION, 1045 S. East St., P.O. Box 65008, Anaheim, CA 92815, Tel: 714-956-9321, FAX: 714-491-8644; FSC No.: 04801; Empl.: 75; *Sls. Mgr.:* Ernest R. Murillo; *Dist. Mgr.:* Ernest R. Murillo

GENERAL PROTECTION CO., INC., Circuit Protection Group, 6149 N. Talman Ave., Chicago, IL 60659, Tel: 312-761-0403, FAX: 312-262-9605; Empl.: 15; *Sls. Mgr.:* N.Pierson; *Dist. Mgr.:* N.Pierson

GENERAL RESISTANCE, A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092, FAX: 203-481-8937; FSC No.: 05591; Empl.: 60; *Sls. Mgr.:* J. L. Jamiesen; *Dist. Mgr.:* Keith MacDowall ..... **A•1913; D•1252-1253**

All States Not Listed Consult Factory, N. Branford, NJ 203-481-5721

Local Sales Offices & Reps

CA	Mountain View, Saber Entprs.	415-968-0427
NV	Clark County, Qualtech	602-967-4655
TX	Austin, Inotek	512-892-2490
EXP	Rajajinagar, Banaglore, Elctrns. Continental	366665

Instruments

AZ	Tempe, Qualtech, Inc.	602-967-4655
CA	Long Beach, Saber Entprs.	213-595-5646
CA	Mountain View, Saber Entprs.	415-968-0427
CO	Littleton, Radco	303-794-4279
CT	Watertown, May Technlg.	203-274-3777
IL	Des Plaines, Marsland Assocs.	312-298-2620
LA	Baton Rouge, Inotek	512-892-2490
MD	Joppa, Please Consult Factory	203-481-5721
MA	Reading, May Technlg.	617-942-7135
MO	St. Louis, Marsland Assocs.	312-298-2620
NJ	Branchville, CB Associates	201-948-5100
NY	Schenectady, CB Assocs.	201-948-5100
NY	Whitney Point, TAE-REP, Inc.	607-692-3705
OH	Dayton, RIXAN Assocs.	513-278-4216
TN	Hixson, Inotek	512-892-2490
TX	Austin, Inotek	512-892-2490
TX	Plano, Qualtech	602-967-4655
VA	Dumfries, Consult Factory	203-481-5721
WA	Seattle, Datacom Assocs.	206-285-2525
WI	New Berlin, Marsland Assocs.	312-298-2620

Components

AZ	Tempe, Qualtech, Inc.	602-967-4655
CA	Saratoga, TESTCO	408-253-1900
CO	Golden, J. F. Hurlbut Co.	303-279-7796
MD	Randallstown, Beacon North, Inc.	703-478-2480
MI	Farmington, W. R. Hummon & Assoc.	313-474-0661
OH	Dayton, RIXAN Assocs.	513-278-4216
TX	Dallas, Blackburn Assocs.	214-750-8927
VA	Sterling, Beacon North, Inc.	703-478-2480

Local Distributors

CA	Saratoga, TESTCO	408-253-1900
OH	Dayton, RIXAN Assocs.	513-278-4216

GENERAL SCANNING RECORDER PRODUCTS DIVISION, 37 Broadway, Arlington, MA 02174, Tel: 617-641-2702, TELEX: 212838, FAX: 617-648-4906; *Sls. Mgr.:* Donald Follansbee ..... **D•1419**

GENERAL SECURITY INC., 16 Newtown Plaza, Plainview, NY 11803, Tel: 516-753-0700, ESYLNK: 800-572-8989, FAX: 516-753-0839; Empl.: 10; *Sls. Mgr.:* J.N. Benjamin

GENERAL SEMICONDUCTOR IND., INC., Square D Company, 2001 W. 10th Place, Tempe, AZ 85281, Tel: 602-968-3101, FAX: 602-966-6396; FSC No.: 24444;19500; Empl.: 591; *Sls. Mgr.:* William Hennigan; *Dist. Mgr.:* Christopher Dingley

GENERAL TECHNOLOGY CORP., 6816 Washington Avenue, NE, Albuquerque, NM 87109, Tel: 505-345-5591, FAX: 505-344-3227; Empl.: 150; *Sls. Mgr.:* Ralph H. Anderson

GENERAL TRANSISTOR CORP., GTC, 216 W. Florence Av., Inglewood, CA 90301, Tel: 213-673-8422, FAX: 213-672-2905; FSC No.: 04662; Empl.: 66

GENERAL VIBRATIONS MFG. CO., 422 North Main St., Manchester, CT 06040, Tel: 203-646-0090, FAX: 203-643-8913; Empl.: 4

GENERAL WIRE PRODUCTS, INC., 425 Shrewsbury Street, Worcester, MA 01604, Tel: 617-752-8260, FAX: 617-753-2173; FSC No.: 5F262; Empl.: 58; *Sls. Mgr.:* Thomas P. Andrews, Jr.

GENICOM

FAX: 703-949-1416

GENICOM CORP., 1 Genicom Dr., Waynesboro, VA 22980, Tel: 703-949-1471, TWX: 710-839-0407; FSC No.: 01526; Empl.: 3000; *Sls. Mgr.:* G.F. Peltier ..... **B•1012-1014, 1482-1485**

Local Sales Offices & Reps

CA	Santa Ana, Genicom Corp.	714-549-5101
CT	Suffield, Genicom Corp.	203-668-6530
FL	Bonita Springs, Genicom, Corp.	813-947-5622
VA	Waynesboro, Genicom Corp.	703-949-1666

Local Distributors

CA	San Jose, JACO/Distel Inc.	408-432-9290
CA	Santa Ana, Norstan	800-854-8344
CA	Tustin, JACO/Distel Inc.	714-258-9003
CA	Westlake Village, JACO/Distel Inc.	800-824-0151
FL	Boca Raton, JACO/QC	407-241-7950
FL	Orlando, T & T Prods., Inc.	305-857-2282
GA	Norcross, JACO/QC	404-449-9508
MD	Baltimore, Elctrn. Comp. Sls.	301-728-2772
MA	Columbia, JACO Elctrns. Inc.	301-995-6620
MA	Tewksbury, JACO Elctrns. Inc.	508-640-0010
NY	Hauppauge, JACO/Elctrns. Inc.	516-273-5500
NC	Charlotte, Electronics Mktg. Corp.	704-394-6195
NC	Raleigh, JACO/QC	919-876-7767
OH	Cleveland, Electronics Mktg. Corp.	216-442-3441
OH	Columbus, Electronics Mktg. Corp.	614-299-4161
OH	Dayton, Elctrns Mktg. Corp.	513-278-5745
OH	Highland Heights, Electronics Mktg. Corp.	216-442-3441
TX	Addison, JACO/QC	214-733-4300
TX	Austin, JACO/QC	512-835-0220
TX	Dallas, Associated Aircraft Supp. Co.	214-331-4381
TX	Sugarland, JACO/QC	713-240-2255
WA	Redmond, Pan Pacific Elctrns., Inc.	206-881-7252

FAX: 619-661-5120

GENISCO ELECTRONICS CORPORATION, 1657 Pacific Rim Court, San Diego, CA 92173, Tel: 619-661-5100; FSC No.: 07294; Empl.: 100; *Sls. Mgr.:* Dick Gurena ..... **A•1624-1625, 1677; B•1153**

Local Sales Offices & Reps

AL	Birmingham, Electro-South Inc.	205-822-5713
AL	Huntsville, EMA	205-830-4030
AZ	Phoenix, Mayco	602-867-3076
CA	Claremont, Cook Entprs.	714-626-3997
CA	San Jose, Kottmeier Assoc. Inc.	408-371-8700
CA	Sunnyvale, DJM Elctrns.	408-749-8936
CA	Valencia, DJM Elctrns.	805-254-2677
CA	Vista, DJM Elctrns.	619-726-1266
CO	Englewood, R.A. Mays Co.	303-761-9447
GA	Roswell, E M A	404-992-7240
KS	Lenexa, Midtech Assoc.	913-541-0505
MD	Baltimore, Eastern Comps.	301-788-7050
NH	Brookline, EMC Sls.	603-672-4455
NM	Mayco	505-299-4002
NY	Roslyn Hgts., November Elctrn. Sls.	516-621-6378
OH	Dayton, Jay Engrg.	513-253-2151
PA	W. Conshohocken, Eastern Comps.	215-825-8610
WA	Bellevue, Underwood-Hanify Inc.	206-643-1793

GENISCO TECHNOLOGY CORP., 14930 E. Alondra Blvd., La Mirada, CA 90638, Tel: 714-523-7001, TWX: 910-346-6773, FAX: 714-522-1058; FSC No.: 07249; Empl.: 450; *Sls. Mgr.:* Rita Deidrich

GENISCO TECHNOLOGY CORP., 14930 E. Alondra Blvd., La Mirada, CA 90638, Tel: 714-523-7001, TWX: 910-346-6773, FAX: 714-522-1058; FSC No.: 07294; Empl.: 380

GENNUM CORPORATION, Linear Technology Inc., P.O. Box 489, Sta. A, Burlington, ON, Canada L7R 3Y3, Tel: 800-263-9353, 416-632-2996, TELEX: 061-8525, FAX: 416-632-2055; Empl.: 180; *Sls. Mgr.:* C. Marshall/I. H. Scot

GENROCO, INC., 205 Kettle Moraine Drive North, Slinge WI 53086-9407, Tel: 414-644-8700, TELEX: 15827942(FAX: 414-644-6667; *Sls. Mgr.:* Donald D. Woelz; *Dis Mgr.:* Barbara Pick

GENSTAR RENTAL ELECTRONICS, INC., 6307 D Soto Ave., Suite J, Woodland Hills, CA 91367, Tel: 800-33 3440 (in CA), 800-227-8409, FAX: 818-715-9249

GENTRON CORPORATION, 7345 E. Acoma, Ste. 1(Scottsdale, AZ 85260, Tel: 602-443-1288, FAX: 602-44 1408; Empl.: 50; *Sls. Mgr.:* Rick Heinz; *Dist. Mgr.:* Ri Heinz

GEOPHYSICAL SURVEY SYSTEMS, INC., 13 Kl Dr., North Salem, NH 03073-0097, Tel: 603-893-1109, F/ 603-889-3984; FSC No.: 02-0278634; Empl.: 50; *Sls. M* J. V. Rosetta, Jr.

GEORATOR CORP., Box 70, Manassas, VA 22110-0(Tel: 800-523-9938, FAX: 703-368-1078; FSC No.: 917 *Sls. Mgr.:* Jay Gormley ..... **D•2195-2**

FAX: 308-235-2609

GEORGE RISK INDUSTRIES, INC., 802 S. Elm St., Kimball, NE 69145, Tel: 308-235-4645; FSC No.: 24229; Empl.: 135; *Sls. Mgr.:* Mohammed A. Ghani; *Dist. Mgr.:* Mohammed A. Ghani ..... **B•1809**

Local Sales Offices & Reps

OR	Portland, Adapt Elctrns.	503-297-2151
AZ	Phoenix, J. F. Hurlbut Co.	602-997-7285
VA	Alexandria, Tech-Reps, Inc.	703-370-2600
CA	Sunnyvale, W.W. Posey Co.	408-746-0771
Can	Toronto, Reptech Elctrns. & Design	416-863-9510
FL	Deerfield Beach, Newell-Hynes Assocs.	305-429-3207
IL	Wheaton, CS Tech. Sls.	708-653-8126
MA	Lexington, Jodan Technlg.	617-863-8898
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	Eden Prairie, O'Reilly Assocs.	612-941-6480
MO	St. Charles, Buckman & Assocs.	314-946-6201
NY	Huntington Station, Morgan Elctrns.	516-549-5180
CA	Orange, VR Elctrns.	714-532-3730
PA	Horsham, Jacobsen Assocs.	215-674-2937
TX	Dallas, Barry Sls.	214-234-0255
GA	Deluth, Stelmack Comps.	404-441-7927
CO	Golden, J. F. Hurlbut Co.	303-279-7796

GERMANIUM POWER DEVICES, Box 3065, Shawsheen Village Sta., Andover, MA 01810-3065, Tel: 508-475-5982, TELEX: 94-7150, FAX: 508-470-1512; FSC No.: 53399; Empl.: 100; *Sls. Mgr.:* R. W. Kassiotis

GETTYS, an AEG Company, 2701 N. Green Bay Rd., Racine, WI 53404, Tel: 414-637-6591, TELEX: 201-309, FAX: 414-637-8400; Empl.: 173; *Sls. Mgr.:* Thomas J. Joyal, VP of Mktg./sls.

GETTYSBURG TRANSFORMER CORPORATION, 1380 Old Harrisburg Rd., P.O. Box 4356, Gettysburg, PA 17325, Tel: 717-334-2191, FAX: 717-334-4961; Empl.: 65; *Sls. Mgr.:* Charles A. Ritter

GEYER SYSTEMS, See GSI Corp.

GFC POWER LTD., 95 Curtis Drive, Guelph, CAN N1K 1E1, Tel: 519-763-3051, FAX: 519-822-9537; Empl.: 80; *Sls. Mgr.:* David Oliver; *Dist. Mgr.:* David Oliver

GGB INDUSTRIES, INC., Picoprobe Division, PO Box 10958, Naples, FL 33941, Tel: 813-643-4400, TELEX: 136692 GGB, FAX: 813-643-4403; *Sls. Mgr.:* Greg Boll

GHIELMETTI, INC., 30961 West Aguora Rd., Ste. 309, Westlake Village, CA 91361, Tel: 800-228-1097, FAX: 818-707-1754; Empl.: 4; *Sls. Mgr.:* Rick Odorfer

GIANNINI INSTITUTE, 51-555 Madison St, Indio, CA 92201, Tel: 619-347-2833, FAX: 619-342-4006; FSC No.: 24727; Empl.: 10; *Sls. Mgr.:* John Phillips

GIBSON/EGAN, See Textool Test & Interconnect Prods. Dept., 3M, Electronic Prods. Div.

GIC THERMODYNAMICS, 2611 Parmenter, Royal Oak, MI 48073, Tel: 313-280-1648, FAX: 313-280-0998; Empl.: 20; *Sls. Mgr.:* Denny Desmond

GIDDINGS & LEWIS-NEXES AUTOMATION, Giddings & Lewis, Inc., 666 S. Military Rd., P.O. Box 1658, Fond du Lac, WI 54936-1658, Tel: 414-921-7100, TELEX: 26-2722, TWX: 910-275-1100; Empl.: 175

Gilway Technical Lamp

FAX: 617-938-5867

GILWAY TECHNICAL LAMP, 800 W. Cummings Pk., Woburn, MA 01801, Tel: 617-935-4442; FSC No.: 3T059; Empl.: 17; *Sls. Mgr.:* Clark Benjamin III; *Dist. Mgr.:* Erin Hurley ..... **B•1155-1163**

GIMIX, INC., 3223 Arnold Lane, Northbrook, IL 60062-2406, Tel: 708-559-0909, FAX: 708-559-0942; Empl.: 14; *Sls. Mgr.:* Robert Phillips

GLAR-BAN, A MARK IV COMPANY, 199 Wales Ave., Tonawanda, NJ 14150, Tel: 716-694-5076, FAX: 716-694-4662; FSC No.: 22973; Empl.: 50; *Sls. Mgr.:* Robert G. Mencer, Jr.

GLASGAL COMMUNICATIONS, INC., 151 Veterans Dr., Northvale, NJ 07647, Tel: 201-768-8082, FAX: 201-768-2947; Empl.: 130; *Sls. Mgr.:* Ingemar Sjunnemark

GLASSMAN EUROPE LIMITED, Studio 4 Intec 2 Wade Rd., Basingstoke, Hampshire RG24 0NE, Tel: (0256) 810808, FAX: (0256) 810815; Empl.: 60; *Sls. Mgr.:* J. Ellis

FAX: 908-534-5672

GLASSMAN HIGH VOLTAGE INC., P.O. Box 551, Salem Indl. Pk., Rte. 22 (East), Whitehouse Sta., NJ 08889, Tel: 908-534-9007, TWX: 710-480-2839; Empl.: 60; *Sls. Mgr.:* John R. Belden ..... **D•1762-1773**

GLASSMAN JAPAN HIGH VOLTAGE LTD., Tiara Bldg. 1-17, Tiara 1-Chome, Miyamae-Ky, Kawasaki 213 Japan, Tel: (044) 877-4546, FAX: (044) 877-3395

GLATZER INDUSTRIES CORP., 15 River St., New Rochelle, NY 10801, Tel: 914-576-2700, FAX: 914-576-7075; Empl.: 25; *Sls. Mgr.:* Patricia M. Wyllie

GLENAIR INC., 1211 Air Way, Glendale, CA 91201-2497, Tel: 818-247-6000, TELEX: 67-3485, TWX: 910-437-2066, FAX: 818-500-9912; FSC No.: 06324; Empl.: 485; *Sls. Mgr.:* Ronald E. Platz

GLENMARC MANUFACTURING INC., 970 Woodlands Pkwy., Vernon Hills, IL 60061, Tel: 708-634-6080, FAX: 708-634-9527; Empl.: 13; *Sls. Mgr.:* David Greenwood

GLEN MILLS INC., 203 Brookdale St., Maywood, NJ 07607, Tel: 201-845-4665, TELEX: 134 656, FAX: 201-487-8469; Empl.: 11; *Sls. Mgr.:* Stanley I. Goldberg

GLENRO, INC., 39 McBride Ave., Paterson, NJ 07501-1715, Tel: 201-279-5900, 800-922-0106, FAX: 201-279-9103; Empl.: 50; *Sls. Mgr.:* Sterling Pitt

GLOBAL COMPONENTS & CONTROLS, 1 Main Street Ste. 210, Eatontown, NJ 07724, Tel: 201-389-1470, FAX: 201-389-8781; Empl.: 4; *Sls. Mgr.:* John M. Chapski

GLOBAL SPECIALTIES, Interplex Electronics, Inc., 70 Fulton Terrace, P.O. Box 1942, New Haven, CT 06509, Tel: 203-624-3103, FAX: 203-468-0060; Empl.: 50; *Sls. Mgr.:* Rachael Fernicola; *Dist. Mgr.:* Rachael Fernicola

Local Distributors

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MA	N. Andover, Contact East	508-682-2000
NY	Hauppauge, Fordham Radio	516-435-8080
SC	Greenville, EMSCO	813-233-4121
TX	Ft. Worth, Allied Elctrn.	817-336-5401
TX	Irving, Specialized Prods.	214-550-1923
WA	Seattle, Radar Elctrns.	206-282-2511
Can	Willowdale, Ont., Electro Sonic	416-494-1666

GLOBE BATTERY DIV., See Johnson Controls, Globe Battery Div.

GLOBE MOTORS, 2275 Stanley Avenue, Dayton, OH 45404, Tel: 513-228-3171, TELEX: 288-224, TWX: 810-459-1642, FAX: 513-229-8531; Empl.: 580; *Dist. Mgr.:* Derek Keegan

GLOBE UNION, See Johnson Controls, Globe Battery Div.

GlobTek

FAX: 201-861-0740

GLOBTEK, INC., 7700 Marine Rd., N. Bergen, NJ 07047, Tel: 201-861-0246, TELEX: 755579; Empl.: 20; *Sls. Mgr.:* Eugene Goldberg; *Dist. Mgr.:* Tom Devaney ... **A•2229; B•1367; C•1386, 1754; D•1775**

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CA	Arcadia/San Diego, HMC Inc.	818-447-0958
CA	San Jose, Silicon Valley Sls.	408-432-1967
CO	Denver, C-Tech	303-451-7100
CT	Ridgefield, Harbor Elctrns.	203-438-9625
IL	Alsip, M & E Comps.	708-396-0700
IA	Cedar Rapids, Technical Elctrns.	319-366-5443
MD	Lisbon, S. K. MacDonald	301-982-1088
MA	Topsfield, Whitehead Assoc. Inc.	508-887-8050
MN	Golden Valley, Highland Elctrns.	612-546-2123
MO	St. Louis, MPC Mktg.	314-652-0139
TX	Dallas, Comp. Technlg.	214-783-8837
TX	Dallas, Exel Tech	214-239-3935
Can	St. Laurent, Que., Componetics	514-331-9930

Glowlite

FAX: 405-238-3029

GLOLITE SALES LTD/GLOWLITE DIV., PO Box 688 Hwy 77 South, Pauls Valley, OK 73075, Tel: 405-238-5541, 800-654-3662; Empl.: 77; *Sls. Mgr.:* John Crego; *Dist. Mgr.:* Stan Ferrell ..... **B•1154, 1611**

Local Sales Offices & Reps

AZ	Peoria, SEM of Arizona	602-486-1191
AR	Little Rock, Doby Assocs.	501-221-0326
CA	Laguna Hills, Jack Fitch Assocs.	714-951-0196
IL	Berkeley, ESA Tech. Mktg.	708-544-0120
IN	Indianapolis, Schank Elctrn. Mktg.	317-842-6204
KS	Kansas City, E.P.I. Inc.	816-523-8911
MD	Randallstown, Chesapeake Indl. Mktg.	301-653-0476
MA	Tyngsboro, Comptech	508-649-3030
MI	Farmington Hills, Schank Elctrn. Mktg.	313-626-2551
MN	Hopkins, Pathway Sls. Inc.	612-933-8267
MS	Jackson, Doby Assocs.	601-981-1138
MO	St. Louis, E.P.I. Inc.	314-962-1411
NM	Albuquerque, Sytech Mktg. Sys.	505-266-7951
NY	Hauppauge, Aurora-Schmitt Assocs.	516-434-1313
NC	Raleigh, Vantage Mktg.	919-870-7123
OH	Beachwood, Elctrn. Salesmasters	216-831-9555
SC	Greenville, Vantage Mktg.	803-268-2186
TX	Hurst, El-Tec Sls.	817-268-2896
UT	Salt Lake City, Butterworth Mktg.	801-969-5566
Can	Aurora, Ont., JRL Assocs.	416-727-1452

Local Distributors

AL	Huntsville, Resistor Cap Elctrn.	205-883-4270
AR	Little Rock, Carlton Bates	501-562-9100
IL	Chicago, Kennedy-Webster Elctrns.	312-876-1612
IL	Chicago, Leeds Electro Comps.	312-625-3800
IL	Schaumburg, QPS Elctrns.	312-884-6620
LA	Shreveport, Carlton Bates	318-636-9975
MD	Columbia, SHP Elctrns.	301-290-8770
MA	Winchester, Webb Dist.	617-729-5800
MN	Plymouth, Leeds Electro Comps.	612-557-1277
MO	Richland, ATR Lighting	314-765-5219
MO	Spingfield, Carlton Bates	417-862-1699
NY	Setauket, KC Electrn. Dist.	516-689-2200
OH	Cleveland, Advacom Elctrns.	216-826-3300
OH	Columbus, Advacom Elctrns.	614-833-9550
OK	Oklahoma City, Carlton Bates	405-681-4446
OK	Tulsa, Carlton Bates	918-250-1626
PA	Lancaster, Advacom Elctrns.	717-741-9277
PA	McKean, Advacom Elctrns.	814-476-7774
TN	Memhpis, Carlton Bates	901-365-3539
TN	Nashville, Carlton Bates	615-244-3562
TX	Austin, Carlton Bates	512-458-1175
TX	Ft. Worth, Carlton Bates	817-831-0395
TX	Ft. Worth, Tandy Nat. Pts.	817-870-5600
WI	Grafton, Lakeview Elctrns.	414-377-8250
WI	Milwaukee, Badger Sls.	414-281-1330

GME SYSTEMS, INC., 12300 Perry Highway, Pittsburgh, PA 15090, Tel: 412-935-0440, FAX: 412-935-9640; Empl.: 7; *Sls. Mgr.:* Bjorn Karlstrom

GML CHIP COMPONENTS LIMITED, Hig, Phasell, Block 2 Flat 16 Baghlingampally, Hyderabad A.P., India 500 044, Tel: (91) 842-60106, 61593, TELEX: 0425-2105 GML IN, FAX: (91) 842-61484; Empl.: 50

GM NAMEPLATE, INC., 2040 15th Ave. West, Seattle, WA 98119, Tel: 206-284-2200, FAX: 206-284-3705; Empl.: 350; *Sls. Mgr.:* Gerry Gallagher

GMR CO., 804 Main St., Venice, CA 90291, Tel: 213-399-1490, TELEX: 499 2468; Empl.: 93; *Sls. Mgr.:* Harvey Mushman

GN NATIONAL ELECTRIC INC., 20639 Lycoming St, Unit B-1, Walnut, CA 91789, Tel: 714-598-1919, 714-598-1337, 800-321-1266, FAX: 714-594-7938; Empl.: 7; *Sls. Mgr.:* John Huang; *Dist. Mgr.:* Kathy Yang

GPE

FAX: 714-993-6023

GOLDEN PACIFIC ELECTRONICS, INC, 560 S. Melrose St, Placentia, CA 92670, Tel: 714-993-6970; Empl.: 15; *Sls. Mgr.:* James Au; *Dist. Mgr.:* James Au ..... **D•1032-1035, 1776-1777**

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CA	Garden Grove, ELSCO Elctrns	714-891-4621
CA	Norwalk, Ed Rivers Assocs.	213-868-1471
CA	San Jose, Applied Eltcrns Mktg	408-441-9610
CO	Longmont, Butler Tech. Sls.	303-651-7703
IL	Arlington Heights, M.J. Peterson & Assocs.	708-577-8200
NJ	Wayne, Breen Assocs	201-696-8683
NY	Elbridge, Northeastern Elctrns., Inc.	315-689-2143
OR	Beaverton, Core II Mktg	503-641-0877

GOLDEN POWER SYSTEMS, INC., 2125-B Madera Rd., Simi Valley, CA 93065, Tel: 805-582-4400, FAX: 805-582-3230; *Sls. Mgr.:* Ron Jones

GOLDSTAR PRECISION CO. LTD., Lucky Goldstar, 13013 E. 166th St, Cerritos, CA 90701, Tel: 213-404-0101, TELEX: 910-583-5719, FAX: 213-926-0849; Empl.: 12; *Sls. Mgr.:* Reginald Bale; *Dist. Mgr.:* Reginald Bale

GOOD-ALL ELECTRIC, INC., 3725 Canal Drive, Fort Collins, CO 80524, Tel: 303-484-3080, 800-826-7891, TWX: 910-930-9015, FAX: 303-484-8649; FSC No.: 22096; Empl.: 135; *Sls. Mgr.:* Sandi K. Salvhus

GORDON BRUSH MFG. CO., INC., 2150 Sacramento St, Los Angeles, CA 90021-1786, Tel: 213-627-6889, FAX: 213-623-4397; FSC No.: 17987; Empl.: 35

GORDON CO.:WATLOW, 5710 Kenosha St., Richmond, IL 60071, Tel: 815-678-2211, TELEX: 72-2427, FAX: 815-678-3961; Empl.: 300

GORDON INSTRUMENTS, INC., 3645 California Rd., Orchard Park, NY 14127, Tel: 716-662-5353, 1-800-333-2672, FAX: 716-662-7839; Empl.: 20; *Sls. Mgr.:* John Savage

GORDON, L., PACKAGING, 1050 S. Paca St., Baltimore, MD 21230, Tel: 301-539-6537, FAX: 301-625-7510; Empl.: 150

GORDON PRODUCTS, 67 Del Mar Dr., Brookfield, CT 06804, Tel: 203-775-4501, FAX: 203-775-1162; Empl.: 45; *Sls. Mgr.:* Leon Najman; *Dist. Mgr.:* Leon Najman

GORDOS

FAX: 501-636-2305

GORDOS, A Flint Industries Company, 1000 N. Second St., Rogers, AR 72756, Tel: 501-636-5000 ..... **A•1725; B•1486-1488; D•1170-1173**

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Mktg. Assoc. Inc.	205-880-8050
CA	Costa Mesa, Jim Pancake	714-751-6760
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CA	Tustin, Schoenbachler-Dobson	714-544-1888
CO	Arvada, Gemini Elctrns.	303-428-5600
FL	Deerfield Bch., Florida Comps., Inc.	305-429-1758
FL	Tampa, Florida Comps., Inc.	813-873-3622
GA	Atlanta, Elctrn. Mktg. Assoc.	404-448-1215
IL	Schaumberg, Martan, Inc.	708-303-5660
IN	Indianapolis, Hy-Tek Sls. Co.	317-887-2564
MA	Burlington, Anacon Sls. Assocs.	617-272-9080
MI	Troy, Pyramid Integrated Control Sys.	313-528-8040
MN	Eden Prairie, Busch Elctrns.	612-934-7922
NM	Albuquerque, Syntech	505-266-7051
NJ	Budd Lake, Guido Assocs.	201-347-4643
AR	Rogers, Bill Wilberg	800-643-3500
NC	Raleigh, Elctrn. Mktg. Assocs., Inc.	919-847-8800
OH	Centerville (Dayton), Omega Sls., Inc.	513-434-5507
OH	Shaker Hgts., Omega Sls., Inc.	216-751-9600
OK	Tulsa, Advanced Tech. Sls.	918-664-0482
PA	Valley Forge, Providence Mktg. Assocs., Inc.	215-935-3300
SC	Greenville, Elctrn. Mktg. Assocs., Inc.	803-233-4637
TX	Austin, Advanced Tech. Sls.	512-467-9209
TX	Dallas, Advanced Tech. Sls.	214-340-1300
TX	Houston, Advanced Tech. Sls.	713-440-3888
WI	Mequon, Martan, Inc.	414-241-4955
Intl	AR Rogers, Gordos	501-636-5000
Can	Mississauga, Ont., Gidden and Morton Assocs., Inc.	416-671-8111

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AL	Auburn, Interstate Elctrl. Supp.	205-821-3341
AL	Montgomery, Control Comps.	205-264-3325
AL	Tempe, Control Design	602-829-7981
AZ	Tempe, Control Design	602-829-7981
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AZ	Phoenix, Future	602-272-7952
AZ	Tempe, Time Elctrns.	602-967-2000
AZ	Tucson, Future	602-882-0808
CA	Anaheim, Control Design	213-821-1516
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Irvine, Future	714-250-4141
CA	Irvine, Integrated Elctrns.	714-837-9960
CA	Los Angeles, Elec. Switches	213-660-1310
CA	Los Angeles, Master Distrs.	215-452-1229
Can	Ontario, Harston & Carlock	714-984-4666
CA	Riverside, Elctrn. Supp.	714-683-7300
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Carlos, Control Design	415-592-4808
CA	San Diego, Time Elctrns.	619-586-1331
CA	San Francisco, Control Design	408-996-9197
CA	San Jose, Future	408-434-1114
CA	San Jose, Integrated Elctrns.	408-435-1000
CA	Santa Clara, Future	408-748-8550
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CT	Wallingford, Control Design	203-269-9955
CO	Denver, Control Design	303-296-1922
CO	Denver, Integrated Elctrns.	303-292-5537
CO	Englewood, Time Elctrns.	303-799-8851
CO	Westminster, Future	303-650-0123
CT	Bethel, Future Elctrns.	203-743-9594
CT	Cheshire, Time Elctrns.	203-271-3200
FL	Altamonte Springs, Control Design	305-788-3220
FL	Clearwater, Future	813-578-2770
FL	Clearwater, General Control, Inc.	813-791-1903
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FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Lakeland, AA Elec.	813-665-6941
FL	Orlando, Future	305-767-8414
FL	Orlando, Hammond	305-849-6060
FL	Orlando, Time Elctrns.	305-841-6565
FL	Pompano Bch., Control Deseign	305-782-1388
GA	Columbus, Interstate Elctrl. Supp.	404-324-1000
GA	Norcross, AA Elec.	404-449-8670
GA	Norcross, Future	404-441-7676
GA	Norcross, Time Elctrns.	404-448-4448
GA	Stone Mtn., Control Design	404-979-3502
IL	Addison, L Comp	312-628-1400
IL	Addison, Pyramid Controls	312-543-0110
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IL	Chicago, Newark	312-784-5100
IL	Hoffman Estates, Integrated Elctrns.	312-843-2040
IN	Indianapolis, Custom Svc. Elctrns.	317-879-9118
IL	Schaumburg, Future	312-882-1255
IL	Wood Dale, Time Elctrns.	312-350-0610
IN	Indianapolis, Control Design	317-788-4614
IA	Cedar Rapids, Control Design	319-373-2923
IA	Marion, Control Design	319-373-2923
KS	Kansas City, Control Design	913-362-4248
LA	New Orleans, Currier & Roser	504-734-1147
MD	Columbia, Future	301-995-1222
MD	Columbia, Jaco	301-995-6620
MD	Columbia, Time	301-964-3090
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MA	Westboro, Future Elctrns.	617-366-2400
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MA	Woburn, Control Design	617-932-9404
MI	Alma, Fischer-Flack	517-463-6104
MI	Ann Arbor, McNaughton-McKay Elec. Co.	313-995-9515
MO	Chesterfield, Advanced Ind. Sys., Inc.	314-532-2477
MI	Detroit, Future	313-261-5270
MI	Detroit, Newark Elctrns.	313-967-0600
MI	Farmington Hills, Control Design	313-473-0220
MI	Flint, Fischer-Flack	313-235-6420
MI	Kalamazoo, Pyramid Controls Inc.	616-327-3733
MI	Madsion Hgts., McNaughton-McKay Elec. Co.	313-399-7500
MI	Oak Pk., Newark Elctrns.	313-968-2950
MI	Port Huron, Fischer-Flack	313-985-8183
MI	Saginaw, Fischer-Flack	517-752-4181
MN	Bloomington, Time Elctrns.	612-944-9192
MN	Eden Prairie, Future	612-944-2200
MN	Eden Prairie, JE Braas	617-937-8902
MN	Minneapolis, Control Design	612-721-1628
MN	Minneapolis, Newark Elctrns.	612-331-6350
MO	Chesterfield, Advanced Ind. Sys. Inc.	314-532-2477
MO	Kansas City, L Comp	816-221-2400
MI	Midland, Fischer-Flack	517-496-3600
MO	St. Louis, Control Design	314-426-3160
MO	St. Louis, Future	314-537-0688
MO	St. Louis, L Comp	314-291-6200
MO	St. Louis, Time Elctrns.	314-391-6444
NJ	E. Rutherford, AA Elec.	201-777-5477
NJ	Fair Lawn, Relay Specialties	201-337-1000
NJ	Fairfield, Future	201-227-4346
NJ	Mt. Laurel, Future	609-778-7600
NM	Albuquerque, Elctrn. Dvcs.	505-884-2950
NY	Bohemia, Key Comps.	516-567-7500
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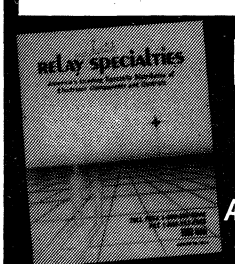

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NY Rochester, Summitt 716-334-8110
NY Syracuse, Future 315-432-1355
NY Syracuse, Time Elctrns. 315-432-1355
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NC Charlotte, Future 704-529-5500
NC Charlotte, Time Elctrns. 704-522-7600
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OH Highland Hgts., Elctrns. Mktg. Corp. ... 216-442-3441
OH Keetering, Elctrns. Mktg. Corp. 513-439-4711
NM Albuquerque, Betatron Elctrns. 505-821-1122
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OR Portland, Time Elctrns. 503-684-3780
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SC Taylors, Cantrel Wholesale Prods., Inc. 803-268-1194
TN Knoxville, Traver 615-531-2255
TN Nashville, AA Elec. 615-832-6632
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TX Dallas, GEA of TX 214-233-0337
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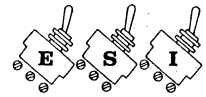

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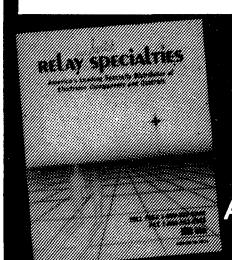

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(415) 835-1500
1026 6th Avenue, Oakland, CA 94606

GREENSPRING COMPUTERS, INC., 1204 O'Brien Drive, Menlo Park, CA 94025, Tel: 415-327-1200, FAX: 415-327-3808; Empl.: 12

GREENWICH INSTRUMENTS USA, 3401 Monroe Rd., Charlotte, NC 28205, Tel: 704-376-1021, FAX: 704-335-8707; *Sls. Mgr.:* Cynthia Rider; *Dist. Mgr.:* Bruce Magruder

GREIBACH INSTRUMENTS DIV., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717, FAX: 914-699-9410; FSC No.: 32590; Empl.: 35

THE GRIEVE CORPORATION, 500 Hart Rd., Round Lake, IL 60073-9989, Tel: 708-546-8225, TELEX: 72-2436, FAX: 708-546-9210; Empl.: 120; *Sls. Mgr.:* Frank Calabrese

GRIM CORP

FAX: 609-261-0921

GRIM CORPORATION, Box 968:Triangle Industrial Center, Medford, NJ 08055-0968, Tel: 609-267-7950; FSC No.: 21870; Empl.: 125; *Sls. Mgr.:* J. Vanden Hoek; *Dist. Mgr.:* Joe Miller ..... **D•1070-1075**

Local Sales Offices & Reps
VA Fairfax, GRIM Corp., Govt. Sls. 703-934-4615

Local Distributors
NJ Medford, GRIM Corp. 800-666-4746

GRM CORP., See Grim Corp.

GRUENBERG OVEN CO., INC., P.O. Box 3246, 2121 Reach Rd., Williamsport, PA 17701, Tel: 717-326-1755, TELEX: 350079; Empl.: 140; *Sls. Mgr.:* James Polk

GRUNER, Advanced Components Industries, Inc., 1308 Sartori Ave., No. 105, Torrance, CA 90501, Tel: 213-328-0060, FAX: 213-328-0062; *Sls. Mgr.:* Irma Spreitzer ..... **B•1492**

Local Sales Offices & Reps
IL Shaumburg, Terry McNulty & Assocs. 708-980-9868
MA Hopkinton, Berkshire Elctrns., Inc. 508-435-9356

GSE, Core Inds., 23640 Research Dr., Farmington Hills, MI 48024, Tel: 313-476-7875, FAX: 313-496-7249; Empl.: 105; *Sls. Mgr.:* Ed Leininger

GSI

FAX: 410-561-1768

GSI CORP., 1917 Greenspring Dr., Timonium, MD 21093, Tel: 410-252-1768; FSC No.: 60990; Empl.: 50; *Sls. Mgr.:* T.B. Weadock ..... **C•1755-1757**

Local Sales Offices & Reps
AZ Tempe, Elctrn. Dev. & Sls. 602-438-1547
CA Bonita, The Bryson Co. 619-428-2788
CA Canoga Pk., Greco-Lough Mktg. 818-346-0224
TX Richardson, EDS 214-238-5193
IL Cary, J. D. Noble & Assocs., Inc. 708-639-2440
MA Clinton, CWS, Inc. 508-368-8753
MA Burlington, Omni-Rep 617-245-4511
MN Eden Prairie, Aldridge Assocs. Inc. 612-944-8433
NJ Ho-Ho-Kus, D. J. Fisher Co., Inc. 201-652-0090
NY Pittsford, Cichy & Cichy Sls. 716-383-0546
NY Syracuse, CCS Inc. 315-488-1250
TX Irving, Elctrn. Dev. & Sls. 214-570-5122
Can Toronto, Kodon Techn. Prods. 416-676-1042

GTE ELECTRONIC REPAIR SERVICES, GTE Supply, GTE Pl. MC:D03C78, W. Airport, TX 75261, Tel: 214-615-7505, FAX: 214-456-3366

GTE FIBEROPTIC PRODUCTS, 2401 Reach Rd., Williamsport, PA 17701, Tel: 717-326-6591, 1-800-FBR-OPTICS

GTE GOVERNMENT SYSTEMS CORP., P.O. Box 7188, Mountain View, CA 94039, Tel: 415-966-2000, TWX: 910-379-6948, FAX: 415-966-2303; Empl.: 3,400; *Sls. Mgr.:* Evan S. Baker; *Dist. Mgr.:* Evan S. Baker

GTE PRODUCTS CORPORATION, Miniature Lighting Products, West Main Street, Hillsboro, NH 03244, Tel: 603-464-5533, 603-464-5538

GTE PRODUCTS GRP. (SYLVANIA), See Sylvania Miniature Lighting

GTE SUPPLY, GTE SUPPLY, GTE Place D01A37, W. Airfield Dr., DFW Airport, TX 75261, Tel: 800-433-4837, FAX: 214-456-3366; Empl.: 2800

GTE SYLVANIA, Emissive Products/Process Heat, Portsmouth Ave., Exeter, NH 03833, Tel: 603-772-4331, FAX: 603-772-9710; Empl.: 200; *Sls. Mgr.:* Joe Stark

GTE SYLVANIA, INC., STANDISH, ME, See Sylvania Control Devices

GTE TESTMARK LABS, GTE Industry Sls., 220 E. Las Colinas Blvd. MC, T11090, Irving, TX 75039, Tel: 214-718-3647, FAX: 214-718-7783; Empl.: 800; *Sls. Mgr.:* Clifton E. Miller

GTI/CIRCUITS DIV., Box 217, Leesburg, IN 46538, Tel: 219-453-3261, TELEX: 023-2653, FAX: 219-453-3833; Empl.: 150; *Sls. Mgr.:* Hugh M. Walker

GTI/ELECTRONICS DIV., P.O. Box 2096, Hadley, PA 16130, Tel: 412-253-3161, FAX: 412-253-3853; Empl.: 180; *Sls. Mgr.:* Richard C. Kaufman

GUARDIAN ELEC. MFG. CO., Koike Electric, 1425 Lake Ave., Woodstock, IL 60098, Tel: 815-337-0050, FAX: 815-337-0377; Empl.: 500; *Sls. Mgr.:* John Cotton; *Dist. Mgr.:* Frank Kudlacz

GUILDLINE INSTRUMENTS, 4403 Vineland Rd, Suite B-10, Orlando, FL 32811-7335, Tel: 407-423-8215, TELEX: 856443; Empl.: 85; *Sls. Mgr.:* Michael S. Shaw

GULTON GRAPHIC INSTRUMENTS DIV., A Mark IV Company, Gulton Ind'l. Pk., E. Greenwich, RI 02818, Tel: 800-343-7929, 401-884-6800, TWX: 710-387-1500; Empl.: 400

GUNTHER, W., GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 82, Germany, Tel: (0)911/65521 or 65520, TWX: 622351 Wigu d, FAX: (0)911/6552-239; Empl.: 340; *Sls. Mgr.:* Kurt Frohlich

Refer to Spectron Inc., 595 Old Path, P.O. Box 13368, Hauppauge, NY 11788 for reps. & distrs.

GW INSTRUMENTS, INC., 35 Medford St., Somerville, MA 02143, Tel: 617-625-4096, FAX: 617-625-1322

HAAKE, See Fison Instruments

HADES MANUFACTURING CORP., 151 Verdi St., Farmingdale, NY 11735, Tel: 516-249-4244, FAX: 516-249-1618; FSC No.: 51578; Empl.: 18; *Sls. Mgr.:* K. Norris

HADLEY, ROBERT M. CO., INC., 750 West 51st St., Los Angeles, CA 90037, Tel: 213-234-9091, FAX: 213-234-2779; FSC No.: 72964; Empl.: 135; *Sls. Mgr.:* Charles A. Hadley

HAEFELY TEST SYSTEMS, E. Haefely & Co. LTD., 2616 Morse Lane, Woodbridge, VA 22192, Tel: 703-494-1900, TELEX: WU 90 1097, FAX: 703-494-4597; Empl.: 800; *Sls. Mgr.:* Leo Makowski

HAFSTROM TECHNICAL PRODUCTS, INC., See Va-Tran Systems, Inc.

THE HALL COMPANY, 420 East Water St., Urbana, OH 43078, Tel: 513-652-1376, FAX: 513-653-7447; Empl.: 75

HALLMARK TECHNOLOGIES, 1717 East Lincoln Ave., Mt. Dora, FL 32757, Tel: 800-874-9063, FAX: 904-383-8146; Empl.: 90; *Sls. Mgr.:* John Santiago

HALMA ENTERPRISES, Tettex Instruments, 1055 W. Germantown Pike, Fairview Village, PA 19409-0281, Tel: 215-539-6050, FAX: 215-539-8005

HALMAR ELECTRONICS, INC., High Voltage Engrg. Corp., 900 N. Hague Ave., Columbus, OH 43204, Tel: 614-275-0530, TWX: 810-482-1654, FAX: 614-274-2559; Empl.: 130

HAMAMATSU CORPORATION, PO Box 6910, 360 Foothill Rd., Bridgewater, NJ 08807, Tel: 201-231-0960, TELEX: 833403, FAX: 201-231-1218; Empl.: 150; *Sls. Mgr.:* George Marshall; *Dist. Mgr.:* George Marshall

HAMAMATSU PHOTONICS K.K., 325-6 Sunayama-Cho, Hamamatsu City, Shizuoka Pref, Japan, Tel: 0534-52-2141, FAX: 0534-56-7889; Empl.: 1200; *Sls. Mgr.:* H. Hiruma

HAMAMATSU PHOTONIC SYSTEMS CORP., Industrial Video, 508 Edgewater Drive, Wakefield, MA 01880, Tel: 617-245-8100, FAX: 617-245-1333; Empl.: 25; *Sls. Mgr.:* Gary P. Green

HAMEG, INC., 88-90 Harbor Rd., Port Washington, NY 11050, Tel: 516-883-3837, TELEX: 023-497-4606, FAX: 516-883-3894; *Sls. Mgr.:* Alex Orloff

HAMEG INSTRUMENTS, 1939 Plaza Real, Oceanside, CA 92056, Tel: 619-630-4080, FAX: 619-630-6507; Empl.: 20; *Sls. Mgr.:* Michael Silverstein

HAMILTON AVNET, 10950 West Washington, Culver City, CA 90230, Tel: 213-558-2645

HAMILTON METALCRAFT, 848 N. Fair Oaks Ave., Pasadena, CA 91103, Tel: 818-795-4811, FAX: 818-795-9705; *Sls. Mgr.:* Mel Stahler

HAMILTON STANDARD CONTROLS/STANCOR, See Stancor/Hamilton Standard Controls

HAMILTON STANDARD DIV., United Technologies Corp., One Hamilton Road, Windsor Locks, CT 06096-1010, Tel: 203-654-6000, TELEX: 99-4439, FAX: 203-654-2620; *Sls. Mgr.:* Andrew H. Voorhis, VP Mktg.

HAMLIN

FAX: 414-648-3001

HAMLIN INC., 612 E. Lake St., Lake Mills, WI 53551, Tel: 414-648-3000; Empl.: 1000; *Sls. Mgr.:* Bill Hanson ..... **B•1493, 1706, 1903**

Local Sales Offices & Reps

AZ	Tempe, Westrep	602-820-9932
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Westrep	408-988-8833
CT	Branford, Coakley, Boyd & Abbett, Inc.	203-481-2218
FL	Altamonte Springs, Electramark	407-830-0844
FL	Boca Raton, Electramark	407-392-1763
FL	Tampa, Electramark	813-889-7775
GA	Atlanta, Wallace Elctrn. Sls.	404-634-3159
GA	Norcross, Electramark	404-446-7915
IL	Itasca, LTD Technlgs.	708-773-2900
IN	Carmel, TMC	317-844-8462
IN	Fort Wayne, TMC	219-432-5553
IN	Kokomo, TMC	317-459-5152
KY	Louisville, TMC	502-893-1377
MD	Gaithersburg, Naudain South	301-258-5040
MA	Framingham, Coakley, Boyd & Abbett, Inc.	508-820-0800
MA	W. Bridgewater, Coakley, Boyd & Abbett	508-559-6700
MI	Farmington Hills, J. L. Montgomery Assocs.	313-489-0099
MN	Minneapolis, R K Sls.	612-571-1001
MO	Blue Springs, Palatine Sls.	816-229-4007
MO	Florissant, Palatine Sls.	314-839-0800
NJ	Hackensack, Coakley, Boyd, Abbett, Metro	201-440-4114
NJ	Marlton, Naudain Assoc.	609-983-5300
NJ	Pinebrook, Coakley, Boyd, Abbett, Metro	201-227-5660
NJ	Riverdale, Coakley, Boyd, Abbett, Metro	201-440-4114
NY	Glen Head, Coakley, Boyd, Abbett, Metro	516-759-0917
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NY	Wantagh, Coakley, Boyd, Abbett, Metro	516-783-4102
NC	Kernersville, Wallace Elctrn. Sls.	919-996-2742
OH	Centerville, Bear Mktg.	513-436-2061
OH	Richfield, Bear Mktg.	216-659-3131
OR	Tigard, Earl & Brown	503-639-2100
PA	Pittsburgh, Bear Mktg.	412-531-2002
TN	Tullahoma, Wallace Elctrn. Sls.	615-455-0501
TX	Austin, Allied Comps.	512-331-4494
TX	Dallas, Allied Comps.	214-238-0408
TX	Hurst, Allied Comps.	817-589-0456
WA	Redmond, Earl & Brown	206-885-5064
WI	Watertown, Deaken Tech.	414-261-7600
Can	Mississauga, Ont., Indigo Elctrns.	416-670-0284
Can	Richmond, B.C., Blackwood Elctrn.	604-273-9910

Local Distributors

CA	Santa Ana, Norstan Elctrns.	714-540-4165
CA	Santa Clara, Cypress Elctrns.	800-538-5112
CA	Torrance, Kent	213-320-2700
CO	Aurora, Capstone Elctrns.	800-388-2277
CO	Littleton, Indelco	303-795-3431
FL	Orlando, Hammond Elctrn.	407-849-6060
IN	Indianapolis, Bell Inds.	317-875-8200
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Wilmington, Heilind Elctrns.	508-657-4870
MN	Fridley, Voyager Electronics	612-571-7766
NJ	Oakland, Relay Spec.	201-337-1000
NJ	W. Berlin, General Comps.	609-768-6767
NY	Buffalo, Summit Distrs.	716-887-2811
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NC	Greensboro, Hammond Elctrns.	919-272-6391
OH	Solon, Repco	216-248-8900
TX	Fort Worth, Allied Elctrns.	817-595-3500
TX	Ft. Worth, Tandy Natl. Parts	817-870-5614
TX	Stafford, Harrison Equip.	713-879-2798
WI	Mequon, Taylor Elec.	414-241-4321
Can	Concord, Ont., ITT Multicomps.	416-736-1148
Can	Markham, Ont., Semad Elctrns.	416-475-8500

HAMLIN LCD STANDISH INDS., See Standish Industries, Hamlin LCD Div.

HAMMOND MANUFACTURING

FAX: 716-894-1156

HAMMOND MANUFACTURING CO., 1690 Walden Ave., Buffalo, NY 14225, Tel: 716-894-5710; Empl.: 1,450; *Sls. Mgr.:* Ray Shatzel ..... **C•1058**

Local Sales Offices & Reps

AZ	Scottsdale, Mahaffey & Assocs.	602-991-9790
CA	N. Hollywood, Bassett Sls. Corp.	818-766-2117
CA	San Carlos, Hickey Indl. Sls.	415-594-9978
CO	Boulder, The Stratford Grp.	303-530-3194
FL	Tampa, SRT Mktg.	813-884-4805
GA	Atlanta, Millar Elctrns.	404-634-3350
IL	Highland Park, Bransky Sls.	312-433-2375
MD	Sykesville, DJC Elctrn. Sls.	301-795-7020
MA	N. Scituate, W. A. Hendrickson Co.	617-545-0652
MI	Southfield, Component Assocs.	313-355-4110
MN	Golden Valley, Ambassador Inds. Mktg.	612-542-8437
MO	St. Louis, Kathrinus, Kelly & Baumhauer	314-647-2400
NY	Bellmore, Selectra Sls.	516-221-7865
NY	Manhasset, Win-Cor Elctrn. Sls.	516-627-9474
NY	Victor, Net Sls.	716-924-1844
NC	Raleigh, Millar Elctrns.	919-828-8840
OH	Cincinnati, Frank E. Kahsar Sls.	513-922-3133
PA	Philadelphia, DJC Elctrn. Sls.	215-334-4533
TX	Dallas, J. Y. Schoonmaker Co., Inc.	214-349-1650

Local Distributors

AL	Birmingham, ACK, Inc.	205-322-0588
AL	Birmingham, Forbes Dist.	205-251-4104
AZ	Phoenix, Electronic Parts Co.	602-277-7281
AZ	Tucson, Southwest Sls.	602-628-1613
AR	Ft. Smith, Carlton Bates	501-646-8201
AR	Little Rock, Carlton Bates	501-562-9100
CA	Chatsworth, Poco Sls.	818-700-8727
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	Milpitas, Zack Elctrns.	408-942-5432
CA	Redwood City, H.D.B.	415-368-1388
CA	San Diego, Western Radio Elec.	619-268-4400
CA	San Jose, Con. Parts, Inc.	408-435-1200
CA	San Jose, Quement Elctrns.	408-998-5900
CA	San Rafael, Elctrns. Plus	415-457-0466
CA	Santa Ana, ITT Multicomponents	714-727-4001
CO	Denver, Fistell Elctrns.	303-629-1312
CT	Bridge Port, Park Distrbg.	203-366-7200
CT	Danbury, Pilgrim Elec.	203-792-7274
CT	Hartford, Hatry Elec.	203-527-1881
CT	New London, Jan Elctrn. Supp.	203-442-4386
CT	Norwalk, Cobra	203-847-6442
CT	Stratford, Hatry Elec.	203-375-5866
CT	Wallingford, Midstate Elec.	203-265-9900
DE	Wilmington, Whisl. Elctrns.	302-652-3222
FL	Orlando, EMSCO	407-849-6060
FL	Tampa, EMSCO	813-253-2684
GA	Atlanta, Ack, Inc.	404-351-6340
GA	Norcross, Whitehead Elctrns.	404-923-6667
GA	Norcross, Wholesale Inds. Elec.	404-447-8431
IL	Bensenville, Magnuson Elctrns.	708-595-7575
IL	Chicago, Newark Elec.	312-784-5100
IL	Joliet, Mainline Elec.	815-436-3900
IL	Niles, Joseph Elec.	708-312-297-4200
IL	Wheeling, Hawk Elec.	708-459-4030
IN	Carmel, Altex Elctrns.	317-848-1323
IN	Indianapolis, Advent Elec.	317-872-4910
IN	Indianapolis, Mar Elec.	317-633-6699
IA	Cedar Rapids, Dee Elec.	319-365-7551
KY	Louisville, Peerless Elctrns.	502-637-7674
LA	New Orleans, W. B. Allen Supp.	504-525-8222
MD	Aberdeen, Harco Elctrns.	301-838-7990
MD	Beltsville, Mark Elctrns.	301-595-5040
MD	Gaithersburg, M. S. Elec.	301-921-0200
MA	Haverhill, Spartan Elctrns.	508-373-1200
MA	Lynn, Land Elec. Supp.	617-592-2220
MA	Needham, Y.D.I.	617-449-1005
MA	Wellesley Hills, Target Elctrns. Supp.	617-235-2545
MA	Woburn, Abbott Elec.	617-935-2040
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MN	Minneapolis, Bergquist	612-835-2322
MN	Minneapolis, Tortec Corp.	612-866-3662
MO	Kansas City, Electronic Supp.	816-931-0250
MO	St. Louis, Van Sickle Radio	314-621-5000
NH	Dover, American Radio Corp.	603-335-3118
NJ	Camden, GRS Elctrns.	609-964-8560
NJ	Edison, Brownell Elctrns.	201-287-2037
NJ	Oakland, Relay Specialties	201-337-1000
NJ	Raritan, Masters Elctrn. Supp.	201-725-3533
NM	Albuquerque, Beta Tron Elctrns.	505-821-1122
NY	Buffalo, Genesee Ind. Elec.	716-873-9661
NY	Buffalo, Summit Dist.	716-887-2800
NY	Commack, Spartan Elctrns.	516-499-9500
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Poughkeepsie, Chief Elctrns.	914-471-1300
NY	Rochester, Goldcrest Elec.	716-546-8464
NY	Rochester, Masline Elec.	716-546-5373
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rome, Rome Elec.	315-337-5400
NY	Syracuse, Salina Elec.	315-422-2336
NY	Troy, Trojan Elec.	518-272-4481
NC	Greensboro, Hammond Elec.	919-275-6391
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cleveland, Roberts Elec.	216-238-1711
OH	Columbus, Thompson Elec. Supp.	614-228-6191
OH	Dayton, Stotts Friedman	513-298-5555
OK	Oklahoma City, Radio, Inc.	405-528-2391
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Toledo, International Co.	503-336-2221
PA	Drexel Hill, Kass Elec.	215-449-2300
PA	McKean, Advacom	814-476-7774
PA	Wayne, Peak Elec.	215-293-9000
RI	Pawtucket, Major Elec. Supp.	401-725-7400
SC	Charleston, Wholsale Inds. Elctrns.	803-722-2634
SC	Greenville, EMSCO	803-233-4121
TN	Knoxville, Bondurant Bros.	615-573-9151
TX	Austin, Galtronics	512-837-7470
TX	Corpus Christi, Douglas Elec.	512-883-5103
TX	Dallas, Off-the-Shelf Comps.	214-247-0052
TX	Dallas, Wholesale Elec.	214-969-9400
TX	Ft. Worth, Allied Elec.	817-336-5401
TX	Houston, Electrotex	713-526-3456
TX	Houston, The Altair Co.	713-462-3029
TX	Midland, ESI Supp.	915-694-9657
TX	San Antonio, Altex Elctrns.	512-828-0503
TX	San Antonio, Sherman Elec.	512-224-1001
UT	Salt Lake City, Standard Elec. Supp.	801-486-3371
VA	Annandale, Arcade Elctrns.	703-256-4610
VA	Arlington, Arlington Elctrns.	703-524-2412
VA	Charlottesville, Virginia Elec. Comps.	804-296-4184
VA	Norfolk, Norfolk Wire	804-499-1100
WA	Bellevue, Integrated Elec.	206-455-2727
WI	Mequon, Taylor Elec.	414-241-4321
WI	Oshkosh, Elctrn. Inds.	414-235-8930
WI	Racine, Badger Elctrn. Supp.	414-637-1256

HANCOCK ELECTRONICS CORP., 75 Terry Drive, Hingham, MA 02043, Tel: 617-740-4190, FAX: 617-740-4192; FSC No.: 66851; Empl.: 8; *Sls. Mgr.:* Robert H. Sturdy

HAND HELD PRODUCTS, INC., 8008 Corporate Center Dr., Charlotte, NC 28226, Tel: 704-541-1380, TWX: 810-621-0380 PROTECH, FAX: 704-541-1333; *Sls. Mgr.:* Jim Trautwein; *Dist. Mgr.:* Jim Trautwein

H & L INSTRUMENTS, 1440 Rollins Road, Burlingame, CA 94010, Tel: 415-342-7850, FAX: 415-347-1065; Empl.: 7; *Sls. Mgr.:* Jenifer H. Landman

HANDY & HARMAN ELCTRN. MATLS. CORP., 72 Elm St., N. Attleboro, MA 02760, Tel: 508-695-1401, FAX: 508-695-7565; Empl.: 300; *Sls. Mgr.:* T. Longo

HANKSCRAFT MOTORS, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959, Tel: 608-524-4341, FAX: 608-524-6779; Empl.: 550

HANOVIA, Canrad, 100 Chestnut St., Newark, NJ 07105, Tel: 201-589-4300, TELEX: 13-8531, FAX: 201-589-4430; Empl.: 250; *Sls. Mgr.:* Dennis M. Priscandaro; *Dist. Mgr.:* Dennis M. Priscandaro

HANSCOM, H. F., CO., INC., 225 Chapman St, Providence, RI 02905, Tel: 401-941-1455, FAX: 401-781-8835; Empl.: 50; *Sls. Mgr.:* John E. Christiansen

HANSEN MANUFACTURING COMPANY, INC., Subsidiary of IMC Magnetics Corp., Box 23, Princeton, IN 47670-0023, Tel: 812-385-3415, FAX: 812-385-3013; Empl.: 400; *Sls. Mgr.:* George A. Gilbert

HANTRONIX

FAX: 408-749-0477

HANTRONIX, INC., Liquid Crystal Display, 250 Santa Ana Ct., Sunnyvale, CA 94086, Tel: 408-736-3191, TELEX: 880165; Empl.: 25; *Sls. Mgr.:* David Kim; *Dist. Mgr.:* Jake B. Yu ..... **B•1078-1079**

Local Sales Offices & Reps

AL	Madison, Benchmark Tech. Sls.	205-464-0033
AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Carlsbad, Zerimar Sls.	619-436-3379
CA	Laguna Hills, 4 Star Elctrn. Sls.	714-583-9781
CA	Los Gatos, Luscombe Engrg. of S.F.	408-370-2020
CO	Longmont, Butler Tech. Sls.	303-651-7703
CT	Bethel, Ray Perron & Co., Inc.	203-798-0261
CT	Farmington, Ray Perron & Co., Inc.	203-673-4825
FL	Melbourne, Synergistic Tech. Sls.	407-242-9661
GA	Norcross, Benchmark Tech. Sls.	404-446-1711
IL	Arlington Heights, Phoenix Elctrn. Sls.	708-394-4422
KS	Prairie Village, Crosslink	913-649-7100
MD	Ellicot City, Technology Sls.	301-461-7802
MA	Needham, Ray Perron & Co., Inc.	617-449-6162
MN	Minneapolis, Technical Comp. Grp.	612-536-9512
MO	St. Louis, Reptronics	314-576-9816
NY	Coram, Sylvester Assocs. Sls. Inc.	516-473-2018
NY	Webster, Impaq Elctrns., Inc.	716-265-0995
NC	Raleigh, Benchmark Tech. Sls.	919-850-0633
OH	Columbus, Scientific Sys.	614-861-0129
OR	Hillsboro, Temco Northwest	503-645-2030
PA	Hatboro, Delta Tech. Sls.	215-957-0600
TX	Austin, RAm Elctrn. Sls., Inc.	512-345-2982
TX	Plano, RAM Elctrn. Sls. Inc.	214-424-4455
WA	Birch Bay, Temco Northwest	206-371-0423
WA	Bothell, Temco Northwest	206-481-6150
WA	Spokane, Temco Northwest	509-927-9392

Local Distributors

CA	Industry, Ital Elctrns Sls.	818-968-8515
CA	Mission Viejo, Opto Plus	714-380-8654
CA	San Jose, Spectra Elctrn. Inc.	408-452-1590
CO	Littleton, Displays Plus	303-730-7333
IL	Schaumburg, QPS Elctrns., Inc.	708-884-6620
NJ	Rockaway, Tonar Inds., Inc.	201-586-9000
TX	Austin, Omni Pro Elctrns.	512-794-9200
TX	Dallas, Omni Pro Elctrns.	214-233-0500
WI	New Berlin, Classic Comps.	414-786-5300
Can	Nippean, Ont., Carsten Elctrns. Ltd.	613-726-9250
Can	Scottsborough, Ont., Carsten Elctrn. Ltd.	416-495-9999

HARBOUR IND. (CANADA) LTD., 1365 Industriel Blvd., Farnham, Quebec, Canada J2N 2X3, Tel: 514-293-5304, FAX: 514-293-2421; Empl.: 31; *Sls. Mgr.:* Marc Longpre

HARDIGG

FAX: 413-665-4801

HARDIGG INDS., INC., 393 N. Main St. P.O. Box 201, South Deerfield, MA 01373, Tel: 413-665-2163; FSC No.: 11214; Empl.: 200; *Sls. Mgr.:* Stanley J. Morgan ..... **C•1059-1061**

HARDMAN INC. A HARCROS CHEMICAL GROUP COMPANY, 600 Cortlandt St, Belleville, NJ 07109, Tel: 201-751-3000, FAX: 201-751-8407; Empl.: 85

HAROWE SERVO CONTROLS, INC.:A FASCO CO., 110 Westtown Rd. P.O. Box 547, West Chester, PA 19380, Tel: 215-692-2700, TELEX: 685-1176; FSC No.: 06989; Empl.: 300; *Sls. Mgr.:* Clayton A. Walters

HARREL, INC., 16 Fitch St, E. Norwalk, CT 06855, Tel: 203-866-2573; *Sls. Mgr.:* Richard Decew

HARRIS CORP., Dracon Div., 809 Calle Plano, Camarillo, CA 93012, Tel: 805-987-9511, TELEX: 182327; Empl.: 350; *Sls. Mgr.:* Tom Erdmann; *Dist. Mgr.:* Keith Boutillier

HARRIS MICROWAVE SEMICONDUCTOR, Harris Semiconductor, 1530 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-433-2222, TWX: 910-338-2247, FAX: 408-432-3268; *Sls. Mgr.:* Vic Kovacevic

HARRIS SEMICONDUCTOR, Box 883, Melbourne, FL 32902, Tel: 305-724-7400, TWX: 510-959-6259; FSC No.: 34371; Empl.: 2300; *Sls. Mgr.:* Gary Pinelli; *Dist. Mgr.:* George Giozinski

HARTING ELEKTRONIK, INC., 2155 Stonington Ave., Ste. 212, Hoffman Estates, IL 60195, Tel: 708-519-7700, FAX: 708-519-9771; Empl.: 15; *Sls. Mgr.:* Donald G. Blummer

HARTLEY PRODUCTS, 1200 N. 23rd St., Ste. 105, Wilmington, NC 28405, Tel: 919-763-7422, FAX: 919-763-7422; *Sls. Mgr.:* R. Schmetterer

HARWIL, 1548 17th St., Santa Monica, CA 90404, Tel: 213-829-2310, FAX: 213-829-2259; Empl.: 10

HASCO COMPONENTS INTERNATIONAL CO., 247-40 Jericho Tpke., Bellrose Village, NY 11001, Tel: 516-328-9292, FAX: 516-326-9125; Empl.: 30; *Sls. Mgr.:* Tab Hauser; *Dist. Mgr.:* Christa Mundelos ..... **B•1494-1500, 1707**

Local Sales Offices & Reps

AL	Huntsville, Over & Over	205-837-7105
AL	Huntsville, Rick Burns Assocs.	800-852-5050
AK	Anchorage, Hasco Comps.	800-852-5050
AZ	Phoenix, Sanford Sls.	602-957-3570
AZ	Phoenix, Sanford Sls.	800-852-5050
CA	Irvine, Groh Assocs.	714-837-9871
CA	Los Angeles, RD&D	800-852-5050
CA	San Francisco, Silicon Valley	800-852-5050
CT	Hartford, Gallagher Assoc.	800-852-5050
GA	Atlanta, Rick Burns Assoc.	800-852-5050
IL	Chicago, Rendell Sls.	312-852-5050
KS	Kansas City, Logsden Assoc.	800-852-5050
LA	New Orleans, TANE	800-852-5050
MA	Framingham, Gallagher	800-852-5050
MO	Kansas City, Logsdan	800-852-5050
NM	Albuquerque, Sanford	800-852-5050
NY	Port Washington, Ashtec	800-852-5050
NY	Rochester, Andres	800-852-5050
NC	Raleigh, Rick Burns Assoc.	800-852-5050
OH	Cleveland	800-852-5050
TX	Dallas, Sls. Assoc.	800-852-5050
VA	Charlottesville, Pacesetter	800-852-5050
WA	Seattle, Jensen Sls.	800-852-5050
WI	Milwaukee, Rendell Sls.	800-852-5050

HATHAWAY CORPORATION:MOTION CONTROL DIV., 10837 E. Marshall, Tulsa, OK 74116, Tel: 918-438-7800, FAX: 918-438-7629; Empl.: 80; *Sls. Mgr.:* David Richards

Local Sales Offices & Reps

CA	Los Angeles, Hathaway: Motion Control Div.	213-398-5369
MA	Boston, Hathaway:Motion Control Div.	617-469-5054

HAUMAN, INC., 2031 Ringwood Avenue, San Jose, CA 95131, Tel: 408-434-0888, TELEX: 510-101-2820, TWX: 408-434-9832; *Sls. Mgr.:* Willis Yeh ..... **D•1782-1783**

Local Sales Offices & Reps

AL	Huntsville, B & C Instruments, Inc.	205-883-6530
CA	Canoga Pk., RAG Elctrns., Inc.	818-998-6500
CA	San Diego, Instr. Engrs.	619-268-8344
CO	Broomfield, Instr. Repair Labs.	303-469-5375
CT	Newtown, Connecticut Cal Labs	203-270-1263
FL	Tampa, Tampa Instrmn.	813-623-3979
GA	Norcross, Allied Elctrns.	404-446-8595
IN	Indianapolis, Loren Green	317-293-9827
MN	Minneapolis, Tonka Tech. Labs.	612-593-1770
NY	Great Neck, Instr. Mart	516-487-7430
NY	Mineola, Allied Elctrns.	516-248-2360
NC	Raleigh, Allied Elctrns.	919-876-5845
OR	Portland, Westcon Inc.	503-283-0132
PA	New Hope, John Bell	215-862-3762
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Garland, Tucker Elctrns.	214-348-8800
WA	Bellevue, Vetco	206-869-7025

Local Distributors

AK	Anchorage, Alaska Elctrnc. Supp.	907-563-3774
MD	Columbia, Allied Elctrns.	301-381-1560
PA	Pittsburgh, Allied Elctrns.	412-367-4124
WA	Seattle, Allied Elctrns.	206-547-2827

HAVERLY SYSTEMS, INC., 12 Hinchman Ave., Box 919, Denville, NJ 07834, Tel: 201-627-1424, FAX: 201-625-2296; Empl.: 33; *Sls. Mgr.:* Ken Spencer

HAYDON SWITCH & INSTRUMENT, 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705, Tel: 203-756-7441, TELEX: 643852-HSIINTLWBY, FAX: 203-756-8724; FSC No.: 02005; Empl.: 100

HAYES INSTRUMENT SERVICE INC., 530 Boston Rd., Billercia, MA 01821, Tel: 508-663-4800, FAX: 508-663-3812; Empl.: 45; *Sls. Mgr.:* Alan Brown; *Dist. Mgr.:* Alan Brown

HBM, INC., 19 Bartlett Street, Marlboro, MA 01752, Tel: 508-624-4500, FAX: 508-485-7480; Empl.: 200; *Sls. Mgr.:* Robert Gray

HBS EQUIPMENT CORPORATION, 3000 Supply Ave., Los Angeles, CA 90040, Tel: 213-726-3033, FAX: 213-888-9982; Empl.: 60; *Sls. Mgr.:* Mark Pedersen

HC Power, inc.

FAX: 714-261-6584

HC POWER INC., 17032 Armstrong Ave., Irvine, CA 92714-5716, Tel: 714-261-2200; FSC No.: 0D6P8; *Sls. Mgr.:* Jack Graham ..... **D•1784-1785**

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
AZ	Phoenix, Morrison & Fern	602-296-8181
CA	Laguna Hills, Electro Venture	714-581-9244
CA	Santa Clara, Electro Venture	408-727-1553
CA	Woodland Hills, Electro Venture	818-884-6574
CO	Englewood, Taylor Mktg.	303-850-0207
CO	Littleton, Taylor Mktg.	303-850-0207
FL	Largo, Graham Assoc.	813-539-6779
FL	Melbourne, Graham Assoc.	407-773-6631
FL	Orlando, Graham Assoc.	407-299-1001
FL	Palm Beach Gardens, Graham Assoc.	407-622-4049
FL	Winter Garden, Graham Assoc.	407-656-9369
IL	Barrington, Omni	708-381-9087
IN	Indianapolis, JC Hofstetter	317-897-7914
IA	Des Moines, The Beams Co.	515-255-1148
KS	Shawnee Mission, The Beams Co.	913-631-0300
MD	Hunt Valley, Eagle Sls. Corp.	301-666-3930
MA	Franklin, OEM Mktg. & Sls.	508-528-4983
MN	Minneapolis, Electro-Serv	612-338-3475
MO	St. Louis, The Beams Co.	314-434-8448
NH	Salem, OEM Mktg. & Sls.	603-893-0009
NC	Winston-Salem, Murcota	919-722-9445
OH	Dayton, JC Hofstetter	513-296-1010
OH	Medina, JC Hofstetter	216-725-4477
OR	Portland, Power Factor Assocs.	503-233-6969
PA	Pittsburg, JC Hofstetter	412-356-2305
TX	Dallas, Dynamark	214-437-3333
UT	Ogden, Taylor Mktg.	801-546-9570
NY	Spring Valley, Powertronics	914-735-3775
Can	Lachine, Digidyne	514-631-1891
Can	Napean, Digidyne	613-727-5632
Can	Toronto, Digidyne	416-674-0444

HDR POWER SYSTEMS, INC., 4242 Reynolds Dr., Hilliard, OH 43026, Tel: 614-771-5500, FAX: 614-771-7219; Empl.: 90; *Sls. Mgr.:* Harlan W. Bates

HDS INC., 12310 Pinecrest Rd., Reston, VA 22091, Tel: 703-620-6200, TELEX: 64585, FAX: 703-620-3169; Empl.: 120

H D SYSTEMS, INC., 89 Cabot Court, Hauppauge, NY 11788, Tel: 516-231-6630, FAX: 516-231-6803; Empl.: 5; *Sls. Mgr.:* Tetsuo Ikuta

HEADWAY RESEARCH, INC., 3713 Forest La., Garland, TX 75042, Tel: 214-272-5431, FAX: 214-272-7817; Empl.: 45

HEATH CO., Hilltop Road, St. Joseph, MI 49085, Tel: 616-982-3200, TELEX: 72-9421; Empl.: 2000

HEAT SYSTEM, INC., 1938 New Hwy., Farmingdale, NY 11735, Tel: 516-694-9555, TELEX: 825-339; Empl.: 35; *Sls. Mgr.:* Irwin Leibson

HEDRICH USA, INC., 684 N. Spence Ave., Goldsboro, NC 27534, Tel: 919-751-1144, FAX: 919-751-0215

HEEGER, INC., 6400 Fleet St., City of Commerce, CA 90040, Tel: 213-728-5108, 728-4729, 728-6913, FAX: 213-728-4740; Empl.: 10; *Sls. Mgr.:* Robert A. Heeger

HEI CORPORATION, P.O. Box 88806, Carol Stream, IL 60188, Tel: 708-665-5500, FAX: 708-665-5769; Empl.: 20

HEIDENHAIN CORP., 115 Commerce Dr., Schaumberg, IL 60173, Tel: 708-490-1191, FAX: 708-490-3931; Empl.: 72; *Sls. Mgr.:* Thomas Wyatt; *Dist. Mgr.:* Rick Glos

HEI, INC., Hybrid Electronics Div., 1495 Steiger Lake Ln., Victoria, MN 55386, Tel: 612-443-2500, ESYLNK: 62940281, FAX: 612-443-2668; Empl.: 200; *Sls. Mgr.:* Leonard Klun ..... **A•1726**

Local Sales Offices & Reps

MN Victoria, HEI Inc. 612-443-2500

HEI, INC., Optoelectronics Div., 1495 Steiger Lake La.,P.O.Box 5000, Victoria, MN 55386, Tel: 612-443-2500, TWX: 510-601-7785, ESYLNK: 62940281, FAX: 612-443-2668; Empl.: 150; *Sls. Mgr.:* Dale Nordquist

HEINEMANN ELECTRIC CO., 2630 Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800, Tel: 609-882-4800, TELEX: 843431; FSC No.: 74193; Empl.: 350 ..... **B•1368-1371**

Local Sales Offices & Reps

AZ Phoenix, O'Donnell Assocs. SW 602-944-9542
CA San Diego, O'Donnell Assocs., Inc. 619-578-1645
CA San Jose, O'Donnell Assocs. No. 408-456-2950
CA Torrance, O'Donnell Assocs., Inc. 213-539-9664
CO Englewood, CompuTech Mktg. 303-773-3981
FL Oviedo, Conley & Assocs. 407-365-3283
FL Wellington, Conley & Assocs., Inc. 407-790-3926
GA Duluth, Dixie Mktg. 404-381-5592
IL Northbrook, D. Dolin Sls. 708-498-6770
IN Ft. Wayne, O.H. Bromberg & Assocs. .. 219-456-6010
IA Hiawatha, Ard Sls. Co. 319-393-6392
KY Alexandria, O.H. Bromberg & Assoc. .. 606-635-3063
KY Louisville, O.H. Bromberg & Assocs. .. 502-456-1498
MD Upperco, Imagitron Sls. Co., Inc. 301-374-5600
MA Southboro, Sullivan Tech. Sls. 617-485-2215
MI Southfield, L. H. Dickelman Co. 313-353-8210
MN Minneapolis, Furber Sls. Co., Inc. 612-881-3620
MO Kansas City, Hill & Co. 816-361-1669
MO St. Louis, Hill & Co. 314-432-1136
NJ Ridgewood, Ballou, Inc. 201-444-6990
NM Albuquerque, O'Donnell Assocs. SW .. 505-889-4522
NY Farmington, R. M. Scanlon & Assocs. 716-924-7450
NY Syracuse, R.M. Scanlon & Assoc., Inc. 315-463-7682
NC Charlotte, J. Rudisill Assocs. 704-377-6901
OH Cleveland, Brown Elect. Prod. 216-331-2072
OH Dayton, KW Elctrn. Sls. 513-890-2150
OH Dayton, O. H. Bromberg & Assocs. 513-434-8788
FL Wellington, Conley & Assoc., Inc. 305-790-3926
NJ Lawrenceville, DVS Co. 609-896-1112
PA Pittsburgh, KW Electrn. Sls. 412-366-9396
TX Dallas, Glidden Electro Equip. 214-341-0610
TX Houston, Glidden Electro Equip. 713-681-1415
WI Milwaukee, Key Entpr. 414-762-2323

Local Distributors

AL Montgomery, Southern Controls 205-277-5030
CA Chatsworth, POCO Sls. 818-700-8727
CA Inglewood, Newark Elctrns. 213-671-7066
CA Los Angeles, Master Distrs. 213-452-1229
CA Oakland, Brill Elctrns. 415-834-5888
CA San Carlos, Campbell & George 415-594-1994
CA Santa Clara, Cypress Elctrns. 408-980-8400
CA Van Nuys, Fuses, Unltd. 818-786-8111
CO Aurora, Jet Elctrns. 303-364-1000
CO Denver, CSID Inc. 303-292-9594
CO Denver, Newark Elctrns. 303-757-3351
CT Hartford, L. E. Whelan Co. 203-296-5000
CT Wallingford, Green Shaw Co. 203-265-3333
FL Oviedo, Dixie Sls. 407-365-5211
GA Atlanta, Georgia Control Cen. 404-876-8833
IL Chicago, Newark Elctrns. 312-784-5100
IL Morton Grove, Nedco Elctrns. 312-967-0500
IL Northbrook, Classic Comps. Supp. 312-272-9650
IN Indianapolis, Bell Inds. 317-875-8200
KS Edwardville, C. Tennant & Sons 913-441-1801
MD Columbia, DK Elctrns., Inc. 301-995-1950
MD Crofton, Custom Marine Svcs. 301-793-3955
MA Needham, Power Electro Supp. 617-444-6866
MA Newton, Green Shaw Co. 617-969-8900
MA Woburn, Apparatus Svc. 617-933-5999
MI Oak Pk., Newark Elctrns. 313-967-1570
MI Southfield, Michigan Lectrols Corp. 313-353-1350
MN Minneapolis, Newark Elctrns. 612-331-6350
MO Maryland Heights, Lcomp, Inc. 314-291-6200
NH Hudson, Bell Inds. 508-474-8880
NJ Lawrenceville, Riverside Comps. Supp. 609-896-1611
NY Johnson City, Help Elctrns., Inc. 607-729-3528
NY Ronkonkoma, Arrow Elctrns. 516-467-1000
NY Roslyn, I/O Corp. of NY 516-625-1040
NY Whitestone, Power Electro Supp. Co. 212-767-1447
NC Charlotte, Motionex Inc. 704-377-1555
NC Raleigh, Greene-Shaw Co. 919-954-7138
OH Cleveland, I/O Corp. of Cleveland 216-642-7300
OH Dayton, Duellman Elec. 513-461-8000
OH Dayton, Stotts Friedman Co. 513-298-5555
PA Pittsburgh, Circuit Breakers, Inc. 412-366-9542
OH Shandon, Cartessa Corp. 513-738-4477
OH Valley View, Newark Elctrns. 216-447-8860
OR Portland, Taylor Elec. 503-233-5321
PA Conshohocken, I/O Corp. of Phila. 215-825-4610
PA Erie, REM Elctrns. 814-453-5626
PA West Chester, West Chester Elec. & Electrn. 215-696-7500
TN Chattanooga, Techni-Tronics, Inc. 615-332-2119
TX Dallas, Geeco Sls. Co. 214-341-2626
TX Garland, Newark Elctrns. 214-494-5911
TX Houston, Newark Elctrns. 713-782-4800
VA Ashland, Hanover Controls & Supp. Corp. 804-550-2449
VA Charlottesville, Va. Elctrn. Comps. 804-296-4184
WA Seattle, H. C. Campbell Co. 206-433-1900
WI Milwaukee, Hunt Co. 414-383-1781

HEITZ, KARL, INC., P.O. Box 427, Woodside, NY 11377, Tel: 718-565-0004, FAX: 718-565-2582; Empl.: 15

HELICAL PRODS. CO., INC., Box 1069, Santa Maria, CA 93456-1069, Tel: 805-928-3851, FAX: 805-928-2369; FSC No.: 13201; Empl.: 85; *Sls. Mgr.:* John Ricker

HELM INSTRUMENT CO., INC., 1387 Dussel Drive, Maumee, OH 43537, Tel: 419-893-4356, FAX: 419-893-1371; Empl.: 55; *Sls. Mgr.:* M. Wilhelm; *Dist. Mgr.:* N. Phillips

HELWIG CARBON PRODUCTS, INC., 8900 W. Tower Ave., Milwaukee, WI 53224, Tel: 414-354-2411, FAX: 414-354-2421; FSC No.: SIC 3624; Empl.: 280; *Sls. Mgr.:* John E. Koenitzer

HERBERT PRODS. INC., 180 Linden Ave., Westbury, NY 11590-0384, Tel: 516-334-6500, TWX: 510-222-5963, FAX: 516-334-6538; Empl.: 94; *Sls. Mgr.:* B. J. Simmons

HERGA INC. HERGA ELECTRIC LIMITED, 602 Brandywine Parkway, West Chester, PA 19380, Tel: 215-430-1970, FAX: 215-430-7785; Empl.: 5

HERITAGE METAL FINISHING INC., 800 S. Market St. P.O. Box 446, Elizabethtown, PA 17022, Tel: 717-367-1561, FAX: 717-367-2474; Empl.: 43; *Sls. Mgr.:* Terry L. Rinesmith ..... **D•2235**

Local Sales Offices & Reps

PA Elizabethtown, Heritage Metal Finishing Inc. 717-367-1561

HERMETIC SEAL CORP., 4232 Temple City Blvd., Rosemead, CA 91770, Tel: 213-283-0411, TWX: 910-587-3352, FAX: 818-443-6610; FSC No.: 04820; Empl.: 200

HERMETIC SWITCH, Box 1325, Hwy. 92, Chickasha, OK 73018, Tel: 405-224-4046, TELEX: 796125 Hermetic CKSA, FAX: 405-224-9423; FSC No.: 65623; Empl.: 150; *Sls. Mgr.:* R. Helms, Kim Baker .... **B•1708, 1904-1905**

Local Sales Offices & Reps

CA Arcadia, V. Gott & Assocs. 818-445-9729
CA San Diego, V. Gott & Assocs. 619-489-0893
GA Atlanta, Electro Technlg. Prods. 404-262-1522
IL Lemont, Trend-Tronics, Inc. 708-972-1166
KS Lenexa, Midtec Assocs. 913-541-0505
MA Canton, New England Elctrn. Sls. 617-828-4835
MN Minneapolis, Peterson Sls. & Assocs. 612-835-5281
MO St. Louis, Midtec Assocs. 314-275-8666
NY Oceanside, Current Inds. 516-678-3895
OR Beaverton, LD Elctrns. 503-684-8221
PA Furlong, Avenir 215-348-8290
TX Austin, R. F. Kimball Co. 512-443-5284
TX Houston, R. F. Kimball Co. 713-890-8810
TX Richardson, R. F. Kimball Co. 214-231-3447
WA Snohomish, LD Elctrns. 206-568-0511
WA Spokane, LD Elctrns. 509-922-4883

Local Distributors

TX Ft.Worth, Allied Elctrns. Inc. 817-595-3500

HERSEY MEASUREMENT CO., A Miller Industries Co., P.O. Box 4585, Spartanburg, SC 29305, Tel: 803-574-8960, 1-800-845-2102, FAX: 803-578-7308; Empl.: 80; *Sls. Mgr.:* Don McLellan

HERSTAL AUTOMATION LTD., 3171 W. Twelve Mile, Berkley, MI 48072, Tel: 313-548-2001, FAX: 313-548-2010; Empl.: 14; *Sls. Mgr.:* Randall M. Elliott

HERTNER DIV.:EXIDE CORP., 12690 Elmwood Ave., Cleveland, OH 44111, Tel: 216-252-4242, FAX: 216-941-4330; FSC No.: 28398; Empl.: 100; *Sls. Mgr.:* R.C. Wright

HERTZ FILTER, 3 Aerial Way, Syosset, NY 11791, Tel: 516-822-4770; Empl.: 22

HEURISTICS INCORPORATED, 9845 Horn Rd., Ste. 170, Sacramento, CA 95827, Tel: 916-369-6606, TELEX: 4940010, FAX: 916-369-6175; Empl.: 70; *Sls. Mgr.:* Mike McMann, Genl. Mgr.

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HEWLETT-PACKARD CO., 19310 Pruneridge Ave. Customer Information Ctr., Cupertino, CA 95014, Tel: 800-752-0900; Empl.: 91,000 ..... **D•1786-1787**

Local Sales Offices & Reps

AL	Birmingham	205-988-0547
AL	Huntsville	205-830-2000
AK	Anchorage	907-563-8855
AZ	Phoenix	602-273-8000
AZ	Tucson	602-573-7400
AR	Little Rock, Hewlett-Packard Co.	501-225-7178
CA	Calabasas	818-880-3400
CA	Carson	213-834-6312
CA	Foster City	415-378-8400
CA	Fresno	209-252-9652
CA	Fullerton	714-999-6700
CA	Goleta	805-685-6100
CA	Irvine	714-472-3000
CA	Los Angeles	213-337-8000
CA	Mountain View	415-694-2000
CA	N. Hollywood	818-509-2300
CA	Pleasanton	415-460-0282
CA	Sacramento	916-929-7222
CA	San Diego	619-279-3200
CA	San Francisco	415-882-6800
CA	Santa Clara	408-988-7000
CA	Santa Rosa	707-578-8888
CA	Ventura	805-658-6898
CO	Boulder	303-938-3065
CO	Englewood	303-649-5000
CT	Darien	203-656-0040
CT	Glastonbury	203-633-8100
FL	Ft. Lauderdale	305-938-9800
FL	Jacksonville	904-296-0252
FL	Melbourne	407-729-0704
FL	Orlando	407-859-2900
FL	Pensacola	904-476-8422
FL	Tampa	813-884-3282
GA	Atlanta	404-955-1500
GA	Norcross	404-448-1894
HI	Honolulu	808-526-1555
ID	Boise	208-323-2700
IL	Bloomington	309-662-9411
IL	Chicago	312-930-0010
IL	Naperville	708-505-8800
IL	Rolling Meadows	708-255-9800
IN	Carmel	317-844-4100
IN	Ft. Wayne	219-482-4283
IA	Cedar Rapids	319-393-0606
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SC	Greenville	803-232-8002
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CA	Hayward, Arow Fasteners	800-227-2901
CA	Riverside, Elctrns. Supp.	714-787-9220
CA	San Jose, Pro Fasteners	408-943-9177
IL	Shaumberg, Engrd. Fasteners	312-980-4082
IN	Elkhart, La Vanture Prods. Co.	219-264-0658
MD	Baltimore, Jandorf Elec. & Mfg.	301-358-5550
MA	Newton, In-Stock Prods.	617-964-6200
MN	St. Paul, Arden Fasteners	612-483-6681
MO	St. Louis, Engrd. Fastener Co.	314-434-2888
NY	Amityville, Yorkville Inds. Inc.	516-225-2100
OK	Oklahoma City, Wesco	405-232-5521
TN	Nashville, Arden Fasteners	615-889-7043
TX	Houston, Rainbow	713-957-0500
WI	Waukesha, Cable Comps.	800-558-4388

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HICO HORIZONS INTL. CO., See Maxon Precision Motors

HI-G COMPANY SUB. OF NYTRONICS, See Stuthers-Dunn, Inc. and Hi-G Co., Inc., Sub. of Nytronics.

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HVT

FAX: 914-968-0347

HIGH VOLTAGE TECHNOLOGY INC., 71 Alexander St., Yonkers, NY 10701, Tel: 914-423-6636; Empl.: 12; *Sls. Mgr.:* Edith Schmelzer ..... **D•1788-1791**

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CA	El Cajon, Atronix Technlg. Inc.	619-444-1501
CA	Solvang, Atronix Technlg. Inc.	805-686-4366
NJ	Hillside, Irwin Brill	201-677-0653
NM	Albuquerque, IMEC	505-883-9010

Local Distributors

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Can	Ontario, QPL Elctrns.	416-674-8858

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AL	Birmingham, Spader & Assocs.	205-979-5500
AZ	Litchfield Pk., S.W. Elctrl. Sls.	602-935-7292
CA	San Diego, RDX Corp.	619-581-0077
CA	San Dimas, RDX Corp.	714-599-0985
CA	Sunnyvale, RDX Corp.	408-734-4500
CO	Parker, Equal Elec. Inc.	303-841-8982
CT	Branford, Abbott Allison Co.	203-481-0405
FL	Daytona Bch. Shores, W. Rihm Assocs.	904-761-7130
GA	Atlanta, Productive Technlg.	404-939-7027
HI	Honolulu, B. F. Wittenberg	808-696-5538
IL	Hawthorne Woods, Ryan & Assocs.	708-438-2905
MO	St. Louis, Fitzgerald Sls. Co.	314-862-1660
MN	Minnetonka, Lee-Noonan Co.	612-938-1112
NJ	Union, Friedman Assocs., Inc.	201-964-6200
NM	Albuquerque, Brytec Sls. Inc.	505-884-1123
NY	Le Roy, Hasgo Power Equip.	716-768-8500
OH	Vermilion, Robert S. Howley	216-967-8787
PA	Downingtown, Kenn Ebert-Hipotronics	215-269-5898
UT	Salt Lake City, Riter Engrg. Co.	801-973-9063
WA	Redmond, Gore Elec. Co.	206-883-4505
PR	Santurce, Mario R. Franceschini Inc.	809-725-7080
Can	Burnaby, B.C., C. D. Nova	604-430-5612
Can	Halifax, N.S., D. C. Keddy Ltd.	902-453-1711
Can	Quebec, J46 1L9, Tremcour Elctrn.,Inc.	514-522-7757
Can	Weston, Ont., U-Tek Svcs. & Supp.	416-747-1879

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IN	Indianapolis, Magnuson Elctrns.	317-247-5108
MA	Canton, EPC Elctrns., Inc.	617-821-2111
NJ	Union, Meridian Supp. Co.	201-687-6220
NY	Bohemia, Key Comps., Inc.	516-567-7500
NY	Mamaroneck, Rye Inds., Inc.	914-698-0080
OH	Highland Hgts., Major Electronix, Inc.	216-461-2100
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TX	Richardson, Centurion Mktg.	214-783-6762

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FL	St. Petersburg, MacKay, Smith & Assocs.	813-530-1873
GA	Atlanta, MacKay, Smith & Assocs.	404-496-9913
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MO	St. Louis, Florence & Meyer	913-722-5210
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
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CA	Irvine, Quadrep	714-527-4222
CA	San Jose, Quadrep	408-432-3300
CO	Parker, Parker Webster	303-841-4888
CT	Wallingford, Technlg. Sls., Inc.	203-269-8853
FL	Orlando, Technlg. Mktg. Assoc.	407-857-3760
GA	Atlanta, Technlg. Mktg. Assoc.	404-446-3565
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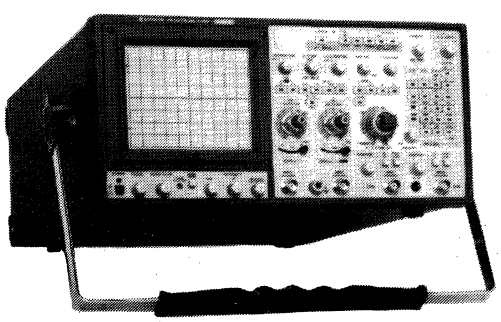

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NM	Albuquerque, System Sls. of AZ	505-889-2901
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GA	Atlanta, Milgray	404-446-9777
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TX	Houston, Sterling	713-627-9800
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CT	Ridgefield, Manning & Assocs., Inc.	203-438-5027
ID	Boise, Calvert Controls	208-343-3964
IL	Addison, Hedge Assocs., Inc.	312-543-0888
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MA	Hopedale, Motion Controls Assocs.	508-478-0736
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NC	Charlotte, Servicon Sls. Corp.	704-588-1035
OR	Eugene, Calvert Controls	503-683-2018
OR	Portland, Calvert Controls	503-236-1358
PA	Fort Washington, Hostvedt-Pavoni, Inc.	215-643-5757
PA	Pittsburgh, Greye Glass Assocs.	412-366-6664
UT	Salt Lake City, Calvert Controls	801-531-8129
WA	Seattle, Calvert Controls	206-251-6135
WA	Spokane, Calvert Controls	509-244-3601
WA	Tacoma, Calvert Controls, Inc.	206-383-1130
WA	Tri-Cities, Calvert Controls	509-545-4506
WV	Sissonville, Interstate Ind. Sls. Corp.	304-988-3687
WI	Brookfield, Kirchmayer-Seidel	414-781-5469
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NY	Jamaica, Queens Indl. Elec. Corp.	718-526-7198
RI	Providence, WALCO Elec. Co.	401-467-6500,

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HOBART TAFA TECHNOLOGIES, Hobart Bros. Co., 146 Pembroke Rd., Concord, NH 03301, Tel: 603-224-9585, TELEX: 94-3424, FAX: 603-225-4342; Empl.: 60; *Sls. Mgr.:* Daniel Tuszynski; *Dist. Mgr.:* Daniel Tuszynski

HOBSON BROS., 4940 W. Lawrence Ave., Chicago, IL 60630-3884, Tel: 312-283-3600, FAX: 312-283-3606; Empl.: 75; *Sls. Mgr.:* Betty Maager

HODGE MANUFACTURING CO., INC., 55 Fisk Ave., Springfield, MA 01107, Tel: 413-781-6800, FAX: 413-733-6573; *Sls. Mgr.:* Edwin L. Kossoy

HOFFMAN, P.R., CO., MATERIALS PROC, 321 Cherry St., Carlisle, PA 17013, Tel: 717-243-2011, FAX: 717-243-1672; Empl.: 125; *Sls. Mgr.:* Galen Martin

HOFFMAN ENGINEERING, 900 Ehlen Dr., Anoka, MN 55303, Tel: 612-421-2240, FAX: 612-421-1556; *Sls. Mgr.:* Brad Dunn; *Dist. Mgr.:* Paul Premo

HOFFMAN ENGINEERING CORP., 20 Acosta St, Stamford, CT 06902, Tel: 203-325-8933, FAX: 203-327-4812; FSC No.: 06097; Empl.: 49; *Sls. Mgr.:* Jack DeSoye

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HOKURIKU USA LTD., 8145 River Dr., Morton Grove, IL 60053, Tel: 708-470-8440, FAX: 708-967-1188; Empl.: 12; *Sls. Mgr.:* Ira Uslander

HOLADAY INDUSTRIES, INC., 14825 Martin Drive, Eden Prairie, MN 55344, Tel: 612-934-4920, FAX: 612-934-3604; Empl.: 29; *Sls. Mgr.:* David Baron

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HOLLEX, INC., See Cabletest Products Co.

HOLLINGSEAD INTERNATIONAL, 13701 Excelsior Drive, Santa Fe Springs, CA 90670, Tel: 213-921-3438, TELEX: 691-462, FAX: 213-921-6313; *Sls. Mgr.:* Doug Wagner

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HOLT INC., 9351 Jeronimo Rd., Irvine, CA 92718, Tel: 714-859-8800, TELEX: 182704, FAX: 714-859-9643; FSC No.: 44270; Empl.: 110; *Sls. Mgr.:* Roger Smith

HOLT INSTRUMENT, C.P.D. Engineering, Inc., 126 Mott St., PO Box 230, Oconto, WI 54153, Tel: 414-834-2222, FAX: 414-834-3178; FSC No.: 09435; Empl.: 10; *Sls. Mgr.:* C. P. De Witt

	Local Sales Offices & Reps	
AZ	Phoenix, Barnhill Assocs.	602-955-2955
CA	Torrance, Cutlass Elctrns., Inc.	213-324-7360
CO	Denver, Barnhill Assocs.	303-792-9500
NM	Albuquerque, Barnhill Assocs.	505-299-7658
OK	Tulsa, Barnhill Assocs.	918-492-5036
TX	Houston, Barnhill Assocs.	713-266-2666
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HOLUB INDS., See Blackburn, Div. of F L Industries

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HOMALITE, Whitco, Inc., 11 Brookside Dr., Wilmington, DE 19804, Tel: 302-652-3686, TWX: 510-600-0874; Empl.: 35; *Sls. Mgr.:* Susan Stepchuck ..... **B•1085**

HONDA CONNECTORS, See Mhotronics, Inc.

HONEYWELL INC., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408, Tel: 612-870-5186, TWX: 910-576-2692; Empl.: 15,000

HONEYWELL INC., Commercial Bldgs. Grp., MN 27-4231, Honeywell Plaza, Minneapolis, MN 55408, Tel: 612-870-2294; Empl.: 6000; *Sls. Mgr.:* Mannie Jackson

HONEYWELL INFORMATION SYSTEMS, 200 Smith St., MS 440, Waltham, MA 02154, Tel: 617-895-6000

HONEYWELL MICROSWITCH DIV., 830 E. Arapaho Dr., Richardson, TX 75081, Tel: 214-470-4271, TELEX: 73-0890, FAX: 214-470-4417; Empl.: 300; *Sls. Mgr.:* Doug Rasmussen; *Dist. Mgr.:* Dave Kimbrough

HOOSIER MAGNETICS, INC., 6545 W. Central Ave. Rm.203, Toledo, OH 43617, Tel: 419-841-7173, FAX: 419-841-7359; FSC No.: 3160; Empl.: 90

HOPKINS ENGRG., 12900 Foothill Blvd., San Fernando, CA 91342, Tel: 818-361-8691, TELEX: 910380-5379, FAX: 818-361-7409; FSC No.: 02777; Empl.: 100

HOPPECKE BATTERY SYSTEMS, INC., 292 Main St., Butler, NJ 07405, Tel: 201-492-0045, TELEX: 5106002498, FAX: 201-492-2714; *Sls. Mgr.:* Arthur M. Silverman; *Dist. Mgr.:* Arthur M. Silverman

HOPPER ELECTRONICS, 1943 West North Lane 9, Phoenix, AZ 85021, Tel: 602-870-3093; Empl.: 10 ..... **D•1175**

HOTPACK CORP., 10940 Dutton Rd., Philadelphia, PA 19154, Tel: 215-824-1700, 800-523-3608, TWX: 710-670-1694, FAX: 215-637-0519; FSC No.: 66; Empl.: 100; *Sls. Mgr.:* Hugh McKenna

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HOUSTON ATLAS, a Baker Hughes Company, 9441 Baythorne Drive, Houston, TX 77041, Tel: 713-462-6116, TELEX: 75-0197, FAX: 713-462-1831; Empl.: 45; *Sls. Mgr.:* Judy Hood

HOUSTON INSTRUMENT, AMETEK, Inc., 8500 Cameron Rd., Austin, TX 78753, Tel: 512-835-0900, TWX: 910-874-2022; Empl.: 450; *Dist. Mgr.:* Rod Schaffner

HOWARD INDUSTRIES, INC., Box 287, One North Dixie Hwy., Milford, IL 60953, Tel: 815-889-4105, FAX: 815-889-4313; Empl.: 350; *Sls. Mgr.:* Dan Sutter; *Dist. Mgr.:* Barb Davis

HOWELL INSTRUMENTS, 3479 W. Vickery Blvd., Ft. Worth, TX 76107, Tel: 817-336-7411, TELEX: 75-8233; FSC No.: 98869; Empl.: 180; *Sls. Mgr.:* Mike Lathem

HP DIRECT, Hewlett-Packard, 1320 Kifer Rd., Sunnyvale, CA 94086, Tel: 800-538-8787; Empl.: 80,000

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HUDSON TOOL & DIE CO., 18 Malvern St., Newark, NJ 07105, Tel: 201-589-1800, TWX: 710-995-4445, FAX: 201-589-8570; FSC No.: 02875; Empl.: 300

HUGHES AIRCRAFT CO., Connecting Devices Div., 17150 Von Karman Ave., Irvine, CA 92714, Tel: 714-660-5701, FAX: 714-660-5825; FSC No.: 53669; *Sls. Mgr.:* Terry Jarnigan

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HUGHES AIRCRAFT CO., Industrial Products Division, 2051 Palomar Airport Rd., Carlsbad, CA 92009, Tel: 619-931-3000, FAX: 619-931-3334

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HUGHES SEMICONDUCTOR PRODUCTS CENTER, 500 Superior Ave., Newport Beach, CA 92663, Tel: 714-759-2665, FAX: 714-759-2913; FSC No.: 62458; *Sls. Mgr.:* Steven Rubin

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HUMISEAL DIV., CHASE Corporation, 26-60 BQE West, Woodside, NY 11377, Tel: 718-932-0800, TWX: 710-582-2141, FAX: 718-932-4345; FSC No.: 99109;46058; Empl.: 150; *Sls. Mgr.:* William G. Lott

HUMPHREY, INC., 9212 Balboa Ave., San Diego, CA 92123, Tel: 619-565-6631, TWX: 910-335-2001, FAX: 619-565-6873; Empl.: 278

HUNTINGTON ELECTRIC INC., P.O. Box 366, Dept. EEM 87, Huntington, IN 46750, Tel: 219-356-0778, FAX: 219-356-7891; *Sls. Mgr.:* Michael Khorshid

HUNTSVILLE MICROSYSTEMS, INC., 3322 South Memorial Pkwy., Huntsville, AL 35801, Tel: 205-881-6005, TWX: 510-600-8258, FAX: 205-882-6701; Empl.: 30; *Sls. Mgr.:* Kay Keller

HURRICANE ELECTRONICS LAB, P.O. Box 1280, Hurricane, UT 84737, Tel: 801-635-2003, FAX: 801-635-2495; FSC No.: 64109; Empl.: 35; *Sls. Mgr.:* C. R. Reeve

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FAX: 812-386-7504

HURST MANUFACTURING DIV., Box 326, Princeton, IN 47670, Tel: 812-385-2564; Empl.: 200; *Sls. Mgr.:* Don Morrow ..... **B•1272-1275**

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IN	Indianapolis, Emerson Motor Div.	317-842-1342
MD	Glen Arm, Hodgins Assoc.	301-592-7047
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MI	Grand Rapids, Emerson Motor Div.	616-942-9500
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NY	Rochester, Agma Sls. Assocs.	716-381-5840
NY	Syracuse, Agma Sls. Assocs.	716-381-5840
NC	Charlotte, Cartwright & Bean, Inc.	704-536-0303
OH	Canton, Emerson Elec. Co.	216-492-4119
OK	Edmond, Emerson Motor Div.	405-340-8228
GA	Norcross, Cartwright & Bean, Inc.	404-368-0160
TX	Arlington, Emerson Motor Div.	213-380-2670
WA	Seattle, Northmar	206-524-5170
WI	Milwaukee, Badgerep Inc.	414-241-9200
EXP	NY, Freeport, Minthorne Int'l.	516-546-4700
Can	Burlington, Ont., White Radio Ltd.	416-632-6894

HUTRONIX, INC., 2400 S. 34th Place, Tucson, AZ 85726, Tel: 602-790-5348, FAX: 602-790-8836; FSC No.: 70206; Empl.: 119

HV COMPONENT ASSOCIATES INC., P O Box 2484, Farmingdale, NJ 07727, Tel: 908-938-4499, FAX: 908-938-4451; Empl.: 20; *Sls. Mgr.:* Dennis R. Dean

HYBRICON CORPORATION, 12 Willow Road, Ayer, MA 01432, Tel: 508-772-5422, TWX: 710-347-0654, FAX: 508-772-2963; Empl.: 74; *Sls. Mgr.:* Janis K. Parker

HYBRID DESIGNS, INC., 666 W. Baker, Costa Mesa, CA 92626, Tel: 714-557-9933, FAX: 714-557-0322; FSC No.: 16450; Empl.: 65; *Sls. Mgr.:* Bob Soberman

HYBRID ELECTRONICS CORP., 6 DeAngelo Dr., Bedford, MA 01730, Tel: 617-275-5350, FAX: 617-275-3470; Empl.: 12; *Sls. Mgr.:* John Pantazis

HYBRIDS INTERNATIONAL LTD., Thick Film Division, 311 N. Lindenwood Dr., Olathe, KS 66062, Tel: 913-764-6400, FAX: 913-764-6409; Empl.: 45; *Sls. Mgr.:* Abdul Ghafoor; *Dist. Mgr.:* John Finley ..... **A•1372-1373, 1727**

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FAX: 602-791-3899

HYBRIDYNE, INC., 2155 N. Forbes Blvd., Tucson, AZ 85745, Tel: 602-629-0001; Empl.: 90; *Sls. Mgr.:* Richard Brady ..... **A•1729**

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CO	Ft. Collins, Rep Sales	303-226-1504
IL	Downers Grove, Rockford Controls Co.	708-960-2046
MA	Needham Hgts., Vanguard Elctrns.	617-449-5578
MN	Burnsville, Xerotex Technlgs. Corp.	612-894-5007
NJ	Cherry Hill, Metz-Benham-Assocs., Inc.	603-424-0404
NY	Hartsdale, Spectrum Sls. Inc.	914-472-8600
PA	Wynnewood, Metz-Benham-Assocs., Inc.	215-896-7300
TX	Austin, Design Mktg. & Assoc.	512-263-9151
TX	Dallas, Design Mktg. & Assoc.	214-480-8151
TX	Houston, Design Mktg. & Assoc.	713-550-3318

HY-CAL ENGINEERING, 9650 Telstar Ave., El Monte, CA 91731, Tel: 818-444-4000, FAX: 818-444-1314; FSC No.: 12199; Empl.: 145; *Sls. Mgr.:* D. Z. Chapman

HYCOMP, INC., 165 Cedar Hill St., Marlborough, MA 01752, Tel: 508-485-6300, TWX: 710-347-0385, FAX: 508-481-1547; FSC No.: 34707; Empl.: 65; *Sls. Mgr.:* David Petros

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WI	Cedarburg, American Microelectronics	414-375-4339

HYPERLOGIC CORPORATION, 2411 E. Valley Pkwy. 294, Escondido, CA 92027, Tel: 619-746-2765, FAX: 619-746-4089; Empl.: 2

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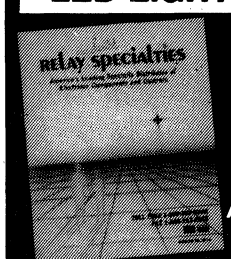
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ICC, INC., 1144 W. Grove Ave., Orange, CA 92665, Tel: 714-998-8310, TELEX: 4992245ICCUSA, FAX: 714-998-5910; Empl.: 25

ICI ADVANCED MATERIALS, 475 Creamery Way, Exton, PA 19341, Tel: 215-363-4500, TELEX: 4973041, TWX: 510-668-6728, FAX: 215-363-4749; *Sls. Mgr.:* William Shaker

ICI INC., 1901 Petra La., Placentia, CA 92670, Tel: 714-579-7575, FAX: 714-579-3127; Empl.: 8

IC MASTER, 645 Stewart Ave., Garden City, NY 11530, Tel: 516-227-1300, FAX: 516-227-1901

ICO-RALLY CORPORATION, 2575 E. Bayshore Rd., Palo Alto, CA 94303, Tel: 415-856-9900, FAX: 415-856-8378; FSC No.: 51705; Empl.: 45; *Dist. Mgr.:* Barbara Enad/Doug Frait

ICS ELECTRONICS CORP., 744 S. Hillview Dr., Milpitas, CA 95035-5545, Tel: 408-263-5500, FAX: 408-263-5896; FSC No.: 58558; Empl.: 20; *Sls. Mgr.:* Thomas D. Curfman; *Dist. Mgr.:* Thomas D. Curfman

IC SENSORS, INC., 1701 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-432-1800, FAX: 408-434-6687; Empl.: 150; *Sls. Mgr.:* Greg Hayes

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FL	Orlando, America's Res. Co.	407-330-3155
IL	Chicago, MGA, Inc.	312-775-1151
IN	Indianapolis, MGA, Inc.	317-846-5788
IA	Cedar Rapids, Tech. Elect., Inc.	319-366-5443
MI	Flint, MGA, Inc.	313-732-3922
MI	Southfield, MGA, Inc.	313-358-4151
NH	Amherst, Bennetron	603-880-7008
TX	Dallas, Tycom Sls. Co.	214-960-7368
VA	Midlothian, Pacesetter Comp. Sls.	804-744-1337
WI	Milwaukee, MGA,Inc.	414-546-4466
WI	Oregon, MGA, Inc.	608-835-5540
Can	Kanata, Ont., Canadian Mktg. Technlgs.	613-591-9555
Can	Mississauga, Ont., Canadian Mktg. Technlgs.	416-612-0900
Can	Pt. Claire, Que., Canadian Mktg. Technlgs.	514-694-6088

Local Distributors

CA	Anaheim Hills, Bulbtronics-West	714-693-0533
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CA	Mission Viejo, Opto Plus ò	714-380-8654
CA	San Jose, Rose Elctrn. Distrbg.	408-943-0360
CT	Wallingford, GRS-Midan Elctrns., Inc.	203-265-2077
FL	Davie, Arco Dist., Inc.	305-473-2550
FL	Delray Beach, Fastbolt Florida Corp.	407-272-3100
FL	Melbourne, GRS-Rome Elctrns.	407-242-8151
IL	Addison, Belford Elctrns., Inc.	708-691-1100
IL	Chicago, Leeds Electro Comps.	312-625-3800
IL	Schaumburg, QPS Elctrns., Inc.	708-884-6620
MD	Columbia, GRS Elctrns.	301-995-6744
MN	Plymouth, Leeds Electro Comp.	612-557-1277
NJ	Camden, GRS Elctrns.	609-964-8500
NY	Farmingdale, Bulbtronics	516-249-2272
OR	Beaverton, Rose Elctrn. Distrbg. Co.	503-629-9288
PA	Reading, GRS Elctrns.	215-375-4477
TX	Richardson, Component Technlg. Corp.	214-437-2211
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Can	Scarborough, Ont., Carsten Elctrns. Ltd.	416-495-7705
Can	St. Laurent, Que., Carsten Elctrns.	514-334-8321
Can	St. Laurent, Que., ZEI Electronicsm Inc.	514-342-6211
Can	Surrey, B.C., Memco Corp.	604-590-1553

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IDEASSOCIATES, INC., 29 Dunham Rd., Billerica, MA 01821, Tel: 508-663-6878, TELEX: 4979780, FAX: 508-663-8851; Empl.: 1500; *Sls. Mgr.:* Nora Feldman Gildea, VP Sls. & Mktg.

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CO	Lakewood, T.M.M.I.	303-232-1516
FL	West Palm Beach, Boggs & Assocs.	407-478-8062
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Local Sales Offices & Reps

CA Dana Point, PCA Mktg. & Sls. Engrg. 714-493-9822,FAX:714-240-1894
CA San Diego, K-Tronics 619-549-7155, FAX:619-578-0063
CA Santa Clara, Pinnacle Sls. 408-249-7400, FAX:408-249-5129
CO Westminster, Straube Assocs. Mountain States, Inc. 303-426-0890,FAX:303-426-0896
CT Glastonbury, Liberty Electro Mktg. 203-657-8023
GA Norcross, Mountain Electro Mktg. 404-448-5594, FAX:404-448-8230
IL Deerfield, Brock & Cushman 708-405-9777, FAX:708-405-9778
IN Granger, Gregory Sls. Co. ..... 219-272-9626, FAX:PRESS 5 & *
MA Topsfield, Liberty Electro Mktg. 508-887-6655, FAX:508-887-2329
MI Brighton, A.P. Assocs. 313-229-6550, FAX:313-229-9356
MN Edina, GP Sales, Inc. 612-831-2362, FAX:612-831-2619
MO Florissant, Delltron 314-839-0033, FAX:314-839-4290
NJ Dyno-Rep, Inc. ..... „201-874-5254
NJ Cherry Hill, Vantage Sls. Co. 609-424-6777, FAX:609-424-8909
NY Glen Cove, Dyno-Rep 516-676-1598, FAX:516-676-4355
OH Delaware, Bill Romine Co. 614-363-1600, FAX:614-363-1085
OK Tulsa, Comptech 918-622-7744, FAX:918-660-0340
TX Austin, Comptech 512-343-0300, FAX:512-345-2530
TX Houston, Comptech 713-492-0005, FAX:713-492-6116
TX Irving, Comptech 214-751-1181, FAX:214-550-8113
UT Salt Lake City, Straube Assocs. Mountain States, Inc. 801-263-2640,FAX:801-261-5846
VA Front Royal, Eltron Sls. Inc. 703-635-7201, FAX:703-635-1933
Can Pointe Claire, Que., Interep Technlgs. Ltd. 514-694-6544,FAX:514-694-2778

Local Distributors

AZ Phoenix, Force Electronics 609-437-1060, FAX:609-437-2369
AZ Tempe, Harper S.I.D. 1-800-442-7737
CA Compton, Harper S.I.D. (H.Q.) 213-979-5090, FAX:213-632-1034
CA El Segundo, Force Electronics 213-772-1324, FAX:213-536-0139
CA San Diego, Harper SID 619-578-2500, FAX:619-566-2923
CA San Jose, Compass Comps. 408-432-7575, FAX:408-432-8013
CA San Jose, Daine Prods. 408-265-7220, FAX:408-265-1038
CA San Jose, Harper SID 408-943-9490, FAX:408-943-1663
CA Santa Clara, DC Elctrns. 408-980-1199, FAX:408-980-9573
CT Southbury, Heiland Electronics 203-262-1700, FAX:203-264-0770
GA Norcross, Applied Power 404-263-0421, FAX:404-242-8316

IL Palatine, OHM Electronics 708-359-5500, FAX:708-359-9686
MA Ashland, Quality Components 508-881-6504, FAX:508-881-1704
MA Ashland, Quality Comps., Inc. 508-881-6504, FAX:508-881-1704
MA Westborough, In-Stock Prods. 508-870-5750, FAX:508-870-0573
MA Wilmington, Heiland Electronics 508-657-4870, FAX:508-658-0278
MA Winchester, Webb Distbn., Inc. 617-729-5800, FAX:617-729-6839
MN Fridley, Voyager Elctrns. 612-571-7766,F, 612-571-9519
MO St. Louis, Beckwith Elec. 314-343-6463, FAX:314-343-7026
NJ West Berlin, GCI Corp. 609-768-6767, FAX:609-768-3649
NY Ronkonkoma, Conco Elctrns. 516-467-8200, FAX:516-467-3165
OH Cincinnati, Hughes-Peters 513-351-3000
OH Columbus, Hughes-Peter Inc. 614-294-5351, FAX:614-294-7115
OK Tulsa, Carlton-Bates 918-250-1626, FAX:918-250-1178
PA Norristown, Century Elctrns. Comp. 215-631-5400, FAX:215-631-5406
TX Farmers Branch, Force Electronics 214-247-9955, FAX:214-247-0619
TX Houston, Force Electronics 713-561-8644
TX Irving, Harper SID 214-621-0500, FAX:214-929-1015
UT Salt Lake City, Standard Supply 801-486-3371, FAX:801-466-2362
VA Charlottesville, Virginia Elctrn. Comp. 804-296-4184,FAX:804-971-8411
WA Redmond, Priebe Elctrns. 206-881-2363, FAX:206-881-0508
Can St. Laurent, Que., ZEI Electronics 514-342-6211, FAX:514-342-4073

INDEPENDENT CABLE, INC., 43 Broad St., Hudson, MA 01749, Tel: 508-562-9913, TELEX: 508-562-9917; Empl.: 120; *Sls. Mgr.:* R. David Gates

INDIANA MICROELECTRONICS CENTER CORP. FOR SCIENCE & TECHNOLOGy, 118 East Ludwig Rd., Fort Wayne, IN 46825, Tel: 219-482-8200, FAX: 219-482-8800; Empl.: 6

INDUCTOR SUPPLY, 1849 W. Sequoia Ave., Orange, CA 92668-1017, Tel: 714-978-2277, 800-854-1881, 800-472-8421, FAX: 714-978-2411; Empl.: 25; *Sls. Mgr.:* Neal McDonald

Industrial Computer Designs

FAX: 818-889-1490

INDUSTRIAL COMPUTER DESIGNS, INC., 31355 Agoura Road, Westlake Village, CA 91361, Tel: 818-889-3179, 800-423-3179; Empl.: 35; *Sls. Mgr.:* Jerry Becker ..... **D•1179**

Local Sales Offices & Reps

CA Corte Madera, Perx, Inc. 415-927-0155
CA San Diego, Indl. Computer Source 619-279-0084
CA Santa Cruz, Digital Distrs. 408-423-1556
OR Portland, D.Treichel & Co. 503-239-5403

INDUSTRIAL COMPUTER SOURCE, 4837 Mercury Street, San Diego, CA 92111, Tel: 619-279-0084, FAX: 619-541-1138; FSC No.: 7042; Empl.: 55; *Sls. Mgr.:* Nate Bailey

INDUSTRIAL CONTROL CO., 3100 Suntree Blvd., Rockledge, FL 32955, Tel: 407-259-7105; FSC No.: 90081; Empl.: 15; *Sls. Mgr.:* I. Nobilio

INDUSTRIAL CPU SYSTEMS, INTL., 111 W. Dyer Rd., Ste. D, Santa Ana, CA 92707, Tel: 714-957-2815, FAX: 714-957-3128; Empl.: 8; *Sls. Mgr.:* Dick McCormick

INDUSTRIAL DEVICES CORPORATION, 64 Digital Drive, Novato, CA 94949-5728, Tel: 415-883-3535, 800-747-0064, FAX: 415-883-2094; Empl.: 42; *Sls. Mgr.:* Louis G. Walton

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AL Huntsville, Hughes Assocs., Inc. 205-533-9108
CA San Diego, Universal Comps. Co. 619-232-5163
AZ Tempe, WestRep 602-820-9932
CA Santa Clara, WestRep 408-988-8833
CA Torrance, Universal Comps. 213-783-0220
CO Littleton, Harthun Assocs., Inc. 303-792-5545
FL Tamarac, Hughes Assocs. Inc. 305-720-1674
IN Indianapolis, Needler Sls. Co., Inc. 317-255-8056
IA Cedar Rapids, KKB, Inc. 313-373-1730
MD Columbia, PSA, Inc. 215-245-0513
MA Westborough, Anchor Engrg. 617-870-0573
MI E. Detroit, Fred Harris & Assocs. 313-776-5430
MN Minneapolis, Elec. Comp. Sls. 612-933-2594
MS Corinth, Hughes Assocs., Inc. 601-287-2915
MO Blue Springs, KKB, Inc. 816-229-0001
MO St. Louis, KKB, Inc. 314-647-2000
NY Glen Cove, Dyno-Rep 516-676-1598
NY Rochester, Apex Assocs. 716-254-6050
NC Cary, Hughes Assocs., Inc. 919-467-7029
OH Dayton, J. C. Hofstetter Co. 513-296-1010
OH Medina, J. C. Hofstetter Co. 216-241-4880
OR Hillsboro, Temco Northwest 503-649-8375
PA Hickory, J. C. Hofstetter Co. 412-356-2305
PA Trevose, PSA, Inc. 215-245-0513
TN Knoxville, Hughes Assocs., Inc. 615-558-0283
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TX Houston, R. F. Kimball Co. 713-580-5754
TX Richardson, R. F. Kimball Co. 214-231-3447
VA Oakton, PSA, Inc. 301-953-4884
WA Bothell, Temco Northwest 206-821-5434
WA Hillsboro, Temco Northwest 503-645-2030
WI Brookfield, Rendell Sls. Co. 312-782-3954

Local Distributors

AL Huntsville, Allied Elctrns. 205-721-3500
AZ Phoenix, Dalis Elctrn. Supp. 602-275-2885
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CA Los Angeles, Elec. Switches 213-664-1141
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CA Sacramento, Zack Elctrns. 916-446-3131
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CA San Diego, Sigma Elctrns. 714-565-2000
CA San Francisco, Zack Elctrns. 415-626-1444
CA San Jose, Quement Elctrns. 408-998-5900
CA San Jose, Rose Elctrn. Distrbg. Co. 408-943-0255
CA Santa Ana, Sunray Lighting, Inc. 714-556-3630
CA Tustin, Allied Elctrns. 714-669-4190
CO Arvada, Denver Beta 303-431-7161
CO Denver, Allied Elctrns. 303-790-1662
CO Denver, Con. Parts 303-623-5313
CT Bridgeport, Park Distrs. 203-366-7200
CT Wallingford, Sager Electrical Supp. 203-265-4600
FL Pompano Bch., Allied Elctrns. 305-978-3008
FL Tampa, Specialty Distrbg. Co. 813-870-3315
FL W. Palm Beach, Atlantic Elctrns. 407-686-8553
GA Atlanta, Wholesale Indl. Elec. 800-282-1857
GA Norcross, Whitehead Elctrns. 404-923-6667
ID Boise, Radar/Elec. 208-336-2322
IL Crystal Lake, Sub-Sem 312-782-3954
IL Elgin, Allied Elctrns. 312-697-8200
IL Rockford, Mid-West Associated 815-962-8036
IL Villa Park, Melvin Elctrns. 312-279-5015
IL Wheeling, Hawk Elctrns. 800-843-4295
IL Wood Dale, Electro-Kinetics 312-595-6700
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IN Fort Wayne, Bell Inds. 219-423-3422
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IN Indianapolis, MAR Elctrns., Inc. 317-633-6699
IN South Bend, Genesis Elctrns. 219-287-2911
IA Cedar Rapids, Dee Elctrns. 319-365-7551
KY Bowling Green, Crescent Elctrns. 502-842-2444
LA Lafayette, Ralph's 318-234-4507
MD Baltimore, PEI/Genesis 301-931-8280
MD Columbia, Sager Elctrns. 301-995-6580
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Norwood, Gerber Elctrns. 617-329-2400
MA Worcester, Coghlin Elect. 617-756-8311
MI Flint, Shand Elctrns. 313-743-8940
MI Livonia, RS Elctrns. 313-525-1155
MI Livonia, Shand Elctrns. 517-799-2527
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MN Minneapolis, Elctrn. Center 612-371-5200
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MS Columbus, Bluff City Elctrns. 601-328-6212
MO Kansas City, Chelsea Inds. 816-842-8556
MO Maryland Hgts., Chelsea Inds. 314-997-7709
MO St. Louis, Van Sickle Radio-Elec. 314-621-5000
NE Lincoln, Scott Elctrn. Supp. 402-466-8221
NH Salem, Sager Elctrns. 603-898-1348
NJ Hanover, State Elctrns. Parts 201-887-2550
NJ Oakland, Relay Spec. 201-337-1000
NY Albany, E. E. Taylor Co. 518-438-7811
NY Buffalo, Summit Distrs. 716-887-2800
NY Hauppauge, Broadline Elctrns. 516-231-4100
NY Hauppauge, Sager Elctrl. Supply Co. 516-348-1300
NY Hempstead, Elctrn. Equip. 800-645-1605
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rochester, Summit Elctrns. 716-334-8110
NC Raleigh, Sager 919-850-9550
NC Raleigh, Southeastern Radio Supp. 919-828-2311
OH Cincinnati, Hughes-Peters 513-351-2000
OH Columbus, Hughes Peters 614-294-5351
OH Dayton, Stotts-Friedman Co. 513-298-5555
OH Warren, REM Elctrns. 216-373-1300
OK Tulsa, PEI Genesis 918-622-8520
OR Portland, United Radio Supp. 503-233-7151
PA Erie, REM Elctrns. 814-453-5626
PA Harrisburg, Cumberland Elctrns. 717-233-5883
PA Mars, Sager Elctrns. 412-772-2233
PA McKean, Advacom, Inc. 814-476-7774
PA Philadelphia, PEI/Genesis 215-673-0400
SC Columbia, Dixie Radio Supp. 803-779-5332
TN Memphis, Bluff City Elctrns. 901-345-9500
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TX Ft. Worth, Allied Elctrns. 817-336-5401
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TX San Antonio, Sherman Elctrns. Supp. 512-224-1004
UT Salt Lake City, Standard Supp. 801-486-3371
VA Glen Allen, Hermitage Distrs. 804-798-3830
WA Redmond, Murphy Elctrns. 206-881-1234
WA Seattle, Allied Elctrns. 206-547-2827
WA Seattle, Radar Elec. 206-282-2511
WA Spokane, Radar Elec. 509-747-3053
WI Milwaukee, Marsh Elctrns. 414-475-6000

INDUSTRIAL DIELECTRICS, INC., P.O. Box 357, Noblesville, IN 46060, Tel: 317-773-1766, FAX: 317-773-3877; Empl.: 250; *Sls. Mgr.:* Tom Merrell; *Dist. Mgr.:* Tom Merrell

FAX: 703-731-0847

INDUSTRIAL DRIVES, A Kollmorgen Div., 201 Rock Rd., Radford, VA 24141, Tel: 703-639-2495; FSC No.: 11384; Empl.: 343; *Sls. Mgr.:* Robert White, Jr. ..... **B•1276-1277**

Local Sales Offices & Reps

CA Laguna Hills, Industrial Drives 714-581-3626
CA Laguna Hills, Western Automation 714-859-6988
CA Milpitas, Maxim Elctrn. Sls. 408-946-6001
CO Longmont, Piper Sls. Co. 303-443-5337
CT Madison, Tedicko, Inc. 203-644-4330
FL Sarasota, Indl. Apparatus Co. 813-377-2482
GA Atlanta, Industrial Apparatus Co. 404-875-8086
IL Arlington Hgts., Industrial Drives 708-981-1433
IN Indianapolis, J.N. Fauver Co. 317-872-3060
MD Annapolis, Homersmith, Inc. 301-269-6493
MA Topsfield, Whitehead Assocs. 508-887-8050
MI Madison Hgts., J.N. Fauver Co. 313-585-5252
MN New Brighton, The Mackubin Grp. 612-636-5533
MO St. Charles, Drives Plus, Inc. 314-441-7765
NJ Ridgewood, Brundage Assocs. 201-445-3897
NJ Williamstown, Homersmith, Inc. 609-629-0606
NY E. Rochester, A&D Devices 716-385-2778

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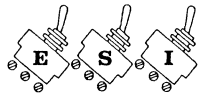

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TX Dallas, Kruvand Assocs.,Inc. 214-437-3355
UT Salt Lake City, Piper Sls. 801-466-9336
VA Radford, The Hatfield Co. 703-639-5471
WA Bellevue, Thorson Co. N.W. 206-455-9180
WI Pewaukee, Indl. Drives 414-691-7399

Local Distributors

AZ Phoenix, Air-Draulics Co. 602-254-8414
CA Anaheim, Minarik Elec. Co. 714-994-2251
CO Denver, Warren Fluid Power 303-377-2736
DE New Castle, J.C. Bennington Co. 302-322-3700
IL Chicago, Kelburn Engrg. Co. 312-775-8383
IN Indianapolis, J. N. Fauver Co. 317-872-3060
MI Flint, J. N. Fauver Co. 313-235-2501
MI Kentwood, J. N. Fauver Co. 616-957-5177
MI Madison Heights, J. N. Fauver Co. 313-585-5252
MI Saginaw, J. N. Fauver Co. 517-753-0474
MO St. Charles, Direct Elec. Co. 314-949-1164
NY Elmira, Wehle Elec. Co., Inc. 607-733-6646, 800-272-6900
OH Cincinatti, J. N. Fauver Co. 513-247-9900
OH Dayton, J. N. Fauver Co. 513-236-3554
OH Hilliard, J. N. Fauver Co. 614-777-2225
OH Northwood, J. N. Fauver Co. 419-666-3404
OH Stow, J. N. Fauver Co. 216-923-8855
TX Dallas, Cates Drives & Controls 214-960-1961
Can Oldcastle (Windsor), Ont., J. N. Fauver Co. 519-737-6925

INDUSTRIAL ELECTRONICS CORP., 24175 Gibson Drive, Warren, MI 48089, Tel: 313-759-4450, FAX: 313-759-1589; Empl.: 30; *Sls. Mgr.:* Allen A. Russell

INDUSTRIAL INDEXING SYSTEMS, INC., 626 Fishers Run, Victor, NY 14564, Tel: 716-924-9181, FAX: 716-924-2169; Empl.: 40; *Sls. Mgr.:* Andrew Kohn

INDUSTRIAL SERVICE TECHNOLOGY, 3286 Kentland Ct. SE, Grand Rapids, MI 49548, Tel: 616-247-1033; Empl.: 13; *Sls. Mgr.:* Julie A. Corby

Powertron

FAX: 516-883-7155

INDUSTRIAL TEST EQUIPMENT CO., Inc., 21 Yennicock Ave., Port Washington, NY 11050, Tel: 516-883-1700; FSC No.: 99074; *Sls. Mgr.:* Jay Monroe ..... **D•1266, 2204-2207**

INDUSTRIAL TIMER CO., 30 Industrial Park Rd., P.O. Box 307, Centerbrook, CT 06705, Tel: 203-767-7130, FAX: 203-767-9137; Empl.: 55; *Sls. Mgr.:* Ann Fraser Carroll

INERTIAL MOTORS, 280 N. Broad St., Doylestown, PA 18901, Tel: 215-345-1010, TELEX: 83-1633, FAX: 215-345-0111; Empl.: 14; *Sls. Mgr.:* Joanne Dorr

INFICON LEYBOLD-HERAEUS, INC., See Leybold Inficon, Inc.

INFINETICS INC., Friskem Div., 201 Vandever Ave., Wilmington, DE 19802, Tel: 302-658-2471, FAX: 302-658-2475; *Sls. Mgr.:* M. Schwartz

INFODEX
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FAX: 203-879-4944(x230)

INFODEX, INC., 10 Venus Dr., Wolcott, CT 06716, Tel: 203-879-4944; FSC No.: 09087; Empl.: 42; *Sls. Mgr.:* Robert Vance ..... **B•1016-1017, 1090**

Local Sales Offices & Reps

MA Medfield, Nortech Engrg. Sls. 508-359-6063

INFO-LITE CORP., See Dio-Rey and Crosspoint

INFOMETRIX, 2200 Sixth Ave. No. 833, Seattle, WA 98121, Tel: 206-441-4696, FAX: 206-441-0841; Empl.: 10; *Sls. Mgr.:* Paul Bailey

INFOPRINT, INC., Micro Electronic Business, Inc., 4315 N. Elston Ave., Chicago, IL 60641, Tel: 312-539-6045, FAX: 312-539-6645 ..... **D•1097**

INFORMATION CONTROL CORP., 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234, FAX: 203-368-3747; Empl.: 50

INFORMATION TRANSFER INC., Box 357, Bloomfield, NY 14469, Tel: 716-657-7074, FAX: 716-657-7432; FSC No.: 55137; Empl.: 50; *Sls. Mgr.:* John Dillman ..... **D•1180-1181**

Local Sales Offices & Reps

AZ Chandler, VIC Myers Assocs. 602-345-6449
CA Montrose, Luscombe Engrg. 818-249-9000
CA San Diego, Luscombe Engrg. 619-292-4337
CO Denver, VIC Myers Assocs. 303-730-7313
CA Sunnyvale, Westech 408-735-8647
FL Winter Park, Wade H. Boggs, Inc. 407-647-2226
NM Albuquerque, VIC Myers Assocs. 505-884-6878
TX El Paso, VIC Myers Assocs. 505-884-6878
WA Bellevue, Tasco 206-453-1414

INFRANOR, 45E Great Hill Road, Naugatuck, CT 06770, Tel: 203-729-8258, 800-BE-SERVO, FAX: 203-729-6969; Empl.: 11 ..... **B•1279**

Local Sales Offices & Reps

IL Arlington Hgts., Infranor Inc. 312-870-0818
OH Columbiana, Infranor Inc. 216-482-9286

INFRARED INDUSTRIES, INC., 12151 Research Parkway, Orlando, FL 32826, Tel: 407-282-7700, FAX: 407-273-9046; Empl.: 50

ING. F. P. KOGL, Weissenwolffstr.14, 4221 Steyregg, Steyregg, Austria, Tel: 732-640-591-0, FAX: 732-640-592-5; Empl.: 8; *Sls. Mgr.:* Ing. Franz Peter Kogl; *Dist. Mgr.:* Mrs. Michaela Eibl

INJECTORALL ELECTRONICS (WOMAN OWNED), 110 Keyland Court, Bohemia, NY 11716, Tel: 516-563-3388, FAX: 516-563-3389 ..... **C•1147**

Local Distributors

AL Birmingham, ACK Radio Supp. 205-322-0588
AZ Tucson, Electronic City 602-622-1173
CA San Luis Obispo, Midstate Elctrns. Supp. 805-543-2770
CA San Rafael, Elctrns. Plus 415-457-0466
CA Sunnyvale, Halted Specialties 408-732-1573
IL Lombard, NyTron Elctrns. 312-691-8900
IN Evansville, Tri-State Supp. Co. 812-423-4257
IA Cedar Rapids, Iowa Radio Supp. Co. .. 800-332-5296
KY Louisville, P.I. Burkes 502-589-3960
MD Rockville, Capitol Radio Whlsrs. 301-881-2270
MA Needham, Y.D.I. 617-449-1005
MI Canton, The Elctrn. Connection 313-595-6655
NY Lindenhurst, RNJ Elctrns. 516-226-2700
NY Long Island City, Typeco 718-706-6666
NY Richmond Hill, Anchor 212-846-2420
NC Charlotte, Slayton Elctrns. 704-375-6600
OK Oklahoma City, Radio Supp., Inc. 405-332-6127
OR Beaverton, Norvac 503-644-1025
SC Charleston, Wholesale Indl. Elctrns. ... 803-722-2634
TX Fort Worth, Sweico 817-335-6521
VA Roanoke, H. C. Baker 703-344-9209

INLAND MOTOR
KOLLMORGEN CORPORATION

FAX: 602-458-2161

INLAND MOTOR, Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635, Tel: 602-459-1150, TWX: 910-973-9869; FSC No.: 11384; Empl.: 580 ... **B•1280-1282**

Local Sales Offices & Reps

FL Deerfield Beach, Technlg. Mktg. Assocs. 305-427-1090
IA Grimes, Drives Plus 515-986-3991
PA Media, Homersmith, Inc. 215-543-2434
FL Orlando, Technlg. Mktg. Assocs. 407-857-3760
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MI Farmington Hills, Carter, McCormic & Peirce, Inc. 313-477-7700
FL Largo, Technlg. Mktg. Assocs. 813-531-4405
KS Kansas City, Drives Plus 913-268-5410
MN New Brighton, Motion Technlgs., Inc. .. 612-631-3069
NJ Williamstown, Homersmith, Inc. 609-629-0606
MO St. Charles, Drives Plus 313-441-7765
OH Medina, Cygnus Inc. 216-725-1663
PA Downingtown, Homersmith, Inc. 215-269-3637
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AL Huntsville, Technology Mktg. Assocs. 205-882-6162
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CA Alhambra, Thorson Co. of Southern CA 818-281-2280
CA Goleta, Thorson Co. of Southern CA .. 805-964-8751
CA La Jolla, Thorson Co. of San Diego ... 619-292-8525
CA Mtn. View, Thorson West 415-964-9300
CA Signal Hill, Thorson Co. of Southern CA 213-595-0361
CO Englewood, Thorson Rocky Mt., Inc. .. 303-799-3435
GA Norcross, Technlg. Mktg. Assocs. 404-446-3565
IA Cedar Rapids, Carlson Elctrn. Sls. 319-378-1450
IL Elk Grove Vl, Carlson Elctrn. Sls. 708-956-8240
IN Indianapolis, Precision Elctrns. 317-842-3740
MA Needham Hgts., Vanguard Elctrns. Corp. 617-449-5578
NJ Wayne, SHL Assocs., Inc. 201-790-1714
NY E. Rochester, A & D Dvcs. 716-385-2778
NC Jamestown, Homersmith, Inc. 919-337-3370
OR Beaverton, Thorson Co. Northwest ... 503-644-5900
UT Salt Lake City, Thorson Rocky Mt., Inc. 801-973-7969
WA Bellevue, Thorson Co. Northwest 206-455-9180
WI Milwaukee, Carlson Elctrn. Sls. 414-476-2790

INMARK CORP., 4 Byington Pl., Norwalk, CT 06854, Tel: 203-866-8474, FAX: 203-866-0918; *Sls. Mgr.:* Roger Hibbert

INMOS CORP., P.O. Box 16000, Colorado Springs, CO 80935, Tel: 719-630-4000 (ext 4357), FAX: 719-630-4325; Empl.: 120; *Sls. Mgr.:* Richard Riker; *Dist. Mgr.:* David Bowers

INNOVATEK MICROSYSTEMS, INC., Smithfield Rd., R1 Box 104, Millerton, NY 12546-9720, Tel: 914-373-9003; Empl.: 8; *Sls. Mgr.:* Paul F. Fitts

INNOVATIVE ELECTRONICS, INC., Dynatech Corporation, 10110 USA Today Way, Miramar, FL 33025, Tel: 305-432-0300, FAX: 305-432-0705; Empl.: 40; *Sls. Mgr.:* Marshall Roper

INNOVUS, 1756 Junction Ave., Ste. E, San Jose, CA 95112, Tel: 408-436-7790, FAX: 408-436-8185; Empl.: 15

INRECO, See Ransco Industries

INRESCO, INC., 2411 Atlantic Avenue, Manasquan, NJ 08736, Tel: 908-223-6330, FAX: 908-223-2571; Empl.: 16

INSERVO, INC., 128 Commerce Drive, Box 110, LaGrange, OH 44050, Tel: 1-216-355-5102, FAX: 1-216-355-5342; Empl.: 70; *Sls. Mgr.:* Sandra Affolter

INSTANT BOARD CIRCUITS GRP., 20 A Pamaron Way, Novato, CA 94949, Tel: 415-883-1717, FAX: 415-883-2626; Empl.: 13

INSTRULAB, P.O. B. 98, Dayton, OH 45404, Tel: 513-223-2241; Empl.: 22; *Sls. Mgr.:* Fred Pummill

INSTRUM, MDH Industries, Inc., 426 W. Duarte Rd., Monrovia, CA 91016, Tel: 818-303-4210, TELEX: 182910, FAX: 818-357-8863; *Sls. Mgr.:* Craig Rahn

ICS

FAX: 708-543-6244

INSTRUMENTATION & CONTROL SYS., ICS.Inc., 520 Interstate Rd, Addison, IL 60101, Tel: 708-543-6200, TELEX: 271503 ICS UR; Empl.: 30; *Sls. Mgr.:* Harold Miller ..... **B•1504-1505; D•2208-2209**

Local Distributors

FL Largo, Allied Elctrns. 813-541-4660
IL Chicago, Leeds Electro Comps. 312-625-3800
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Allied Elctrns. 317-875-0448
MA Norwood, Allied Elctrns. 617-255-0361
MN Eden Prairie, Allied Elctrns. 612-829-7554
NJ Audubon, Universal Elctrn. Supp. ... 1-800-327-3529
NJ Mt. Laurel, Allied Elctrns. 609-234-7769
NY Fairport, Allied Elctrns. 716-425-3850
OH Solon, Allied Elctrns. 216-248-4200

PA Pittsburgh, Allied Elctrns. 412-367-4124
WI Green Bay, Power/Mation 414-496-0944

Local Sales Offices & Reps

Timer Representatives
CA Arcadia, HMC, Inc. 818-447-0958

UPS Representatives
TX Houston, Gettys-Eads-Adair 713-827-7155
AL Huntsville, Allied Elctrns. 205-721-3500
CA Canoga Park, C & A Elctrns. 818-340-6022
CA Fremont, Allied Elctrns. 415-770-0590
CA Tustin, Allied Elctrns. 213-860-0090
CO Englewood, Allied Elctrns. 303-790-1664
FL Pompano Bch., Allied Elctrns. 305-978-3008
GA Duluth, Allied Elctrns. 404-497-9544
GA Roswell, Henderson Ind. Equip. 404-552-0185
IL Berwyn, B-B & W, Inc. 312-749-1710
IL Rockford, Power/Mation 515-397-0510
IL Rosemont, Advent Elctrns. 312-297-6200
IA Cedar Rapids, Advent Elctrns. 319-363-0221
IL Wood Dale, Allied Elctrns. 708-860-0007
MD Columbia, Allied Elctrns. 301-381-1560
MI Farmington Hills, Advent Elctrns. 313-447-1650
MN St. Paul, Powermation 612-645-0781
NY Hauppauge, N & L Instrs. 516-234-9797
NY Mineola, Allied Elctrns. 516-248-2360
NC Raleigh, Allied Elctrns. 800-638-1381
OH Chagrin Falls, Comm-Omni 216-543-1328
OH Warren, REM Elctrn. Supp. Co., Inc. ... 216-373-1300
TX Brownsville, Garden Indl. Grp. 512-546-1612
TX Dallas, Wofford Elctrns. 214-320-0294
TX Ft. Worth, Allied Elctrns. 817-336-5401, 214-265-9341
TX Ft. Worth, Allied Export Svcs. 817-336-5401
WA Seattle, Allied Elctrns. 206-547-2827
WI Fond du Lac, Fedco Elctrns. 414-922-6490
WI Waukesha, Powermation 414-542-2868

INSTRUMENTATION MEAS. LAB., See Lockheed Electronics Co., Inc.

INSTRUMENTATION SERVICES, INC., 957 Winnetka Ave. N., Minneapolis, MN 55427, Tel: 612-544-8916, FAX: 612-544-4887; Empl.: 30; *Sls. Mgr.:* G. Ryan

INSTRUMENT DESIGN ENGINEERING ASSOCS., INC., See IDEA, Inc.

INSTRUMENTED SENSOR TECHNOLOGY, INC., 1305 S. Cedar St., Lansing, MI 48910, Tel: 517-371-1980, TELEX: 517-371-1244; Empl.: 10

INSTRUMENT ENCLOSURES, 9767 Glenoaks Blvd., Sun Valley, CA 91352, Tel: 818-768-4622, FAX: 818-767-4988; FSC No.: 62012; Empl.: 35; *Sls. Mgr.:* Guy Crutchfield

INSTRUMENT RESEARCH CO., Box 40207, Santa Barbara, CA 93103, Tel: 805-962-8336; Empl.: 6

INSTRUMENT RESISTOR CO., See INRESCO/Instr. Resistor

INSTRUMENTS, INC., 7263 Engineer Rd., Ste. G, San Diego, CA 92111, Tel: 619-571-1111, FAX: 619-571-0188; FSC No.: 34563; Empl.: 28; *Sls. Mgr.:* Ken Kalbfell

INSTRUMENTS & CONTROLS DIV., See Technology Systems Div., KRUG Intl.

FAX: 516-467-8558

INSTRUMENTS FOR INDUSTRY, INC., 731 Union Parkway, Ronkonkoma, NY 11779, Tel: 516-467-8400; Empl.: 25 ..... **D•1012**

Local Sales Offices & Reps

AL Eva, Barr Elctrn. Instrs. 205-796-7533
AZ Mesa, DJM Elctrns. 602-820-4030
CA Valencia, DJM Elctrns. 805-254-2677
CO Englewood, R.A. Mayes Co. 303-761-9447
FL Barr Elctrns. 407-723-4109
IA Hiawatha, EIR Co. 319-395-4500
KS Lenexa, KJS Mktg. 913-962-1795
MD Beltsville, Applied Engrg. 301-595-5393
MO Leasburg, KJS Mktg. 314-245-6579
NH Hudson, EMC Sls., Inc. 603-672-4455
NJ N. Plainfield, Brady Co. 201-755-7900
NM Albuquerque, Mesa Tech. Corp. 505-883-8833
NC Winston-Salem, Scientific Dvcs. S.E. .. 919-859-0868
PA Sewickley, Teplitz/Byrne Assocs. 412-741-3628
TX Richardson, Scientific Dvcs. 214-231-8106
WA Seattle, Del Black Assocs. 206-788-6131
Can Nepean, Ont., Multilek, Inc. 613-226-2365

INSTRUMENT SOCIETY OF AMERICA, P.O. Box 12277, Research Triangle Park, NC 27709, Tel: 919-549-8411, TELEX: 802-540, FAX: 919-549-8288; Empl.: 102

Instrument Specialties Co., Inc.

FAX: 717-424-6213

INSTRUMENT SPECIALTIES CO. HEADQUARTERS, P.O. Box A, Delaware Water Gap, PA 18327-0136, Tel: 717-424-8510, TWX: 510-671-4526; Empl.: 300; *Sls. Mgr.:* John Blazejewski ..... **B•1018; C•1691-1697**

Local Sales Offices & Reps

AZ Phoenix, O'Donnell Assocs. 602-944-9542
CA San Jose, O'Donnell Assocs. 408-456-2950
CA Torrance, O'Donnell Assocs. 213-539-9664
CO Englewood, D. M. Harthun Assocs., Inc. 303-792-5050
FL Boca Raton, Kinetic Sls., Inc. 407-368-7373
ID Boise, Temco Northwest 208-345-2051
KS Wichita, Thunderbird Tech. Sls. 316-636-5018
MN St. Paul, Arkco Sls. 612-777-7454
MO Maryland Heights, Thunderbird Tech. Sls. 314-298-8940
NM Albuquerque, O'Donnell Assocs. S.W. 505-889-4522
OR Hillsboro, Temco Northwest 503-645-2030
TX Dallas, J. M. Spell 214-620-0040
WA Bothell, Temco Northwest 503-645-2030
WA Spokane, Temco Northwest 509-927-9392
Can Pickering, Ont., A. C. Simmonds & Sons, Ltd. 416-839-8041

INSTRUMENT SPECIALTIES CO., Western Div., 505 Porter Way, Placentia, CA 92670, Tel: 714-579-7100, FAX: 714-579-7105; Empl.: 25; *Sls. Mgr.:* William Oliver; *Dist. Mgr.:* Phil Strong

INSULATON COMPONENTS ASSOCIATES, INC., P.O. Box 4849, Downey, CA 90241, Tel: 213-861-7268, FAX: 213-861-7265

INSULCAST, Permagile Inds. Inc., 101 Commercial St., Plainview, NY 11803, Tel: 516-349-1100, TELEX: 221720 PERM UR, FAX: 516-349-1156; FSC No.: 13549; *Sls. Mgr.:* William P. Flaim, Natl. Sls. Mgr.

FAX: 206-284-3705

INTAQ KEY PANELS, GM Nameplate, Inc., 2040 15th Ave. W., Seattle, WA 98119, Tel: 206-284-5475; FSC No.: 9905; Empl.: 350; *Sls. Mgr.:* Alan Burk ..... **B•1815**

Local Sales Offices & Reps

AZ Tempe, Elctrn. Dev./Sls. 602-438-1547
AL Huntsville, JWL Assocs. 205-883-1712
CA San Diego, Omni 619-268-9606
CA San Jose, G M California 408-435-1666
CA Irvine, Balzer-Wolf Assoc. 714-261-6877
CO Englewood, Delltron 303-741-2122
FL St. Petersburg, Gulfport & Tech. Sls. .. 813-573-3910
HI Honolulu, Menehune Unlimited 808-737-3472
ID Eagle, GM/West 208-939-7202
IL Elgin, BK/Custom Engrd. Pts. 708-741-8556
IN Zionsville, WK/Custom Engrd. Pts. 317-873-5626
MI Southfield, E&A Inds., Inc. 313-647-0330
MN Burnsville, Electromec Sls., Inc. 612-894-8200
MO St. Louis, Halpin D. Burke & Son 314-968-2727
NH Mt. Vernon, GM/Northeast 603-673-9737
NJ Pitman, Colrud Corp. 609-589-5866
NJ West Caldwell, Grimm, Siegel & Assoc. 201-575-9300
NC Charlotte, JWL Assocs. 704-541-5750
OH Akron, Augnat Assocs. 216-239-2499
OR Portland, GM-Portland 503-223-9879
PA Pittsburgh, Allied Entprs. 412-788-2992
TX Irving, EDS Southwest 214-929-8140
VA Reston, Colrud Corp. 703-904-0240
WA Seattle, GM Nameplate Seattle 206-284-2200
Can Richmond,B.C., Enerlev Sls. Ltd. 604-273-0882
Can Scarborough, Ont., Banks Elctrns. Ltd. 416-292-5152

INTEC CONTROLS CORP., 55 West St., Walpole, MA 02081, Tel: 508-660-1221, FAX: 508-660-2374; Empl.: 25; *Sls. Mgr.:* Bruce Manthey; *Dist. Mgr.:* Bruce Manthey

INTEGRATED CIRCUITS INC. (ICI), See Interpoint

INTEGRATED DEVICE TECHNOLOGY, INC., 3236 Scott Blvd., Santa Clara, CA 95054-3090, Tel: 408-727-6116, TWX: 910-338-2070, FAX: 408-492-8674; FSC No.: 61772; Empl.: 2090; *Sls. Mgr.:* Joe Zabkar (VP); *Dist. Mgr.:* Bill Franciscovich

INTEGRATED ENGINEERING SOFTWARE, 347-435 Ellice Ave., Winnipeg, Man., Canada R3B 1Y6, Tel: 204-942-5636, FAX: 204-944-8010; Empl.: 10; *Sls. Mgr.:* Bennetta Benson

INTEGRATED MICROWAVE

FAX: 619-755-8679

INTEGRATED MICROWAVE, 3422 Tripp Ct., San Diego, CA 92121-1009, Tel: 619-259-2600; FSC No.: 60656; Empl.: 75; *Sls. Mgr.:* Jeff Beard ... **A•1678-1679**

Local Sales Offices & Reps

AZ Tempe, Cain Technology 602-966-4322
CA Mountain View, Disman Bakner 415-969-3010
CA Orange, Cain Technology 714-997-7311
CA Van Nuys, Cain Technology 818-904-9392
FL Satellite Beach, BWS Microwave Mktg. 407-773-6170
MD Burtonsville, Mid-Atlantic Microwave Sales 301-725-3955
MA Chelmsford, Matrix Sales 508-459-4000
NJ Paramus, El-Tech Sales 916-463-2664
NY E. Syracuse, Em-Tech Assocs. 315-437-6410
PA Ft. Washington, Beta Sales 215-643-6650

INTEGRATED POWER DESIGNS, INC., 9c Princess Rd., Lawrenceville, NJ 08648, Tel: 609-896-2122, FAX: 609-895-1738; Empl.: 18; *Sls. Mgr.:* Steven Thompson

INTEGRATED TECHNOLOGIES SOLUTIONS INC., 402 Chestnut Lane, East Meadow, NY 11554, Tel: 516-481-0857, FAX: 516-292-3115; Empl.: 8; *Sls. Mgr.:* M. Lieber ..... **D•1267**

Local Sales Offices & Reps

CA Chino, Deltatec Intl. Inc. 714-551-8546

INTEGRITY TECHNOLOGY CORP., 1400 Coleman Ave., Ste. E15, Santa Clara, CA 95050, Tel: 408-262-8640, TELEX: 697-2396, ESYLNK: MCI Mail:209837, FAX: 408-262-1680; Empl.: 247; *Sls. Mgr.:* Larry Young

Local Sales Offices & Reps

CA Santa Clara, Integrity Techng. Co. 408-262-8640
CO Littleton, GLX, Inc. 303-771-3230
FL Clearwater, H.E. Johnson & Assocs. .. 813-447-7529
MA Agawam, Hi-Q Mktg. 413-789-4683
NY Wading River, Niktronics 516-929-4671

INTEK, INC., 751 Intek Way, Westerville, OH 43081, Tel: 614-895-0301, FAX: 614-895-0319; FSC No.: 6680; *Sls. Mgr.:* Robert Curry

INTELCO, 8 Craig Road, Acton, MA 01720, Tel: 508-264-4485, TELEX: 62923380, FAX: 508-264-9677; Empl.: 35

INTELLIGENCE POWER TECHNOLOGY, 829 Flynn Rd., Camarillo, CA 93012, Tel: 805-484-4441, FAX: 805-987-0271; Empl.: 22; *Sls. Mgr.:* K. Iwan

INTELLIGENT INSTRUMENTATION/BURR-BROWN, 1141 W. Grant Road,MS 131, Tucson, AZ 85705, Tel: 602-624-2434, FAX: 602-623-8965; *Sls. Mgr.:* Bill McGovern ..... **D•1637-1639**

INTELLIGENT INTERFACES, INC., P.O. Box 1486, Stone Mountain, GA 30086, Tel: 404-381-9891, 1-800-842-0888; FSC No.: OA4H9; Empl.: 3; *Sls. Mgr.:* Robert E. Jarvis

INTELLUTION, INC., 315 Norwood Park South, Norwood, MA 02062, Tel: 617-769-8878, TELEX: 940-103, FAX: 617-769-1990; *Sls. Mgr.:* Jeff Cassis; *Dist. Mgr.:* Jeff Cassis

INTEPRO SYSTEMS INC., Six Fortune Dr., Billerica, MA 01821, Tel: 508-663-7555, FAX: 508-663-7558; Empl.: 50; *Sls. Mgr.:* Mike O'Connor; *Dist. Mgr.:* Mike O'Connor

INTERACTION SYSTEMS INC., 86 Coolidge Ave., Watertown, MA 02172, Tel: 617-923-6001, FAX: 617-923-2112 ..... **D•1098**

INTERACTIVE CIRCUITS SYSTEMS LTD., 5430 Canotek Rd., Gloucester,Ont., Canada K1J 9G2, Tel: 613-749-9241, 1-800-267-9794, FAX: 613-749-9461; Empl.: 20

INTERACTIVE COMPUTER PRODUCTS, INC., 23482 Peralta, unit C, Laguna Hills, CA 92653, Tel: 714-770-5332; Empl.: 20; *Sls. Mgr.:* Pat Cooper

INTERCONNECT DEVICES, INC., 5101 Richland Ave., Kansas City, KS 66106, Tel: 913-342-5544, TELEX: 286767 IDIKC UR, FAX: 913-342-7043; Empl.: 150; *Sls. Mgr.:* Donna McKinney, Cathy Snead; *Dist. Mgr.:* Carol Narr

Distributor

FAX: 714-447-3976

INTERCONNECT SPECIALTIES, INC., Tel: 800-752-4777, 714-773-0411, TELEX: 910 321 0310

.....613, 620, 633, 714, 718, 724, 752, 791, 813, 816

INTERELECTRONICS CORP., Interelectronics Park, 550 U.S. Rte. 303, Congers, NY 10920, Tel: 914-EL8-8000; Empl.: 82; *Sls. Mgr.:* M. H. Pintell; *Dist. Mgr.:* G. Sherwood ..... **D•1797**

INTERFACE, INC., 7401 E. Butherus Dr., Scottsdale, AZ 85260, Tel: 602-948-5555, TELEX: 825-882, FAX: 602-948-1924; FSC No.: 32311; Empl.: 85; *Sls. Mgr.:* Irv Wilson

FAX: 617-986-8932

INTERFACE ENGINEERING INC., 300 Centre St., Holbrook, MA 02343, Tel: 617-986-2600, TELEX: 249-545; FSC No.: 14352; Empl.: 25; *Sls. Mgr.:* Thomas Scanlon ..... **D•1182-1183**

Local Sales Offices & Reps

NY	Great Neck, Industron Assoc.	516-487-2620
VA	Herndon, Gans & Pugh Assocs., Inc.	703-709-0305

Local Distributors

VA	Arlington, Gans & Pugh Assocs., Inc.	

INTERFACE PRODUCTS, INC., 4630 North Ave., Oceanside, CA 92056, Tel: 619-945-0230, FAX: 619-945-0239; FSC No.: 55300; Empl.: 75; *Sls. Mgr.:* William Lang

INTERFACE TECHNOLOGY, Dynatech Corp., 2100 E. Alosta Ave., Glendora, CA 91740, Tel: 818-914-2741, TELEX: 4945489, FAX: 818-335-8346

FAX: 415-340-1670

INTERFAN, William J. Purdy Co., 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-1203; Empl.: 12; *Sls. Mgr.:* F. L. Nelson ..... **C•1626-1629**

Local Sales Offices & Reps

AZ	Glendale, Knight Co.	602-433-2166
CA	Anaheim, Impact Elctrns., Inc.	714-533-1351,
CA	Burbank, Darco	818-504-2425
CA	Burlingame, William J. Purdy Co.	415-347-7701
CO	Englewood, William J. Purdy Co., Assocs.	303-790-2211
FL	Lighthouse Pt., Jack Krutek & Assocs.	305-783-2501
IL	Mt. Prospect, The Dombrow Co.	708-253-3326
IN	Indianapolis, John Sukup, Inc.	317-253-5501
MD	Monkton, Imagitron Sls. Co.	301-374-5600
MI	Royal Oak, Hilltronics Inc.	313-435-0920
MN	St. Paul, Proud Inds., Inc.	612-646-9428
MO	Bridgeton, AEM, Inc.	314-298-9900
NY	Hempstead, Kahgan Brody Assocs.	516-538-2300
NY	E. Syracuse, R.M. Scanlon & Assocs.	315-463-7682
OH	Cleveland, Marlow Assocs. Inc.	216-831-8232
OR	Beaverton, Pacific Mktg. Specialists	503-641-9373
PA	Pittsburgh, Marlow Assocs. Inc.	412-343-5050
TX	Bedford, El-Tec Sls., Inc.	817-268-2896
WA	Redmond, Pacific Mktg. Specialists	206-882-3144
Can	Lachine, Que., Bytewide Mktg.	514-636-4121

INTERGRAPH CORP., Advanced Processor Division, 2400 Geng Rd., Palo Alto, CA 94303, Tel: 415-494-8800, FAX: 415-856-9224; *Sls. Mgr.:* James Pierce; *Dist. Mgr.:* James Pierce, Sls. Rep. Mgr.

INTERLOGIC INDUSTRIES, 85 Marcus Dr., Melville, NY 11747-4294, Tel: 516-420-8111, FAX: 516-420-8007; Empl.: 46; *Sls. Mgr.:* Bert Freifeld

INTERLOOP, 706 Charcot Ave., San Jose, CA 95131, Tel: 408-922-0520, FAX: 408-922-0545; Empl.: 3

INTER-MARKET, 1946 Lehigh Ave., Glenview, IL 60025, Tel: 708-729-5330, FAX: 708-729-4849; FSC No.: 34165; Empl.: 10; *Sls. Mgr.:* Phil Gardanier

INTERMATIC, Intermatic Plaza, Spring Grove, IL 60081, Tel: 815-675-2321, TELEX: 25-265, FAX: 815-675-2112; Empl.: 1000

INTERMETRICS MICROSYSTEMS SOFTWARE, INC., 733 Concord Ave., Cambridge, MA 02138, Tel: 617-661-1840, 800-356-3594, FAX: 617-661-0072; Empl.: 600ò; *Sls. Mgr.:* Burr Tupper

INTER METRO INDUSTRIES CORP., North Washington St., Wilkes-Barre, PA 18705, Tel: 717-825-2741, TELEX: 831-833, FAX: 717-823-0250

INTERNATIONAL COMPONENTS CORP., 105 Maxess Rd., Melville, NY 11747, Tel: 516-293-1500, TELEX: 221576, FAX: 516-293-4983; Empl.: 100; *Sls. Mgr.:* Ken Reed ..... **D•1037-1039**

Local Sales Offices & Reps

AL	Huntsville, Hughes Assocs.	205-533-9108
AR	Mabelville, Erickson Sls.	501-455-0618
CA	Burbank, Darco	818-504-2425
CO	Littleton, Romulus Elctrns.	303-770-4888
FL	Tamarac, Hughes Assocs.	305-720-1674
GA	Atlanta, Hughes Assocs.	404-662-1587
IL	Arlington Heights, MJ Petersen	708-577-8200
IA	Cedar Rapids, Delltron Co.	319-393-0075
LA	Chalmette, Erickson Sls. Inc.	504-271-1976
MA	Framingham, Stone Comp. Sls.	508-875-3226
MA	Long Meadow, Stone Comp. Sls.	413-567-1019
MS	Corinth, Hughes Assocs.	601-287-2915
MO	Florissant, Delltron Co.	314-839-0033
MO	Kansas City, Delltron Co.	816-436-6445
NJ	Pennsuakem, ArJay Tech.	609-662-0285
NY	Melville, ICC	516-293-1500
NC	Charlotte, Hughes Assocs.	919-467-7029
OH	Cincinnati, Bob Gilbert Assocs.	513-574-1932
OR	Portland, Adapt E2	503-297-2151
TN	Knoxville, Hughes Assocs.	615-558-0283
TX	Dallas, Erickson Sls. Inc.	214-739-5833
WA	Bellevue, Adapt E2	206-637-0302
PR	Hato Rey, Casanova Indl. Sls. Corp.	809-753-8674

Local Distributors

CA	Canoga Park, Myco Vickers	213-340-2025
CA	Redwood City, Hi-Cor	415-365-5087
CA	San Diego, Tauber Elctrns. Corp.	619-274-7242
CA	Sunnyvale, Penstock Microwave Dist.	408-727-1200
CT	Bridgeport, Park Distr.	203-366-7200
CT	East Haven, JV Elctrns.	203-469-2321
FL	Ft. Lauderdale, Bros. Elctrns.	305-561-6700
FL	Ft. Lauderdale, National Resistor Co.	305-772-4500
GA	Norcross, Applied Power, Inc.	404-263-0421
IL	Bensenville, Voyager Elctrns. Corp.	312-860-1300
IL	Wheeling, Hawk Elctrns., Inc.	708-459-4030
IN	Indianapolis, RM Elctrns.	317-291-7110
IA	Cedar Rapids, Dee Elctrns.	319-365-7551
MA	Chelmsford, Shelly Ragon	508-250-9666
MA	Sharon, Adcour Passive Comps.	617-784-8123
MI	Grand Rapids, R M Elctrns.	616-531-9300
MI	Southfield, R M Elctrns.	313-262-1582
MN	Eden Prarie, Cassidy Elctrns.	612-944-0100
MN	Fridley, Voyager Elctrns. Corp.	612-571-7766
MN	Minneapolis, Cassidy Elctrns.	612-835-7746
MN	New Brighton, Chris Elctrns.	612-631-2647
MO	St. Louis, Beckwith Elctrns.	314-343-6463
NJ	Bellmaur, Mid-Atlantic Elctrns.	609-931-5303
NJ	Clifton, Vantage Comps.	201-667-1840
NJ	Rockaway, Tonar Inds.	201-586-9000
NJ	Sparta, Instruments & Equip.	201-729-4293
NY	Commack, Vantage Comps. Corp.	516-543-2000
PA	Philadelphia, Mur'Tronics	215-632-4330
TN	Hixson, Techni-Tronics	615-842-0514
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FAX: 508-879-8669

INTERNATIONAL POWER SOURCES, INC., 200 Butterfield Dr., Ashland, MA 01721, Tel: 508-881-7434 ..... **D•1807-1809**

Local Sales Offices & Reps

AL Huntsville, Murcota 205-539-8476
AZ Scottsdale, Power Up Elctrns. 602-955-1105
CA Laguna Hills, Electro Venture South 714-581-9244
CA Los Altos Hills, H B Mktg. 415-941-4080
FL Palm Beach Gardens, Graham Assocs., Inc. 407-622-4049
IL Arlington Hgts., Phoenix Elctrn. Sls. 708-394-4422
KS Olathe, Tech. Sls. Assocs. 913-829-2800
MD Hunt Valley, Eagle Sls. Corp. 301-666-3930
MA Franklin, OEM Mktg. & Sls. 508-528-4983
MN Edina, Engineering Prods. Assoc., Inc. 612-835-9022
MO St. Louis, Tech. Sls. Assocs. 314-521-2044
NH Salem, OEM Mktg. & Sls. 603-893-0009
NY Jericho, J-Square Mktg. 516-935-3200
NC Winston-Salem, Murcota 919-722-9445
OH Cincinnati, KCH Co. 513-931-1686
PA Montgomeryville, Eastern Sci. Mktg. 215-368-4570
TX Richardson, Jim D. Gray & Assocs. 214-699-9976
UT Ogden, Taylor Mktg. 801-456-9570
WI Brookfield, McMahon Sls., Inc. 414-782-3335

Local Distributors

CA Redwood City, HdB Elctrns. 415-368-1388
GA Norcross, Applied Power, Inc. 404-263-0421
MI Brighton, Applied Power, Inc. 313-227-3604
NH Londonderry, Orion Inds., Inc. 603-437-4446
TX Stafford, Southwest Elctrns. 713-240-4000

International IOR Rectifier

FAX: 213-772-9028

INTERNATIONAL RECTIFIER CORP., 233 Kansas St., El Segundo, CA 90245, Tel: 213-772-2000; Empl: 2400; *Sls. Mgr.:* Don Prescott; *Dist. Mgr.:* Shawn Fogarty ..... **B•1507**

Local Sales Offices & Reps

AL Huntsville, Montgomery Mktg., Inc. 205-830-0498
AZ Phoenix, Sun State Tech. Sls. 602-220-0595
CA Chatsworth, First Rep 818-718-6155
CA Mtn. View, Brooks Tech. Grp. 415-960-3880
CA San Diego, Harvey King, Inc. 619-587-9300
CA Tarzana, Power Comp. Sls. 818-881-9111
CO Englewood, Thorson Rocky Mountain, Inc. 303-799-3435
CT Fairfield, N.R.G. Ltd., Inc. 203-384-1112
FL Altamonte Springs, Lawrence Assocs., Inc. 407-339-3855
FL Kissimmee, Intl. Rectifier 407-933-2383
GA Norcross, Montgomery Mktg., Inc. 404-447-6124
IL Palatine, International Rectifier 312-397-0002
IL Rolling Meadows, Phase II Mktg., Inc. 708-806-1330
KY Carmel, Tech. Mktg. Corp. 317-844-8462
IN Ft. Wayne, Tech. Mktg. Corp. 219-432-5553
IA Cedar Rapids, Hitec Central, Inc. 319-396-3228
KY Louisville, Technlg. Mktg. Corp. 502-893-1377
MO Independence, Hitec Central, Inc. 816-796-6684
MA Burlington, AD/Nova Sls., Inc. 617-270-9600
MI Farmington Hills, Luebbe Sls. 313-489-8828
MN Edina, Mel Foster Tech. Sls. 612-941-9790
MO Bridgeton, Hitec Central, Inc. 314-291-5920
NJ Pallisades Park, International Rectifier 201-943-4554
NJ W. Caldwell, Tech. Mktg. Grp. 201-226-3300
NM Albuquerque, Reptronix Ltd. 505-292-1718
NY E. Syracuse, Nycom, Inc. 315-437-8343
NY Fishkill, Intl. Rectifier 914-896-4262
NY Melville, Tech. Mktg. Grp. 516-351-8833
NC Cary, Montgomery Mktg., Inc. 919-467-6319
NC Greensboro, Intl. Rectifier 919-299-4762
NC Raleigh, Montgomery Mktg., Inc. 919-851-0010
OH Cincinnati, Luebbe Sls. Co: 513-530-0600
OH Dayton, Luebbe Sls. Co. 513-294-0426
OH Northfield, Intl. Rectifier 216-467-0852
OH Westlake, Luebbe Sls. Co. 216-899-0071
OR Beaverton, Electra Tech. Sls., Inc. 503-643-5074
PA Broomal, L. D. Lowery, Inc. 215-356-5300
PA Pittsburgh, Luebbe Sls. Co. 412-364-0490
TX Austin, BP Sls. 512-346-9186
TX Houston, BP Sls. 713-782-4144
TX Richardson, BP Sls. 214-234-8438
UT Salt Lake City, Thorson Rocky Mtn., Inc. 801-973-7679
WA Kirkland, Electra Tech. Sls., Inc. 206-821-7442
WI Brookfield, International Rectifier 414-784-2480
WI Wauwatosa, Phase II Mktg., Inc. 414-771-9986

INTERNATIONAL RESISTIVE COMPANY, P.O. Box 1860, Boone, NC 28607, Tel: 704-264-8861, TELEX: 46-9902, FAX: 704-264-8865; Empl.: 1700; *Dist. Mgr.:* Larry J. Johnston

INTERNATIONAL RESOURCE SVCS., 7792 N.W. 72nd Ave., Miami, FL 33166, Tel: 305-884-2924, FAX: 305-885-3127; Empl.: 5; *Sls. Mgr.:* Richard L. Winn

FAX: 402-694-6180

INTERNATIONAL SENSOR SYSTEMS, INC., Aurora Industrial Pk., Box 345, Aurora, NE 68818, Tel: 402-694-6111; Empl.: 45; *Sls. Mgr.:* Wayne Roblee ..... **A•1730-1731**

Local Sales Offices & Reps

CA Mission Viejo, EAB Assocs. Inc 714-859-7701
MD Baldwin, Quarterback Sls. Inc. 301-764-9400
MA Scituate, Olsen Tech Sls. Inc. 617-545-5101
MN Minneapolis, Stoss Assocs., Inc. 612-925-2757
MO Jefferson City, Williams Assocs. Co. 314-893-2459
NE Omaha, IONEB 402-895-4431
NJ Collingswood, Resource Partnerships, Inc. 609-869-3170
NY Liverpool, Syronics, Inc. 315-451-0968
NC Raleigh, Raycom, Inc. 912-266-9827
OH Cincinnati, Applied Data Mgt. 513-579-8108
TN McMinnville, B & D Mktg. 615-473-7155
WA Bothell, Evergreen Mktg. Grp. 206-485-8063

INTERNATIONAL SENSOR TECHNOLOGY, 17771 Fitch St., Irvine, CA 92714, Tel: 714-863-9999, FAX: 714-474-7417; *Sls. Mgr.:* Jack McCann

INTERNATIONAL TECHNOLOGIES, INC., 68 Albany Rd., Warwick, RI 02888, Tel: 401-781-5595, FAX: 401-467-5885; Empl.: 15; *Sls. Mgr.:* R.W. Elsdoerfer

INTERNATIONAL TELECOMMUNICATIONS COMPONENTS, INC., 94 B East Jefryn Blvd., Deer Park, NY 11729, Tel: 516-243-1444, FAX: 516-595-9160; FSC No.: 0E6J8; Empl.: 15; *Sls. Mgr.:* Rick Walter

INTERNATIONAL TRANSDUCER CORP., Channel Technologies, Inc., 869 Ward Dr., Santa Barbara, CA 93111, Tel: 805-683-2575, TELEX: 658 495, FAX: 805-967-8199; FSC No.: ID 532; Empl.: 65; *Sls. Mgr.:* Christine M. Bashforth

INTEROPTICS

FAX: 415-340-1670

INTEROPTICS, Purdy Group, 770 Airport Blvd, Burlingame, CA 94010, Tel: 415-347-7727, TELEX: 677-1439 (PURDY UW); Empl: 35 ..... **B•1217**

Local Sales Offices & Reps

AZ Mesa, McDonald-Kerr Tech. Assoc. 602-833-7734
CA Poway, William Steffens Assoc. 619-487-1115
CA Sunnyvale, Pass Assocs. 408-735-9040
FL Boca Raton, Beacon Elctrns. 407-997-5740
FL Clearwater, Beacon Elctrns 813-796-2378

FL Longwood, Beacon Elctrns. 407-332-1940
MA Mendon, DMA Mktg. 508-473-9456
MN Edina, Dytec Instrs., Inc. 612-831-7169
NJ Passaic, Lightcomm Sls. Assocs. 201-778-6540
NY New York, Lightcomm Sls. Assocs. 212-254-3211
NC Fayetteville, Zim-Tek 919-488-4101
OH Cleveland, Marlow Assocs. 216-831-8232
TX Dallas, Allied Comps., Inc. 214-238-0408
OR Beaverton, Pacific Mktg. Specialists ... 503-641-9373
TX Austin, Allied Comps., Inc. 512-331-4494
TX Hurst, Allied Comps., Inc. 817-589-0456
VA Richmond, EME IV, Inc. 804-360-5049
VA Williamsburg, EME IV, Inc. 804-253-0171
WA Redmond, Pacific Mktg. Specialists ... 206-882-3144

interpoint

FAX: 206-882-1990

INTERPOINT CORPORATION, 10301 Willows Roads, P.O. Box 97005, Redmond, WA 98073-9705, Tel: 206-882-3100; FSC No.: 50821; Empl.: 450; *Sls. Mgr.:* D.T. Baughman, VP of Sls. .... **A•1732-1733; D•1810-1820**

Local Sales Offices & Reps

AL Huntsville, Novus Grp. 205-534-0044
AZ Tempe, Gassner & Clark 602-968-9037
TX Irving, Kite Elctrn. Sls. 214-986-0321
CA San Diego, Varigon San Diego 619-576-0100
CA Woodland Hills, Varigon Inc. 818-594-5080
CO Parker, Tech. Mktg. Assocs. 303-841-3435
FL Lighthouse Point, Krutek & Assocs. ... 305-783-2501
GA Norcross, Novus Grp. 404-263-0320
IN Ft. Wayne, Corrao Marsh Inc. 219-482-2725
IN Greenfield, Corrao Marsh Inc. 317-462-6568
CA Mountain View, Weseloh-Swanson ... 415-961-0565
FL Maitland, Jack Krutek & Assoc. 407-628-4837
MD Owings Mills, Neal Deoul Assocs. 301-363-4311
MA Wakefield, Howard C. Jappe Co. 617-245-9359
MN Minneapolis, Intertec 612-921-8443
KS Lenexa, Midwest Tech. Sls. 913-888-5100
MD Marriotsville, Neal Deoul Assoc. 301-795-5775
NJ Flanders, K & R Engrg. Sls. 201-584-5235, 800-631-9362
NY E. Syracuse, Advanced Comps. Corp. 315-699-2671
NC Cary, Novus Grp. 919-460-7771
OH Mayfield Village, Arthur H. Baier Co.... 216-461-6161
PA Pipersville, Yax Assocs. 215-766-2100
TX Houston, Kite Electrn. Sls. 713-738-5258
Can Calgary, Alb., Cana Rep. Grp. Inc. 403-243-5148
Can Montreal, Que., Cana Rep Grp. Inc. 514-276-4477
Can Surrey, BC, Cana Rep Grp. Inc. 604-589-8595
Can Willowdale, Ont., Cana Rep. Grp. Inc. .. 416-250-6683

Local Distributors

IA Cedar Rapids, Midwest Tech. Sls. 319-393-5115
KS Goddard, Midwest Tech. Sls. 316-794-8565
MO Earth City, Midwest Tech. Sls. 314-298-8787
UT Salt Lake City, Technology Mktg. Assoc. 801-943-5609

INTERSWITCH, Wm. J. Purdy Co., 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-8217, TELEX: 677-1439, FAX: 415-340-1670; FSC No.: (Purdy UW); Empl.: 32; *Sls. Mgr.:* Clarence Bruce ..... **B•1817**

Local Sales Offices & Reps

CA Burlingame, Interswitch 415-347-8217
CA Burbank, Darco 818-504-2425
CA Burlingame, William J. Purdy Co. 415-347-7701
CO Englewood, William J. Purdy Co. 303-790-2211
IL Addison, Hedge Assocs., Inc. 708-543-0888
IN Indianapolis, John Sukup Inc. 317-253-5501
MA Framingham, Gallagher Assocs., Inc. .. 508-626-2346
MI Royal Oak, Hilltronics, Inc. 313-435-0920
MN Minneapolis, Hei-Lite Sls., Inc. 612-550-0506
NY Victor, Net Sls., Inc. 716-924-1844
OH Cleveland, Marlow Assocs. 216-861-8232
OH Dayton, Marlow Assocs. 513-274-9666
OR Beaverton, Pacific Mktg. 503-641-9373
PA Ambler, W.R. Hartmaier Assocs. 215-643-6691
TX Dallas, Elcom Mktg. 214-241-2166
TX Houston, Elcom Mktg. 713-350-8064
WA Redmond, Pacific Mktg. 206-882-3144
NJ Leonia, Peter E. Schmitt Co., Inc. 201-944-2806

Local Distributors

AL Huntsville, Powell Elctrns. 205-539-2731
CA Costa Mesa, Powell Elctrns. 714-754-1717
CA Fremont, Allied Elctrns. 415-770-0590
CA San Jose, Powell Elctrns. 408-943-9020
CA Sunnyvale, Penstock 408-730-0300
CA Tustin, Allied Elctrns. 714-669-4190
CO Denver, Integrated Elctrns. 303-292-6121
FL Ft. Lauderdale, Powell Elctrns. 305-484-8377
GA Norcross, Allied Elctrns. 404-446-8595
IL Chicago, Federal Screw Prods. 312-478-5744
IL Elgin, Allied Elctrns. 312-697-8200
MD Columbia, Powell Elctrns. 301-621-8080
MA Lynn, Land Elctrn. Co. 617-592-2220
MA Westborough, Powell Elctrns. 617-366-6100
MA Wilmington, Allied Elctrns. 617-942-0150
MN Minneapolis, Bergquist 612-835-2322
NJ Englewood, Powell Elctrns. 201-894-0800
NJ Mt. Laurel, Allied Elctrns. 609-234-7769
NY Buffalo, Summit Distrs. 716-887-2800
NY Rochester, Allied Elctrns. 716-244-9440
NY Rochester, Summit Elctrns. 716-334-8110
NC Raleigh, Allied Elctrns. 919-876-5845
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
PA Philadelphia, Powell Elctrns. 215-365-1900
PA Pittsburgh, Allied Elctrns. 412-367-4124
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Irving, Powell 214-550-0547
UT Salt Lake City, Standard Supp. Co. 801-486-3371
WA Seattle, Allied Elctrns. 206-547-2827
WI Milwaukee, Taylor Elec. Co. 414-241-4321
Can Don Mills, Ont., Saynor Varah 416-445-0723

INTER-TECHNICAL GROUP INC., WIMA Div., 2269 Saw Mill River Rd., Ste. 400, P.O. Box 217, Elmsford, NY 10523, Tel: 914-347-2474, FAX: 914-347-7230; Empl.: 17; *Sls. Mgr.:* Gary M. Fey; *Dist. Mgr.:* Andrew E. Dvorscak ..... **A•1071-1073**

Local Sales Offices & Reps

AL Huntsville, J. R. Assocs. 205-830-2130
AZ Phoenix, Saguaro Sls. 602-861-1856
CA Campbell, Shur Sls. 408-374-5577
CO Arvada, ArrowHead/CSI Sls. Corp. 303-423-5556
FL Clearwater, Electrocraft, Inc. 813-573-2277
GA Conyers, J.R. Assocs. 404-760-1815
MA Millis, Selmark Assocs., Inc. 508-376-2914
MI Detroit, Qualitron 313-534-1511
MN Minneapolis, Holmgren Assocs. 612-786-7641
NY Rochester, BKT Assocs., Inc. 716-461-9880
NY Smithtown, T & K Sls. 516-724-3456
NC Greensboro, Arthur, Harris and Assoc., Inc. 919-275-3030
OR Beaverton, Harry Levinson Co. 503-690-1312
OH Columbus, Tom Mulligan Co. 614-457-2242
TN Chattanooga, J. R. Assocs. 615-977-0711
TX Houston, Barry Sls., Inc. 713-784-5860
TX Richardson, Barry Sls, Inc. 214-234-0255
UT Midvale, Arrowhead/CSI Sls. Corp. 303-423-5556
VA Richmond, Glasscock Assocs. 804-740-0063
WA Seattle, Harry Levinson Co. 206-382-1300

Local Distributors

CA San Jose, Shelly-Ragon, Inc. 408-432-0600
CA Sunnyvale, Capsco Sls., Inc. 408-734-3020
CT Bridgeport, Park Distrs. Inc. 203-366-7200
CT Wallingford, Midstate Elctrns. 203-265-9900
FL Melbourne, Pridmore Corp. 407-727-2491
CO Englewood, Indelco, Inc. 303-694-9444
IL Rosemont, Advent Elctrns., Inc. 312-297-6200
IN Indianapolis, Advent Elctrns., Inc. 317-872-4910
IA Cedar Rapids, Advent Elctrns., Inc. 319-363-0221
MA Ashland, March Elctrns. 508-881-6715
MN New Brighton, Chris Elctrns. Distr. 612-631-2647
NJ East Brunswick, Brothers Elctrns., Inc. 201-238-2200
NM Albuquerque, Betatron Elctrns. 505-821-1122
NY Bohemia, March Elctrns. 516-563-6000
NY Penn Yan, Advacom Technlg., Inc. 315-536-2221
OH Englewood, Argent Inds., Inc. 513-836-8633
PA Exton, VSH Elctrns. 215-363-2250
PA North Versailles, CMD Elctrns., Inc. 412-678-6020
TX McKinney, Prime Distrbg. Co. 214-231-0170
WA Seattle, Kam Elctrns. Div. 206-382-1300

INTRA-COMPUTER, 87-46 Van Wyck Expwy., Jamacia, NY 11418, Tel: 718-297-5500, FAX: 718-297-5518; Empl.: 9; *Sls. Mgr.:* Art Yaglian

INTRONICS, INC., 150 Dan Rd., Canton, MA 02021, Tel: 617-828-4992, FAX: 617-828-5050; Empl.: 75

ION PHYSICS CO., 11 Industrial Way, Atkinson, NH 03811, Tel: 603-893-6687, FAX: 603-893-6729

IPAC GRP., 3047 Indl. Blvd., Bethel Pk., PA 15102, Tel: 412-831-9200, TWX: 510-697-3935, FAX: 412-831-9580; Empl.: 50; *Sls. Mgr.:* Joseph Gill

IPM, INC., Elnik Systems, 3 Edison Place, Fairfield, NJ 07004, Tel: 201-882-8033, FAX: 201-882-8037; Empl.: 8; *Sls. Mgr.:* Claus J. Joens

IRONICS INCORPORATED, 798 Cascadilla St., Ithaca, NY 14850, Tel: 607-277-4060, TELEX: 705-742; *Sls. Mgr.:* R. Chris Martens

IR SCIENTIFIC, Box 110, Carlisle, MA 01741, Tel: 508-667-7110; Empl.: 10

ISC CARDION ELECTRONICS, INC., Long Island Expwy., Woodbury, NY 11797, Tel: 516-921-7300, TELEX: 221683 CARD, TWX: 510-221-2179, FAX: 516-921-7330; FSC No.: 12909; Empl.: 450; *Sls. Mgr.:* F. J. Gareffa

ISC DATACOM, ISC Defense & Space, 1288 Reamwood Ave., Sunnyvale, CA 94089, Tel: 408-747-0300, FAX: 408-747-1873; FSC No.: 74444; Empl.: 35; *Sls. Mgr.:* C. Frank

ISC MAGNETICS DIV., See Aeroflex Labs., Inc., Magnetic Prods. Div.

ISKRA ELECTRONICS, INC., 155 Dupont St., Plainview, NY 11803, Tel: 516-349-0222, TELEX: 221527, FAX: 516-349-7642; *Sls. Mgr.:* Debbie Gremito ..... **A•1075, 1923, 2095**

Local Sales Offices & Reps

IL Cary, Bob Burns & Assocs. 708-516-3322
NM Albuquerque, FP Sls. 505-345-5553
IN Indianapolis, Insul Reps. 317-251-1994
LA Hammond, Design Mktg. of LA, Inc. ... 504-542-1115
AZ Tempe, F P Sls. 602-894-5303
NJ Medford, CEF Assocs. 609-953-8945
GA Alpharetta, R A Sls. 404-442-6749
NY North Port, R. P. Luce & Co. 516-754-5064
NC New Bern, R A Sls. 919-244-2672
OH Mentor, Sales Plus 216-942-7811
SC Easley, R A Sls. 803-859-1859
TN Knoxville, Insul Reps 615-691-7586
UT Salt Lake City, Sage Assoc. 801-467-5451

Local Distributors

MA Billerica, Baldwin Comps. Ctr. 508-667-6710
NJ Westwood, Seacor 201-666-5600
NY Ronkonkoma, Baldwin Comps. 516-588-5700

FAX: 516-937-3840

ISL PRODUCTS INT'L., LTD., 235 Robbins La., Ste. 270, Syosset, NY 11791-6093, Tel: 516-937-3475, TELEX: 503242; Empl.: 10; *Sls. Mgr.:* Ken Kawaller ..... **A•1734, 2042, 2237; C•1399, 1759**

Local Sales Offices & Reps

IN Indianapolis, C.C. Electro Sales 317-255-1508
MN St. Paul, Countryman Assoc. 612-645-9151

ISOCOM INC., 274 E. Hamilton Ave., Ste.E, Campbell, CA 95008, Tel: 408-370-2212, FAX: 408-370-2309; *Sls. Mgr.:* Stephen Parry; *Dist. Mgr.:* Glenda Rees

ISOLATION PRODUCTS, INC., 157 San Lazaro Ave., Sunnyvale, CA 94086, Tel: 408-730-4672; Empl.: 5

ISOREG CORP., 410 Great Rd., P.O. Box 486, Littleton, MA 01460, Tel: 508-486-9483, FAX: 508-486-3539; FSC No.: 7Y052; Empl.: 75; *Sls. Mgr.:* Paul Foss; *Dist. Mgr.:* Paul Foss

FAX: 508-676-0885

ISOTEK CORPORATION, 566 Wilbur Ave., Swansea, MA 02777, Tel: 508-673-2900; Empl.: 3; *Sls. Mgr.:* Steve Mathewson ..... **A•1925-1927**

FAX: 804-977-1849

ISOTEMP RESEARCH, INC., P.O. Box 3389, Charlottesville, VA 22903, Tel: 804-295-3101; FSC No.: 031785; Empl.: 58 ..... **A•1376-1377**

Local Sales Offices & Reps

CA	Fremont, Wm. Parks & Assocs.	415-796-0875
CA	San Diego, Qualtronics	619-695-0118
IL	Woodridge, Trend-Tronics	312-985-0626
NC	Raleigh, Godwin Assocs.	919-847-3006

ISOTRONICS, INC., Industrial Park, New Bedford, MA 02745, Tel: 508-998-2000, TWX: 710-344-1961; *Sls. Mgr.:* Jeffrey Lang

ITEK ENCODER, See BEI Motion System/ITEK Encoder Div.

ITHACO, INC., Meas. & Control Instrs. Div., 735 W. Clinton St., P.O. Box 6437, Ithaca, NY 14851-6437, Tel: 607-272-7640, TWX: 510-255-9307, FAX: 607-272-4550; Empl.: 100; *Sls. Mgr.:* E. W. Seymour

ITL CIRCUITS, 90 Don Park Road, Markham, Ontario, Canada L3R 1C4, Tel: 416-475-6658, 416-492-9307, FAX: 416-475-5097; FSC No.: FSCM 38747; Empl.: 95; *Sls. Mgr.:* Derk Wissink

ITRONIC-FUCHS CORP., P.O. Box 543, Buford, GA 30518, Tel: 404-945-3844, FAX: 404-945-7766; Empl.: 2; *Sls. Mgr.:* Michael Wegner; *Dist. Mgr.:* Michael Wegner

ITT CANNON, 666 E. Dyer Road, Santa Ana, CA 92705-5684, Tel: 714-557-4700, TELEX: 75-3917, TWX: 910-997-0523; FSC No.: 71468;Multiple; Empl.: 1500; *Sls. Mgr.:* Richard Torson; *Dist. Mgr.:* Richard Torson

ITT

FAX: 714-727-2109

ITT COMPONENTS, ITT Corporation, 5 Jenner St., Irvine, CA 92718, Tel: 714-727-3001, TELEX: 681-389, TWX: 910-595-1744; FSC No.: 61725; Empl.: 20; *Dist. Mgr.:* M. Pommier ..... **A•2096-2097; B•1508-1515**

Local Sales Offices & Reps

AL	Huntsville, JWL	205-883-1712
AZ	Phoenix, Hartland	602-492-0012
CA	Burbank, Darco	818-504-2425
CA	San Diego, Varigon	619-576-0100
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Englewood, Romulus Elctrns.	303-770-4888
CT	Guilford, Data Mark, Inc.	203-453-0575
FL	Pompano Bch., Bolton Assocs.	305-975-7245
FL	St. Petersburg, Bolton	813-864-2294
GA	Atlanta, JWL	404-320-7643
IL	Inverness, Heartland Tech. Sls.	708-358-6622
IN	Ft. Wayne, M/S Sls.	219-436-3023
IN	Indianapolis, M/S	317-881-0110
KS	Wichita, Thunderbird Tech. Sls.	316-684-3941
MD	Lutherville, DGR	301-583-1360
MA	Sudbury, KSA of New England	508-443-5881
MI	Brighton, Elctrn. Sources Inc.	313-227-3598
MN	Minnetonka, Neotech	612-935-7930
MO	Maryland Hgts., Thunderbird Tech. Sls.	314-298-8940
NJ	Mt. Laurel, Wyck Mktg.	609-727-1070
NM	Albuquerque, Syntech	505-266-7951
NY	Manhasset, Win Cor Elctrns.	516-627-9474
NY	Victor, Net Sls. Co.	716-924-1844
NC	Charlotte, JWL & Assocs.	704-541-5750

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OH	Centerville, Omega Sls.	513-434-5507
OH	Cleveland, Omega Sls.	216-360-9400
OK	Tulsa, Milco	918-582-9411
TX	Plano, Milco Mktg.	214-578-1996
WA	Redmond, EMG	206-882-0962
WA	Vancouver, EMG	206-254-4572
WI	Brookfield, Heartland	414-792-0920

Local Distributors

AL	Huntsville, Time	205-721-1133
AL	Mobile, Control Design Supp.	205-666-6693
AZ	Tempe, Control Design Supp.	602-829-7981
AZ	Tempe, Richey Impact Elctrns.	800-421-7258
AZ	Tempe, Time	602-967-2000
AR	Maumelle, Control Design Supp.	501-851-3137
CA	Anaheim, Control Design Supp.	714-821-1516
CA	Chatsworth, Time	818-998-7200
CA	Garden Grove, Richey Impact Elctrns.	714-895-0060
CA	Irvine, Integrated Elctrns.	714-837-9960
CA	Irvine, ITT Multi Comps.	714-727-4001
CA	Oakland, Brill	415-834-5888
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Diego, Richey Impact Elctrns.	619-271-4511
CA	San Diego, Time	619-586-0129
CA	San Jose, Integrated Elctrns.	408-263-1100
CA	San Jose, ITT Multicomps.	408-279-0685
CA	San Jose, Richey Impact Elctrns.	408-432-7100
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Capsco Sls.	408-734-3020
CA	Sunnyvale, Time	408-734-9888
CA	Torrance, Time	213-320-0880
CA	Tustin, Time	714-669-0100
CO	Denver, Control Design Supp.	303-296-1822
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Englewood, NEP Elctrns.	303-799-9898
CO	Englewood, Time	303-721-8882
CO	Westminster, ITT Multicomponents	303-451-8740
CT	Cheshire, Time	203-271-3200
CT	East Haven, J.V. Elctrns.	203-469-2321
CT	New Haven, Greene Shaw Co.	203-397-0710
CT	Wallingford, Control Design Supp.	203-269-9955
FL	Almonte Spgs., Control Design Supp.	305-788-3220
FL	Davie, ARCO Distrs.	305-473-2550
FL	Ft. Lauderdale, Time	305-484-1778
FL	Melbourne, Greene Shaw	407-951-3636
FL	Orlando, Time	407-841-6565
FL	Pompano Bch., Control Design Supp.	305-782-1311
GA	Norcross, Time	404-368-0969
GA	Stone Mountain, Control Design Supp.	404-979-3500
IL	Chicago, Leeds Electro Comps.	312-825-3800
IL	Chicago, NEP Elctrns.	708-595-8500
IL	Hoffman Estates, Integrated Elctrns.	312-843-2040
IL	Schaumberg, Time	708-303-3000
IL	Schaumburg, Control Design Supp.	708-307-8900
IN	Indianapolis, Control Design Supp.	317-788-4559
IN	Indianapolis, CSE	317-879-9119
IN	Indianapolis, Mar Elctrns.	317-633-6699
IA	Marion, Control Design Supp.	319-373-2923
KS	Kansas City, Control Design Supp.	913-362-4248
MD	Beltsville, RESCO-Washington	301-937-9100
MD	Columbia, Time	301-964-3090
MD	Jessup, TREEKO Sls.	301-470-3300
MD	White Marsh, Resco	301-529-0500
MA	Canton, Richey Impact Elctrns.	617-821-1500
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Peabody, Time	508-532-9900
MA	Woburn, Control Design Supp.	617-932-9404
MI	Farmington Hills, Control Design Supp.	313-473-0220
MI	Livonia, Key Elctrns.	313-489-5455
MN	Edina, Time	612-943-2433
MN	Minneapolis, Control Design Supp.	612-721-1628
MN	St. Paul, Shelley-Ragon	612-642-2828
MO	Kansas City, Control Design Supp.	913-362-4248
MO	Manchester, Time	314-391-6444
MO	St. Louis, Control Design Supp.	314-426-3150
NV	Las Vegas, Kiesub Elctrns.	702-733-3888
NJ	Marlton, Time	609-596-6700
NJ	Oakland, Relay Specialties	201-337-1000
NJ	Rockaway, Tonar Inds.	201-586-9000
NJ	W. Berlin, GCI	609-768-6767
NJ	Wayne, Time	201-785-8250
NM	Albuquerque, Betatron Elctrns.	505-344-2381
NM	Albuquerque, Harrison/Intl.	505-291-9951
NY	E. Syracuse, Time	315-432-0355
NY	Hauppauge, Time	516-273-0100
NY	Rochester, Masline	716-546-5373
NC	Charlotte, Control Design Supp.	704-588-4410
NC	Raleigh, Greene-Shaw	919-954-7138
NC	Raleigh, Resco	919-781-5700
NC	Raleigh, Time	919-847-9650
OH	Cincinnati, Schuster	513-489-1400
OH	Cleveland, Schuster	216-425-8134
OH	Columbus, Time	614-794-3301
OK	Tulsa, Altair Co.	918-252-5781
OR	Beaverton, Integrated Elctrns.	503-641-1690
OR	Portland, Time	503-684-3780
PA	Malverne, Control Design Supp.	215-296-0150
TX	Austin, Time	512-346-7346
TX	Carrollton, LCD	214-245-0600
TX	El Paso, Harrison/Intl.	915-598-3406
TX	Houston, Control Design Supp.	713-868-4018
TX	Houston, Harrison Elctrns.	713-879-2727
TX	Richardson, Time	214-644-4644
UT	Nephi, Control Design Supp.	801-623-2908
UT	W. Salt Lake, Integrated	801-298-1869
UT	W. Valley, Time	801-973-8494
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Kent, Control Design Supp.	206-251-6323
WA	Redmond, Time	206-882-1600
WA	Seattle, Radar	206-282-2511
WA	Seattle, Richey Impact Elctrns.	206-575-1910
WI	New Berlin, Control Design Supp.	414-784-1015
WI	New Berlin, NEP Elctrns.	414-785-9100

ITT CONOFLOW, ITT Fluid Technology Corp., Route 78, St. George, SC 29477, Tel: 803-563-9281, TELEX: 4945706, FAX: 803-563-2131; *Sls. Mgr.:* Thomas Floro

ITT GILFILLAN, ITT Defense Inc., 7821 Orion Ave., P.O. Box 7713, Van Nuys, CA 91409, Tel: 818-988-2600, TELEX: 651421, TWX: 910-495-1787; FSC No.: 24930; Empl.: 1250; *Sls. Mgr.:* Nick Riley, VP

ITT HIGBIE BAYLOCK, 3000 University Drive, Auburn Hills, MI 48321-7016, Tel: 313-340-3000, FAX: 313-340-3707; Empl.: 1500; *Sls. Mgr.:* R.M. Davie VP Sls.

ITT POWERSYSTEMS CORP., Box 688, Galion, OH 44833-0688, Tel: 419-468-5200, TELEX: 4972923, FAX: 419-468-3235; Empl.: 450; *Sls. Mgr.:* C. Searles; *Dist. Mgr.:* G. Ardolino

ITT SCHADOW, 8081 Wallace Rd., Eden Prairie, MN 55344, Tel: 612-934-4400, TELEX: 29-0556, TWX: 910-576-2469, FAX: 612-934-9121; Empl.: 115; *Sls. Mgr.:* Darrell Wilk; *Dist. Mgr.:* Scott Mork

ITT SEALECTRO, INC., 585 East Main St., New Britian, CT 06051, Tel: 203-223-2700, TELEX: 71-425-501, FAX: 203-225-2781; FSC No.: 98291; Empl.: 350; *Sls. Mgr.:* Ray Champi; *Dist. Mgr.:* Karen Muratori

ITW FASTEX DISTRIBUTOR BUSINESS, 226 Gerry Dr., Wood Dale, IL 60191-1150, Tel: 708-350-8200, FAX: 708-595-2141; *Sls. Mgr.:* S. Blank,B. Casey, R. Grega, B. Vanbebber

ITW Paktron

FAX: 804-239-4730

ITW PAKTRON, Div. of Illinois Tool Works, P.O. Box 4539, 1205 McConville Rd., Lynchburg, VA 24502, Tel: 804-239-6941; FSC No.: 19396; *Sls. Mgr.:* Richard Slocum ..... **A•1076-1077**

Local Sales Offices & Reps

AL	Huntsville, ACM, Inc.	205-881-5493
AZ	Paradise Valley, Astrocom Mktg.	602-991-6646
CA	Playa-del-Ray, Corcoran Assoc.	213-823-4589
CA	Santa Clara, Synelect Mktg.	408-244-9900
CO	Parker, High Plains Mktg.	303-841-6464
FL	Cassel Berry, Dyne-A-Mark	407-831-2822
FL	Clearwater, Dyne-A-Mark	813-441-4702
FL	Ft. Lauderdale, Dyne-A-Mark	305-771-6501
GA	Norcross, ACM, Inc.	404-448-7025
IL	Rolling Meadows, Weisser Assoc.	312-392-5556
IN	Indianapolis, Central Regional Off.	317-257-3704
IN	Indianapolis, Leslie M. Devoe	317-842-3245
IA	West Des Moines, SPS Assocs., Ltd.	515-225-0607
KS	Olathe, SPS Assocs., Ltd.	913-764-4460
MD	Annapolis, Parogem Inc.	301-269-1898
MA	Randolph, Hatch Assocs.	617-963-3306
MI	Oak Pk., A. Blumenberg Assocs. Inc.	313-968-3230
MN	Hopkins, Forsythe Assoc.	612-933-8267
MO	Earth City, SPS Assocs., Ltd.	314-291-0520
NE	Panama, SPS Assocs.	402-788-2536
NY	E. Rochester, L-Mar Assocs., Inc.	716-681-9100
NY	Poughkeepsie, L-Mar Assoc. Inc.	914-462-8025
NC	Raleigh, C-Tech	919-782-8100
OH	Solon, J R Thornberry Co. Inc.	216-248-4995
TX	Austin, Electra Reps, Inc.	512-339-1163
TX	Dallas, Electra Reps, Inc.	214-248-3852
VA	Lynchburg, Paktron Div.	804-239-6941
WA	Bellevue, Caruso & Co.	206-455-8811

WI	Hartland, Selective Sls. Inc.	414-367-1133
Can	Markham, Ont., Avotronics	416-475-2024
Can	Pointe Claire, Que., Avotronics	514-697-2135
	Local Distributors	
AZ	Phoenix, Future Elctrns.	602-272-7951
CA	Chatsworth, Future Elctrns.	818-772-6240
CA	Irvine, Future Elctrns.	714-250-4141
CA	San Diego, Future Elctrns.	619-278-5020
CA	San Jose, Future Elctrns.	408-434-1122
CA	Van Nuys, E.W. Elctrns.	818-782-9020
CO	Westminster, Future Elctrns., Inc.	303-650-0123
CT	Bethel, Future Elctrns.	203-743-9594
FL	Altamonte Springs, Future Elctrns., Inc.	305-767-8414
FL	Clearwater, Future Elctrns., Inc.	813-578-2770
FL	Ft. Lauderdale, N R C Elctrns.	305-772-4500
GA	Augusta, Dixie Elctrns., Inc.	404-722-2055
GA	Norcross, Future Elctrns., Inc.	404-441-7676
IL	Elk Grove Village, Bell Inds.	312-640-1910
IL	Schaumburg, Future Elctrns.	312-882-1255
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Custom Svcs. Elec.	317-879-9119
IA	Cedar Rapids, Dee Elctrns.	319-365-7551
MD	Columbia, Future Elctrns.	301-290-0600
MD	Jessup, Treeko Sls.	301-470-3300
MD	Spencerville, U.S. Elctrns.	301-384-3300
MA	Billerica, Mayer Elctrns.	508-667-6900
MA	Westboro, Future Elctrns.	617-366-2400
MI	Livonia, Future Elctrns.	313-261-5270
MN	Eden Prairie, Future Elctrns.	612-944-2200
MN	Eitzen, Capacitor Assocs.	507-495-3306
MN	St. Paul, Gopher Elctrns.	612-483-3322
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Bellmaur, Mid Atlantic Elctrns.	609-931-5303
NJ	E. Hanover, State Elctrns.	201-887-2550
NJ	Fairfield, Future Elctrns.	201-227-4346
NJ	Mt. Laurel, Future Elctrns.	609-778-7600
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NY	Hauppauge, Future Elctrns. Inc.	516-234-4000
NY	Liverpool, Future Elctrns.	315-451-2371
NY	Rochester, Future Elctrns.	716-272-1120
NY	Rochester, Simcona Elctrns.	716-328-3230
NC	Charlotte, Dixie Elctrns.	704-377-5413
NC	Charlotte, Elctrn. Mktg. Corp.	704-394-6195
NC	Charlotte, Future Elctrns.	704-529-5500
NC	Greensboro, Golden Elctrns.	919-294-4653
NC	Winston-Salem, Dixie Elctrns.	919-724-5961
OH	Columbus, Elctrn. Mktg. Corp.	614-299-4161
OH	Dayton, Elctrn. Mktg. Corp.	513-439-4711
OH	Highland Heights, Elctrn. Mktg. Corp.	216-442-3441
OK	Tulsa, Altair Co.	918-252-5781
OR	Beaverton, Future Elctrns.	503-646-9454
PA	McKean, Advacom, Inc.	814-476-7774
SC	Columbia, Dixie Elctrns., Inc.	803-779-5332
SC	Greenville, Dixie Elctrns., Inc.	803-297-1435
SC	N. Charleston, Dixie Elctrns.	803-552-2671
TN	Gray, Dixie Elctrns., Inc.	615-477-3838
TN	Knoxville, Dixie Elctrns., Inc.	615-938-4131
TX	Austin, Altair Co.	512-837-4970
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
TX	Richardson, Future Elctrns., Inc.	214-437-2437
UT	Salt Lake City, Future Elctrns. Inc.	801-972-8489
WA	Redmond, Future Elctrns., Inc.	206-881-8199
WI	Mequon, Taylor Elec.	414-241-4321
WI	Racine, Badger Elctrns. Co. Inc.	414-637-1256
WI	Waukesha, Bell Inds.	414-547-8879
EXP	Bucks, Eng., C & CD Ltd.	494-882-848
Can	Calgary, Alberta, Future Elctrns.	403-235-5325
Can	Downsview, Ont, Future Elctrns.	416-638-4771
Can	Edmonton, Future Elctrns.	403-438-2858
Can	Ottawa, Ont., Future Elctrns.	613-820-8313
Can	Point Claire, Que., Future Elctrns.	514-694-7710
Can	St. Foy, Que., Future Elctrns.	418-682-8092
Can	Vancouver, B.C., Future Elctrns.	604-294-1166
Can	Winnipeg, Manitoba, Future Elctrns.	204-786-7711

ITW Switches

FAX: 312-545-4450

ITW SWITCHES, Illinois Tool Works, 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, TELEX: 275226; Empl.: 500; *Dist. Mgr.:* P. Smentek ..... **B•1712-1721**

Local Sales Offices & Reps

AL	Huntsville, Electro Mech	205-880-0592
AZ	Glendale, The Knight Co.	602-433-2166
CA	Los Angeles, The Knight Co.	213-670-2833
CA	Santa Clara, Westrep	408-988-8833
CO	Parker, High Plains Mktg.	303-841-6464
CT	Clinton, Selmark Assoc.	203-573-9088
FL	Altamonte Springs, Semtronics	407-831-8233
GA	Atlanta, Electro Mech.	404-447-6478
IL	Downer's Cove, Golten Assoc.	708-512-0093
IA	Cedar Rapids, R. F. Welch Co.	319-362-6824
KS	Kansas City, BC Elctrns.	913-342-1211
MD	Baltimore, MicroComp	301-644-5700
MA	Millis, Selmark Assoc.	508-376-2914
MI	Grand Rapids, Urban & Assoc.	616-245-0511
MN	Minneapolis, Comstrand	612-788-9234
MO	St. Louis, BC Elctrns.	314-521-6683
NJ	Red Bank, Varrelman-Gorman Co.	201-219-0088
NY	E. Syracuse, Fountain, Young & Co.	315-437-7733
NC	Raleigh, Electro Mech	919-790-9300
OH	Medina, Rockford Controls	216-725-3705
PA	Oreland, Precision Mktg.	215-233-9233
TX	Dallas, Electra Reps.	214-248-3852

IVEK CORP., Fairbanks Rd., N. Springfield, VT 05150, Tel: 802-886-2238, FAX: 802-886-8274; Empl.: 15; *Sls. Mgr.:* Mark Tanny; *Dist. Mgr.:* Frank Nobile

IVO

FAX: 908-542-2938

IVO INDUSTRIES, INC., 201 Industrial Way W., Eatontown, NJ 07724, Tel: 908-542-5151, 800-932-0489; Empl.: 10; *Sls. Mgr.:* Daniel Vannote ..... **B•1091, 1722-1723, 1906-1907**

IXYS CORP., 2355 Zanker Rd., San Jose, CA 95131-1109, Tel: 408-435-1900, TELEX: 384928IXYSSNJ UD, FAX: 408-435-0670; FSC No.: 408-435-1033; Empl.: 100; *Sls. Mgr.:* Kent Paris

JAE
JAE Electronics, Inc.

FAX: 714-753-2699

JAE ELECTRONICS INC., 142 Technology Drive, Irvine, CA 92718, Tel: 714-753-2600; Empl.: 3400 (Worldwide); *Sls. Mgr.:* David Shaff, Dir. Field Sls.; *Dist. Mgr.:* Paul Parkinson ..... **B•1724-1725; C•1400-1403**

Local Sales Offices & Reps

AL	Huntsville, Glen White Assocs.	205-882-6751
CA	Newport Beach, Camda, Inc.	714-553-9228
CA	San Diego, Camda, Inc.	619-726-9844
CA	Santa Clara, Pinnacle Sls.	408-249-7400
CA	Studio City, Camda, Inc.	818-762-9261
CO	Littleton, Con-Tek Mktg.	303-973-8490
FL	Clearwater, Glen White Assocs.	813-938-7557
FL	Deerfield Beach, Glen White Assocs.	305-570-8545
FL	Ft. Lauderdale, JAE Elctrns.	305-563-3484, 800-248-0737
FL	Satellite Bch., Glen White Assocs.	407-773-3514
GA	Norcross, Glen White Assocs.	404-441-1447
IN	Ft. Wayne, Frank J. Campisano Co.	219-486-6443
IN	Indianapolis, Campisano Co.	319-577-0319
MD	Baltimore, Glen White Assocs.	301-321-7235
MA	Harvard, Cycle Sls.	508-456-6868
NJ	Matawan, Shepard & Assocs.	908- 254-5757
NY	Pittsford, Franklin Sls. Corp.	716-248-8251
NC	Charlotte, Glen White Assocs.	704-875-3777
NC	Raleigh, Glen White Assocs.	919-848-1931
OH	Cincinnati, Frank J. Campisano Co.	513-574-7111
OH	Columbus, Frank J. Campisano Co.	614-876-5404
OH	Mentor, Frank J. Campisano	216-975-9300
TX	Plano, Jae Elctrns.	214-881-1183
TX	Plano, RAM	214-424-4455
OR	Portland, Venture Elctrns.	503-624-0617
PA	Coraopolis, Frank J. Campisano Co.	412-264-5151
RI	Cranston, Jae Elctrns.	401-946-0210
PA	West Chester, TCA Inc.	215-692-6853
TX	Austin, RAM	512-250-5082
TN	Gray, Glen White Assocs.	615-477-8850
TX	Houston, RAM	713-580-7394
TX	Houston, RAM	713-955-0768
VA	Lynchburg, Glen White Assocs.	804-385-6110
WA	Bellevue, Venture Elctrns.	206-454-4594
	Local Distributors	
AZ	Scottsdale, Cypress Elctrns.	602-949-0802
CA	Buena Pk., Cypress Elctrns.	213-404-0445, 714-521-5230
CA	San Diego, Cypress Elctrns.	619-535-0011
CA	Santa Clara, Compass Elctrns.	408-432-7575
CA	Santa Clara, Cypress Elctrns.	408-980-2500
CO	Englewood, Cypress Elctrns.	303-792-5829
GA	Atlanta, Satori	404-242-0606
MA	Middleboro, Glynn Elctrns.	508-947-4262
MN	Eden Prairie, Cypress Elctrns.	612-934-2104
NH	Manchester, Glynn Elctrns.	603-622-8131
NY	Deer Pk., Ramtronix Inc.	516-242-4700
OH	Akron, Aesco Elctrns.	216-762-8818
OH	Columbus, Aesco Elctrns.	614-882-6762
OR	Beaverton, Cypress Elctrns.	503-223-8900
PA	Bristol, AIM Elctrns.	215-785-3500
TX	Dallas, Satori	214-518-1946
TX	Dallas, Cypress Elctrns.	214-225-0065
WA	Bothell, Cypress Elctrns.	206-483-1144

JAICO PRODUCTS, Jaidinger Mfg. Co., Inc., 1921 W. Hubbard St., Chicago, IL 60622, Tel: 312-421-1090, FAX: 312-421-1165; Empl.: 35; *Sls. Mgr.:* John S. Jaidinger

JAMES ELECTRONICS, 4050 N. Rockwell, Chicago, IL 60618, Tel: 312-463-6500, FAX: 312-465-1504; Empl.: 220; *Sls. Mgr.:* Vincent Kennedy

JANCO
AN ESOP CORP.

FAX: 818-842-3396

JANCO CORP., Box 3038-Glenoaks Sta., Burbank, CA 91508, Tel: 818-846-1800, TWX: 910-498-2701; FSC No.: 91812; Empl.: 185; *Sls. Mgr.:* Maurice Goldwater ..... **B•1726-1727**

Local Sales Offices & Reps

AZ	Mesa, Sys. Sls. of AZ. Inc.	602-464-9989
CA	San Diego & So. California, Gabriel & Assoc.	714-666-0660
CA	San Jose, Ruppert Sls. & Engrg.	408-998-8717
CO	Aurora, Key Specs.	303-690-6106
FL	Orlando, MacKay, Smith & Assocs.	305-423-4353
GA	Atlanta, MacKay, Smith & Assocs.	404-449-7444
IL	Addison, Vikeland Sls.	708-832-8425
IN	Greenwood, Aktron Corp.	317-888-2260
KS	Wichita, Dy-Tronix Inc.	316-838-2645
MD	Ellicott, Tech. Sls. Inc.	800-225-4335
MA	Swansea, Eastrep Co.	617-672-0788
MN	St. Paul, Cahill, Schmitz & Cahill	612-646-7217
MO	Bridgeton, Dy-Tronix Inc.	314-291-4777
NJ	Cherry Hill, Quality Comps.	609-428-6266
NY	Fairport, TAC Sls. Inc.	716-377-2250
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
OH	Columbus, Tom Mulligan Company	614-457-2242
TX	Irving, Trice Mktg. Corp.	214-255-1877
WA	Seattle, Norwest	206-827-9562
	Local Distributors	
CA	Burbank, Merit Comp. Supp.	818-842-7607
CA	Westlake Village, Tech-Cable Prods.	818-991-4697

JAN

FAX: 718-784-0796

JAN HARDWARE MFG. CO., P.O. Box 1199, Melville, NY 11747, Tel: 718-361-0800; FSC No.: 99813; Empl.: 35; *Sls. Mgr.:* Irwin E. Wasserman ..... **C•1585-1590**

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Local Sales Offices & Reps

CA	San Diego, James E. Fitch & Assocs.	213-946-8062
CA	Santa Fe Springs, James E. Fitch & Assoc.	213-945-2624
MD	Gaithersburg, Naudain Assocs. South.	301-258-5040
MA	Brookline, Harman Assoc., Inc.	617-232-6687
MA	Lee, Harman Assoc., Inc.	413-243-1158
NJ	Marlton, Naudain Assoc.	609-983-5300
TX	Richardson, AGM Sls. Co.	214-644-1475

JEMA

FAX: 708-251-3738

JAPAN ELECTRONIC MANUFACTURERS AGENCY, INC., 1000 Skokie Blvd., Wilmette, IL 60091, Tel: 708-251-3600; Empl.: 10; *Sls. Mgr.:* James Schafen; *Dist. Mgr.:* Chris Gantz **D•1022-1023, 1040-1041, 1268-1269**

JAPANESE PRODUCTS CORP., 7 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-8880, TELEX: 516929 ANS BACK ENFD, FAX: 914-592-7001; Empl.: 8; *Sls. Mgr.:* Don Cassalia

JARO COMPONENTS, INC., 1225 Broken Sound Pkwy., Boca Raton, FL 33431, Tel: 305-771-7000, FAX: 305-772-8899; Empl.: 30; *Sls. Mgr.:* Floyd Burwell; *Dist. Mgr.:* Floyd Burwell

J.A.W. INDUSTRIES, INC., 1750-A Costner Dr., Warrington, PA 18976, Tel: 215-343-8990, FAX: 215-343-8942; Empl.: 20; *Sls. Mgr.:* J. McLaughlin; *Dist. Mgr.:* J. McLaughlin

JAYCO PLASTICS OF CALIFORNIA, INC., 507 W. Blueridge Ave., Orange, CA 92665, Tel: 714-974-1701, TELEX: 678401, FAX: 714-998-4954; Empl.: 33 **B•1818-1819**

Local Sales Offices & Reps

AZ	Tempe, ETS	602-921-7122
CA	Los Angeles, Satori Elec.	213-214-1791
CA	San Diego, Coastal Elctrn. Sls.	619-459-4148
CA	Sunnyvale, Pass Assocs.	408-735-9040
CO	Boulder, Stratford Grp.	303-530-3194
GA	Atlanta, Satori Elec.	404-242-0606
IL	Berkeley, ESA	708-544-0120
NM	Albuquerque, ETS	800-424-2540
NY	New York, Breen Assocs.	201-696-8683
NC	Raleigh, Pinnacle Mktg.	919-878-4658
OR	Portland, D.A. Sullivan Co.	503-292-2448
TX	Dallas, Satori Elec.	214-518-1946

JAYCOR, P.O. Box 85154, San Diego, CA 92186, Tel: 619-453-6580, FAX: 619-535-9763; FSC No.: 3M687; Empl.: 800; *Sls. Mgr.:* Steven Lutjens

JB ELECTRONIC TRANSFORMERS, 2300 W. Armitage Ave., Chicago, IL 60647, Tel: 312-342-0080, FAX: 312-342-9098; FSC No.: 11700; Empl.: 150

jbm

FAX: 603-623-0446

JBM ELECTRONICS, INC., 1 Commerce Drive, Bedford, NH 03110-6802, Tel: 603-623-0222; FSC No.: 62694; Empl.: Approx. 50; *Sls. Mgr.:* Susan Bennett **A•1572-1577, 2238-2239**

Local Sales Offices & Reps

AL	Huntsville, BCI, Inc.	205-539-4411
AZ	Tucson, Clemick & Assocs.	602-749-4003
CA	San Diego, Quattro Sls.	619-581-3093
CA	Santa Clara, Westrep	408-988-8833, FAX:408-988-3186
FL	Miramar, Dan-Tech Sls.	305-963-6142
GA	Chamblee, BCI, Inc.	404-455-0405
IL	Arlington Hgts., Davix Intl. Ltd.	414-255-1600, FAX:414-255-1863
MD	Kensington, Koebert Assocs.	301-493-8924
MA	Needham Hgts., Kanan Technlgs.	617-449-7400
MN	St. Paul, Proud Assocs.	612-646-9428
NY	Pittsford, Franklin Sls. Corp.	716-248-8251
NY	Roslyn Hgts., November Elctrn. Sls.	516-621-6378
NC	Charlotte, Quantum Mktg.	704-523-8822
NC	Raleigh, Quantum Mktg.	919-846-5728
PA	Glenside, Koebert Assocs.	215-887-2310
TX	Austin, Texoma Sls.	512-441-1771
TX	Freeport, Texoma Sls.	409-233-3192
TX	Houston, Texoma Sls.	713-462-1432
TX	Richardson, Texoma Sls.	214-238-8127
WV	Inwood, Koebert Assocs.	304-229-8401
Can	Mississauga, Ont., Indigo Electronics	416-670-0284

J-B-T INSTRUMENTS, INC., Box 1818, New Haven, CT 06508-1818, Tel: 203-776-1111, FAX: 203-624-8142; Empl.: 25; *Sls. Mgr.:* Lillian Sharron

JC SYSTEMS, INC., 11175 Flintkote Ave., San Diego, CA 92121, Tel: 619-453-9980, FAX: 619-453-2115; Empl.: 20; *Sls. Mgr.:* Ralph Aniunas

JDK CONTROLS, INC., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593, Tel: 805-499-7779, FAX: 805-499-0990; Empl.: 40; *Sls. Mgr.:* Reece Kendall **A•2043**

Local Sales Offices & Reps

NJ	Matawan, Tim Reilly Assocs.	908-566-4555

JEFFERS ELECTRONICS, Grand Plaza, 945 Grand Ave., Nogales, AZ 85621, Tel: 602-281-4925, TELEX: 165036, FAX: 602-281-2930; FSC No.: 59474; Empl.: 400; *Sls. Mgr.:* Ken Shobert; *Dist. Mgr.:* Steve Morris

W. S. JENKS & SON, 1933 Montana Ave. NE, Washington, DC 20002, Tel: 202-529-6020, 800-673-8199, FAX: 202-832-3411

JENNINGS
HIGH VOLTAGE COMPONENTS

FAX: 408-286-1789

JENNINGS, 970 McLaughlin Ave., San Jose, CA 95122-2696, Tel: 408-292-4025, TELEX: 34-6311, TWX: 910-338-0159; FSC No.: 73905; Empl.: 350; *Sls. Mgr.:* E. V. Valehrach **A•1079; B•1516-1519; D•1274**

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens	205-883-0445
AZ	Phoenix, Crown Systems	602-274-3180
CA	Encino, King-Way Assocs.	818-788-4124
CA	San Jose, H. W. Assocs.	408-996-9940
CO	Denver, Lindberg Co.	303-758-9033
FL	Deerfield Beach, Brandel-Stephens	305-427-8558
FL	Orlando, Brandel-Stephens	305-425-3202
GA	Atlanta, Brandel-Stephens	404-261-7579
IL	Arlington Hgts., Berndt Assocs.	312-632-0900
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Shawnee Mission, Lowell-Kangas & Assoc.	913-631-3515
MD	Hunt Valley, Marktron	301-628-1111
MD	Rockville, Marktron	301-251-8990
MA	Haverhill, L.K. Assocs.	617-373-1313
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NJ	Flanders, K&R Engrg. Sls.	201-584-5235
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Kingston, Leonard D. Allen, Inc.	914-338-7588
NY	Syracuse, Leonard D. Allen, Inc.	315-437-8387
NC	Greensboro, Brandel-Stephens	919-274-6952
OH	Centerville, Bear Mktg., Inc.	513-436-2061
OH	Richfield, Bear Mktg., Inc.	216-659-3131
PA	Huntingdon Valley, Omega Elctrns.	215-947-4135
PA	Pittsburgh, Bear Mktg., Inc.	412-531-2002
TX	Houston, Barry Sales	713-784-5860
TX	Richardson, Barry Sales	214-234-0255
UT	Salt Lake City, Lindberg Co.	801-277-2643
WI	Milwaukee, Berndt Assocs.	414-545-8400

Local Distributors

CA	Carlsbad, Surcom Assocs.	619-438-4420
IL	La Fox, Richardson Elctrns., Ltd.	312-456-0600
TN	Bristol, Kintronics	615-878-3141

JENSEN TOOLS, INC., Axia, Inc., 7815 S. 46th St., Phoenix, AZ 85044, Tel: 602-968-6241, FAX: 800-366-9662; Empl.: 250; *Sls. Mgr.:* Bill Frost

JEROME INDUSTRIES CORP., 730 E. Division St., Elizabeth, NJ 07201, Tel: 908-353-5700, FAX: 908-353-1021; Empl.: 150; *Sls. Mgr.:* Anthony Di Girolamo **A•2241; D•1822-1825**

JERSEY SPECIALTY CO., See JSC Wire & Cable

JETA POWER SYSTEMS, INC

FAX: 213-426-2417

JETA POWER SYSTEMS, INC., 2675 Junipero, Signal Hill, CA 90806, Tel: 213-427-0095; Empl.: 110; *Sls. Mgr.:* Derek Steel **D•1826-1827**

Local Sales Offices & Reps

AL	Huntsville, R.O. Whitesell & Assoc.	205-883-5110
AZ	Phoenix, ISBS	602-971-6250
CA	Los Alamitos, Power Specialists, Inc.	213-594-9418
CO	Arvada, Arrowhead/CSI Sls., Inc.	303-423-5597
CT	Vernon, George Urban & Assocs.	203-647-3991
FL	Boca Raton, S. Atlantic Comp. Sls.	407-391-1034
FL	Orlando, S. Atlantic Comp. Sls.	407-857-3650
FL	Winterhaven, S. Atlantic Comp. Sls.	813-324-0953
GA	Atlanta, R. O. Whitesell & Assocs.	404-449-9190
IL	Elmhurst, UTRONIX	708-834-1100
IN	Indianapolis, R. O. Whitesell	317-359-9283
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Dover, George Urban & Assocs.	617-329-4068
MN	Edina, Engrg. Prods. Assocs.	612-835-9022
NH	Londonderry, George Urban Assoc.	603-437-3622
NY	Fairport, Hi-Tec Sls.	716-223-5922
NY	Yonkers, Sonkin Assocs.	914-968-8282
NC	Fuguay-Varina, R.O. Whitesell & Assoc.	919-552-1122
NC	Greensboro, R.O. Whitesell & Assocs.	919-273-1945
OH	Cincinnati, R.O. Whitesell & Assocs.	513-521-2290
OH	Cleveland, R.O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R.O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R.O. Whitesell & Assocs.	513-298-9546
PA	Allentown, TRC Elctrns.	215-391-8977
PA	Pittsburgh, R. O. Whitesell	412-963-6161
TN	Knoxville, R.O. Whitesell & Assocs.	205-883-5150
TX	Dallas, Sunbelt Comps.	214-248-8000
UT	Midvale, Arrowhead/CSI Sls.	801-561-5688
WA	Vancouver, Northwest Comp. Sls.	206-695-1331
WA	Kirkland, N.W. Comp. Sls.	206-828-2104
Can	Montreal, Empro Sls.	514-341-6420

JETTRON PRODUCTS INC., P.O. Box 337, E. Hanover, NJ 07936, Tel: 201-887-0571, FAX: 201-887-4182; FSC No.: 04435; Empl.: 30; *Sls. Mgr.:* Ben Latawiec **C•1404-1405**

Local Sales Offices & Reps

CA	El Cajon, A-Tronics	619-444-1501
NY	New York, Eltron Export Co.	212-944-7635

JEWELL ELECTRICAL INSTRUMENTS, 850 Perimeter Rd., Manchester, NH 03103, Tel: 603-669-6400, FAX: 603-669-5962; Empl.: 175; *Sls. Mgr.:* Andrew Roeper; *Dist. Mgr.:* Andrew Roeper

JFD ELCTRNS., See Murata Erie No. Amer., Inc.

JF MICROSYSTEMS, 3641 Frontier Road, Pasco, WA 99301-9619, Tel: 509-297-4294, 800-532-2737; Empl.: 2; *Sls. Mgr.:* Jim Follansbee

JFW INDUSTRIES, INC., 5134 Commerce Sq. Dr., Indianapolis, IN 46237, Tel: 317-887-1340, FAX: 317-881-6790; FSC No.: 61162; Empl.: 87; *Sls. Mgr.:* Carrie Glover

JH

FAX: 213-328-0057

JH AMERICA, INC., JI-HAW Group, 20809 Higgins Court, Torrance, CA 90501, Tel: 213-328-0051 **C•1406-1407, 1760-1763**

Local Sales Offices & Reps

CA	Sunnyvale, Logan Sls.	408-732-6020
CA	Ventura, R D Sls.	805-650-0112
MN	St. Paul, Johnson Co.	612-641-1878
NC	Kernersville, Wallace Elctrn. Sls.	919-996-2742

Local Distributors

AZ	Tempe, Comtel Corp.	602-829-9471
CA	Anaheim, Deco Elctrns.	714-630-8252
CA	San Diego, Deco Elctrns.	619-693-1595
FL	Orlando, Computel	407-682-3957
NJ	Kennilworth, Computel	201-241-5400
NC	Charlotte, Computel	704-376-4414

JKL COMPONENTS CORPORATION

FAX: 818-897-3056

JKL COMPONENTS CORPORATION, 13343 Paxton St., Pacoima, CA 91331-2376, Tel: 818-896-0019; FSC No.: 55335; Empl.: 35; *Sls. Mgr.:* Ernie Soares; *Dist. Mgr.:* Bob Brandt ..... **B•1169**

Local Sales Offices & Reps

AL	Huntsville, Taylor-Stone Inc.	205-830-9322
CA	San Diego, Lawsco	619-755-0200
IL	Cary, Bob Burns & Assocs.	708-516-3322
NY	Henrietta, CMJ, Inc.	716-334-3277
IN	Indianapolis, Apex-Tec, Inc.	317-842-5559
MI	Farmington Hills, Clark Sls.	313-553-0610
MN	Bloomington, Murnco	612-854-4161
OH	Cincinnati, Clark Sls. Co.	513-922-7555
OH	Painsville, Clark Sls. Co.	216-247-7848
PA	Philadelphia, Check Assoc.	215-487-3007
TX	Irving, Kite Elec. Sls.	214-986-0321

Local Distributors

AL	Huntsville, Powell Elec.	205-539-2731
CA	San Diego, Richie/Impact Sls.	619-271-4511
AZ	Phoenix, Capital Elctrns.	602-252-5897
CA	Garden Grove, Richey Western	714-895-0060
CA	Gardena, Cal. Switch & Signal	213-770-2330
CA	San Diego, Richie/Impact Sls.	619-271-4511
CA	Santa Clara, Richey/Western Elec.	408-727-7411
CA	Sunnyvale, Target Elec.	415-961-1170
CT	Wallingford, Sager Elec.	203-265-4600
FL	Ft. Lauderdale, Powell Elec.	305-484-8377
GA	Norcross, Specialty Distrbg. Co.	404-446-3190
IL	Wheeling, Hawk Elec.	312-459-4030
IN	Indianapolis, Meunier Elctrns.	317-635-3511
KS	Lenexa, Amer. Elec. & Cable	913-469-0099
MD	Kensington, Marine Air Supp.	301-949-1353
MD	Rockville, M S Elctrns.	301-340-6400
MA	Hingham, Sager Elec.	617-749-6700
MA	Westborough, Powell Elec.	617-366-6100
MI	Livonia, LWC Distrs.	313-464-7700
MN	Minneapolis, Bergquist Co.	612-835-2322
MO	Richland, ATR Ent.	314-765-5219
MN	Fridley, Voyager Elec.	612-571-7766
NJ	Clifton, Vantage Comps.	201-777-4100
NM	Albuquerque, Walker Elec. Supply	505-883-2992
NY	Apalachin, Rogan Elec.	607-625-2949
NY	Bohemia, Genelco	516-589-0909
NH	Salem, Sager Elec.	603-898-1348
NC	Greensboro, Hammond	919-275-6391
OH	Cincinnati, Schuster Elec.	216-425-8134
OK	Oklahoma City, Radio Supp. Inc.	405-232-6127
PA	Bristol, Aim Elec.	215-785-3500
PA	Philadelphia, Powell Elec.	215-365-1900
TN	Chattanooga, Specialty Distr. Co.	615-624-1040
OH	Yellow Springs, Electro-Shield	513-767-1054
TX	Ft. Worth, T & S. Supp.	817-248-4781
WA	Greenacres, Mica Co.	509-928-1720
WA	Seattle, Radar Elec. Co.	206-282-2511
WI	Oshkosh, Electronic Inds.	414-235-8930
Can	Quebec, Future Elec.	514-694-7710

JMJ TECHNICAL PRODS., 50 Wheeler Point Rd., Newark, NJ 07105, Tel: 201-589-4257, FAX: 201-762-9334; Empl.: 8; *Sls. Mgr.:* Kevin Kolenut ..... **C•1591**

JMK INCORPORATED

FAX: 603-886-4115

JMK, INC., 15 Caldwell Dr., Amherst, NH 03031, Tel: 603-886-4100; Empl.: 200; *Sls. Mgr.:* J. Kennedy ..... **A•1626-1627**

Local Sales Offices & Reps

CA	Santa Clara, Cummings & Assocs.	408-247-8656
MN	St. Paul, Arkco Sls.	612-777-7454

JMR ELECTRONICS, 1525 Blondell Ave., Bronx, NY 10461, Tel: 212-597-6050, FAX: 212-597-6137; Empl.: 50

JM TRANSFORMER CO., INC., 112 Florida St., Farmingdale, NY 11735, Tel: 516-293-0475, FAX: 516-293-3923; Empl.: 18; *Sls. Mgr.:* J. Millman ..... **A•2242-2247**

JOBMASTER CORP., 9010 Liberty Rd., Randallstown, MD 21133-0207, Tel: 410-655-1400, FAX: 410-521-5461; Empl.: 16 ..... **A•1285**

JOHANSON DIELECTRICS, INC., 2220 Screenland Dr., Burbank, CA 91505, Tel: 818-848-4465, TWX: 910-498-2735, FAX: 818-841-7261; Empl.: 300 ..... **A•1081**

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
AZ	Tempe, Reptronix, Inc.	602-345-4580
AZ	Tucson, Compass Mktg. & Sls.	602-293-1220
CA	Costa Mesa, Richland Tech. Sls.	714-722-9881
CA	Mountain View, Straube Assocs.	415-969-6060
CO	Westminster, Straube Assocs.	303-426-0890
CT	Waterbury, Compak Inc.	203-753-6431
FL	Ft. Lauderdale, VG Sales Co.	305-938-4333
FL	Altamonte Springs, VG Sales Co.	407-831-8688
FL	Largo, VG Sales Co.	813-536-7787
IL	Lisle, WG Controls	708-963-5954
IN	Indianapolis, M & L Elctrns.	317-359-4742
KS	Lenexa, Midtec Assocs.	913-541-0505
MD	Columbia, PSA South	301-730-0359
MA	Hudson, Compak Inc.	508-568-0331
CT	Wethersfield, Compac Sls.	203-563-4784
MI	Ypsilanti, Techrep, Inc.	313-572-1950
MN	St. Paul, Cahill, Schmitz & Cahill, Inc.	612-646-7217
MO	St. Louis, Midtec Assocs.	314-275-8666
NM	Albuquerque, Reptronix, Inc.	505-292-1718
NY	East Rochester, L-Mar Assocs.	716-381-9100
NY	Huntington, Compar New York Inc.	516-423-5660
NC	Winston-Salem, Murcota	919-722-9445
OH	Westlake, Baehr Greenleaf Assocs.	216-892-1770
PA	Trevose, PSA, Inc.	215-245-0513
PA	Warrendale, Baehr-Greenleaf Assocs.	412-934-3088
TX	Dallas, C & J Assocs.	214-539-0140
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Oakton, PSA South	703-281-1806
WA	Seattle, Northmar, Inc.	206-524-5170

Local Distributors

AZ	Tempe, Bell Inds.	602-966-7800
CA	Los Alamitos, SEMI DICE	213-594-4631
CA	San Diego, Bell Industries	619-268-1277
CA	Santa Clara, SEMI DICE	408-980-9777
CA	Yorba Linda, Corona Elctrns.	714-283-8185
CO	Denver, Newark Elctrns.	303-757-8531
CT	Bloomfield, Newark Elctrns.	203-243-1731
FL	Orlando, Newark Elctrns.	407-896-8350
IL	Chicago, Newark	312-784-5100
IN	Indianapolis, Bell Inds.	317-875-8200
MD	Columbia, Jaco Elctrns.	301-995-6620
MA	South Easton, Semi Dice	508-238-8344
MA	Tewksbury, Jaco Elctrns.	508-640-0010
MI	Jackson, Newark Elctrns.	601-956-8300
MN	Minneapolis, Newark Elctrns.	612-331-6350
NJ	Fairfield, Micross Comps.	201-227-8007
NY	Mt. Vernon, ASAP Elctrns.	914-699-2727
OR	Lake Oswego, Bell Industries	503-635-6500
TX	Allen, Prime Distribution	214-542-7915
WI	Waukesha, Bell Industries	414-547-8879

JOHANSON MANUFACTURING CORPORATION, 400 Rockaway Valley Rd., Boonton, NJ 07005, Tel: 201-334-2676, FAX: 201-334-2954; FSC No.: 91293; Empl.: 200 ..... **A•1080**

Local Sales Offices & Reps

AL	Huntsville, Murcota Corp.	205-539-8476
AZ	Tempe, Reptronix, Ltd.	602-345-4580
CA	Escondido, Knight Co.	619-743-5136
CA	Los Angeles, Knight Co.	213-670-2833
CA	Mountain View, Straube Assocs.	415-969-6060
CO	Westminster, Straube Assoc., Mt. States	303-426-0890
CT	Wetherfield, Compak, Inc.	203-563-4784
FL	Ft. Lauderdale, Vg Sls.	305-938-4333
FL	Largo, Vg Sls.	813-536-7787
FL	Pompano Beach, Vg Sls.	305-971-0900
IL	Lisle, W.G. Controls	708-963-5954
IN	Kokomo, Schillinger Assocs.	317-455-2708
IA	Hiawatha, ARD Sales Co.	319-393-6392
MA	Hudson, Compak, Inc.	617-568-0331
MN	St. Paul, Cahill, Schmirz & Cahill, Inc.	612-646-7217
MO	St. Louis, Midtec Assocs.	314-275-8666
NM	Albuquerque, Reptronix Inc.	505-292-1718
NY	Boonton, Johanson Mfg. Corp.	201-334-2676
NY	Mount Vernon, Friedman-Smith Elctrn. Sls.	914-664-4866
NC	Winston-Salem, Murcota Corp.	919-722-9445
OH	Columbus, Baehr, Greenleaf & Assocs.	614-847-0220
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OH	Westlake, Baehr, Greenleaf & Assoc.	216-842-1770
PA	Evans City, Baehr, Greenleaf & Assocs.	412-776-2151
PA	Trevose, P.S.A.	215-245-0513
TX	Austin, W. Pat Fralia & Assocs.	512-835-7911
TX	Euless, W. Pat Fralia & Assocs.	817-267-3577
TX	Houston, W. Pat Fralia & Assocs.	713-772-1572
UT	Salt Lake City, Straube Assocs., Mt. States	801-263-2640
VA	Oakton, PSA South	703-281-1806
WA	Seattle, Northmar	206-524-5170

Local Distributors

AZ	Tempe, Penstock	800-255-6788
CA	Beverly Hills, Penstock	818-841-8881
CA	Garden Grove, Bell Inds.	714-895-7801
CA	Gardena, Bell Inds.	213-515-1800
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Penstock	619-225-8600
CA	San Jose, All American Semiconductor	408-287-0190
CA	San Pedro, ASAP Elctrns./West	213-519-8377
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Penstock	408-730-0300
CA	Thousand Oaks, Bell Inds.	213-826-6778
CA	Westlake VL, JACO/Distel, Inc.	805-495-9998
CO	Denver, Penstock	303-973-3010
CO	Wheatridge, Bell Inds.	303-424-1985
FL	Deerfield Bch., Bell Inds.	305-421-1997
FL	Ft. Lauderdale, All American	305-572-7999
FL	Tampa, JACO	813-628-4665
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Elk Grove VL, Bell Inds.	312-640-1910
IL	Palatine, Penstock	708-934-3700
IN	Indianapolis, Bell Inds.	317-634-8202
IN	Indianapolis, Penstock	317-784-3870
MD	Baltimore, Radio Elec. Svc.	301-529-0500
MD	Beltsville, Radio Elec. Svc.	301-937-9100
MA	Seekonk, M-Squared	617-761-5490
MA	Wakefield, All American	617-246-2300
MA	Wilmington, RC/Jaco Elctrns.	617-273-1860
NJ	Fairfield, Penstock	201-808-1414
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Mt. Vernon, ASAP Elctrns.	914-699-2727
NY	Syracuse, Newark Elctrns.	315-437-6611
OH	Dayton, Bell Inds.	513-435-8660
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Philadelphia, PEI-Genesis	215-673-0400
TX	Ft. Worth, PATCO Supplies	817-429-8596
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Bell Inds.	206-747-1515

JOHNSON, E. F., CO., P.O. Box 59089, Minneapolis, MN 55459-0089, Tel: 612-943-5500, FAX: 507-835-6485; Empl.: 1400; *Sls. Mgr.:* Arnie Nicklin

JOHNSON CONTROLS BATTERY GROUP, INC., 900 East Keefe Ave., Milwaukee, WI 53212, Tel: 414-961-6500, FAX: 414-961-6506; Empl.: 250; *Sls. Mgr.:* Daniel E. Ellis, Dir. Sls. & Mktg.

JOHNSON YOKOGAWA CORP., 4 Dart Road, Newnan, GA 30265, Tel: 404-254-0400, FAX: 404-254-0928; Empl.: 700; *Sls. Mgr.:* Chuck Micallef

JOLO INDUSTRIES, INC., 13921 Nautilus Dr., Garden Grove, CA 92643, Tel: 714-554-6840, FAX: 714-554-0306; FSC No.: 30035; Empl.: 20; *Sls. Mgr.:* J.S. Giampiccolo, Jr. ..... **C•1408-1409**

Local Sales Offices & Reps

AZ	Scottsdale, JK & Assocs.	602-990-8804
CA	Los Angeles, Quattro Sls. Assocs.	213-372-4221
CA	Mountain View, Leddy Assocs.	415-969-6313
CA	Orange County, Quattro Sls. Assocs.	800-735-4510
CA	San Diego, Quattro Sls. Assocs.	619-581-3093
CA	San Fernando Valley, Quattro Sls. Assocs.	805-523-2978
FL	Longwood, Mathias Assocs., Inc.	407-682-1700
IL	Chicago, McNulty & Assocs.	312-980-9868
MA	Reading, Lincoln Tech. Sls.	617-944-9594
MI	Sterling Heights, Geotronix, Inc.	313-254-0520
OH	Cleveland, Geotronix Mktg. Assocs.	216-659-6100
OH	Trotwood, Geotronix, Inc.	513-854-5939
OR	Beaverton, Evergreen Mktg. Grp.	503-643-8020
PA	Allison Park, Geotronix, Inc.	412-487-1770
TX	Austin, Barry Sls., Inc.	512-837-3616
TX	Houston, Barry Sls., Inc.	713-784-5860
TX	Richardson, Barry Sls., Inc.	214-234-0255
WA	Seattle, Evergreen Mktg. Grp. Inc.	206-485-8063
Can	Nepean, Ont., Tech-Trad, Inc.	613-727-1272

Local Distributors

FL	Miami, Elec. Equip.	305-526-6060
OH	Richfield, Alpha Distr. Corp.	216-659-7100

JONARD INDUSTRIES CORP., 134 Marbledale Rd., Tuckahoe, NY 10707, Tel: 914-793-0700, TELEX: 996570, TWX: 710-562-0107, FAX: 914-793-4527; Empl.: 65; *Sls. Mgr.:* C. McClory

JONATHAN MANUFACTURING CORP., 1101 So. Acacia Ave., Fullerton, CA 92631, Tel: 714-526-4651, FAX: 714-879-1212; Empl.: 375; *Sls. Mgr.:* Todd Leverich

JONES, HIRAM, ELCTRNS. INC., See Hiram Jones Elctrns. Inc.

JORI RESOURCES, 2128 Knoll Dr., Ventura, CA 93003, Tel: 805-642-2266, FAX: 805-642-5978; Empl.: 4

JOSLYN ELECTRONIC SYSTEMS, P.O. Box 817, Goleta, CA 93116, Tel: 800-752-8068, 805-968-3551, TELEX: 181824, FAX: 805-968-2335; FSC No.: 23663; Empl.: 240; *Sls. Mgr.:* M. Young

JOULE POWER, INC., Joyce Industrial Pk., Summer Rd., Boxborough, MA 01719, Tel: 508-263-9712, FAX: 508-263-9071 ..... **D•1829**

Local Sales Offices & Reps

AL Huntsville, Over & Over 205-837-7105
AZ Scottsdale, Sun Tech Mktg. 602-483-1082
CA San Jose, Silicon Valley Sls. 408-432-1967
FL Altamonte Springs, Over & Over 407-332-1222
GA Norcross, Over & Over 404-449-6205
IL Schaumberg, Victory Sls. 708-490-0300
MA Burlington, Tech Rep. Inc. 617-272-5965
NJ Fairfield, Metrologic Corp. 201-575-5585
NC Raleigh, Over & Over 919-876-7338
OH Chargin Falls, Larry Bennett & Assocs. 216-247-2174
PA Wayne, John Lyons Mktg. 215-687-2277
TX Plano, Aticus 214-964-0663
UT Ogden, Doug Taylor & Assocs. 801-546-9570
VA Alexandria, Tech Reps. Inc. 703-370-2600
WA Edmonds, Power Sources Unlimited .. 206-743-6641
Can Montreal, Que., Solid State Engrg. 514-481-3313

JOVIL MANUFACTURING CO., INC., Precision Rd., Danbury, CT 06810, Tel: 203-792-6700, TELEX: 969634, FAX: 203-790-8645; Empl.: 25; *Sls. Mgr.:* Keith Fredlund

JRW INDUSTRIES, INC., 2312 N Second St., Harrisburg, PA 17110, Tel: 717-236-1418, FAX: 717-236-1895; Empl.: 4; *Sls. Mgr.:* Kevin J. Williams, Sls. Mgr.

JSC WIRE & CABLE, Box 248, Burgess Pl., Wayne, NJ 07474, Tel: 201-694-6200, 1-800-572-9473, FAX: 201-694-8297; Empl.: 40; *Sls. Mgr.:* Richard Wojtovitz

J.S.T. CORP., 1200 Business Ctr. Dr., Ste. 400, Mt. Prospect, IL 60056, Tel: 1-800-292-4243, FAX: 708-803-4918; *Sls. Mgr.:* Ron Lesky; *Dist. Mgr.:* Ron Lesky ..... **C•1411-1421**

Local Sales Offices & Reps

AL Huntsville, Over & Over, Inc. 205-837-7105, FAX:205-837-7305
AZ Scottsdale, Whyle & Assocs. 602-391-0226, FAX:602-391-9498
CA Arcadia, Van Gott & Assocs. 818-445-9728, FAX:818-445-5019
CA Auburn, Ad. Tech. Mktg. 916-888-0788, FAX:916-888-0787
CA Escondido, Van Gott & Assocs. 619-489-0893, FAX:619-489-8167
CA Santa Clara, GMB Tech Sls. 408-496-6181, FAX:408-496-0634
CO Arvada, Arrowhead Sls. Corp. 303-423-5556, FAX:303-423-5598
FL Altamonte Spgs., Over & Over, Inc. 407-322-1222, FAX:407-332-4433
FL Coral Springs, Over & Over, Inc. 305-753-7050, FAX:305-753-0337

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IN Ft. Wayne, Corrao/Marsh 219-482-2725, FAX:219-484-7491
IN Greenfield, Corrao/Marsh, Inc. 317-462-4446, FAX:317-462-6568
MD Ellicott, AM-Tech Assocs. 301-461-5599, FAX:301-461-5659
MA Norwell, M.J. Sls., Inc. 617-982-8776, FAX:617-878-6707
MA Randolph, The T.M.R. Grp. 617-961-4486, FAX:617-986-4640
MI St. Joseph, Six Sigma 616-429-7788, FAX:616-429-7788
MI Sylvan Lake, Six Sigma 313-332-4900, FAX:313-332-4903
MN St. Paul, Countryman Assoc. Co. 612-645-9151, FAX:612-641-6153
MS Horn Lake, Edward Alan Co. 601-342-4989
MO Florissant, Palatine Engrg. & Sls. Inc. 314-839-0800,FAX:314-839-6023
MO Kansas City, Palatine Engrg. & Sls; Inc. 816-531-7221,FAX:816-531-7443
NJ Madsion, Venture Quest, Inc. 201-377-4922, FAX:201-377-0453
NY Clay, MJ Sls., Inc. 315-699-9596, FAX:315-699-7851
NY W. Babylon, Venture Quest, Inc. 516-491-3120, FAX:516-491-0907
NC Charlotte, Over & Over, Inc. 704-542-9111, FAX:704-542-9937
NC Raleigh, Over & Over 919-876-7338, FAX:919-876-8098
OH Highland Hgts., KT/DEPCO 216-442-6200, FAX:216-461-2101
OH Mentor, Qualtek Elctrns. Corp. 216-951-3300, FAX:216-951-7252
OR Hillsboro, Turn-A-Round Sls. 503-640-4641, FAX:503-640-4640
PA Fort Washington, SMC Inc. 215-628-3394, FAX:215-628-3395
PA Pittsburg, KT/Depco 412-367-1011, FAX:412-367-2153
TX Arlington, T-Tec Sls. 817-429-9151, FAX:817-457-6704
TX Arlington, T-Tec Sls. 817-461-0522, FAX:817-277-8502
TX El Paso, T-Tec Sls. 915-598-1898, FAX:915-598-2485
TX Gilmer, T-Tec Sls. 918-747-8316, FAX:903-734-5316
TX Katy, T-Tec Sales 713-347-2926, FAX:713-347-2088
WA Kirkland, Turn-A-Round Sls. 206-822-4634, FAX:206-828-0633
WI Brookfield, Circuit Sls. 414-784-7773, FAX:414-784-4528
Can Markham, Ont., Avotronics, Ltd. 416-475-2024, FAX:416-475-2019
Can Vancouver, BC, Fairwest Sls. 604-685-1473, FAX:604-681-7712

Local Distributors

AL Birmingham, KSM Elctrns. 205-879-8377, FAX:205-879-8406
AZ Tempe, Elctrn. Hardware 602-967-1691, FAX:602-967-1694
AZ Tucson, SWS Elctrns; Inc. 602-628-1613, FAX:602-628-1921
CA Fremont, Vic/Tal Sls. 415-651-6420, FAX:415-651-8795
CA Fullerton, I.S.I. 714-773-0411,FAX:714-447-3976
CA Huntington Bch., On-Line Elctrns. 714-847-5111, FAX:714-847-4485
CA Irvine, Kensington Elctrns. 714-588-0575, FAX:714-588-0176
CA N. Hollywood, Elctrn. Hardware 818-982-6100, FAX:818-764-1889
CA Norwalk, Myco Elctrns. Supp. 213-404-2053, FAX:213-926-8536
CA San Carlos, Logan Elctrns. 415-594-0700, FAX:415-594-1687
CA San Diego, Mock III 619-693-8230, FAX:619-693-3355
CA San Jose, Spectra Elctrns. 408-452-1590, FAX:408-452-1683
CA Santa Clara, Elctrn. Hardware 408-988-1000, FAX:408-988-4189
CA Santa Clara, Trinty Elctrns. 408-980-9011, FAX:408-980-9014
CA Vista, Elctrn. Hardware 619-231-1307, FAX:619-598-6958
CO Englewood, Indelco 303-795-3431, FAX:303-795-8298
CT Wallingford, Midstate Elctrns. 203-265-9900, FAX:203-269-2374
FL Ft. Lauderdale, KSM Elctrns. 305-971-5900, FAX:305-977-0489
GA Athens, Dixie Elctrns. 404-613-7755, FAX:404-613-7856
GA Atlanta, KSM Elctrns. 404-458-2013, FAX:404-451-0891
GA Augusta, Dixie Elctrns. 404-722-2055, FAX:404-722-0388
IL Addison, Belford Elctrns. 708-691-1100, FAX:708-691-1118
IL Bensenville, Voyager I 708-860-1300, FAX:708-860-1573
IL Glendale Hgts., KSM Elctrns. 708-529-1700, FAX:708-529-3668
IL Palatine, OHM Elctrns. 708-359-5500, FAX:708-359-9686
IN Carmel, Altex Elctrns. 317-848-1323, FAX:317-844-6593
IN Elkhart, Babsco, Inc. 219-293-0631, FAX:219-293-7207
IN Indianapolis, Mar Elctrns. 317-633-6699, FAX:317-633-6687
MD Gaithersburg, Axis Elctrns., Inc. 301-840-9640, FAX:301-840-9299
MA Burlington, QPL Elctrns. Distrs. 617-229-2424, FAX:617-273-5075
MA Franklin, JEM Elctrns. 508-520-3105, FAX:508-520-3109
MI Grand Rapids, S.F. Elctrns. 616-459-0216, FAX:616-459-5601
MI Southfield, Michigan Lectrols Corp. 313-353-1350, FAX:313-353-1433
MI Wyoming, E.C. Elctrns. 616-530-0576, FAX:616-530-8598
MN Fridley, Voyager II 612-571-7766, FAX:612-571-9519
MN New Brighton, Chris Elctrns. 612-631-2647, FAX:612-631-3071
MN Roseville, TLC Distbn. 612-483-2226, FAX:612-481-0287
NE Lincoln, Scott Elctrns. 402-466-8221, FAX:402-466-4187
NE Omaha, Scott Elctrns. 402-734-6750, FAX:402-734-1442
NJ Cherry Hill, Jeta Corp. 609-663-7272, FAX:609-663-1698
NJ Moorestown, Marlac Elctrns. 609-234-4200, FAX:609-234-0672
NJ Woodbridge, Calmm Elctrns. 201-750-4497, FAX:201-750-4212
NM Albuquerque, TMA, Inc. 505-345-8921, FAX:505-344-1113
NY Bohemia, Key Comps., Inc. 516-567-7500, FAX:516-567-2920
NY Hauppauge, Addem Distbg. Div. 516-273-6777, FAX:516-273-7086
NC Charlotte, Dixie Elctrns. 704-377-5413, FAX:704-377-2561
NC Winston-Salem, Dixie Elctrns. 919-724-5961, FAX:919-723-7024
OH South Euclid, Circuit Elec. 216-382-0330, FAX:216-382-4411
OR Aloha, Elctrn. Concepts 503-642-9715, FAX:503-591-8383
OR Beaverton, Micro Power Elctrns. 503-626-7086, FAX:503-643-1556
PA Bristol, Aim Elctrns. 215-785-3500, FAX:215-785-3510
SC Columbia, Dixie Elctrns. 803-779-5332, FAX:803-765-9276
SC Greenville, Dixie Elctrns. 803-297-1430, FAX:803-297-1439
SC N. Charleston, Dixie Elctrns. 803-552-2671, FAX:803-552-2676
TN Gray, Dixie Elctrns. 615-477-2131, FAX:615-477-4407
TN Oak Ridge, Dixie Elctrns. 615-481-3393, FAX:615-481-3397
TN Soddy Daisy, Techni-Tronics 615-332-2119, FAX:615-332-1061
TX Austin, Wofford Elctrns. 512-339-1131, FAX:512-835-7351
TX Dallas, Wofford Elctrns. 214-320-0294:FAX:214-320-2017
TX El Paso, Schick Entprs. 915-772-3283:FAX:915-772-3034
TX Friendswood, Schick Enterprises 713-388-1714
TX Houston, Wofford Elctrns. 713-847-3583, FAX:713-847-4035
TX N. Richland Hills, Swieco Elctrns (Dixie) 817-281-1811,FAX:817-281-1783
WA Redmond, Priebe Elctrns. 206-881-2363, FAX:206-881-0508
Can Burlington, Ont., Alternate Source Comps., Ltd. 416-335-6385,FAX:416-332-1385
Can Concord, Ont., Zierick Canada Corp. ... 416-669-1429, FAX:416-669-5626

Can Markham, Ont., ARMA Elctrns. Sls., Inc. 416-475-1858,FAX:416-475-2019
Can Vancouver, B.C., Brockton Elctrns. Ltd. 604-291-6665,FAX:604-291-6664

JUDCO MFG. INC., P.O. Box 487-E84, 1429 240th St., Harbor City, CA 90710, Tel: 213-534-0959; *Sls. Mgr.:* Kevin Johnson

JUDD WIRE INC., 57 Turnpike Rd., Turners Falls, MA 01376, Tel: 413-863-4357, FAX: 413-863-2305; FSC No.: 3357; Empl.: 148; *Sls. Mgr.:* Jim Paradise ..... **B•1020-1021; C•1764**

Local Sales Offices & Reps

AL	Huntsville, R & G Assocs.	205-880-8020
AZ	Phoenix, O'Donnell Associates	602-944-9542
CA	Los Altos, Ewing Foley	415-941-4525
CA	Torrance, O'Donnell Assocs.	213-539-9664
CO	Boulder, Stratford Grp.	303-530-3194
FL	Coral Springs, J.P. Jasco & Assocs.	813-371-3814
IL	Arlington Heights, Rozner Sls. Co.	312-577-0067
KS	Overland Pk., Spectrum Sls.	913-648-6811
MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
MA	Marlborough, O.K. Engrg.	617-481-6400
MN	Bloomington, EMT Engineering	612-888-1020
MO	Hazelwood, Spectrum Sls.	314-731-5151
NJ	Haddonfield, M & S Mesa Inc.	609-429-9531
NM	Albuquerque, O'Donnell Assocs.	505-883-1030
NY	Fairport, Senntec Sls.	716-425-3954
OH	Worthington, Simcox Assocs.	614-885-8776
OR	Beaverton, Jas. J. Backer Co.	503-627-0775
TX	Dallas, Stevens Sls. Co.	214-702-0132
WA	Seattle, Jas. J. Backer Co.	206-285-1300

Local Distributors

AL	Madison, Sea Wire & Cable	205-772-9616
CA	Concord, Control Master	415-939-3600
CA	Fountain Valley, Innovative Sys.	714-968-6383
CA	Irvine, Republic Elctrns.	714-855-2222
CA	Menlo Park, Bay Associates	415-321-2990
CA	San Leandro, Anixter	415-352-3100
CA	Torrance, Blake Wire & Cable	213-533-8141
CA	Valencia, Wirenetics Co.	805-257-2400
CO	Colorado Springs, SCI	303-598-6888
CT	East Hartford, E. J. Stephens Co.	203-282-9400
CT	Manchester, I.M.S.	203-649-4415
FL	Altamonte Springs, Royce Elctrns.	305-869-4700
FL	Ft. Lauderdale, Anixter	305-485-4455
FL	Ft. Lauderdale, Pacer Elctrns.	305-462-0902
IL	Brookfield, Conductors Unltd.	312-485-7855
MA	Woburn, Pacer Elctrns.	617-935-8330
MN	Bloomington, K. L. Tannehill	612-881-6700
NH	Amherst, North Country Wire & Cable	603-889-0063
NJ	Dover, Electro Spec.	201-361-6300
NY	Farmingdale, Weico Elctrns.	516-293-0050
MA	Lowell, Anixter	508-459-6400
NY	Rochester, Simcona Elctrn.	716-328-3230
FL	Tampa, Conductors Unlimited	813-248-1620
NC	Raleigh, Wholesale Electric	919-878-9400
OH	Dayton, Astro Inds.	513-429-5900
PA	Montgomeryville, Pyttronic Ind.	215-242-6700
TX	Dallas, Interstate Wire	214-553-1311
WA	Tukwila, Carlyle Inc.	206-251-0700
WI	New Berlin, Indl. Elec. Wire & Cable	414-782-2323

JUDD WIRE INC., 870 Los Vallecitos Blvd., San Marcos, CA 92069, Tel: 619-744-7720, FAX: 619-744-6089; FSC No.: 3357 ..... **B•1020-1021; C•1764**

Refer to Judd Wire, Turners Falls, MA for sales office and distributor information.

JRL JULIE RESEARCH

FAX: 212-691-3320

JULIE RESEARCH LABS., 508 West 26 Street, New York, NY 10001, Tel: 212-633-6625, TWX: 710-581-5138; FSC No.: 07062; Empl.: 35; *Sls. Mgr.:* Pamela Spencer; *Dist. Mgr.:* Pamela Spencer ..... **A•1929; D•1270-1273**

Local Sales Offices & Reps

CA	Fresno, Lion Elctrn. Labs	209-233-9096

JUMO PROCESS CONTROL, INC., 735 Fox Chase, Coatsville, PA 19320, Tel: 215-380-8002, FAX: 215-380-8009; *Sls. Mgr.:* Gunnar Oberg

KAHLE ENGINEERING, 50 S. Center St. Bldg. No. 1, Orange, NJ 07050, Tel: 201-678-2020, FAX: 201-678-0326; Empl.: 50; *Sls. Mgr.:* Daniel Fowler

KSI

FAX: 508-922-8374

KAISER SYSTEMS, INC., 126 Sohier Road, Beverly, MA 01915, Tel: 508-922-9300; FSC No.: IFD78; Empl.: 100; *Sls. Mgr.:* Steve Swech ..... **D•1830-1835**

KALAMAZOO TECHNICAL FURNITURE, See TECLAB

KALGLO ELCTRNS. CO., INC., 6584 Ruch Rd., E. Allen Twp., Bethlehem, PA 18017-9359, Tel: 215-837-0700, TWX: 510-651-2101, FAX: 215-837-7978; FSC No.: 64521; *Sls. Mgr.:* James H. Beidelman

KALMUS & ASSOCS., INC., 2424 S. 25th Ave., Broadview, IL 60153, Tel: 708-343-7004, FAX: 708-343-7016; Empl.: 250; *Sls. Mgr.:* Kent Prather

KAMAN INSTRUMENTATION, 1500 Garden of the Gods, P.O. Box 7463, Colo Springs, CO 80907, Tel: 1-719-599-1892, FAX: 719-599-1823; FSC No.: 21732; Empl.: 200

KAM COMPONENTS, INC., P. O. Box 192-EEM, Nesconset, NY 11767, Tel: 516-585-0666, FAX: 516-585-1580; Empl.: 29; *Sls. Mgr.:* Cheryl Day

K&L MICROWAVE, INC., 408 Coles Circle, Salisbury, MD 21801, Tel: 301-749-2424, FAX: 301-749-5725; FSC No.: 50140; Empl.: 550; *Sls. Mgr.:* Jim Price

K & L OSCILLATEK, A DOVER TECHNOLOGY CO., See Oscillatek, A Dover Technology Co.

K & M ELECTRONICS, 11 Interstate Dr., W. Springfield, MA 01089, Tel: 413-781-1350, FAX: 413-737-0608; FSC No.: 66613; Empl.: 700; *Sls. Mgr.:* James Chase

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KAPPA TECHNOLOGIES, INC., 1443 Pinewood St, Rahway, NJ 07065, Tel: 908-396-9400, 1-800-223-0603; FSC No.: 20933; Empl.: 175; *Sls. Mgr.:* M. Pearl ..... **A•1578-1588, 1680-1681, 2248-2249; D•1836**

Local Sales Offices & Reps

AZ	Scottsdale, Interstate Marketing	602-244-9050
CA	Woodland Hills, Interstate Marketing	818-883-7606
CO	Wheatridge, Wescom Mktg. Inc.	303-422-8957
MD	Middletown, S.T./Woolard Co., Inc.	301-371-4500
MN	Osseo, Gaffney Sls. Co.	612-425-5484
NJ	Ft. Lee, Neptune Elctrns. Co.	201-461-2789
NY	Cazenovia, S.T./Woolard Co., Inc.	315-655-8145
NY	Plainview, Neptune Elctrns. Co.	516-349-1600
PA	Ft. Washington, SMC, Inc.	215-628-3394
TX	Austin, Gardin-Moore Sls.	512-794-2900
TX	Dallas, Gardin-Moore Sls.	214-985-1193
TX	Houston, Gardin-Moores Sls.	713-496-7651
UT	Salt Lake City, Wescom Mktg. Inc.	801-269-0419
SC	Pickens, S.T./Woolard Co., Inc.	803-878-3830

Local Distributors

CA	Laguna Hills, Jaco/Distel, Inc.	714-837-8966
CA	San Jose, Jaco/Distel, Inc.	408-432-9290
CA	Sherman Oaks, Delay Line Distrs. Inc.	213-283-2058
CA	Westlake, Jaco/Distel, Inc.	805-495-9998
CT	Meriden, Jaco Elctrns., Inc.	203-235-1422
FL	Boca Raton, Jaco/QC	407-241-7950
GA	Norcross, Jaco/QC	404-449-9508
MD	Columbia, Jaco Elctrns., Inc.	301-995-6620
MA	Tewksbury, Jaco Elctrns., Inc.	508-640-0010
NY	Hauppauge, Jaco/Elctrns., Inc.	516-273-5500
NC	Raleigh, Jaco/QC	919-876-7767
OK	Tulsa, Jaco/QC	918-664-8812
TX	Addison, Jaco/QC	214-733-4300
TX	Austin, Jaco/QC	512-835-0220
TX	Sugar Land, Jaco/QC	713-240-2255
WA	Redmond, Jaco/Distel, Inc.	206-881-9700

KATRONIC ELEKTRONIC GES.M.B.H., OrtenburgerstraBe 28, Austria, Tel: 04762-5340, FAX: 534075; Empl.: 74; *Sls. Mgr.:* Herbert Sandner

KAUT & BUX MANUFACTURING CO., 675 Tower Rd., P.O. Box 867, Mundelein, IL 60060, Tel: 708-949-8505, TELEX: 6871289 KBM UN/, FAX: 1-708-949-4250; *Sls. Mgr.:* Heinz Kutschera

KAVLICO CORP., 14501 Los Angeles Ave., Moorpark, CA 93021, Tel: 805-523-2000, TELEX: 65-1481, FAX: 805-523-7125; Empl.: 500; *Dist. Mgr.:* Drew Distin

KAYCEE INDUSTRIES LTD., 32 Ramjibhai Kamani Rd, B.E., Bombay-38, INDIA, Tel: 2615567-68, 2613521-22-23, FAX: (91-22) 2616106; Empl.: 400

KAY ELEMETRICS CORP., 12 Maple Ave., P.O. Box 2025, Pine Brook, NJ 07058-2025, Tel: 201-227-2000, TWX: 710-734-4347; FSC No.: 80138; Empl.: 50; *Sls. Mgr.:* Stephen P. Crump ..... **A•1750**

KAY-RAY/SENSALL, INC., 1400 Business Center Drive, Mt. Prospect, IL 60056, Tel: 708-803-5100; Empl.: 170

KAY-TOWNES, Div. of Alco Industries, Inc., P.O. Box 593, Rome, GA 30161, Tel: 404-291-9871, FAX: 404-235-6851; Empl.: 60; *Sls. Mgr.:* James Joiner; *Dist. Mgr.:* Pauline Petty

KB ELECTRONICS, 73 Wortman Ave., Brooklyn, NY 11207, Tel: 718-257-3300, TWX: 710-584-2308, FAX: 718-257-4740; Empl.: 140; *Sls. Mgr.:* A Bueller

KCK AMERICA INC., Mitsubishi Materials Corporation, 930 Remington Rd., Schaumburg, IL 60173-4516, Tel: 708-884-8688, FAX: 708-884-9327; Empl.: 500; *Sls. Mgr.:* K. G. Such, V.P.

KD COMPONENTS, INC., 2710 S. Main St., Santa Ana, CA 92707, Tel: 714-545-7108, TWX: 910-595-2678, FAX: 714-549-7966; FSC No.: 58421; Empl.: 32; *Sls. Mgr.:* Wayne Devine

KDI/TRIANGLE ELECTRONICS, 60 S. Jefferson Rd, Whippany, NJ 07981, Tel: 201-887-5700, TWX: 710-986-8220; FSC No.: 64537; Empl.: 385

KDS AMERICA, Daishinku Corp., 10901 Granada Ln., Overland Pk., KS 66211, Tel: 913-491-6825, FAX: 913-491-6812; Empl.: 12; *Sls. Mgr.:* Tom Lawrence-East. Reg.; *Dist. Mgr.:* Sara Peterson ..... **A•1379**

Local Sales Offices & Reps

AL	Huntsville, ACM	205-881-5493
AZ	Carefree, Integrated Rep Co., Inc.	602-488-1740
CA	Fountain Valley, Dyna Rep.	619-693-1111
CA	San Diego, Bestronics	714-545-3255
CA	San Jose, QCI Assocs.	408-432-1070
CA	Simi Valley, Dyna Rep.	805-527-0072
CO	Wheatridge, Wescom Mktg., Inc.	303-422-8957
FL	Boynton, D-Assocs.	305-492-8634
FL	Sanford, D-Assocs.	407-321-9594
FL	Tampa, D-Assocs.	407-321-9594
GA	Norcross, ACM	404-448-7025
IL	Itasca, Circuit Sls.	708-773-0200
IN	Fishers, Rathsburg Assoc.	317-577-4500
IA	Cedar Rapids, Barnes Wes Tech. Assoc.	319-393-9790
MA	Scituate, CTC Assocs.	617-848-2077
MI	Farmington Hills, Rathsburg Assocs.	313-489-1500
MN	Chanhassen, Barnes Sls. Assocs.	612-934-2907
NY	Buffalo, Quality Comps.	716-837-5430
NY	Manlius, Quality Comps.	315-682-8885
NY	Smithtown, PAF Assocs.	516-360-0940
NC	Charlotte, Prime Comps., Inc.	704-522-1150
NC	Raleigh, Prime Comps. Inc.	919-850-9866
OH	North Royalton, Rathsburg Assocs.	216-582-9550
OH	Reynoldsburg, Rathsburg Assocs.	614-866-2490
OR	Beaverton, Western Tech. Sls.	503-644-8860
PA	Norristown, DER, Inc.	215-272-4502
TX	Austin, SW Mktg. Assoc., Inc.	512-255-8010
TX	Dallas, SW Mktg. Assoc., Inc.	214-341-8631
TX	Houston, SW Mktg. Assoc.,Inc.	713-537-8166
UT	Salt Lake City, Wescom Mktg., Inc.	801-269-0419
WA	Bellevue, Western Tech. Sls.	206-641-3900
WA	Spokane, Western Tech. Sls.	509-922-7600
WI	Brookfield, Circuit Sls.	414-784-7773
Can	Burnaby, B.C., Vitel Elctrns.	514-636-5951
Can	Kanata, Ont., Vitel Elctrns.	613-592-0090
Can	Lachine, Que., Vitel Elctrns.	514-636-5951
Can	Mississauga, Ont., Vitel Elctrns.	416-676-9720

Local Distributors

AL	Huntsville, Future Electronics	205-830-2322
AL	Huntsville, Reptron	205-722-9500
AZ	Phoenix, Future Electronics	602-968-2140
CA	Chatsworth, Future Elctrns.	818-772-6240
CA	Garden Grove, Natl Elctrns.	714-892-7749
CA	Irvine, Future Elctrns.	714-250-4141
CA	Irvine, ITT Multicomps.	714-727-3001
CA	San Diego, Future Elctrns.	619-278-5020

CA San Jose, Compass Comps. 408-432-7575
CA San Jose, Eric Elctrns. 408-432-1111
CA San Jose, Future Elctrns. 408-434-1122
CA San Jose, PSC Elctrns. 408-737-1333
CA Saratoga, Western Micro 408-725-1660
CO Englewood, NEP Elctrns. 303-799-9898
CO Westminster, Future Electrns. 303-650-0123
CO Westminster, ITT Multicomponents ... 303-451-8740
CT Bethel, Future Elctrns. 203-743-9594
FL Altamonte Springs, Future Elctrns. 305-767-8414
FL Clearwater, Future Elctrns. 813-578-2770
FL Ft. Lauderdale, Reptron 305-735-1112
FL Tampa, Reptron 813-854-2351
GA Norcross, Future Elctrns. 404-441-7676
GA Norcross, Reptron 404-446-1300
IL Schaumburg, Future Elctrns. 312-882-1255
IL Schaumburg, Reptron 708-882-1700
IL Wood Dale, NEP Elctrns. 708-595-8500
MD Columbia, Future Elctrns. 301-995-1222
MA Burlington, Western Micro Technology 617-273-2800
MA Hopkinton, Interface Electronics 508-436-6858
MA Westboro, Future Elctronics 617-366-7400
MI Livonia, Future Elctrns. 313-261-5270
MI Livonia, Reptron 313-525-2700
MN Eden Prairie, Future Elctrns. 612-944-2200
MN Minnetonka, Reptron 612-938-0000
MO St. Louis, Future Elctrns. 314-469-6805
NJ Fairfield, Future Elctrns. 201-227-4346
NJ Mount Laurel Future Elctrns. 609-778-7600
NY Liverpool, Future Elctrns. 315-451-2371
NY Long Island, Future Elctrns. 516-234-4000
NY Rochester, Future Elctrns. 716-272-1120
NC Charlotte, Future Elctrns. 704-529-5500
NC Raleigh, Reptron 919-870-5189
OH Solon, Reptron 216-349-1415
OH Worthington, Reptron 813-436-6675
OR Beaverton, Future Electrns. 503-645-9454
OR Beaverton, Western Microtechnology 503-629-2082
TX Austin, Omni Pro 512-794-9200
TX Dallas, Omni Pro 214-233-0500
TX Richardson, Future Elctrns. 214-437-2437
UT Salt Lake City, Future Elctrns. 801-972-8489
UT Salt Lake City, Western Microtechnology 801-575-7150
WA Redmond, Future Elctrns. 206-881-8199
WA Redmond, Western Microtechnology .. 206-881-6737
WI Waukesha, Future Elctrns. 414-786-1884
Can Pointe Claire, Future Elctrns. 514-694-7710

KEDMAN CO., Box 25667, Salt Lake City, UT 84125, Tel: 801-973-9112, FAX: 801-972-2756; Empl.: 100

KEITHLEY INSTRUMENTS

FAX: 216-248-6168

KEITHLEY INSTRS., 28775 Aurora Rd., Cleveland, OH 44139, Tel: 800-552-1115; Empl.: 750; *Sls. Mgr.:* Mike Sciulli ..... **D•1275-1277**

Local Sales Offices & Reps

AL Huntsville, W. A. Brown Instrs. 205-830-9224
AZ Tempe, Aztec Entprs. 602-431-8401
CA Carson, Tritek Solutions, Inc. 213-515-1590
PA Huntington Valley, Scientific Reps. 215-322-6500
CO Denver, Aztec Entrprs. 303-779-5285
FL Orlando, W. A. Brown Instrs. 407-648-9660
IL Buffalo Grove, Torkelson 708-520-0710
IN Indianapolis, Torkelson 317-244-7867
IA Cedar Rapids, Torkelson 319-373-0200
MA Reading, Keithley 800-552-1115
MI Detroit, EQS Sys. 313-455-7920
MN Minneapolis, Torkelson 612-835-2414
MO Florissant, Keithley 800-552-1115
NJ Paramus, Keithley 800-552-1115
NM Albuquerque, Aztec Entrprs. 505-262-1688
NY Melville, Keithley 800-552-1115
NY Syracuse, Labtronics 315-455-7314
NC Cary, W.A. Brown Instrs., Inc. 919-460-1120
OH Chesterland, EQS Sys. 216-729-2222
OR Wilsonville, Syntek 503-682-2750
TX Austin, Testech 512-338-9246
TX Houston, Testech 713-893-9661
TX Richardson, Testech 214-644-5010
VA Fairfax, Scientific Assocs. 703-385-0600
WA Bellevue, Syntek 206-462-7700
WI Waukesha, Torkelson Assocs., Inc. 414-784-7736

KEITHLEY METRABYTE, 440 Myles Standish Blvd., Taunton, MA 02780, Tel: 508-880-3000, TELEX: 503989, FAX: 508-880-0179; FSC No.: 1 FG 11; Empl.: 140; *Sls. Mgr.:* Gary Gross; *Dist. Mgr.:* Gary Gross ..... **D•1184**

Local Sales Offices & Reps

AL Huntsville, Magaro Assocs. 205-882-0827
AZ Tempe, Aztec Entprs. 602-431-8401
CA Orange, X. B. X. Sls. 714-998-8200
CA San Jose, Nelson Elctrn. 408-437-9300
CO Denver, Aztec Entprs. 303-779-5285
FL Orlando, Magaro & Assocs. 407-859-6546
GA Atlanta, Magaro Assocs. 404-451-8862
IL Arlington Hts., Berndt Assocs. 708-632-0900
IN Carmel, Berndt Assocs. 317-844-0114
MN Minneapolis, Berndt Assocs. 612-546-2021
MO Manchester, Vertec Assoc., Inc. 314-394-6242
NJ Elmwood Park, L & M Assocs. 201-797-0441
NM Albuquerque, Aztec Entprs. 505-262-1688
NY Canandaigua, West Technlgs., Inc. 716-394-6355
NC Greensboro, Magaro Assocs. 919-282-4424
OH Chesterland, EQS Sys. 216-729-2222
OR Beaverton, Northwest Test & Meas. ... 503-645-9000
PA Huntington Valley, Sci-Rep, Inc. 215-322-6500
RI Narragansett, Pat Assocs. 401-783-9598
TX Richardson, Testech, Inc. 214-644-5010
UT Salt Lake City, Aztec Entprs. 801-467-4675
VA Fairfax, Sci-Rep, Inc. 703-385-0600
WA Bellevue, Northwest Test & Meas. 206-881-8857
WI Milwaukee, Berndt Assocs. 414-545-8400

KEL AM, See Teltec, Inc.

KELLER-PSI, 503 No. 15A Vista Bella, Oceanside, CA 92056, Tel: 619-967-6066, TELEX: 380-948, ESYLNK: 62744770, FAX: 619-967-0563; Empl.: 8; *Sls. Mgr.:* Dick Grove; *Dist. Mgr.:* Dick Grove

KEL CONNECTORS, INC., KEL Corp., 1250 Oakmead Pkwy., No. 105, Sunnyvale, CA 94086, Tel: 408-720-9044, FAX: 408-720-1989; *Sls. Mgr.:* Jim Eilers

Local Distributors

CA San Carlos, LoDan West 415-592-4600
FL Largo, LoDan Elctrns. 813-586-2851
IL Arlington Heights, LoDan Elctrns. 708-398-5311
MN Eitzen, Capacitor Assocs. 507-495-3306

KELLY AMERICAN, INC., 640 Federal Rd., Brookfield, CT 06804, Tel: 203-775-2590, TELEX: 4750159ELECABUL, FAX: 203-775-9048; *Sls. Mgr.:* Robert Buckley

KELMET, INC., 569 W. Covina Blvd., San Dimas, CA 91773, Tel: 714-599-0954, FAX: 714-599-2835; Empl.: 6; *Sls. Mgr.:* Paul Hodge

KELTEC FLORIDA, INC., MICROWAVE PRO, P.O. Box 2917, Ft. Walton Bch., FL 32549-2917, Tel: 904-244-0043, FAX: 904-243-0103; FSC No.: 09062; Empl.: 350; *Sls. Mgr.:* I. Rampurawala

KELTECH INC., 7508 Hitech Rd., Roanoke, VA 24019, Tel: 703-362-8466, FAX: 703-362-3957; Empl.: 35; *Sls. Mgr.:* William Sinclair, Gen. Mgr.

KELTRON CORPORATION

FAX: 617-899-9602

KELTRON CORP. High Voltage Power Supply Div., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, TELEX: 948197; Empl.: 170; *Sls. Mgr.:* T. Chadurjian ..... **D•1099**

KELTRON CORP., Miniprinter/Security Systems Div., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, TELEX: 948197, FAX: 617-899-9602; FSC No.: 18662; Empl.: 250; *Sls. Mgr.:* Steven P. Sargent ..... **D•1099**

Local Sales Offices & Reps

CA Canoga Pk, Dolphin Tech Entprs. 818-710-1966
IL Palatine, Key Entprs. 708-991-2144
MD Baltimore, Advanced Tech. Sls., Inc. ... 301-323-3140
NY Amsterdam, Traxonics 518-843-1445
PA Oreland, Precision Mktg. Grp. 215-233-9233
WI South Milwauke, Key Entprs. 414-762-2323

Local Distributors

AL Decatur, Mgt. Security, Inc. 205-355-3030
CA San Francisco, SF Fire & Burg. 415-861-0994
DC District of Columbia, Ellenco Inc. 301-927-4370
FL Miami, Glanz Technlg., Inc. 305-893-1269
GA Albany, Tri-L Sys. 912-888-1266
IL Chicago, Natl. Guardian Alarm 312-775-8600
MA Georgetown, B & B Engrg. 508-352-6402
MI Bloomfield Hills, W.E. Healy & Assocs. 313-335-9245
NC Raleigh, National Security 919-821-1150
OK Tulsa, Pendergraph, Inc. 918-835-8403
TX Amarillo, Firehawk Safety Sys. 806-374-9613
WI Brookfield, John Guetzke & Assocs., Inc. 414-784-5929

KELVIN INDUSTRIES, INC., 14724 Ventura Blvd., No. 1003, Sherman Oaks, CA 91403-3501, Tel: 818-990-1192, FAX: 818-995-6460; FSC No.: 19587; Empl.: 180; *Sls. Mgr.:* R. A. Featherston

KEMET®

FAX: 803-963-6521

KEMET ELECTRONICS CORPORATION, Box 5928, Greenville, SC 29606, Tel: 803-963-6621, TELEX: 57-0496, TWX: 810-287-2536; FSC No.: 31433; Empl.: 6,200; *Sls. Mgr.:* Robert Taylor; *Dist. Mgr.:* Dan Manly ..... **A•1082-1083**

Refer to Kemet, Union Carbide Corp., Elctrns. Div. for sales office information and for distributor listings.

Local Sales Offices & Reps

AL Huntsville 205-830-1090
AZ Tempe 602-831-2151
CA Encino 818-609-7561
CA Newport Beach 714-640-9320
CA Santa Clara 408-986-0424
CO Englewood 303-220-0759
FL Ft. Lauderdale 407-394-2326
FL Orlando 407-855-8886
GA Norcross 404-441-7701
IL
IL Schaumburg 708-517-1030
IN Carmel 317-844-7756
MD Columbia 301-992-5600
MA Wakefield 617-245-4646
MI Farmington Hills 313-489-5850
MN Edina 612-929-4642
NY Elmsford 914-347-4390
NY Liverpool 315-451-0720
NC Raleigh 919-872-2877
OH Columbus 614-885-3330
OK Tulsa 918-664-8592
PA Exton 215-363-8310
SC Greenville 803-242-5789
TX Austin 512-458-3181
TX Irving 214-556-0009
WA Kirkland 206-828-4853

Local Distributors

CA Agoura Hills, Time Elctrns. 818-707-2890
CA Compton, Harper SID 213-979-5090
CA Culver City, Hamilton/Avnet Elctrns. .. 213-558-2100
CA Los Angeles, Bell Inds. 213-826-6778
CA Sunnyvale, Capsco Sls., Inc. 408-734-3020
CO Denver, Integrated Elctrns. 303-292-5537
DE Wilmington, J.V. Elctrns. 508-657-6523
GA Gaithersburg, Pioneer Technlgs. 301-921-0660
IL Chicago, Newark Elctrns. 312-784-5100
NJ Old Bridge, Arm Bar Inds. 201-679-3377
NM Albuquerque, Alliance Elctrns. 505-292-3360
NY Buffalo, Summit Distrs., Inc. 716-887-2800
NY Central Islip, Semicap Elctrns. 516-582-4400
NY Hauppauge, L.I., Jaco Elctrns. 516-273-5500
NY Westbury, Schweber Elctrns. 516-876-4000
NC Greensboro, Golden Elctrns. 919-294-4653
NC Greensboro, Hammond Elctrns. 919-275-6391
OH Cleveland, Pioneer Elctrns. 216-587-3600
TX Fort Worth, TTI Elctrns. 817-831-8300
Can Vancouver, B.C., Deskin Sls. 604-324-8343

KEMLON PRODUCTS & DEVELOPMENT COMPANY, 6310 Sidney, Houston, TX 77021, Tel: 713-747-5020, FAX: 713-747-0049; Empl.: 165; *Sls. Mgr.:* Bob Horton

KEMTRON CIRCUITS & ELCTRNS. CORP., 110 S. Long Bch. Rd., Rockville Centre, NY 11570, Tel: 516-766-2772; Empl.: 7; *Sls. Mgr.:* Walter Carlock

KENMAR MANUFACTURING SERVICES, Kenmar Business Groups, Inc., 3020 Barrow Drive, Raleigh, NC 27604, Tel: 919-876-6049, FAX: 919-876-6292; Empl.: 35

M.S. KENNEDY CORP., 8170 Thompson Rd., Cicero, NY 13039, Tel: 315-699-9201, FAX: 315-699-8023; FSC No.: 51651; Empl.: 60; *Sls. Mgr.:* Greg Overend

KENTRON, INC., P.O. Box 142, Cedarburg, WI 53012-0142, Tel: 414-377-3733, FAX: 414-377-3733; *Sls. Mgr.:* Kenneth L. Krolski

KEN-TRON MFG., INC., 610 Industrial Dr., Owensboro, KY 42301, Tel: 502-684-0431, TELEX: 20-4305, FAX: 502-684-0435; Empl.: 100; *Sls. Mgr.:* R. Thompson

KEPCO
THE POWER SUPPLIER™

FAX: 718-767-1102

KEPCO, INC., 131-38 Sanford Ave., Flushing, NY 11352, Tel: 718-461-7000, TWX: 710-582-2631; Empl.: 300; *Sls. Mgr.:* Frank Toich ..... **D•1837-1870**

Local Sales Offices & Reps

AL	Huntsville, W. A. Brown, Inc.	205-830-9224
AZ	Phoenix, Aztec Entprs.	602-431-8401
CA	Carson, TRITEK	213-515-1590
CA	San Diego, Earle Assocs., Inc.	619-278-5441
CA	Sunnyvale, N-S Westronics	408-745-1102
CO	Denver, Aztec Entprs.	303-779-5285
CT	Bethel, Ray Perron & Co., Inc.	203-798-0261
CT	Waterbury, R. Perron Co.	203-756-9684
DC	Washington, Eastern Instrmn. Corp.	301-384-8500
FL	Ft. Lauderdale, W. A. Brown Instrs., Inc.	305-581-6444
FL	Melbourne, W. A. Brown Instrs., Inc.	407-723-0766
FL	Orlando, W. A. Brown Instrs., Inc.	407-648-9660
GA	Atlanta, W. A. Brown Instrs., Inc.	404-449-7160
KS	Kansas City, ATECH, Div. of ATA, Inc.	913-268-9644
MD	Baltimore, Eastern Instrmn. Corp.	301-792-7039
MA	Boston, R. Perron Co.	617-449-6162
MI	Plymouth, EQS	313-445-7924
MN	Plymouth, Kepco Inc.	612-559-1128
MO	St. Louis, ATECH, Div. of ATA, Inc.	314-949-9075
NM	Albuquerque, Aztec Entrps.	505-262-1688
NY	Liverpool, NTS Assocs., Inc.	315-451-1091
NC	Cary, W. A. Brown Instrs., Inc.	919-460-1120
OH	Chesterland, EQS	216-729-2222
OK	Tulsa, Airep Elctrns.	918-592-7711
OR	Beaverton, H. Levinson Co.	503-690-1312
TX	Austin, Airep Elctrns.	512-327-0778
TX	Dallas, Airep Elctrns.	214-349-4360
TX	Houston, Airep Elctrns.	713-952-5395
UT	Ogden, Aztec Entprs., Inc.	801-467-4675
WA	Seattle, H. Levinson Co.	206-382-1300
WI	Milwaukee, Star Engineering	414-645-3680
Can	Downsview, Ont., Rayonics	416-736-1600
Can	Ottowa, Ont., Rayonics	613-521-8251
Can	St. Laurent, Que., Rayonics	514-335-0105

KEPRO CIRCUIT SYSTEMS, 630 Axminister Dr., Fenton, MO 63026-2992, Tel: 314-343-1630, FAX: 314-343-0668; FSC No.: 5999; Empl.: 17; *Sls. Mgr.:* Jeff R. Keil; *Dist. Mgr.:* Jeff R. Keil

KEPTEL/ARMIGER, 56 Park Rd., Tinton Falls, NJ 07724, Tel: 800-526-3697, 201-389-8800; Empl.: 300; *Sls. Mgr.:* Kathy Plesnarski; *Dist. Mgr.:* Larry Bucknell

KESSLER-ELLIS PRODS., 120 1st Ave., Atlantic Highlands, NJ 07716, Tel: 201-291-0500, 800-631-2165, TELEX: 13-2496-, FAX: 201-291-8097; FSC No.: 28222; Empl.: 85

KESTER

FAX: 708-390-9338

KESTER SOLDER DIV., Litton Sys., Inc., 515 E. Touhy Ave, Des Plaines, IL 60018, Tel: 708-297-1600; Empl.: 350; *Sls. Mgr.:* Nick Bohun; *Dist. Mgr.:* Carl Voelkel ..... **C•1701**

Local Sales Offices & Reps

CA	Anaheim	714-871-0280
NJ	Newark	201-589-0246

KETEMA
RODAN DIVISION

FAX: 714-630-4131

KETEMA/RODAN DIVISION, 2900 Blue Star St., Anaheim, CA 92806, Tel: 714-630-0081, TWX: 910-591-1684; FSC No.: 15454;DESC-EQP-75-1387; Empl.: 170; *Sls. Mgr.:* Jack H. Moore ..... **B•1846-1848**

Local Sales Offices & Reps

AL	Huntsville, Alpha Mktg.	205-533-0766
AZ	Phoenix, TC Elctrn. Sls., Inc.	602-994-5153
AZ	Scottsdale, TC Elctrn. Sls., Inc.	602-994-5153
CA	Chatsworth, Wes-K/Raltech	818-700-0933
CO	Westminster, Straube Assocs.	303-426-0890
IL	Inverness, Heartland Tech. Mktg.	708-358-6622
IN	Ft. Wayne, Menze Sls. Co.	219-747-5616
KS	Parker, S. W. Assocs., Inc.	913-898-6552
MA	Framingham, Marathon Sls. Ltd.	508-875-3566
MN	Mendota Hgts., G-II Sls.	612-454-3086
MO	St. Louis, Abrams & Assocs.	314-569-0447
NJ	Bellmawr, TAI Corp.	609-933-2600
NY	Melville, Comtronic Assocs.	516-249-0505
NY	Syracuse, Canavan-Scanlon Assocs.	315-437-1271
NC	Charlotte, Arthur, Harris Assocs.	704-542-9338
WI	Brookfield, Heartland Tech. Mktg.	414-792-0920
TX	Houston, R-Squared Elctrns.	713-820-3210
UT	Salt Lake City, Straube Assocs.	801-263-2640
WA	Vancouver, R. Over Sls.	206-695-6179

Local Distributors

AZ	Tempe, Elctrn. Supp.	602-276-1199
CA	Los Alamitos, Permag Pacific Corp.	213-594-6515
CA	Riverside, Elctrn. Supp.	714-543-9214
CA	San Diego, Elctrn. Supp.	619-693-8222
CA	Sunnyvale, Permag Sierra	408-738-1080
CO	Denver, Permag Corp.	303-693-6612
GA	Norcross, Permag S.E. Div.	404-448-4998
IL	Elk Grove Vl., Permag Cen. Div.	312-956-1140
MA	Billerica, Permag N.E. Div.	617-663-7500
MN	Eden Prairie, Permag Minnesota Div.	612-934-4635
NY	Hauppauge, Fairmont Elctrns.	516-231-3313
NY	Hicksville, Permag Atlantic Div.	516-822-3311
OH	Toledo, Permag Magnetics Div.	419-385-4621
TX	Richardson, Permag S.W. Div.	214-699-1121
WA	Bellevue, Permag N.W. Div.	206-882-2507
Can	Mississauga, Ont., R-Theta, Inc.	416-890-0221

KEWAUNEE SCIENTIFIC CORP., Technical Workstation Div., 901 FM 20, P.O. Box 930, Lockhart, TX 78644, Tel: 512-398-5292, TELEX: 752706, FAX: 512-398-5104; Empl.: 165 (This Location) 800 (Company Wide); *Sls. Mgr.:* Frank Johnson, Dir. Sls./Mktg.

Keystone
CARBON COMPANY

FAX: 814-781-7648

KEYSTONE CARBON, Thermistor Div., 1935 State Street, St. Marys, PA 15857, Tel: 814-781-1591; FSC No.: 75-263; Empl.: 1200; *Sls. Mgr.:* John A. Brock; *Dist. Mgr.:* John A. Brock ..... **B•1849-1851**

Local Sales Offices & Reps

CA	Redwood City, Hickey Inds. Sls.	415-594-9978
CA	San Diego, ProSales	619-571-1133
CT	Wethersfield, L.J. Labant	203-529-0048
GA	Marietta, J.J. Arnold	404-427-1062
IL	Palatine, David J. Brock	708-359-0955
IN	Fort Wayne, R.O. Whitesell & Assocs.	219-432-5591
IN	Indianapolis, R.O. Whitesell & Assocs.	317-876-9000
IN	Kokomo, R.O. Whitesell & Assocs.	317-457-9127
KS	Shawnee, Benson Engrg.	913-491-4446
MI	Birmingham, Mi, Gregory J. Lukas	313-642-9115
MI	Farmington Hills, J.L. Montgomery Assocs.	313-489-0099
MN	Minneapolis, Dave Marrone	612-566-6573
NY	Rochester, Foster & Wager	716-385-7744
OH	Cincinnati, R.O. Whitesell & Assocs.	513-528-5644
OH	Cleveland, R.O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R.O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R.O. Whitesell & Assocs.	513-298-9546
NC	Cary, J. E. Shea	919-481-2475
PA	Pittsburgh, R.O. Whitesell & Assocs.	412-963-6161
TX	Dallas, Benson Engrg.	214-352-7541
TX	Houston, Benson Engrg.	713-333-3112
EXP	Great Neck NY, Minthorne Int'l.	516-487-0700

Local Distributors

AL	Huntsville, Allied Elctrns.	205-721-3500
AZ	Phoenix, Allied Elctrns.	602-437-9080
AR	Little Rock, Newark Elctrns.	501-225-8130
CA	Torrance, Allied Elctrns.	213-373-8828
CO	Denver, Newark Elctrns.	303-373-4540
CT	Cheshire, Allied Elctrns.	203-272-7730
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
GA	Norcross, Allied Elctrns.	404-446-8595
HI	Aiea, Newark Elctrns.	808-487-8951
ID	Boise, Newark Elctrns.	208-342-4311
IL	Chicago, Newark Elctrns.	312-784-5100
IN	Indianapolis, Allied Elctrns.	317-875-0448
IA	Bettendorf, Newark Elctrns.	319-359-3711
KS	Lenexa, Allied Elctrns.	913-599-6227
KY	Louisville, Allied Elctrns.	502-452-2293
LA	Metairie, Allied Elctrns.	504-885-1195
MD	Columbia, Newark Elctrns.	301-964-4482
MA	Billerica, Allied Elctrns.	508-667-7921
MI	Oak Park, Newark Elctrns.	313-967-0600
MN	Thief River Falls, Digi-Key Corp.	800-344-4539
MS	Jackson, Newark Elctrns.	601-956-3834
MO	Earth City, Allied Elctrns.	314-291-7031
NE	Omaha, Newark Elctrns.	402-392-1221
NH	Nashua, Allied Elctrns.	603-883-3006
NJ	Frenchtown, Sintec	201-996-4093
NM	Albuquerque, Newark Elctrns.	505-883-6181
NY	Fairport, Allied Elctrns.	716-425-3850
NC	Charlotte, Newark Elctrns.	704-535-5650
OH	Solon, Allied Elctrns.	216-248-4200
OK	Tulsa, Newark Elctrns.	918-832-7004
OR	Portland, Allied Elctrns.	503-245-4225
PA	Pittsburgh, Newark Elctrns.	412-343-9090
RI	Cranston, Newark Electrns.	401-943-3340
SC	Greenville, Newark Elctrns.	803-288-9610
TN	Memphis, Allied Elctrns.	901-367-2895
TX	Fort Worth, Allied Elctrns.	817-336-5401
UT	Salt Lake City, Newark Electrns.	801-484-8611
VA	Virginia Beach, Allied Elctrns.	804-363-8662
WA	Seattle, Allied Elctrns.	206-547-2827
WV	Charleston, Newark Elctrns.	304-345-6505
WI	New Berlin, Allied Elctrns.	414-796-1280
Can	Mississauga, Ont., Newark Elctrns.	416-675-8351

KEYSTONE ELECTRONICS CORP., 31-07 20th Rd., Astoria, NY 11105-2017, Tel: 718-956-8900, TELEX: 35-3700, FAX: 718-956-9040; FSC No.: 91833; Empl.: 80; *Sls. Mgr.:* Charles Gold

KEYTEK INSTRUMENT CORP., 260 Fordham Rd., Wilmington, MA 01887, Tel: 508-658-0880, TELEX: 951389 KEYTEK BURL, FAX: 508-657-4803; *Sls. Mgr.:* Michael Hopkins

KEYTEK KEYBOARDS CANADA INC., 16 Mary St., Units 3 & 4, Aurora, Ontario, Canada L4G 3W8, Tel: 416-727-9491, FAX: 416-727-7118; Empl.: 20

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KGS ELECTRONICS, INC., 2029 N. Lincoln Ave., Pasadena, CA 91103, Tel: 818-798-0786; Empl.: 60 ..... **D•1871, 2210**

Local Sales Offices & Reps

NJ	Wayne, BIZ Intl.	201-694-2417
TX	Hurst, McGarrah & Assocs.	817-268-3557

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AZ	Chandler, Vic Myers Assocs.	602-345-6449
CA	Santa Clara, Alltronics	408-982-9222
CA	Torrance, Amasco South	213-781-9494
CO	Littleton, Vic Myers Assocs.	303-730-7313
FL	Cape Canaveral, Teqspec	407-783-3444
FL	Palm Harbor, Teqspec	813-942-6006
HI	Honolulu, Honolulu Elctrns.	808-949-5564
IL	Elmhurst, Sector Engrg. Sls.	708-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-253-9221
KS	Lenexa, Midtec Assocs.	913-541-0505
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Billerica, Eastronix	508-670-2400
MI	Bloomfield Hills, MacKellar Assoc. Inc.	313-335-4440
MN	Minneapolis, Sector Engrg. Sls.	612-378-2123
MO	St. Louis, Midtech Assocs.	314-275-8666
NJ	Ridgefield Park, Scientific Dvcs. East	201-440-1400
NM	Albuquerque, Vic Myers Assocs., Inc.	505-884-6878
NY	Rochester, Eastern Sys.	716-292-1460
OH	Columbus, MacKellar Assoc. Inc.	614-848-3552
OK	Tulsa, Scientific Dvcs.-S.W.	918-457-4888
OR	Wilsonville, Syntek, Inc.	503-682-2750
PA	Horsham, PA Scientific Dvcs.	215-956-0700
TX	Houston, Scientific Dvcs. SW	713-645-4100
TX	Richardson, Scientific Dvcs. SW	214-231-8106, 800-256-6633
UT	Salt Lake City, Vic Myers Assoc. Inc.	801-581-1760
WA	Bellevue, Syntek, Inc.	206-462-7700
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280
PR	San Juan, David S. Ternent	809-762-2688
Can	Burnaby, BC, Interfax Sys., Inc.	604-430-1410
Can	Nepean, Ont., Interfax Sys., Inc.	613-726-8888
Can	Rexdale, Ont., Interfax Sys., Inc.	416-674-8970
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Local Sales Offices & Reps

CA	Campbell, Kottmeier Assocs.	408-371-8700
CA	La Habra, Cygnus Sls. Engrg. Corp.	213-691-2993
FL	Orlando, Comp. Design Mktg.	407-240-3903
GA	Atlanta, Electro Tech	404-262-1522
IL	Elgin, Gassner & Clark, Inc.	312-695-9540
IA	Cedar Rapids, Seltec Sls. Corp.	319-364-7660
KS	Overland Pk., Spectrum Sls.	913-648-6811
NH	Nashua, Bell Controls	603-882-6984
NM	Albuquerque, Cleveland Entprs., Inc.	505-265-7893
NY	Great Neck, Trionic Assocs.	516-466-2300
NY	Rochester, Lamb Comp., Inc.	716-323-1250
NC	Winston-Salem, DGW, Inc.	919-768-7166
OH	Cleveland, Electronic Components, Inc.	216-331-5330
OH	Columbus, Electronic Comp., Inc.	614-231-2318
OH	Miamisburgh, Electronic Comps., Inc.	513-866-3340
OR	Tigard, Components West, Inc.	503-684-1671
TX	Dallas, Caton Sls. Co.	214-243-4718
WA	Redmond, Components West, Inc.	206-885-5880
Can	Brit. Columbia, Macom Agencies, Ltd.	604-271-2661

KINEMETRICS/SYSTEMS, Kinemetrics, Inc., 222 Vista Ave., Pasadena, CA 91107, Tel: 818-795-2220, TELEX: 67-5402, FAX: 818-795-0868; Empl.: 65; *Sls. Mgr.:* Mel Lund

KINEMETRICS/TRUETIME, 3243 Santa Rose Ave, Santa Rosa, CA 95407, Tel: 707-528-1230, TELEX: 176687(TRUETIME SARO), FAX: 707-527-6640; Empl.: 45; *Sls. Mgr.:* R. J. Dielman

KINETICSYSTEMS, 11 Maryknoll Dr., Lockport, IL 60441, Tel: 815-838-0005, TWX: 910-638-2831, FAX: 815-838-4424; Empl.: 135; *Sls. Mgr.:* Norman R. Ellison, Dir. Domestic Sls.

KINGBRIGHT LED

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KINGBRIGHT USA CORP., Kingbright Elec. Co., Ltd., 200 S. Garfield Ave., No. 204, Alhambra, CA 91801, Tel: 818-281-9788, 818-281-9807; Empl.: 3 **B•1170-1172**

Local Sales Offices & Reps

AL	Madison, Contact Manufacturer	818-281-9788
AZ	Phoenix, C.T. Carlberg Assocs.	602-468-0750
CO	Denver, Parker-Webster	303-841-4888
GA	Norcross, Benchmark Tech. Sls.	404-446-1711
IL	Rolling Hills, Eagle Tech. Sls.	708-991-0700
IA	Cedar Rapids, Contact Manufacturer	818-281-9788
MD	Gaithersburg, Contact Manufacturer	818-281-9788
MO	Florissant, Contact Manufacturer	818-281-9788
MO	St. Louis, Rush & West Assocs.	314-965-3322
NY	Tuckahoe, Disty-Brown Sls.	800-933-4789
NC	Raleigh, Benchmark Tech. Sls.	919-850-0633
PA	Ft. Washington, Contact Manufacturer	818-281-9788
VA	Front Royal, Contact Manufacturer	818-281-9788
WI	Colgate, Contact Manufacturer	818-281-9788

Local Distributors

AZ	Phoenix, C.T. Carlsberg & Assocs. Inc.	800-888-1408
CA	Chatsworth, Passive Comps. Inc.	818-700-8838
CA	Los Angeles, Electric Switches Inc.	800-252-4640
CA	Milpitas, Sierra West	408-945-1050
CA	Mission Viejo, Opto Plus, Inc.	714-380-8654
CA	San Diego, Southland Comps. Inc.	619-673-3800
CA	Santa Maria, Garrett/IEU Inc.	805-922-6383
CA	Simi Valley, Tri-Electro Sls., Inc.	805-527-3317
CO	Englewood, Computech Mktg.	303-773-3981
CT	Norwalk, Cobra Comps., Inc.	203-847-6442
CT	Sudbury, KSA of New England	508-443-5881
FL	Boca Raton, N.R.C. Elctrns., Inc.	407-241-8600
FL	Clearwater, Atlantic Elctrns., Inc.	813-531-5900
FL	Clearwater, Source Research Inc.	813-443-7001
FL	Pembroke Pines, Munday Sls., Inc.	306-961-9420
IL	Cleveland, RK Comp. Sls. Inc.	216-642-9312
IL	Rolling Meadows, Eagle Tech. Sls., Inc.	708-991-0700
MD	Baltimore, Astrex	800-257-7717
MA	W. Springfield, Astrex	800-445-9763
MO	St. Louis, Ric-Tronics, Inc.	314-997-4707
MO	St. Louis, Rush & West	314-965-3322
NJ	Pennsauken, Astrex	800-257-7713
NJ	Tenafly, Michelle Assocs.	201-894-8964
NY	East Syracuse, ADR Technlgs., Inc.	315-437-7087
NY	Endwell, Astrex	800-252-8711
NY	Endwell, Elctrns., Inc.	607-754-3823
NY	Tuckahoe, Disty-Brown Sls. Co.	914-933-4789
NC	Raleigh, Benchmark Tech. Sls., Inc.	919-850-0633
TX	Austin, Wofford Elctrns., Inc.	512-339-1131
TX	Carrollton, LCD Elctrns., Inc.	800-245-0342
TX	Dallas, Orion Assocs.	214-241-3505
TX	Richardson, Ewing Elctrns., Inc.	214-231-6725
WA	Bellevue, Luscombe Engrg.	206-223-1541
EXP	Los Angeles, Kingbright USA Corp.	818-281-9788

KINGS ELECTRONICS CO., INC., 40 Marbledale Rd, Tuckahoe, NY 10707, Tel: 914-793-5000, TELEX: 6818293; Empl.: 550; *Sls. Mgr.:* Fred Pack; *Dist. Mgr.:* Ed Lagarto/F. Dellaiancano

KIPP & ZONEN, Enraf-Nonius, 390 Central Ave., Bohemia, NY 11716, Tel: 516-589-2885, 800-645-1025, FAX: 516-589-2068; Empl.: 25; *Sls. Mgr.:* Wm. Novack; *Dist. Mgr.:* Joe Carlin

KIRKWOOD INDUSTRIES INC., 4855 West 130 St, Cleveland, OH 44135, Tel: 216-267-6200, TELEX: 980630, FAX: 216-362-3804; *Sls. Mgr.:* Tom Bauer

KISTLER INSTRUMENTS CORP., 75 John Glenn Dr., Amherst, NY 14221-2171, Tel: 716-691-5100, FAX: 716-691-5226; Empl.: 67; *Sls. Mgr.:* Mike Murphy

KISTLER-MORSE, P.O. Box 3009, Redmond, WA 98073, Tel: 206-881-8000, FAX: 206-883-4893; *Sls. Mgr.:* Sesh Velamoor

KLC/KARL LAMBRECHT CORP., 4204 N. Lincoln Ave., Chicago, IL 60618, Tel: 312-472-5442, FAX: 312-472-2724; Empl.: 29; *Sls. Mgr.:* Raymond Lambrecht

KLOCKNER MOELLER, 25 Forge Pkwy., Franklin, MA 02038, Tel: 508-520-7080, FAX: 508-520-7084; Empl.: 250; *Sls. Mgr.:* T. Thornton; *Dist. Mgr.:* P. Feruglio

KMC SYSTEMS, INC., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432, Tel: 201-447-0007, FAX: 201-447-0014; Empl.: 35; *Sls. Mgr.:* E. Verder

KMS ADVANCED PRODUCTS, INC., 700 KMS Place, P.O. Box 1868, Ann Arbor, MI 48106-1868, Tel: 313-769-1780, FAX: 313-769-8660; Empl.: 150; *Sls. Mgr.:* Al Schalk

KNIGHTFIRE TECHNOLOGY, 2139 University Dr., Ste.211, Coral Springs, FL 33071, Tel: 305-344-3682, FAX: 305-752-4353; FSC No.: FSC 6130; Empl.: 4; *Sls. Mgr.:* Sue Pantelakis

KNOWLEDGEWARE, INC., 3340 Peachtree Rd., N.E., Atlanta, GA 30326, Tel: 404-231-8575, TELEX: 544080; FSC No.: 7030-0003; Empl.: 350; *Sls. Mgr.:* Donald P. Addington

KNOWLES ELECTRONICS, INC., 1151 Maplewood Dr., Itasca, IL 60143, Tel: 708-250-5100, TELEX: 433-0330, FAX: 708-250-0575; *Sls. Mgr.:* W. Jeff Taylor

KNURR USA INC., Knurr A.G., 1890 N. Voyager Ave., Simi Valley, CA 93063, Tel: 805-526-7733, FAX: 805-584-8371; Empl.: 20; *Sls. Mgr.:* Georg Wolf (acting)

KOA

FAX: 814-362-8883

KOA SPEER ELECTRONICS, Bolivar Dr., P.O. Box 547, Bradford, PA 16701, Tel: 814-362-5536, TELEX: 91-4404; FSC No.: 09021; Empl.: 3000; *Sls. Mgr.:* L. G. Holzwarth; *Dist. Mgr.:* L. Rice .... **A•1002, 1085, 1834, 1930-1934**

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Garden Grove, ELSCO Elctrns.	714-891-4621
Can	Mississauga, Ont., Indigo Elctrns.	416-670-0284
Can	Montreal, Que., Indigo Elctrns.	514-696-6104
CA	San Diego, Westrep	619-566-6580
CA	Santa Clara, Caltron Comps.	408-980-0181
CO	Boulder, R. G. Entprs.	303-447-9211
CT	Plainville, Northeast Representatives	203-747-2423
FL	Altamonte Springs, APM Assocs.	407-869-6831
FL	Ft. Lauderdale, APM Assocs.	305-978-9941
FL	Tampa, APM Assocs.	813-886-2457
GA	Norcross, Cartwright & Bean	404-368-0160
IL	Arlington Hgts., C. L. Greenslade Sls.	708-593-3450
IN	Fort Wayne, John F. Kilfoil	219-483-6208
KS	Overland Pk., Spectrum Sls.	913-648-6811
LA	Covington, Cartwright & Bean	504-892-1780
MA	Hingham, Northeast Representatives	617-749-8700
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	Edina, Grayden & Flemmer	612-941-1120
MS	Jackson, Cartwright & Bean	601-981-1170
MO	Florissant, Spectrum Sls.	314-921-1313
NH	Mont Vernon, Northeast Representatives	603-880-8199
NJ	Cherry Hill, Metz-Benham Assoc.	609-424-0404
NM	Albuquerque, SynTech	505-266-7951
NY	East Rochester, Tri-Tech Elctrns.	716-385-6500
NY	Endwell, Tri-Tech Elctrns.	607-754-1094
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881
NY	Fishkill, Tri-Tech Elctrns.	914-897-5611
NY	Great Neck, MOS Assocs.	516-487-3966
NC	Charlotte, Cartwright & Bean	704-536-0303
NC	Raleigh, Cartwright & Bean	919-876-4130
OH	Cincinnati, John F. Kilfoil	513-791-6150
OR	Tigard, Earl & Brown Co.	503-639-2100
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TN	Knoxville, Cartwright & Bean	615-693-7450
TN	Memphis, Cartwright & Bean	901-362-8345
TX	Lewisville, Jim Hughes	214-221-1536
WA	Redmond, Earl & Brown Co.	206-885-5064
PR	San German, Digit-Tech Sls.	809-892-4260
Can	Calgary, Alb., A. Deskin Sls.	403-270-4440
Can	Edmonton, Alb., A. Deskin Sls.	403-466-2106
Can	Kanata, Ont., Indigo Elctrns.	613-831-3107
Can	Transcona, Manit., A. Deskin Sls.	204-224-1321
Can	Vancouver, B.C., A. Deskin Sls.	604-324-8343

Local Distributors

AL	Huntsville, Reptron	205-722-9500
AZ	Ftn. Hill, RCD Inds.	602-483-6412
CA	Santa Ana, TTI	714-641-9393
AZ	Tempe, Shelley- Ragon	602-894-2058
AZ	Tempe, T.T.I.	602-431-1191
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Campbell, Lartronics	408-379-6454
CA	Chatsworth, MIL-Comm Distrs.	818-998-3111
CA	Chatsworth, Shelley-Ragon	818-998-3333
CA	Costa Mesa, Eric Elctrns.	714-751-1185
CA	Fountain Valley, Comps. Ctr.	714-979-0433
CA	Garden Grove, Natl. Elctrns.	714-892-7749
CA	Huntington Beach, SMD, Inc.	714-841-4556
CA	Irvine, KELEX	714-863-1230
CA	Milpitas, T.T.I.	408-946-5577
CA	Mission Hills, T.T.I.	818-891-8885
CA	San Diego, Shelley-Ragon	619-453-7133
CA	San Diego, T.T.I.	619-748-2025
CA	San Jose, Capstone Elctrns.	408-453-9804
CA	San Jose, Eric Elctrns.	408-432-1111
CA	San Jose, Jaco	408-432-9290
CA	San Jose, Shelley Ragon	408-432-0600
CA	Santa Clara, Components Ctr.	408-988-3751
CA	Sunnyvale, SAI	408-745-0800
CA	Tustin, Capstone Elctrns.	714-730-0349
CA	Tustin, Jaco Elctrns.	714-258-9003
CA	Westlake Village, Jaco	805-495-9998
CO	Aurora, Capstone Elctrns.	303-375-1300
CO	Boulder, R. G. Entprs.	303-447-9211
CO	Denver, T.T.I.	303-429-6806
CO	Englewood, Shelly-Ragon Elec. Parts	303-762-0670
CT	Wallingford, Midstate Elctrns.	203-265-9900
CT	Wallingford, T.T.I.	203-284-7474
CT	Wallingford, Utronics	203-265-2724
FL	Boca Raton, Jaco Elctrns.	407-241-7943
FL	Ft. Lauderdale, Reptron Elctrns.	305-735-1112
FL	Orlando, TTI	407-859-1000
FL	Tampa, Reptron	813-855-4656
FL	Tampa, Reptron Elec.	813-854-2351
FL	Tampa, Shelley-Ragon	813-623-6560
FL	W. Palm Beach, Atlantic Elctrns.	407-686-8553
GA	Norcross, Reptron	404-446-1300
GA	Norcross, T.T.I.	404-662-0911
IL	Bensenville, Goold Elctrns.	708-860-7171
IL	Glendale Heights, Shelley-Ragon	708-529-9977
IL	Itasca, Capstone Elctrns.	708-250-0300
IL	Northbrook, Classic Comp. Supp.	708-272-9650
IL	Rosemont, Advent Elctrns.	708-298-4210
IL	Schaumburg, Reptron Elctrns.	708-882-1700
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
IA	Cedar Rapids, Dee Elctrns.	319-365-7551
MD	Baltimore, Radio Elec. Svc. Co.	301-931-8200
MD	Beltsville, Radio Elec. Svc.	301-937-9100
MD	Columbia, Jaco Comps.	301-995-6620
MD	Columbia, T.T.I.	301-995-1331
MA	Billerica, Baldwin Comp. Ctr.	617-667-6710
MA	Chelmsford, Shelly-Ragon	508-250-9666
MA	Norwood, EMTEL Electronics	617-769-9500
MA	Wilmington, Capstone Elctrns.	508-657-5874
MA	Wilmington, North Star Elect.	508-657-5155
MA	Wilmington, T.T.I.	508-658-4700
MI	Ann Arbor, Wedemeyer	313-665-8611
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Livonia, Reptron Elctrns.	313-525-2700
MN	Hibbing, Minn Tech Elctrns.	218-262-5228
MN	Minnetonka, Reptron	612-938-0000
MN	Minnetonka, T.T.I.	612-933-8555
MN	St. Paul, Shelley-Ragon Elctrns.	612-642-2828
MO	Independence, Shelley-Ragon Elctrns.	816-254-3410
MO	St. Louis, Franklin Elctrns.	314-429-3111
NE	Lincoln, Scott Elctrns.	402-466-8221
NV	Las Vegas, Kiesub Corp.	702-733-3888
NH	Nashua, Brevan Elctrns.	603-889-7230
NJ	Mount Laurel, TTI Inc.	609-234-6400
NJ	Mt. Laurel, Capstone Elctrns.	609-727-7800
NJ	Rockaway, Nasco	201-625-7777
NM	Albuquerque, Betatron	505-821-1122
NY	Amherst, Standard Elctrns.	716-691-3801
NY	Buffalo, Summit Distrs.	716-887-2845
NY	Hauppauge, Jaco	516-273-5500
NY	Melville, S.A.I.	516-293-2710
NC	Raleigh, Reptron	919-832-3117
NY	Rochester, Summit Distrs.	716-334-8110
NY	Ronkonkoma, Baldwin Comp. Ctr.	516-588-5700
NY	Ronkonkoma, Prime Comps.	516-737-1730
NY	Ronkonkoma, T.T.I.	516-737-2000
NC	Greensboro, Golden Elctrns.	919-294-4653
NC	Raleigh, Jaco	919-876-7767
NC	Raleigh, Resco-Raleigh	919-781-5700
NC	Raleigh, Southeastern Radio	919-828-2311
OH	Cleveland, Roberts Elect. Corp.	216-238-1711
OH	Columbus, T.T.I.	614-848-5770
OH	Independence, TTI	216-328-9755
OH	Solon, Reptron	216-349-1415
OH	Worthington, Reptron	614-436-6675
OK	Tulsa, Altair Co.	918-252-5781
OR	Beaverton, Murphy Elctrns.	503-642-2001
NC	Raleigh, Capstone Elctrns.	919-954-0600
PA	Erie, Rem Elctrns.	814-453-5626
PA	Harrisburg, Cumberland Elctrns.	717-233-5883
PA	Philadelphia, PEI/Genesis	215-673-0400
PA	Philadelphia, Shap	215-969-3300
PA	Trevose, Sager Electronics	215-464-4336
RI	Pawtucket, Major Edwards	401-725-7400
TX	Addison, Jaco/QC Elctrns.	214-733-4300
TX	Carrollton, Capstone Elctrns.	214-380-9049
TX	Fort Worth, TTI	817-847-6666
TX	Ft. Worth, Carlton Bates	817-831-0395
TX	Ft. Worth, T.T.I.	817-831-8300
TX	Ft. Worth, T.T.I. Inc.	817-595-3100
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
TX	Richardson, Jaco	214-235-9575
WA	Redmond, JACO Electronics	206-881-9700
WA	Redmond, Murphy Elctrns.	206-881-1234
WA	Redmond, Shelley-Ragon	206-883-2220
WA	Redmond, T.T.I.	206-882-0291
WI	Oconomowac, G W Elctrns.	414-567-9445
Can	Calgary, Alb., A. Deskin Sls.	403-270-4440
Can	Edmonton, Alb., A. Deskin Sls.	403-468-3019
Can	Markham, Ontario, Semad	416-475-3922
Can	Transcona, Manit., A. Deskin Sls.	204-224-1321
Can	Vancouver, B.C., A. Deskin Sls.	604-324-8343

KOEP PRECISION STANDARDS, INC., 121 Helen Street, 2nd Fl, South Plainfield, NJ 07080, Tel: 201-757-2220/2277, FAX: 201-757-2332; FSC No.: 57114; Empl.: 4; *Dist. Mgr.:* N/A

KOLIN INDS., Box 300, Pound Ridge, NY 10576, Tel: 914-764-5775, FAX: 914-764-5386; Empl.: 30; *Sls. Mgr.:* J. Kolinsky

KONTES, Kimble Div. of Owens/IL, 1001 Spruce St, Vineland, NJ 08360, Tel: 800-223-7150, TWX: 510-687-8967

KONTRON ELEKTRONIK-US KONTRON ELEKTRONIK GMBH-SUB. BM, 66 Cherry Hill Dr., Beverly, MA 01915, Tel: 508-927-6575, FAX: 508-927-6511; Empl.: 30

KOOLTRONIC, INC., Hamilton Ave., Hopewell, NJ 08525, Tel: 609-466-3400, TELEX: 843345, FAX: 609-466-1114; Empl.: 200; *Sls. Mgr.:* John J. Drages

KOOLTRONIC, INC., 1700 Morse Avenue, Ventura, CA 93003, Tel: 805-642-8521, FAX: 805-658-2901; Empl.: 200

KRAFT DYNATRONIX, INC., 105 Power St, Amery, WI 54001, Tel: 715-268-8118, 800-826-7172, FAX: 715-268-8183; Empl.: 28; *Sls. Mgr.:* R. W. Kappler; *Dist. Mgr.:* R. W. Kappler, Natl. Sls. Mgr.

KRECKMAN, HERB, CO., 27 Spruce Cabin Road, Cresco, PA 18326, Tel: 717-595-2212, FAX: 717-595-2024; Empl.: 4

KR ELECTRONICS, INC., 91 Avenel St., Avenel, NJ 07001, Tel: 908-636-1900, FAX: 908-636-1982; FSC No.: 55259; Empl.: 20; *Sls. Mgr.:* none ..... **A•1682-1683**

Local Sales Offices & Reps

CO	Englewood, Tech. Mktg. Co.	303-770-8994
OH	Kettering, Frank Bold & Assocs.	513-298-6145
TX	Richardson, Jim Wisdom & Assocs., Inc.	214-470-9093

KRENZ ELECTRONIC, INC., 1020 Calle Cordillera Ste.107, San Clemente, CA 92672, Tel: 714-361-2433, FAX: 714-361-2434; Empl.: 75; *Sls. Mgr.:* Alex Schlag, VP

KRISTEL CORPORATION, 833 Industrial Dr., West Chicago, IL 60185, Tel: 708-293-0850, FAX: 708-293-1255; Empl.: 35; *Sls. Mgr.:* Kevin Michael

KRL

FAX: 603-624-0634

KRL/BANTRY COMPONENTS, INC., 160 Bouchard St., Manchester, NH 03103, Tel: 603-668-3210; FSC No.: 18235; Empl.: 100; *Sls. Mgr.:* Bert A. Spiller ..... **A•1935-1940**

Local Sales Offices & Reps

TX	Grand Prairie, Claybrook & Assocs.	214-262-1188
CA	Mtn. View, Francisco & Assocs.	415-962-1717
CA	Sepulveda, Gil & Assocs.	818-894-1262
FL	Boca Raton, Sls. Specialists	813-754-1329
IN	Indianapolis, CC Electro Sls.	800-423-7799
NH	Amherst, D. A. Crowley & Assocs.	603-673-7050
NY	Port Washington, Ashtec	516-767-0336
NY	Rochester, H. C. Johnson Agencies	716-586-0777
OH	Akron, Augnat Assocs.	216-273-1211
TX	Dallas, Claybrook & Assocs.	214-690-9881
PA	Wyndmoor, Precision Mktg. Grp.	215-233-9233
TX	Houston, Milco Mktg.	713-723-5003
TX	Richardson, Milco Mktg.	214-738-2716
UT	Salt Lake City, Sage Assocs.	801-467-5451
WA	Seattle, The Harry Levinson Co.	206-382-1300

Local Distributors

MA	Billerica, Baldwin Comps.	617-667-6710
NY	Ronkonkoma, Baldwin Comps. Center	516-588-5700,800-645-5608
PA	Harrisburg, Ad-Tech	717-939-8337

KROHN-HITE CORP., Avon Indl. Pk., Bodwell St., Avon MA 02322, Tel: 508-580-1660, FAX: 617-583-8989; Empl.: 35 ..... **A•1684; D•1271**

Local Sales Offices & Reps

AL	Huntsville, Gentry Assocs.	205-837-0691
AZ	Phoenix, Odyssey 1	602-246-8841
CA	Huntington Bch., Sci-Dev West	714-840-3501
CA	San Jose, Scientific Devs. West	408-554-0451

CO Englewood, Odyssey 1 303-773-8176
FL Ft. Lauderdale, Gentry Assocs. 305-791-8405
FL Orlando, Gentry Assocs. 305-859-7450
FL Tampa, Gentry Assocs. 813-886-0720
GA Atlanta, Gentry Assocs. 404-998-2828
IL Chicago, Berndt Assocs. 312-283-0713
IN Carmel, Berndt Assocs. 317-844-0114
KS Overland Park, Ramsey Assocs. 913-649-6996
LA Gretna, Gentry Assocs. 504-367-3975
MD Baltimore, Sci-Rep 703-385-0600
MI Detroit, EQS Sys. 313-961-3042
MN Minneapolis, Berndt Assocs. 612-546-2021
MO St. Louis, Ramsey Assocs. 314-878-5042
NJ Englewood, Sci. Devices E. 201-871-3916
NM Albuquerque, Odyssey 1 505-265-6645
NY Syracuse, Labtronics 315-455-7314
OH Chesterland, EQS Sys. 216-729-2222
OH Columbus, EQS Sys. 614-228-3453
WA Bellevue, Sci. Dvcs., N.W. 206-747-5189
PA Pittsburgh, EQS Sys. 216-729-2222
PA Spring House, Scientific Devices East 215-643-3335
SC Columbia, Gentry Assocs. 803-772-6786
TN Knoxville, Gentry Assocs. 615-584-0281
TX Houston, Barnhill Assocs. 713-444-1733
VA Fairfax, Sci-Rep 703-385-0600
WA Bellevue, Sci. Dvcs. N. W. 206-747-5169
WI Milwaukee, Berndt Assocs. 414-545-8400

KRYSTINEL CORP., 126 Pennsylvania Ave., Paterson, NJ 07509, Tel: 201-345-8900, TWX: 710-988-5931, FAX: 201-345-1172; Empl.: 200; *Sls. Mgr.:* William Perkins ,Mgr.Customer Service

KSI, See Kaiser Systems, Inc.

K-SYSTEMS OF TEXAS, INC., 11501 Rojas Dr. Ste. P, El Paso, TX 79936, Tel: 915-598-9769, TELEX: WUI 6502763972, FAX: 915-593-2080; Empl.: 4; *Sls. Mgr.:* J.C. Kates

K-TRONICS, See U. S. Elco Inc. (Under Elco)

K-TWO INDUSTRIES, 4331 Miranda Ave., Palo Alto, CA 94306, Tel: 408-720-9316; Empl.: 5

KULITE SEMICONDUCTOR PRODS., INC., One Willow Tree Rd., Leonia, NJ 07605, Tel: 201-461-0900, TELEX: 685-3296, FAX: 201-461-0990; Empl.: 350

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AL Huntsville, Jim Springer, Inc. 205-883-4163
AZ Scottsdale, Dave Menegey Assocs. ... 602-994-9519
CA Hollywood, B. J. Wolfe Entprs. 213-877-5518
CA Walnut Creek, Dale-Dahl Assocs. 415-933-9595
CO Boulder, Measurement Cnslts. 303-449-7506
FL Bonita Springs, United Sls. Assocs. ... 813-947-4115
IL Carpentersville, Precision Meas. Prods., Inc. 312-426-4446
MA Brockton, JHL Assocs. 508-580-1703
MI Madison Heights, WKM Assocs. 313-588-2300
MN Minneapolis, Trask Engrg. 612-537-2434
MO St. Louis, Ozark Elctrn. Mktg. 314-423-7200
NJ Glen Gardner, United Sls. Assocs. 813-947-4115
NM Albuquerque, Amonette Entprs. 505-344-4143
NY Fairport, D.H. Brennan 716-223-7935
OH Cleveland, WKM Assocs. 216-524-5930
OH Dayton, WKM Assocs 513-434-7500
PA Doylestown, United Sls. Assocs. 813-947-4115
PA Pittsburgh, WKM Assocs. 412-892-2953
TX Dallas, Seaton Corp. 214-980-9860
UT Centerville, MC 2 801-298-3388
WA Seattle, Brett Assocs. 206-431-8090

KULKA (DIALIGHT CO.), See H.H. Smith, NT-T Inc.

KURZ INSTRUMENTS INC., 2411 Garden Rd., Monterey, CA 93940, Tel: 800-424-7356, TELEX: 172275; FSC No.: 94-24-11681; Empl.: 72; *Sls. Mgr.:* Tom Setliff

K-W MANUFACTURING CO., INC., P. O. Box 508, Prague, OK 74864, Tel: 405-567-2285, TELEX: 4932625, FAX: 405-567-4153; Empl.: 60; *Sls. Mgr.:* Freda Pickard

KYCON CABLE & CONNECTOR, INC., 1772 Little Orchard St., San Jose, CA 95125, Tel: 408-295-1110, FAX: 408-295-8054; Empl.: 9; *Sls. Mgr.:* Wendy Wuerth; *Dist. Mgr.:* Wendy Wuerth ..... **C•1422-1423, 1765**

Local Sales Offices & Reps
AZ Tempe, ACS of Arizona 602-731-9711
CA Aliso Viejo, Pro Assocs. 914-588-2700
CA San Jose, Kycon Cable & Connector, Inc. 408-295-1110
CA San Jose, Kycon Sls. Off. 408-295-1110
FL Clearwater, Dan-Tech Sls. 813-791-4551
FL Miramar, Dan-Tech Sls. 305-963-6142
GA Norcross, Pinnacle Mktg. 404-621-0212
KY Lexington, Protocol Sls. 606-272-4203
MA Sudbury, KSA of New England 508-443-5881
MO Chesterfield, Weisler and Assocs. 314-537-0010
NJ Oakland, Relay Specialties 800-526-5376
NC Raleigh, Pinnacle Mktg. 919-848-0404
OH Twinsburg, Protocol Sls. 216-425-2569
OR Beaverton, Quest Mktg. 503-641-7377
TX Dallas, Weisler and Assocs. 214-437-2386
WA Bellvue, Quest Mktg. 206-747-9424

Local Distributors
MA Ashland, Quality 508-881-6500
NC Raleigh, Resco Raleigh 919-781-5700

KYOCERA AMERICA, INC., 8611 Balboa Avenue, San Diego, CA 92123, Tel: 619-576-2766, TELEX: 47Z3069; Empl.: 1,150; *Sls. Mgr.:* Rick Sigliano

KYOCERA NORTHWEST, Electronic Components Group, 5701 E. Fourth Plain Blvd., Vancouver, WA 98661, Tel: 206-696-2840, FAX: 206-695-5836; FSC No.: 0FDX0; Empl.: 450; *Sls. Mgr.:* Koji Kanatani; *Dist. Mgr.:* Phil Elliott, Dist. Sales

LAB-LINE INSTRUMENTS, 15th & Bloomingdale, Melrose Park, IL 60160, Tel: 708-450-2600, TELEX: 6781028, FAX: 708-450-0943; Empl.: 225

LABORATORY TECHNOLOGIES CORP., 400 Research Dr., Wilmington, MA 01887, Tel: 508-657-5400, TELEX: 989695, FAX: 508-658-9972; Empl.: 31; *Sls. Mgr.:* Neil Parmenter

LABTRONICS INC., 75 Rickson Ave., Guelph, Ont., Canada N1G 3B6, Tel: 519-767-1061

LAFRANCE CORP., Entprs & Exec Aves, Philadelphia, PA 19153-3893, Tel: 215-365-8000, TELEX: 506-082, FAX: 215-365-4420; Empl.: 502; *Sls. Mgr.:* J. Singer

LAFRANCE CORP., PACTEC DIV., See PacTec Div., LaFrance Corp.

LAKE SHORE CRYOTRONICS, INC., 64 E. Walnut St., Westerville, OH 43081, Tel: 614-891-2243, TELEX: 24-5415, FAX: 614-891-1392; *Sls. Mgr.:* David L. Calvelage

LA MARCHE MFG., 106 Bradrock Dr., Des Plaines, IL 60018, Tel: 708-299-1188, TELEX: 28-2526; FSC No.: ;15736; Empl.: 225

LABORATORY TECHNOLOGIES CORP., 400 Research Drive, Wilmington, MA 01887, Tel: 508-657-5400, TELEX: 989695, FAX: 508-658-9972; Empl.: 30

LAMBDA ELECTRONICS INC., 515 Broad Hollow Rd., Melville, NY 11747-3700, Tel: 516-694-4200, FAX: 516-293-0519; Empl.: 1200; *Sls. Mgr.:* John Valenti

LAMBERT ENGINEERING INC., 601 N.W. Harmon Blvd., Bend, OR 97701, Tel: 503-388-2623, FAX: 503-388-1794; Empl.: 9

LAMB INDUSTRIES, INC., 6585 S.W. Raleighwood Ln., Portland, OR 97225, Tel: 503-297-8878, 800-824-9374, TELEX: 263373LAMBUR, FAX: 503-297-8879; Empl.: 5; *Sls. Mgr.:* Gary Rhode; *Dist. Mgr.:* Joanne McIntyre ..... **B•1728-1729**

Local Sales Offices & Reps
CA Canoga Park, Acorp Inds. 818-700-2991
CA San Diego, Deco Elctrns. 619-693-1595
CA San Diego, Sigma Elctrns. 619-565-2000
IA Des Moines, Mid State Distrbg. 515-244-7231
MN Fridley, Voyager Elctrns. 612-571-7766
MO St. Louis, Wes Garde 314-567-7776
NE Omaha, Mid State Distrbg. 402-592-5965
WA Redmond, Priebe Elctrns. 206-881-2363

Local Distributors
CA San Carlos, Logan Elctrns. 415-594-0700
CA Sunnyvale, Target Elctrns. 408-733-0384
CA Van Nuys, EW Elctrns. 714-857-4422
CA Van Nuys, Wes-Garde 213-873-4802
CT Hartford, Wes-Garde 203-527-7705
FL Lakeland, Wes-Garde 813-644-7564
IL Carrol Stream, Wes-Garde 312-653-1460
MN Minneapolis, Tor/Tec Corp. 612-866-3662
NY Freeport, KRP Elctrns. 516-623-3346
OH Westerville, Wes-Garde 614-885-0319
OR Portland, Radar Elctrns. 503-232-3404
TX Dallas, Wes-Garde 214-357-1768
WA Seattle, Radar Elctrns. 206-282-2511
WI Mequon, Lakeview Elctrns. 414-377-8250

LAMP TECHNOLOGY, INC., 1645 Sycamore Ave., Bohemia, NY 11716, Tel: 516-567-1800, FAX: 516-567-1806; Empl.: 20; *Sls. Mgr.:* Janet Lang

LAMPTRONIX CO., LTD.

FAX: 815-455-7916

LAMPTRONIX CO., LTD., 81 N. Williams St., Crystal Lake, IL 60014-4443, Tel: 815-455-0400; FSC No.: 61342; *Sls. Mgr.:* Karen Huizenga ..... **B•1173**

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CA Signal Hill, Leo Miller Co. 213-498-6063
IL Tinley Park, South Lake Comps. 708-532-4055
IN Indianapolis, D-M Assocs. 317-842-4424
CA Westlake V1., Casco 818-889-7889
NJ Moutainside, H.G. Richter, Inc. 201-233-4615
NC Raleigh, Eastern Elctrns. 919-876-7591
PA Phonexville, Richter Co. 215-495-6176
RI Warwick, Ertronics, Inc. 401-732-3567

LAMTECH ELECTRONICS, 620 Easy Street, Garland, TX 75042, Tel: 214-272-3504, FAX: 214 272 7176; FSC No.: 07R487; Empl.: 100; *Sls. Mgr.:* Phillip Rasor; *Dist. Mgr.:* Phillip Rasor

LANCE INDUSTRIES, 13001 Bradley Avenue, Sylmar, CA 91342-3832, Tel: 818-367-1811, FAX: 818-362-3594; *Sls. Mgr.:* Jerry Updyke; *Dist. Mgr.:* Joe Barris

LAND INFRARED, Land Instruments Intl. Inc., 2525 Pearl Buck Road, Bristol, PA 19007, Tel: 215-781-0700, 800-523-8989, FAX: 215-781-0723; Empl.: 25; *Sls. Mgr.:* Richard Parello

LANDIS & GYR, INC., See Maxmar Controls Inc.

L & L SPECIAL FURNACE, 20 Kent Rd., Aston, PA 19014, Tel: 215-459-9216, FAX: 215-459-3689; Empl.: 20; *Sls. Mgr.:* Greg Lewicki; *Dist. Mgr.:* Stephen Lewicki

L & R MFG. CO., 577 Elm St., Kearny, NJ 07032, Tel: 201-991-5330, FAX: 201-991-5870; Empl.: 180; *Sls. Mgr.:* Robert Lasky

LANGLEY:FLEET AEROSPACE, INC., P.O. Box 2911, San Diego, CA 92112, Tel: 619-264-3181, FAX: 619-264-4329; FSC No.: 83549; Empl.: 110; *Sls. Mgr.:* H.J. Sauer

LANSING INSTRUMENT CORP., P.O. Box 730, Ithaca, NY 14851-0730, Tel: 607-272-3265, 800-847-3535, FAX: 607-277-1953; *Sls. Mgr.:* Fred B. Widding ..... **C•1063**

LARK ELECTRONICS, INC., Box 390, New York, NY 10040, Tel: 212-569-0430; FSC No.: 52682

LARK ENGINEERING CO., Baier & Baier Inc., 27151 Calle Delgado, San Juan Capistrano, CA 92675, Tel: 714-240-1233, FAX: 714-240-7910; FSC No.: 33174; Empl.: 25

LARSON INSTRUMENT, Greenbush Rd., Orangeburg, NY 10962, Tel: 914-359-3800, FAX: 914-365-1581; Empl.: 18; *Sls. Mgr.:* A. D. Stephens

LASER CONCEPTS, Omega Organization Intl., P.O. Box 33623 E, Seattle, WA 98133, Tel: 206-364-7881, FAX: 206-542-1157; Empl.: 35; *Sls. Mgr.:* Roberta Forsythe

LASER DIODE, INC., Morgan Crucible, 1130 Somerset St., New Brunswick, NJ 08901, Tel: 201-249-7000, TWX: 710-998-0597, FAX: 201-249-9165; Empl.: 170; *Sls. Mgr.:* Stephen Lerner; *Dist. Mgr.:* Stephen Lerner

LASER PRECISION CORP., 1231 Hart St., Utica, NY 13502, Tel: 315-797-4449, TELEX: 646803; Empl.: 180; *Sls. Mgr.:* Jim Nerschook

LASERTECHNICS, INC., 5500 Wilshire Ave.,N.E., Albuquerque, NM 87113, Tel: 505-822-1123, TELEX: 757222, FAX: 505-821-2213; Empl.: 66; *Sls. Mgr.:* Keith Green; *Dist. Mgr.:* Keith Green

LASER TECHNOLOGY, INC., 10624 Ventura Blvd., N. Hollywood, CA 91604, Tel: 818-763-7091, TELEX: Cable-LASTEC (No. Hollywood), FAX: 818-763-7382; Empl.: 20; *Sls. Mgr.:* Richard Alfonso

LAUBE TECHNOLOGY, 6400 Variel Ave., Woodland Hills, CA 91367, Tel: 818-703-1188, FAX: 818-716-0422; Empl.: 20; *Sls. Mgr.:* Arnold Aloi; *Dist. Mgr.:* Teri Harrington

LAUREL

FAX: 714-645-1239

LAUREL ELECTRONICS, INC., 709 Kings Rd., Newport Beach, CA 92663, Tel: 714-646-6846; Empl.: 4 ..... **D•1359-1361**

LAZER DATA, Electro Corporation, 2400 Diversified Way, Orlando, FL 32804, Tel: 1-800-843-2700; Empl.: 75; *Sls. Mgr.:* Dick Wheeler

L-com®

FAX: 508-689-9484

L-COM INC., 1755 Osgood St, N. Andover, MA 01845, Tel: 508-682-6936; Empl.: 20; *Sls. Mgr.:* Scott Black ..... **C•1424-1425; D•1281-1285**

LCT ELECTRONIC CORPORATION, 700 N.Valley St., Suite K, Anaheim, CA 92801, Tel: 714-991-7317, FAX: 714-991-3661; FSC No.: 3613, 3643, 3861; Empl.: 9; *Sls. Mgr.:* Lee R. Couts ..... **C•1683**

Local Sales Offices & Reps

CA	Arcadia, Van Gott & Assocs., Inc.	818-445-9728, FAX:818-445-5019
CA	Santa Clara, Norcal Repco	408-988-1643, FAX:408-727-9351
CO	Denver, Candal, Inc.	303-692-8484, FAX:303-692-8416
GA	Atlanta, Grady Duckett Sls. Co.	404-634-7279
IN	Indianapolis, Elctrn. Sls. & Eng. Inc.	317-849-4260, FAX:317-841-0231
KS	Lenexa, Midtec Assocs., Inc.	913-541-0505, FAX:913-541-1729
MA	Haverhill, L-K Assocs., Inc.	508-373-1313, FAX:508-373-8024
MI	Farmington Hills, W.R. Hummon & Assoc. Inc.	313-474-0661,FAX:313-474-8162
MN	Paul Ericson & Assoc. Inc.	612-831-5016, FAX:612-831-8266
NJ	Bellmawr, Mid-Atlantic Elctrns. Corp.	609-931-5303,FAX:609-931-4928
NM	Albuquerque, H & H Elctrns., Inc.	505-884-9100, FAX:505-889-3302
NY	Glen Cove, J. Kunze Co.	516-671-2376, FAX:516-674-0221
OR	Beaverton, Ravencraft, Inc.	503-646-9261, FAX:503-646-9299
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Can	Kingston Ont., Elctrn. Packaging Sys. Ltd.	613-384-1142,FAX:613-384-6266

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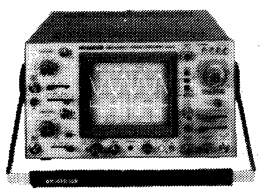

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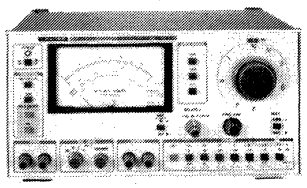

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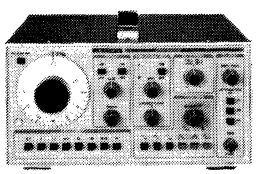

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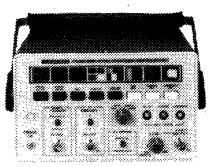

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CT	W. Hartford, Component Concept	203-523-4066
GA	Norcross, Electramark, Inc.	404-446-7915
Can	Brossard, Que., DB Lectro, Inc.	514-672-7029

Local Distributors

AL	Birmingham, MG Elctrns.	205-328-4525
CA	Covina, Selecta Switch	818-967-4119
CA	Hayward, Electro Comps.	415-783-5800
CA	Los Angeles, Master Distrs.	213-452-1229
CA	San Diego, Shanks & Wright	714-239-0176
CT	E. Hartford, R & S Elctrn. Distrs.	203-528-9901
CT	Fairfield, Indl. Elec.	203-255-9547
FL	Hialeah, Atlas Elec. Supp.	305-885-8941
FL	Miami, Miramar Elec. Sys.	305-871-4072
GA	Rome, Battey Machine	404-291-4141
IL	Elk Grove Village, Elk Grove Elec.	312-956-6350
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KY	Louisville, Cameron & Barkley	919-758-2507
MA	Allston, Hilco Elec. Supp.	617-783-2600
MA	Lynn, Land Elctrns. Supp., Inc.	617-592-2220
NY	Nanuet, BJ Inds.	914-623-2660
NC	Forest City, Lucky One	704-245-8053
NJ	Jersey City, Cuny & Gerber	201-653-0222
NJ	Linden, Turtle & Hughes	201-574-3600
NJ	Piscataway, Fromm Elec.	209-981-0400
NJ	Secaucus, Franklin & Smith	201-864-0555
NM	Hobbs, K & S Elec. Co.	505-393-3114
NY	Baldwinsville, Scibetta Distrs.	315-622-3993
NY	Bronx, Smith Elctrns.	212-292-4670
NY	New York, Blan Elctrns.	212-233-6288
OH	Cincinnati, Cincinnati Controls	513-530-0049
OH	Cleveland, Specialized Comp. Sls. Co., Inc.	216-464-0405
OH	Dayton, John A. Becker Co.	513-226-1341
PA	Philadelphia, F & C Sls. Co.	215-228-5656
TX	San Angelo, Gunter Wholesale Co.	915-655-9181

LINEMASTER SWITCH, 29 Plaine Hill Rd.,P.O Box 238, Woodstock, CT 06281-0238, Tel: 203-974-1000, FAX: 203-974-0691; FSC No.: 979180; Empl.: 190

LINSEIS, INC., P.O. Box 666, Princeton Junction, NJ 08550, Tel: 609-799-6282, 800-RECORDER, FAX: 609-799-7739; *Sls. Mgr.:* Michael Bissell ..... **D•1420**

LISK, G. W., CO., 2 South St., Clifton Springs, NY 14432, Tel: 315-462-2611, TELEX: 71-6854113, FAX: 315-462-7661; Empl.: 300; *Sls. Mgr.:* D.J. Riggs; *Dist. Mgr.:* D.J. Riggs

LITEON

FAX: 408-942-1527

LITE-ON INC., 720 S. Hillview Dr., Milpitas, CA 95035, Tel: 408-946-4873; Empl.: 1100; *Sls. Mgr.:* Michael Barnes; *Dist. Mgr.:* Mark King ..... **A•2098-2099; B•1092-1095**

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrn. Assoc.	205-881-5031
AZ	Mesa, System Sls. of AZ.	602-464-9989
CA	Agoura, Quadrep Southern	818-597-0222
CA	Irvine, Quadrep Southern	714-727-4222
CA	San Diego, Quadrep Southern	619-560-8330
CA	San Jose, Quadrep, Inc.	408-432-3300
CO	Lakewood, Candal, Inc.	303-935-7128
CT	Middletown, Gerber Sls.	203-347-3000
FL	Altamonte Spgs., Semtronics Assoc. Inc.	407-831-8233
FL	Clearwater, Semtronics Assoc. Inc.	813-461-4675
FL	Ft. Lauderdale, Semtronics Assoc. Inc.	305-731-2484
GA	Atlanta, Beacon Elctrn. Assoc.	404-256-9640
IL	Itasca, Circuit Sls. Inc.	312-773-0200
IN	Fort Wayne, Corrao Marsh, Inc.	219-482-2725
IN	Greenfield, Corrao Marsh, Inc.	317-462-4446
IA	Cedar Rapids, Hitec Central, Inc.	319-396-3228
MD	Glen Burnie, Third Wave Solutions	301-290-5990
MA	Burlington, Gerber Sls.	617-229-1150
MI	Brighton, AP Assocs.	313-229-6550
MN	Minneapolis, Comstrand	612-788-9234
MO	Bridgeton, Hi-Tec Central	314-731-7243
NJ	Morristown, Andrews & Andrews	201-569-8800
NJ	Totowa, R.O.I. Sls. Co.	201-812-9606
NM	Albuquerque, System Sls. of Az.	505-889-2901
NC	Raleigh, Beacon Elctrn. Assoc.	919-787-0330
OH	Dublin, Sales Plus	614-889-8362
OH	Mentor, Sales Plus	216-942-7811
OR	Portland, Q.R./Crown, Inc.	503-620-8320
PA	Willow Grove, Tech Sales Assoc.	215-784-0170
TN	Knoxville, Beacon Elctrn. Assoc.	615-689-2141
TX	Houston, RAM Elctrn. Sls., Inc.	713-855-0768
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AL Huntsville, Cartwright & Bean, Inc. 205-830-1540
AZ Tucson, Clemick & Assocs. 602-749-4003
AR Little Rock, Erickson Sls., Inc. 501-455-0618
CA Burlingame, Wm. J. Purdy Co. 415-347-7701
CA Irvine, Gravley & Assocs. 714-852-9994
CO Denver, The Lindberg Co. 303-758-9033
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IL Mt. Prospect, The Dornbrow Co. 708-253-3631
IN Indianapolis, L. M. DeVoe Co. 317-842-3245
IA Cedar Rapids, T.L. Dowell Assoc. 319-364-3880
KS Overland Park, T. L. Dowell & Assocs. 913-599-1100
LA Chalmette, Erickson Sls. Inc. 504-271-1976
MD Silver Spring, Mid-Atlantic Sls. Co. 301-593-7749
MA Framingham, Coakley, Boyd & Abbett, Inc. 508-820-0800
MA W. Bridgewater, Coakley,Boyd & Abbott, Inc. 508-559-6700
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MI St. Joseph, R. C. Merchant 616-983-7378
MN Edina, M. Foster Tech. Sls., Inc. 612-941-9790
MO St. Louis, T. L. Dowell & Assocs. 314-849-4234
NJ Englewood, MOS Mktg. Assoc. 201-569-2071
NM Albuquerque, The Lindberg Co. 505-881-1006
NY Binghamton, R.W. Mitscher Co., Inc. ... 607-724-6561
NY Clarence, R. W. Mitscher Co., Inc. 716-759-2350
NY New York, MOS Mktg. Assoc. 516-487-3966
NY Pittsford, R. W. Mitscher Co., Inc. 716-586-4012
NY Rochester, R. W. Mitscher Co., Inc. 716-227-0839
NY Utica, R.W. Mitscher Co., Inc. 315-724-3947
NC Charlotte, Cartwright & Bean, Inc. 704-536-0303
NC Raleigh, Cartwright & Bean,Inc. 919-876-4130
OH Centerville, Bear Mktg., Inc. 513-436-2061
OH Richfield, Bear Mktg., Inc. 216-659-3131
OR Portland, J. E. Belusko Co. 503-222-4279
PA Harrisburg, Beil & Whitaker, Inc. 717-564-6900
PA Narberth, Bresson Assocs., Inc. 215-664-6460
PA Pittsburgh, Bear Mktg., Inc. 412-531-2002
TN Knoxville, Cartwright & Bean, Inc. 615-693-7450
TX Dallas, Elcom Mktg., Inc. 214-241-2166
TX Dallas, Erickson Sls., Inc. 214-739-5833
VA Charlottesville, Mid-Atlantic Sls. Co. 804-973-8099
Can Pickering, Ont., A. C. Simmonds 416-839-8041

LITTON ELECTRON DEVICES, 960 Industrial Rd., San Carlos, CA 94070, Tel: 415-591-8411, TWX: 910-376-4900, FAX: 415-591-5623; Empl.: 800

LITTON ELECTRON DEVICES, Litton Systems, Inc., 1215 South 52nd St., Tempe, AZ 85281, Tel: 602-968-4471, TELEX: 910-950-0149, FAX: 602-966-9055; FSC No.: 55311; Empl.: 708; *Sls. Mgr.:* C. M. Wood, Byron Harding, Mktg. Mgrs.; *Dist. Mgr.:* C. M. Wood, Byron Harding,Mktg. Mgrs.

LITTON ENCODER DIV., 20745 Nordhoff St., Chatsworth, CA 91311, Tel: 818-341-6161, TWX: 910-494-1229, FAX: 818-882-4553; FSC No.: 17080; Empl.: 150

LITTON LASER SYSTEMS, CLS OPERATIONS, 5 Jeffrey Drive, South Windsor, CT 06074, Tel: 203-289-3551

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FAX: 703-953-1841

LITTON POLY-SCIENTIFIC, Div. of Litton Industries, 1213 N. Main St., Blacksburg, VA 24060-3100, Tel: 800-336-5917, 703-953-4751, TWX: 710-875-3694; Empl.: 800 ..... **B•1218-1223, 1283-1292**

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AZ Phoenix, Dick Palmer 602-242-0910
CA Huntington Beach, Mike Baggetta 714-968-0434
CA Woodland Hills, Bob Billington 818-347-0603
FL Fern Park, Blair Engrg. 305-834-1244
MA Sturbridge, Russ Persson 203-871-8900
MI Stockbridge, Erhart Engrg. 517-851-8770
MN Prior Lake, Midwest Meridian 612-447-8222
KS Olathe, Technical Sls. Assoc. 913-829-2800
NY Mineola, Kahn Assocs. 516-742-1900
TX Dallas, Blair Engrg. 214-241-5655
OH Medina, Stress Analysis Svcs. 216-725-7733
TX Garland, Carey, McMahill & Associates 214-681-1414
WA Bellevue, Thorsen Co. 206-455-9180

LITTON POTENTIOMETER DIV., 750 So. Fulton Ave., Mt. Vernon, NY 10551, Tel: 914-664-7733, TWX: 710-562-0129, FAX: 914-664-2466; FSC No.: 04454;Multiple; Empl.: 300; *Sls. Mgr.:* Sales Director

LITTON SOLID STATE, Litton Systems, Inc., 1504 Mc Carthy Blvd., Milpitas, CA 95035, Tel: 408-433-0933, FAX: 408-954-9652

LIXI, INC., 1438 Brook Dr., Downers Grove, IL 60515, Tel: 708-620-4646, FAX: 708-620-7776; Empl.: 17; *Sls. Mgr.:* Tom Nguyen; *Dist. Mgr.:* Andy Xydakis

LJ TECHNICAL SYSTEMS, 19 Power Drive, Hauppauge, NY 11788, Tel: 516-234-2100, FAX: 516-234-2656; Empl.: 25; *Sls. Mgr.:* Christopher Rowe

LMB HEEGER, INC., 6400 Fleet St., Commerce, CA 90040, Tel: 213-728-5108, FAX: 213-728-4740; *Sls. Mgr.:* Robert Heeger

lmi CONNECTORS INC

FAX: 518-298-5371

LMI CONNECTORS INC., 34 West Service Rd., Champlain, NY 12919, Tel: 518-298-5360; *Sls. Mgr.:* David Asseraf; *Dist. Mgr.:* David Asseraf ..... **C•1442-1445**

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AZ Phoenix, Piatt Sls. 602-957-3570
CA Arcadia, Van Gott & Assocs. 818-445-9728
CA San Diego, Van Gott & Assoc. 714-698-7774
CT Bloomfield, The Newscott 203-243-8514
CT Killingsworth, Newscott Co. 203-663-2338
FL Altamonte Springs, Over & Over, Inc. 407-332-1222
FL Coral Springs, Over & Over, Inc. 305-753-7050
FL Tampa, Over & Over, Inc. 813-626-9100
GA Norcross, Over & Over 404-449-6505
IL Glenview, Prime Dvcs. 708-729-2550
IN Columbus, Connect 21 502-426-8955
KS Olathe, G.M. Brown & Assocs. 913-829-3086
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MD Millerville, Components & Assemblies 301-987-0034
MA Needham Heights, The Newscott Co. 617-444-1923
MN Eden Prairie, Electro Mark 612-944-5850
MO Florissant, G.M. Brown & Assocs. 314-839-3600
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OH Columbus, McFadden Sls. 614-761-3177
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WI Oak Creek, Prime Dvcs. 414-263-3900
Can Montreal, Que., Avotronics 514-697-2135
Can Toronto, Ont., Avotronics 416-475-2019

Local Distributors

AZ Tempe, Control Design Supp. 602-829-7981
CA Anaheim, Control Design Supp. 714-821-6173
CA Fullerton, Interconnect Specs. 714-773-0411
CA San Carlos, Control Design Supp. 415-592-4806
CA San Diego, Control Design Supply 619-457-9822
CA Santa Ana, BDS Elctrns. 714-662-1050
CO Denver, Control Design Supp. 303-296-1922
CT Wallingford, Control Design Supp. 203-269-9955
FL Altamonte, Control Design Supp. 305-788-3220
FL Pompano Beach, Control Design Supp. 305-782-1311
GA Stone Mountain, Control Design Supp. 404-979-3500
IL Chicago, Control Design Supp. 708-307-8944
IL Chicago, Leeds 312-625-3800
IL Schaumburg, Control Design Supp. 708-307-8900
IN Indianapolis, Control Design Supp. 317-788-4559
IA Marion, Control Design Supp. 319-373-2923
KS Kansas City, Control Design Supp. 913-362-4248
MD Gaithersburg, Axis Elctrns. 301-840-9640
MA Woburn, Control Design Supp. 617-932-9404
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MO St. Louis, Control Design Supp. 314-426-3150
NJ Union, Avanti 201-964-0333
NY Canandaigua, Advacom 716-396-9050
NY Whitestone, Power Electro Supp. 718-767-1447
NC Charlotte, Control Design Supp. 704-588-4410
PA Malvern, Control Design Supp. 215-296-0150
TX Arlington, Bell Comp. Sls. 817-461-5303
TX Austin, Wofford Elctrns. 512-339-1131
TX Dallas, Control Design Supp. 214-358-1441
TX Dallas, Wofford Elctrns. 214-320-0294
TX Houston, Wofford Elctrns., Inc. 713-847-3583
UT Nephi, Control Design Supp. 801-623-2977

WA Kent, Control Design Supply 206-251-6323
WI New Berlin, Control Design Supp. 414-784-1015
Can Calgary, AB, Memco 403-258-3399
Can Edmonton, AB, Wholesale Electronics 403-451-2180
Can Montreal, Que., Ferrotronic Components 514-341-3450
Can Montreal, Que., Megastar Electronics 514-329-0042
Can Ottawa, Ont., Z.E.I. 613-526-2911
Can St. Laurent, Que., Z.E.I. 514-342-6211
Can Ste-Foy, Que., Z.E.I. 418-681-1262
Can Surrey, B.C., Memco 604-590-1553
Can Toronto, Ont., Z.E.I. 514-674-7220
Can Victoria, B.C., Pacific Coast Electronics 604-385-5111

LMI CONNECTORS INC., 8415 Dalton Rd., Town of Mount Royal, Canada H4T 1V5, Tel: 514-733-8311, FAX: 514-733-8440

LNR COMMUNICATIONS, INC., 180 Marcus Blvd., Hauppauge, NY 11788, Tel: 516-273-7111, TELEX: 221620, TWX: 510-227-9871, FAX: 516-273-7119; FSC No.: 51049; Empl.: 200; *Sls. Mgr.:* F. Kelly, Dir. Mktg.

LOCKHEED SANDERS, INC., EMC Dept., 95 Canal St., Nashua, NH 03061-2004, Tel: 603-885-3602, TELEX: 94-3430, TWX: 710-228-1894, FAX: 603-885-5133; FSC No.: 94117; *Sls. Mgr.:* (EMC) R. Bossart

LOCTITE LUMINESCENT SYS., INC., LocTite Corp., Etna Rd., Lebanon, NH 03766, Tel: 603-448-3444, TELEX: 710-366-0607, FAX: 603-448-3452; Empl.: 200

LOCUS, INC., Box 740, State College, PA 16804, Tel: 814-466-6275, FAX: 814-466-3341; *Sls. Mgr.:* Ellwood E. Brem

LOCUS, Karnan, PO Box 740, State College, PA 16804, Tel: 814-466-6275; *Sls. Mgr.:* Ellwood E. Brem

LOCUS COMPUTING CORP., 9800 La Cienega Blvd., Inglewood, CA 90301-4440, Tel: 213-670-6500, FAX: 213-670-2980; Empl.: 275

LOCUS INC., 1842 Hoffman Street, Madison, WI 53704, Tel: 608-244-0500, FAX: 608-244-0528; Empl.: 18

LODESTONE PACIFIC, 4065 E. La Palma Ave. Bldg. G, Anaheim, CA 92807, Tel: 714-630-1343, FAX: 714-630-8480; FSC No.: OJWU1; Empl.: 11; *Sls. Mgr.:* Mark Soukup ..... **A•1210-1211**

Local Sales Offices & Reps
IL Chicago, Charles Atwater Assoc. 708-668-2303
MA Boston, Anchor Engrg. Corp. 508-898-2724
NY Long Island, Kahgan Brody Assoc. 516-538-2300
PA Easton, Kendon Co. 215-253-3100
VA Roanoke, A.B. Kreger Co. 703-989-4738
Intl Frankfurt, Germany, BFI 06074 4098-0
Intl Hong Kong, P. Leo & Co. Ltd. 5-413655
Intl London, England, Cirkit 0992-444111
Intl Milano, Italy, BFI 2-33100535
Intl Paris, France, BFI 145-330137
Intl Roskilete, Denmark, BFI 488-8289900
Intl Sollenton, Sweden, BFI 488 828 9900

LOGICAL DESIGN GROUP, INC., 6301 Chapel Hill Rd., Raleigh, NC 27607, Tel: 919-851-1101, FAX: 919-851-2844; Empl.: 22; *Sls. Mgr.:* Cam McPhee; *Dist. Mgr.:* Barbara Boyette

LOGICAL DEVICES, INC., 1201 N.W. 65th Place, Fort Lauderdale 33309, Tel: 305-974-0967, FAX: 305-491-6956; *Sls. Mgr.:* Bob Sims

LOGIC BEACH INC., 8033 Pasadena Ave., La Mesa, CA 91941, Tel: 619-698-3300, FAX: 619-469-8604; Empl.: 10; *Sls. Mgr.:* David Parks; *Dist. Mgr.:* David Parks

LOGI COMP ELECTRONICS, INC., 1009 W. Boston Post Rd., Mamaroneck, NY 10543, Tel: 914-698-9332, FAX: 914-698-9456; Empl.: 6

LOGICOMP ELCTRNS., INC., See Pres-Air-Trol Corp.

LOGIC TECHNOLOGY, INC., 1090-B L'Avenida, Mtn. View, CA 94043, Tel: 415-967-1007, FAX: 213-641-4691; FSC No.: 51019; *Sls. Mgr.:* Mel Morgan

LOGIMETRICS, 121-03 Dupont St., Plainview, NY 11803, Tel: 516-349-1700, TELEX: 7608152, FAX: 516-349-8552; FSC No.: 33013; Empl.: 75; *Sls. Mgr.:* Eugene Blum

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CA Campbell, Shur Sls., Inc. 408-374-5577
CO Englewood, Advanced Technlg. Mktg. 303-789-2606
CA Simi Valley, Logitek 805-883-7608
CT Hartford, Dynamic Sls. of New England 203-693-6567
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IN Indianapolis, R.O. Whitesell & Assocs. 317-359-9283
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KY Pewee Valley, R.O. Whitesell & Assocs. 502-241-1441
MA Burlington, Dynamic Sls. of New England 617-272-5676
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MO Southfield, R.O. Whitesell & Assocs. .. 313-559-5454
NY Ronkonkoma, JL Sls. 516-737-2801
NC Greensboro, R.O. Whitesell & Assocs. 919-273-1945
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OK D&O Engrg. Co. 316-686-2808
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TX Dallas, D&O Engrg. Co. 214-241-3099
VT Burlington, Dynamic Sls. of New England 802-863-6665
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WA Kirkland, Skye-Tek 206-828-2115
Can Lachine, Que., Electrodesign Ltd. 514-636-4838

LONG ISLAND TRANSFORMER & INDUCTOR COMPANY, INC., 882 Wallace Ave., Baldwin, NY 11510, Tel: 516-766-5644; Empl.: 5

LONGSHINE TECHNLG. INC., 2013 N. Capitol Ave., San Jose, CA 95132, Tel: 408-942-1746, FAX: 408-942-1745; Empl.: 300

LORAIN PRODUCTS, Reliance Electric, 1122 F St., Lorain, OH 44052, Tel: 216-288-1122, TELEX: 98-0505, TWX: 196131; Empl.: 1200; *Sls. Mgr.:* T. F. McFadden

LORAL DATA SYSTEMS, P.O. Box 3041, Sarasota, FL 34230, Tel: 813-371-0811, FAX: 813-378-1893; FSC No.: 06141; Empl.: 900; *Sls. Mgr.:* F. V. Bud Hinkel

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LORAL FAIRCHILD, Imaging Sensors, 1801 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-433-2500, TWX: 910-373-2110, FAX: 408-433-2508; *Sls. Mgr.:* Jim Johnson; *Dist. Mgr.:* Jim Johnson

LORAL MICROWAVE-FSI, Semiconductor Div., 16 Maple Rd., Chelmsford, MA 01824, Tel: 508-256-4113/8101, TWX: 710-343-0404, FAX: 508-937-3748; FSC No.: 26629; Empl.: 90; *Sls. Mgr.:* D. Langan

LORAL MICROWAVE NARDA, 435 Moreland Rd., Hauppauge, NY 11788, Tel: 516-231-1700, TWX: 510-221-1867, FAX: 516-231-1711; FSC No.: 99899; Empl.: 400; *Sls. Mgr.:* Robert Nopper

LORAL MICROWAVE-NARDA WEST, 214 Devcon Dr., San Jose, CA 95112-4210, Tel: 408-436-4400, FAX: 408-436-8476; FSC No.: 8F150; Empl.: 200; *Sls. Mgr.:* Leon Becker

LORAL MICROWAVE-WAVECOM, 9036 Winnetka Ave., Northridge, CA 91324, Tel: 818-882-3010, TELEX: 6502408147; FSC No.: 28979; Empl.: 109

LORAL TERRACOM, Sub. of Loral Corp., 9020 Balboa Ave., San Diego, CA 92123, Tel: 619-278-4100, TELEX: TERRACOM A SDG 18-2774, FAX: 619-292-1140; *Sls. Mgr.:* Michael A. Lapadula

LORCH ELECTRONICS:DIV. OF VERNITRON CORP., 2801 - 72nd St., No., St. Petersburg, FL 33710, Tel: 813-347-2181, FAX: 813-347-3881; FSC No.: 29971; Empl.: 50; *Sls. Mgr.:* Carol McCoy ..... **A•1751**

Local Sales Offices & Reps
AZ Phoenix, J.F. Hurlbut 602-952-2079
CA Los Angeles, McDougall/McLauglin Co. 213-477-8556
CO Golden, J. F. Hurlbut Co. 303-279-7796
KY Ft. Mitchell, G. W. Thelen Co., Inc. 606-341-8181
MO St. Louis, Engrg. Svcs. 314-997-1515
NH Amherst, D.A.Crowley & Assocs., Inc. .. 603-673-7050
NJ W. Orange, E-F Tech. Sls. 201-731-7203
NJ W. Orange, E-F Tech. Sls., Inc. 201-731-7203
NY Liverpool, R & D Assocs. 315-457-0100
NY Plainview, E-F Tech. Sls. 516-942-7400
OH Chagrin Falls, G.W. Thelen Co.,Inc. 216-543-1095
PA Glenside, Koebert Assocs., Inc. 215-887-2310
TX Plano, Zeus Engrg. 214-423-2027
WA Seattle, G. M. Gillett & Assocs. 206-284-3344
EXP NY, Great Neck, Ad. Auriema 516-487-0700
Can La Salle, Que., Electrodesign, Ltd. 514-363-0245

LORLIN TEST SYSTEMS, 8 Lakeside Office Pk. 599 North Ave., Wakefield, MA 01867, Tel: 617-245-9044, FAX: 617-246-5822; Empl.: 45; *Sls. Mgr.:* Paul Pedigo

LORTEC POWER SYSTEMS, INC., 145 Keep Court, Elyria, OH 44035-2214, Tel: 216-327-5050, FAX: 216-327-9628; Empl.: 65; *Sls. Mgr.:* Dale Lamirand

LOVE CONTROLS CORP., 1475 S. Wheeling Rd., Wheeling, IL 60090, Tel: 708-541-3232, TELEX: 297115, FAX: 708-541-7366; FSC No.: 8L919; Empl.: 72; *Sls. Mgr.:* James Nolan; *Dist. Mgr.:* Jim Clark

low key

FAX: 508-281-6321

LOW KEY CORPORATION, Strong Group, 105 Maplewood Ave., P.O. Box 1195, Gloucester, MA 01930, Tel: 508-281-0448; Empl.: 25; *Sls. Mgr.:* Brian Hendricks ..... **B•1820-1821**

Local Sales Offices & Reps
AL Huntsville, MacKay Smith Assocs. 205-539-8005
CO Englewood, Elctrn. Comp. Sls. 303-762-9576
CT Weatherfield, Compak 203-563-4784
FL Orlando, MacKay Smith Assocs. 407-423-4353
GA Tucker, MacKay Smith Assocs. 404-496-9913
IL Skokie, Electro Tech Mktg. 312-676-3151
IN Greenfield, France Entprs. 317-462-6098
MD Baltimore, Hagy Assocs. 301-529-3995
MA Westford, Bucher Assoc. 508-692-7503
NJ Lebanon, F.F. Sylvester Assocs. 201-735-2488
NY Coram, F.F. Sylvester Assocs. 516-473-2018
NC Raleigh, MacKay Smith Assocs. 919-847-2277
PA Newtown Sq., Hagy Assocs. 215-459-0504
UT Salt Lake City, Elctrn. Comp. Sls.

LSI LOGIC CORP., 1551 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-433-8000, TELEX: 172153; *Dist. Mgr.:* John Mucciaro

LTI, INC., 363 St. Paul Blvd., Carol Stream, IL 60188, Tel: 708-668-8886, FAX: 708-668-9480; Empl.: 60; *Sls. Mgr.:* Mike Khetarpal

LTX CORPORATION, LTX Pk. @ University Ave., Westwood, MA 02090, Tel: 617-461-1000, TELEX: 4430108, FAX: 617-326-5895; Empl.: 1,500; *Sls. Mgr.:* Roger Blethen, Sr. V.P. Sls.

LUCAS DEECO CORP., 31047 Genstar Road, Hayward, CA 94544-7831, Tel: 415-471-4700, FAX: 415-489-3500; *Sls. Mgr.:* Bill Lepior, Natl; *Dist. Mgr.:* Brian Frey, Intl.

LUCAS DURALITH CORPORATION, 525 Orange St., Millville, NJ 08332, Tel: 609-825-6900, TWX: 609-825-6345 -; Empl.: 375; *Sls. Mgr.:* Leroy Nopper, V.P. Sls.; *Dist. Mgr.:* Nick Tonkery, Sls. Mgr. ..... **B•1822**

Local Sales Offices & Reps
CA Anaheim, Lucas Duralith-Western Div. 714-776-6700
NH Milford, Lucas Duralith-AKT Div. 603-672-0470
NJ Millville, Lucas Duralith-Eastern Div. .. 609-825-6900

LUCAS EPSCO, INC., 99 South St., Hopkinton, MA 01748-2204, Tel: 508-435-2400, TELEX: 95-1110, FAX: 508-435-2022; FSC No.: 15894; Empl.: 240; *Sls. Mgr.:* John M. Shalhoub

Local Sales Offices & Reps

IA	Cedar Rapids, Midwest Tech. Sls., Inc.	319-365-4011
KS	Lenexa, Midwest Tech. Sls., Inc.	913-888-5100
MO	St. Charles, Midwest Tech. Sls., Inc.	314-441-1012
NY	Huntington, CDB Entprs. Inc.	516-692-5200
NY	Syracuse, I. A. Holtze	315-479-6641
OH	Dayton, R. A. Ehlert Assocs., Inc.	513-253-9197
TX	Dallas, Kruvand Assoc., Inc.	214-437-3355

LUCAS LEDEX INC., P.O. Box 427, 801 Scholz Dr., Vandalia, OH 45377-0427, Tel: 513-898-3621, TELEX: 6874241/6874243, FAX: 513-898-8624; FSC No.: 81840; Empl.: 450; *Sls. Mgr.:* T. C. Ristoff **B•1629-1631, 1731, 1915**

Local Sales Offices & Reps

AL	Huntsville, DHR Mktg., Inc.	205-722-0440
AZ	Scottsdale, Arcom Sls., Inc.	602-947-5745
CA	San Diego, Interstate Mktg. Assocs.	619-693-3220
CA	Saratoga, Testco, Inc.	408-253-1900
CA	Woodland Hills, Interstate Mktg. Assocs.	818-883-7606
CO	Englewood, Integrated Motion Sys.	303-792-5516
CT	Bloomfield, SIR-Assocs.	203-243-9343
FL	Deerfield, Techn. Mktg. Assocs.	305-427-1090
FL	Largo, Techn. Mktg. Assocs.	813-531-4405
FL	Orlando, Techn. Mktg. Assocs.	407-857-3760
GA	Duluth, DHR Mktg., Inc.	404-564-0529
IL	Elk Grove VL, Control Sls., Inc.	312-595-2110
KS	Leawood, Thunderbird Tech. Sls. & Svcs.	913-642-7220
KS	Wichita, Thunderbird Tech. Sls. & Svcs.	316-636-5777
MA	Westford, SIR Assocs.	508-692-2500
MI	Royal Oak, Hilltronics, Inc.	313-435-0920
MN	Minneapolis, Josco/Melius, Inc.	612-861-3343
MO	Maryland Heights, Thunderbird Tech. Sls. & Svcs.	314-298-8940
NY	Clark Mills, KLM-Garner Co.	315-853-6126
NY	Oceanside, Bittan Assocs., Inc.	516-678-6222
NY	Pittsford, KLM-Garner Co.	716-381-8350
NC	Raleigh, DHR Mktg., Inc.	919-829-1970
PA	King of Prussia, Freedman-Malta Assocs.	215-337-9211
SC	Greenville, DHR Mktg., Inc.	803-235-3594
TN	Nashville, DHR Mktg., Inc.	615-331-2745
TX	Austin, ION Assocs., Inc.	512-794-9007
TX	Grand Prairie, ION Assocs., Inc.	214-647-8225
TX	Houston, ION Assocs., Inc.	713-537-7717
WA	Bellevue, Testco, Inc.	206-454-7422
WA	Vancouver, Testco, Inc.	206-693-7262
WI	Brookfield, Control Sls., Inc.	414-797-9500

LUCAS SCHAEVITZ, 7905 N. Route 130, Pennsauken, NJ 08110-1489, Tel: 609-662-8000, TWX: 710-892-0714; FSC No.: 93190; Empl.: 201; *Sls. Mgr.:* Mike Finnerty

LUCAS WEINSCHEL, P.O. Box 6001, Gaithersburg, MD 20884-6001, Tel: 301-948-3434, TELEX: 440702, FAX: 301-948-3625; FSC No.: 93459; *Sls. Mgr.:* Curtis W. Crews

LUCAS WESTERN INC., Electro Systems Division, 610 Neptune Ave., Brea, CA 92621, Tel: 714-671-4500, TWX: 910-240-3603, FAX: 714-671-4503; Empl.: 175; *Sls. Mgr.:* Jerry Neumayer

LUCAS ZETA, INC., Lucas Aerospace, Inc., 2811 Orchard Parkway, San Jose, CA 95134, Tel: 408-434-3600, FAX: 408-433-0205; FSC No.: 31260; Empl.: 280; *Sls. Mgr.:* Richard Wood

LUFF RESEARCH, 22 N. Tyson Ave., Floral Park, NY 11001, Tel: 516-358-2880, FAX: 516-358-2757; Empl.: 5; *Sls. Mgr.:* R. Scheer

LUFT INSTRUMENTS, INC., Hillside Rd., P.O. Box 214, Lincoln, MA 01773, Tel: 617-259-9215, FAX: 617-259-9215; Empl.: 12

LUMEX OPTO/COMPONENTS, INC., 292 E. Hellen Rd., Palatine, IL 60067-6955, Tel: 708-359-2790, FAX: 708-359-8904; Empl.: 125; *Sls. Mgr.:* Hank Zabanski; *Dist. Mgr.:* Tanya Bons

LUMITRON, PO Box 267, Summit, NJ 07902-0267, Tel: 201-273-8998, FAX: 201-273-0853; FSC No.: 51702; Empl.: 20; *Sls. Mgr.:* Gil Chassie

LUNAIRE ENVIRONMENTAL, INC., Lunaire Limited, 4 Quality St., Williamsport, PA 17701, Tel: 717-326-1770, FAX: 717-326-7304; Empl.: 130; *Sls. Mgr.:* Stu Lunick

LUNDAHL INSTRUMENTS, INC., Ezra C. Lundahl Inc., 429 South Main, Logan, UT 84321, Tel: 801-753-7300, FAX: 801-753-7490; Empl.: 17; *Sls. Mgr.:* Val Potter

LUTRON ELECTRONICS CO., 205 Suter Rd., Coopersburg, PA 18036, Tel: 215-282-3800, TELEX: 847475, TWX: 510-651-3755; Empl.: 378; *Sls. Mgr.:* John McKiernan; *Dist. Mgr.:* Robert Van Horne

LUTZE, INC., 38 Fairfield Place, West Caldwell, NJ 07006, Tel: 201-227-2371, 800-447-2371, FAX: 201-227-2954; Empl.: 6

LUXO LAMP CORP., P.O. Box 951, Port Chester, NY 10573, Tel: 914-937-4433, FAX: 914-937-7016; Empl.: 150; *Sls. Mgr.:* Robert H. Newton

LXD

FAX: 216-786-8711

LXD, INC., 7650 First Place, Cleveland, OH 44146, Tel: 216-786-8700, TELEX: 98-5442 LXD BCWD; FSC No.: 66706; Empl.: 100; *Sls. Mgr.:* Patrick Bowen; *Dist. Mgr.:* Patrick Bowen **B•1097-1099**

Local Sales Offices & Reps

AL	Madison, DTM Inc.	205-837-5062
CA	Redwood City, James S. Heaton Co.	415-367-9000
CO	Littleton, MRC	303-794-4684
IL	Northbrook, Howard Benjamin Assoc.	708-272-2900
CT	Seymore, Sturdy Corp.	203-888-1480
ID	Boise, N.R. Schultz Co.	208-377-8686
IN	Fort Wayne, RL Bontempo Assoc.	219-478-1057
IN	Indianapolis, R. L. Bontempo Assocs.	317-293-8312
KS	Prairie Village, C. Logsdon & Assocs.	913-381-3833
MA	Wellesley Hills, Sturdy Corp.	617-235-2330
MN	Minneapolis, George Russell & Assocs.	612-854-1166
MO	St. Louis, C. Logsdon & Assocs.	314-849-5125
NH	Derry, Sturdy Corp.	603-434-8440
NJ	Haddonfield, Sunday O'Brien	609-429-4013
NJ	Westwood, Jarms Elctrns.	201-666-9390
NC	Raleigh, Eastern Elctrns.	919-876-7591
OH	Cleveland, Electronics Mktg. Corp.	216-442-3441
OH	Columbus, Electronics Mktg. Corp.	614-299-4161
OR	Beaverton, N.R. Schultz Co.	503-643-1644
TX	Austin, THT Sls.	512-835-2796
TX	Dallas, THT Sls.	214-783-1501
WA	Bellevue, N.R. Schultz Co.	206-764-1890
Can	Concord, Ont., ITT Multicomponents	416-736-1144

LYDALL INC., MANNING DIV., P.O. Box 328, Troy, NY 12181, Tel: 518-273-6320, FAX: 518-273-6361; Empl.: 185; *Sls. Mgr.:* Ray Dugan

LYNN ELECTRONICS, 915 Pennsylvania Blvd., Feasterville, PA 19047, Tel: 215-677-6700, 800-523-6075, TWX: 510-667-1988, FAX: 215-364-2944; FSC No.: 19151; Empl.: 125; *Sls. Mgr.:* H. T. Colas

LYNTRONICS, INC., 569 Acorn St., Unit 5, Deer Park, NY 11729, Tel: 516-243-6397, FAX: 516-243-0232; FSC No.: OBSY 9; Empl.: 12; *Sls. Mgr.:* Gary L. Miller **D•1467**

LYN-TRON, INC., 3150 Damon Way, Burbank, CA 91505, Tel: 213-849-6211, 800-423-2734, FAX: 818-840-9581; FSC No.: 05791; Empl.: 85; *Sls. Mgr.:* Kory L. Wardle; *Dist. Mgr.:* Kory L. Wardle

LYON METAL PRODUCTS, INC., Box 671, Aurora, IL 60507, Tel: 708-892-8941, FAX: 1-800-367-6681; Empl.: 600; *Sls. Mgr.:* J. L. Wiebusch

LYTRON INCORPORATED, Dragon Court, Woburn, MA 01801, Tel: 617-933-7300, TELEX: 951-934, FAX: 617-935-4529; Empl.: 75; *Sls. Mgr.:* Edwin Carell

LZRelectronics,inc.

FAX: 301-670-0436

LZR ELECTRONICS, INC., 8051 Cessna Ave., Gaithersburg, MD 20879, Tel: 301-921-4600; Empl.: 35; *Sls. Mgr.:* John Andreoli; *Dist. Mgr.:* Greg Mozingo **B•1823; C•1446-1462, 1766-1769; D•1042-1043, 1878-1889**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe	602-264-7971
CA	Los Alamitos, Power Specialists	213-594-9418
CA	San Jose, Bytec Sls.	408-435-8004
CA	Simi Valley, Power Specialists	805-581-4785
CO	Arvada, Mountain High Mktg.	303-422-2573
CT	Guilford, Data Mark, Inc.	203-453-0575
FL	Melbourne, Jim Kennedy Assocs.	407-676-6875
AL	Huntsville, Dean Assocs., Inc.	205-534-2255
MD	Lutherville, DGR	301-583-1360
MA	Norwood, JMG, Inc.	617-762-5333
NJ	Clifton, ROI Sls.	201-340-1515
NM	Albuquerque, Nelco Electronix	505-293-1399
NY	Victor, Net Sls.(Upper NY)	716-924-1844
OH	Troy, S-Tek	408-435-8004
OH	Mason, S-TEK	513-339-5233
PA	West Chester, TCA Assocs.	215-692-6853
MN	Richfield, Clap Rep Co.	612-861-2191
NJ	Totowa, R.O.I. Sls.	201-812-9606
WA	Lynnwood, Blair Hirsch Co.	206-774-8151
WI	Genoa City, Vine Sales, Inc.	414-279-3871
Can	Scarborough, Cantronics Ltd.	416-297-8668

MABUCHI MOTOR AMERICA CORP., 475 Park Ave. South, New York, NY 10016, Tel: 212-686-3622, TELEX: 23-4374, TWX: MABU, FAX: 212-532-4263; Empl.: 10,000 **B•1293**

PANAFAX: 212-532-4263

Local Sales Offices & Reps

MI	Detroit, Mabuchi Motor America Corp.	313-370-9090

MACCOR, INC., 2805 W. 40th Street, Tulsa, OK 74107, Tel: 918-446-1874, FAX: 918-445-1496; FSC No.: 6625; *Sls. Mgr.:* Andrew D. MacKay

MACHINE COMPONENTS CORP., 70 Newtown Rd., Plainview, NY 11803, Tel: 516-694-7222, FAX: 516-694-7252; FSC No.: 15531; Empl.: 46; *Sls. Mgr.:* D. L. Dubov

MACOM, INC., 43 Second Ave., Bldg. 8, Burlington, MA 01803, Tel: 617-272-3000, TELEX: 94-9464, TWX: 710-332-6789

M/A-COM CONTROL COMPONENTS DIV., M/A-COM, 21 Continental Blvd., Merrimack, NH 03054-4343, Tel: 603-424-4111, TWX: 710-336-0674, ESYLNK: 62038279, FAX: 603-424-6580; FSC No.: 16179; Empl.: 750

M/A-COM GOVERNMENT PRODUCTS, INC., 10713 Gilroy Rd., Hunt Valley, MD 21030, Tel: 301-771-0077, FAX: 301-771-6025; FSC No.: 29644; *Sls. Mgr.:* Frederick D. Reynolds

M/A-COM LASER DIODE, INC., See Laser Diode, Inc., Div. of Morgan Crucible

M/A COM LTD., Humphrey Rd., Dunstable, Bedfordshire, England LU5 4SX, England, Tel: 44(582)471200, TELEX: 82295; Empl.: 500; *Sls. Mgr.:* D. McGuinness

M/A-COM OMNI SPECTRA, INC., 140 Fourth Avenue, Waltham, MA 02254-9101, Tel: 617-890-4750, FAX: 617-890-2381; FSC No.: 26805; Empl.: 750

M/A-COM PHI, INC., M/A COM, Inc., 1742 Crenshaw Blvd., Torrance, CA 90501, Tel: 213-320-6160, TWX: 910-349-6651, FAX: 213-618-9191; FSC No.: 50998; Empl.: 260; *Sls. Mgr.:* Charlie Hancock

MACROAMP INC., P.O. Box 1512, Ukiah, CA 95482, Tel: 707-462-2222, FAX: 707-462-4103; Empl.: 25

MACRODYNE INC., 4 Chelsea Pl., Box 376, Clifton Pk., NY 12065, Tel: 518-383-3800, FAX: 518-383-0049; Empl.: 16; *Sls. Mgr.:* Clifford J. Jurus

MACROLINK, 1500 N. Kellogg Drive, Anaheim, CA 92807, Tel: 714-777-8800, FAX: 714-777-8807; Empl.: 40; *Sls. Mgr.:* Bill Goodale

MACROMATIC DIVISION, Milwaukee Elctrns. Corp., 7817 W. Clinton Ave., Milwaukee, WI 53223, Tel: 414-358-4000, FAX: 414-358-4001; FSC No.: 98664; Empl.: 100-150; *Sls. Mgr.:* James Scholler

MACRONETICS, See Veeco Instrs. Inc.

MAG-CON, 1626 Terrace Dr., St. Paul, MN 55113, Tel: 612-633-8820, FAX: 612-633-1851; Empl.: 40; *Sls. Mgr.:* Gene Litzau

MAG DEV INC., 17 Downing Three, Pittsfield, MA 01201, Tel: 413-442-6368, FAX: 413-443-9107; Empl.: 10

MAG-HEAD ENGINEERING CO., 686-Mendelssohn Ave., Minneapolis, MN 55427, Tel: 612-545-1321, FAX: 612-545-0335; FSC No.: (Cage) 0DU70; Empl.: 30; *Sls. Mgr.:* Anthony T. Price

MAGNA-POWER ELECTRONICS, INC., 135 Route 10, Whippany, NJ 07981, Tel: 201-428-1197, TELEX: 201-428-2853; FSC No.: 7V550; Empl.: 10 ..... **D•1891**

MAGNATROL VALVE CORP., 67 Fifth Ave., Hawthorne, NJ 07507, Tel: 201-427-4341, FAX: 201-427-7611; *Sls. Mgr.:* R. Kretschmer

MAGNECOMP

FAX: 803-878-0507

MAGNECOMP, INC., P.O. Box 625, Gravley Rd., Pickens, SC 29671, Tel: 803-878-4700; Empl.: 10; *Sls. Mgr.:* T. Sullivan ..... **A•2252**

MAGNECRAFT ELECTRIC CO., 1910 Techny Road, Northbrook, IL 60062-5376, Tel: 708-564-8800, TWX: 910-221-0122, FAX: 312-564-3027; FSC No.: 94696; Empl.: 700; *Sls. Mgr.:* Wiley Greenwood; *Dist. Mgr.:* Wiley Greenwood

MAGNELAB CORPORATION

FAX: 303-447-1588

MAGNELAB, 7315 Red Deer Dr., Boulder, CO 80301-4696, Tel: 303-442-6700; FSC No.: 58439; Empl.: 25; *Sls. Mgr.:* Carl A. Forsberg ..... **A•1209, 2253-2257**

Local Sales Offices & Reps

CA	San Diego, Mesa Sls. & Engrg.	619-278-8021

MAGNETEK, Transducer Products, 650 Easy St., Simi Valley, CA 93065, Tel: 805-581-3985, FAX: 805-583-1526; FSC No.: 65998; Empl.: 37; *Sls. Mgr.:* Dave Snyder

MAGNETEK DEFENSE SYSTEMS, MagneTek, Inc., 901 E. Ball Road, Anaheim, CA 92805, Tel: 714-956-9200, FAX: 714-956-5397; Empl.: 450; *Sls. Mgr.:* Ty Fredericksen

MAGNETEK TRIAD, 1124 E. Franklin St., Huntington, IN 46750, Tel: 219-356-7100, FAX: 219-356-3148; Empl.: 963; *Sls. Mgr.:* Mark Decker ..... **A•2259-2263**

MAGNETIC CIRCUIT ELEMENTS, 1540 Moffett St., Salinas, CA 93905, Tel: 408-757-8752, FAX: 408-757-5478; FSC No.: 09349; Empl.: 30; *Sls. Mgr.:* Lisa Battaglia

Local Sales Offices & Reps

CA	Fremont, R-C Elctrns.	415-656-8490
WA	Bellevue, Advanced Power Comps. ...	206-747-9127
WA	Seattle, Advanced Power Comps.	206-527-7945

MAGNETIC COILS, INC., See MCI Transformer Corporation

MAGNETIC COMPONENT ENGINEERING CO., 11379 Playa Street, Culver City, CA 90230, Tel: 213-398-4761, FAX: 213-572-1691; FSC No.: 52634; Empl.: 12; *Sls. Mgr.:* L.D. Montgomerie

Local Sales Offices & Reps

AZ	Phoenix, C.T. Carlberg Assocs.	602-468-0750
CA	Culver City, Magnetic Comp. Engrg. ...	213-398-4761
CA	San Jose, Silicon Valley Sls.	408-432-1967
MN	Minneapolis, A. J. Warner Co., Inc.	612-823-8272
NJ	Englewood, Cooper Assocs.	201-871-4985
NY	Rochester, Irondequoit Inds.	716-544-6257
NM	Albuquerque, C.T. Carlberg Assocs. ...	505-836-1448

mi

FAX: 317-549-0502

MAGNETIC INSTRUMENTATION, 8350 E. 48TH ST., Indianapolis, IN 46226, Tel: 317-545-2102, TELEX: 27-2111; Empl.: 35; *Sls. Mgr.:* Peter Stolpe ..... **D•1290**

MAGNETICO INC.

FAX: 516-758-7408

MAGNETICO INC., 182 Morris Ave., Holtsville, NY 11742, Tel: 516-654-1166; FSC No.: 10581; Empl.: 65 ..... **A•2264-2265**

MAGNETIC RADIATION LABS, 690 Hilltop Drive, Itasca, IL 60143, Tel: 708-285-0800, FAX: 708-285-0807; Empl.: 43; *Sls. Mgr.:* Ken Phillips

MAGNETICS, Spang & Co., Box 391, Butler, PA 16003-0391, Tel: 412-282-8282, TWX: 710-373-3821, FAX: 412-282-6955; Empl.: 750; *Sls. Mgr.:* J. F. Huth

MAGNETIC SHIELD CORPORATION, Perfection Mica Co., 750 North Thomas Dr., Bensenville, IL 60106, Tel: 708-766-7800, TWX: 910-256-4815, FAX: 708-766-2813; FSC No.: 06682; Empl.: 43 ..... **C•1698-1699**

Local Sales Offices & Reps

CA	Foster City, Polach & Bensinger Inc. ..	415-578-8200
CA	Woodland Hills, Cal-Ward Sls. Co.	213-883-2202
FL	Orlando, Ludlum Assoc. Co.	305-894-7761
MD	Baltimore, Bernard White & Co.	301-484-5400
MA	Framingham, Harvard Technlg.	617-899-4568
MI	Livonia, Amtech Reps.	313-474-8300
MN	Minneapolis, Josco-Meluis & Assocs.	612-861-3343
NM	Albuquerque, IMEC	505-883-9010
NJ	Morristown, Kenneth L. Love Assocs.	201-540-0204
NY	Plainview, Robert Smith Assoc.	516-932-3975
OR	Hillsboro, Temco Northwest	503-648-8171
PA	Newton Square, W. Reeves Assocs. ..	215-356-7500
PA	Sewickley, Teplitz-Byrne Assoc.	412-741-3268
SC	Walhalla, Overton Assoc.	803-638-7101
TX	Dallas, Allied Components,Inc.	214-238-0408
WA	Bothell, Temco Northwest	206-821-5434

MAGNETIC TECHNOLOGIES CORP., 770 Linden Avenue, Rochester, NY 14625, Tel: 716-385-9010, FAX: 716-385-5625; Empl.: 65; *Sls. Mgr.:* Gordon H. McNeil

MAGNETOELASTIC DEVICES, Box 625, Pittsfield, MA 01202, Tel: 413-445-5608, FAX: 413-442-3750

MAGNETROL INTERNATIONAL, 5300 Belmont Rd., Downers Grove, IL 60515-4499, Tel: 708-969-4000, FAX: 708-969-9489; *Sls. Mgr.:* Roger T. Piegza, Natl. Sls. Mgr.

MAGNET SALES & MFG. CO. INC., 11248 Playa Court, Culver City, CA 90230-6127, Tel: 213-391-7213, 800-421-6692, FAX: 213-390-4357; FSC No.: 17853; Empl.: 55; *Sls. Mgr.:* Chris Nanji; *Dist. Mgr.:* Chris Nanji

MAGNOS, 9 Bonazzoli Ave., Unit 17, Hudson, MA 01749, Tel: 508-562-1173, TELEX: 951417MAGN, FAX: 508-562-1175; Empl.: 5 ..... **D•1291**

MAGNUM MICROWAVE CORP., 4575 Cushing Pkwy., Fremont, CA 94538, Tel: 415-657-9898, FAX: 415-490-3351; FSC No.: 59277; Empl.: 105; *Sls. Mgr.:* Harry L. Fowler

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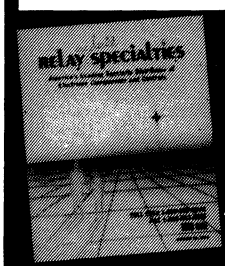

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MAGTECH CONTROLS, Vernitron Corporation, 1601 Precision Park La., San Diego, CA 92073, Tel: 619-428-5581, FAX: 619-428-5090; FSC No.: 10112; Empl.: 200; *Sls. Mgr.:* R. Campbell ..... **B•1294**

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	818-246-8263
CO	Wheat Ridge, Waugaman Assocs.	303-423-1020
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Largo, Labrant	813-536-8480
GA	Dunwood, Hugh Assoc.	404-396-5848
IL	Northbrook, Howard Benjamin	708-272-2900
MA	Burlington, Kitchen & Kutchin	617-229-2660
MO	St. Louis, Rush & West	314-965-3332
NJ	Cherry Hill, Lanson Assocs.	609-424-4670
NY	Jericho, Metro Tech. Sls.	516-935-3330
NY	Syracuse, T-Squared Elctrns., Inc.	315-463-8592
NY	Victor, T-Squared Elctrns., Inc.	716-924-9101
OH	Dayton, Rixan Assocs.	513-222-0011
TX	Dallas, CMR	817-379-6540
UT	Salt Lake City, Waugaman Assocs. ...	801-261-0802
VA	Fredericksburg, Vernitron	703-752-4499

MAG-TEK, 20725 S. Annalee Ave., Carson, CA 90746, Tel: 213-631-8602, TWX: 510-600-0621 MAG TEK CRSN, FAX: 213-631-3956; *Dist. Mgr.:* Shelley Schira

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FAX: 804-722-1194

MAIDA DEVELOPMENT CO., 20 Libby St., Hampton, VA 23663, Tel: 804-723-0785; Empl.: 299; *Sls. Mgr.:* Edward T. Maida, Frank Thompson ..... **A•1086-1089, 1942-1944**

Local Sales Offices & Reps

CA	La Habra, Cygnus Sls. Engrg. Corp. ...	213-691-2993
CA	Redwood City, Hickey Inds. Sls. Corp.	415-594-9978

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IL	Schaumburg, Seas (Silvers Elctrns.) ..	708-893-7999
MI	Southfield, M. Gottlieb Assocs.	313-358-4151
MN	St. Paul, Johnson Co.	612-641-1878
NH	Amherst, D.A. Crowley & Assocs.	603-673-7050
NY	Rockville Centre, S-I Assocs., Inc.	516-536-4242
NY	Upstate, Inactive Comp. Sls.	315-445-9600
NC	Raleigh, F.B.D. Sls. Corp.	919-832-0202
OH	Cleveland, RK Comps.	216-642-9312
OR	Beaverton, UniComp, Inc.	503-643-1645
SC	Mauldin, Carl Hart	803-288-2323
TX	Plano, Mega Tech Mktg., Inc.	214-423-6342
VA	Danville, F.B.D. Sls.	804-836-1499
VA	Hampton, Maida Dev. Co.	804-723-0785
VA	Manassas(Northern), F.B.D. Sls. Corp.	703-369-7212
WA	Snohomish, UniComp, Inc.	206-568-0511
Can	Dundas, D. J. Hyslop & Co.	416-628-0266

MAINE POLY, INC., P.O. Box 8 Rte. 202, Greene, ME 04236, Tel: 207-946-7440, FAX: 207-946-5492; FSC No.: 46280; Empl.: 130; *Sls. Mgr.:* Jon Chase

MAIN PROTOTYPES LTD., Moldmakers/Injectors, 15 Raglin Pl, Cambridge, Ont., CAN N1R7J2, Tel: 519-622-2291, FAX: 519-622-3208; Empl.: 10; *Sls. Mgr.:* David Main

MAKK-O INDUSTRIES, 761 Nepperhan Ave., Yonkers, NY 10703, Tel: 914-376-0160, 914-376-0161, FAX: 914-376-0162; Empl.: 18; *Sls. Mgr.:* Vincent Passalacqua; *Dist. Mgr.:* Debbie Carroll ..... **C•1596**

Local Sales Offices & Reps

AZ	Prescott, IMEC	602-445-8727
MA	Lee, Francis Biasin	413-243-0970
NJ	Upper Montclair, McCarron Entprs.	201-783-3112
NM	Albuquerque, IMEC	505-294-1124
TX	Dallas, S & B Sls.	214-369-5936

MALCO, DIV. OF MICRODOT, INC., See Microdot, Interconnect Sys. Div.

MALLORY BATTERY, See Duracell Intl.

MALLORY CONTROLS, Emerson Electric Canada, P.O. Box 210, 1079 Parkinson Rd., Woodstock, Ont., Canada N4S 7W8, Tel: 519-539-4891, TELEX: 23 MOY 001, FAX: 519-539-6684; FSC No.: 37942;76055; *Sls. Mgr.:* Joe Labonte; *Dist. Mgr.:* Joe Labonte ..... **A•1091, 2064-2065**

Local Sales Offices & Reps

IL	Chicago, M & S Sls.	708-934-1200, FAX:708-934-9169
MN	St. Paul, Johnson Co.	612-641-1878, FAX:612-641-0146
NY	New York, Hebert Rude Assoc., Inc.	212-721-1001, FAX:212-721-1004
OH	Cleveland, ESI	216-831-9555,FAX:216-831-8647
TX	Dallas, Eltec Sls. ...	817-268-2896,FAX:817-282-3010

MALLORY CONTROLS, Emerson Electric, 2831 Waterfront Pkwy-E. Drive, Indianapolis, IN 46214, Tel: 317-328-4010, FAX: 317-328-4244; Empl.: 2,000; *Sls. Mgr.:* Lewis Jones

MALLORY/NORTH AMERICAN CAPACITOR CO., 4760 Kentucky Ave., Indianapolis, IN 46241, Tel: 317-856-3731, TELEX: 317-687-6090, FAX: 317-856-2500; Empl.: 450; *Dist. Mgr.:* Tom Green, V.P. Sls. & Mktg.

MANAGE, INC., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014, Tel: 413-592-9123, FAX: 413-594-4891; Empl.: 33; *Sls. Mgr.:* David Menard

MANGER ELECTRIC COMPANY, INC., W. Henry St., Stamford, CT 06902, Tel: 203-348-7761, FAX: 203-324-5447; FSC No.: 20262; Empl.: 100; *Sls. Mgr.:* Peter J. Romaniello

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MANHATTAN ELECTRIC CABLE CORPORATION, Station Plaza, Rye, NY 10580, Tel: 914-967-8000, TELEX: 137-387; Empl.: 150; *Sls. Mgr.:* Allan P. Marconi, V.P. Sls. & Mktg. ..... **C•1771**

Local Sales Offices & Reps

CA	Hayward, Manhattan Elec. Cable Corp.	800-423-4040
CA	Los Angeles, Manhattan Elec. Cable Corp.	800-423-4040
CA	San Francisco, Manhattan Elec. Cable Corp.	800-423-4040
GA	Atlanta, Manhattan Elec. Cable Corp.	800-356-4796
IL	Niles, Bensdorf & Johnson	708-647-8512
IN	Indianapolis, Wiltrout Sls., Inc.	317-577-7500
MA	Holliston, Manhattan Elec. Cable Corp.	800-255-1429
MN	Maple Grove, North Central Sls.	800-829-2885
NJ	Bridgeton, Manhattan Elec. Cable Corp.	800-225-2293
NJ	Fairfield, Manhattan Elec. Cable Corp.	800-888-0146
OH	Cleveland, Manhattan Elec. Cable Corp.	800-966-9473
TX	Houston, Manhattan Elec. Cable Corp.	800-392-4928
WA	Redmond, Elctrn. Mktg. Grp., Inc.	206-882-0962

Local Distributors

AL	Madison, Sea Wire & Cable	205-772-9616
CA	El Monte, Marshall Elctrns.	818-442-7204
CA	El Toro, Sourcery Wire & Cable	714-380-0466
CA	Long Beach, John B. Rudy Co.	213-636-6934
CA	Oakland, Brill Elctrns.	415-834-5888
CA	San Jose, Compass Comps.	408-432-7575
CA	Santa Clara, Trinity Elctrns.	408-980-9011
CO	Denver, CSID	303-292-9594
CT	Greenwich, Wise Comps.	203-531-4880
FL	Orlando, Hammond Elctrns.	407-849-6060
FL	Pensacola, Elctrn. Supp. Co.	904-432-6916
FL	Tamarac, Pacer Elctrns.	305-749-1910
FL	Tampa, Dow Elctrns.	813-626-5195
LA	Harahan, MG Elctrns.	504-733-0070
MD	Owings Mill, Cameo Elctrns.	800-227-7077
MA	Burlington, QPL	617-229-2424
MA	Hudson, Metro Wire & Cable	508-562-6288
MA	Woburn, Pacer	617-935-8330
MI	Madison Heights, Quad Elctrns.	800-969-9220
NY	Johnson City, Help Elctrns.	607-729-3528
NY	Long Island City, H. L. Dalis	718-361-1100
NY	Mt. Vernon, QAR/All American	914-699-2224
NY	Rochester, Simcona Elctrns.	800-274-6266
NY	Syracuse, Newark Elctrns.	315-437-6611
OH	Cincinnati, Hughes Peters	800-543-4483
OH	Columbus, Hughes Peters	800-282-1262
OH	Strongsville, Calvert Wire & Cable	800-321-1203
OH	Yellow Springs, Electroshield	800-662-1054
PA	Allentown, P. A. Peters	800-322-9583
PA	Harrisburg, Cumberland Elctrns.	800-692-7425
PA	Montgomeryville, Pytronic Inds.	800-562-5780
TN	Memphis, Bluff City Elctrns.	901-345-9500
TX	Austin, Wholesale Elctrn. Supp.	512-478-9568
TX	Houston, Houston Wholesale Elctrns.	713-644-8320
TX	Houston, Kent Elctrns.	713-780-7770
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
VT	Bethel, Clifford of Vermont	802-234-9921
WA	Seattle, Radar Elec. Co.	206-282-2511
WA	Woodinville, Northwest Wire & Cable	206-486-8342

MANN, HENRY, INC., 3983 Mann Road, Huntingdon Valley, PA 19006, Tel: 215-355-7200, TELEX: 6851160, FAX: 215-355-5134; Empl.: 52; *Dist. Mgr.:* Mickey Hoffer

MANTEX CORP., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48371, Tel: 313-628-8210, FAX: 313-628-1520; Empl.: 100; *Sls. Mgr.:* David Rice

MANUFACTURERS COMPONENTS, INC., 2260 W. 77 St., Hialeah, FL 33016, Tel: 305-556-4481, 800-367-0377, TELEX: 514181, FAX: 305-823-8934; Empl.: 5; *Sls. Mgr.:* Jackie Barker

MANU-TRONICS, INC., 8701-100th St, Lakeview Corporate Pk., Kenosha, WI 53142-9508, Tel: 414-947-7700 , 414-947-7302, FAX: 414-947-7729; Empl.: 300

MARATHON POWER TECHNOLOGIES, P.O. Box 8233, Waco, TX 76714-8233, Tel: 817-776-0650, TWX: 910-894-5203 MARATHON WAC

MARATHON SPECIAL PRODS., Marathon Electric, 13300 Van Camp Rd., Bowling Green, OH 43402, Tel: 419-352-8441, TWX: 810-499-2988, FAX: 419-352-0875; FSC No.: 26405; Empl.: 150; *Sls. Mgr.:* J. Campisi

MARCO MANUFACTURING CO., INC., 2021-43 So. 29th St., Philadelphia, PA 19145, Tel: 215-463-2332, FAX: 215-334-4990; Empl.: 35-40

MARCON AMERICA CORP., 998 Forest Edge Dr., Vernon Hills, IL 60061, Tel: 312-913-9980, FAX: 312-913-1150; Empl.: 14; *Sls. Mgr.:* Tony Olita; *Dist. Mgr.:* Helen A. Stubbs

MARCONI CIRCUIT TECHNOLOGY CORP., 160 Smith St., Farmingdale, NY 11735, Tel: 516-293-8636, FAX: 516-293-0061; Empl.: 500; *Sls. Mgr.:* Kurt Kuhl

MARCONI INSTRUMENTS, 3 Pearl Court, Allendale, NJ 07401, Tel: 201-934-9050, FAX: 201-934-9229; *Sls. Mgr.:* Carl Pepple, Gen. Mgr. ..... **D•1292**

Local Sales Offices & Reps

AZ	Tempe, Scientific Dvcs.West	602-730-9774
CA	Citrus Hights, Larry Allen d/b/a/ L.K. Allen	916-638-7655
CA	Santa Fe Springs, Wallace & Wallace	213-945-2908
CA	Shingle Springs, LK Allen Comms.	916-676-2533
CO	Broomfield, Scientific Dvcs. West	303-469-5145
CO	Littleton, K. C. Marketers, Inc.	303-972-8411
FL	Orlando, Panterra Sls., Inc.	407-855-6130
GA	Alpharetta, Panterra Sls.	404-772-9944
GA	Decatur, Panterra Sls., Inc.	404-325-0165
IL	Schaumburg, K.W. Meyers	708-882-4808
IN	Indianapolis, K. Meyers	317-573-0966
KY	Louisville, Webster Assocs., Inc.	502-937-8189
MD	Burtonsville, Elect. Mktg. Assocs.	301-792-9300
MD	Laurel, Elect. Mktg. Assocs.	301-953-7800
MA	Westford, ICS Assocs.	508-765-5131
MA	Westford, ICS Assocs.	508-692-3545
MI	Houghton Lake, W.E.Price & Co.	517-366-8702
MI	Rochester, Webster Assocs., Inc.	313-375-0420
MN	Minneapolis, K.W. Meyers	612-822-9253
MO	Maryland Hgts., Comms. Equip. Specialties	314-291-7841
NJ	Allendale, Allan Mowat	201-934-9050
NM	Albuquerque, Scientific Dvcs.	505-883-3668
NY	Rochester, TAE-REP	716-586-8710
NY	Whitney Point, Tae-Rep	607-692-3705
NC	Pineville, Communications Mktg. SE, Inc.	704-542-0374
OH	St. Mary's, Thomas Shelby Co.	419-394-3377
OR	Oregon City, Proctor Sls. & Mktg.	503-657-7583
TX	Austin, Eng. Equip. Sls.	512-467-9655
TX	Dallas, EES	214-644-8881
TX	Richardson, Engrg. Equip. Sls.	512-467-9655
VT	Graniteville, ICS Assocs.	802-476-4223
WI	Burtonsville, K.W. Meyers Co.	708-882-4808

MAREL INSTR. CO., 907 South East 13th Pl, Cape Coral, FL 33990, Tel: 813-574-8788; Empl.: 14; *Sls. Mgr.:* T. Swift

MARKAT DIV., Wild Oats Corp., 1432 Fox Hollow Way, N. Myrtle Bch., SC 29582, Tel: 803-249-5191, FAX: 803-249-5191; Empl.: 211; *Sls. Mgr.:* K. L. Campbell; *Dist. Mgr.:* W. B. Heather

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MARKEL CORP., P.O. Box 752, Norristown, PA 19404, Tel: 215-272-8960, TWX: 510-660-0929; FSC No.: 03890; Empl.: 228; *Sls. Mgr.:* Allan R. Soldwisch; *Dist. Mgr.:* L. J. Clemente ..... **C•1677**

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn	602-257-9015
AL	Montgomery, MYA, Inc.	205-284-1948
CA	LA., Natl. Wire & Cable	213-225-5611
CO	Evergreen, Mid/West Co.	303-374-4829
CT	Hamden, Datcom	203-288-7005
FL	Deerfield Bch., Jack Krutek & Assoc.	305-427-4202
IL	Schiller Pk., Wm. R. Bolles	312-678-7888
MD	Glen Burnie, F. Lott	301-744-4611
MA	Waltham, Datcom	617-891-4600
MI	Canton, L. George & Assoc.	313-454-0580
MN	Minneapolis, Technical Comps. Grp.	612-536-9512
MO	Florissant, Mid/West Co.	314-837-3361
NJ	Colonia, Heft & Ficarra	201-381-5193
NY	Lynbrook, Heft & Ficarra	516-599-3351
NY	Rochester, Apex	716-272-7040
OH	Chagrin Falls, Electrolock	216-543-6626
PA	Flourtown, CGM Inc.	215-233-0333
SC	Greenville, Electrolock Inc.	803-297-9830
TN	Murfreesboro, Alpha Mktg.	615-896-6102
TX	Richardson, C.J. Garvey	214-234-3371
WI	Mequon, Wm. R. Bolles	414-241-3320
EXP	Plymouth Meeting, Pa., Ballogh & Thrall	215-825-5710
Can	Rexdale,Ont, True North Technology	416-744-2233

Local Distributors

CA	Los Angeles, Natl. Wire & Cable	213-225-5611
CA	San Bernadino, Indl. Dielectrics West	714-381-4734
CO	Denver, Brownell Elctrns.	303-333-3541
NY	Endwell, Pryme-Line	607-748-5200
CT	Hartford, Wes-Garde	203-527-7705
FL	Davie, Arco Distrs.	305-473-2550
FL	Lakeland, Switch Controls	800-282-7619
GA	Atlanta, Accu-Tech Cable	404-455-6422
IL	Chicago, Fay Electric Wire	708-267-9222
IL	West Chicago, J.J. Glenn	708-293-7800
IN	Indianapolis, Marian Rubber	317-638-6525
KS	Wichita, Midwest Aircraft Supp.	316-267-3318
LA	New Orleans, Radio Parts	504-581-5959
MD	Rockville, Read Plastics	301-881-7900
MI	St. Clair Shores, Spemco	313-771-2700
MN	Bloomington, K.L. Tannenill	612-881-6700
MO	St. Louis, Midwest Switch	314-567-7164
NY	Rochester, Simcona Elctrns.	716-328-3230
OH	Chagrin Falls, Electrolock	216-543-6626
OR	Wilsonville, O.T.S. Wire	503-682-7050
SC	Greenville, Electrolock, Inc.	803-297-9830
AR	Little Rock, Hisco	501-568-3105
CT	Manchester, IMS Inc.	203-288-7005
VA	Roanoke, Control Distbn.	703-774-4586
Can	Mississauga, Ont., Marflex-Barrett Ltd.	416-828-0220

MARKEM CORP., 150 Congress St., Keene, NH 03431, Tel: 603-352-1130, TELEX: 710-366-1800, FAX: 603-357-5871; FSC No.: 38360; Empl.: 1400; *Sls. Mgr.:* Rich Howsen

MARKENRICH CORP., 1812 Flower Avenue, Duarte, CA 91010, Tel: 818-359-9190, TELEX: 298727, FAX: 818-359-5223; FSC No.: 63837; Empl.: 8

MARK EYELET INC., AMP, Inc., 63 Wakelee Rd., Wolcott, CT 06716, Tel: 203-756-8847, TELEX: 69-6191, FAX: 203-755-9410; Empl.: 90; *Dist. Mgr.:* Andrew Babiak

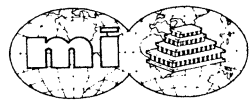
Local Distributors

CA	San Francisco, Marshall	408-942-4600
CA	SAn Jose, Compass Comps.	408-432-7575
CT	Wallingford, Cronin	203-265-3134
FL	Orlando, Hammond Elctrns., Inc.	407-841-1010
FL	Orlando, Marshall	407-767-8585
IL	Chicago, Newark	312-784-5100
MA	Needham, Cronin	617-449-5000
NY	Bohemia, Car-Lac Elctrns.	516-567-4200
NY	Rochester, Masline Elctrns.,Inc.	716-546-5373
PA	Philadelphia, Powell Elctrns.	215-365-1900
WI	Milwaukee, Marsh Elctrns.	414-475-6000

MARK POLARIZED CORP., 25 Davids Dr., Hauppauge, NY 11788, Tel: 516-273-1122, FAX: 516-436-7257; FSC No.: 5895; Empl.: 10; *Sls. Mgr.:* Ronald M. Miller

MARKTECH INTERNATIONAL CORP., 5 Hemlock St., Latham, NY 12110, Tel: 518-786-6591, FAX: 518-786-6599; Empl.: 42; *Sls. Mgr.:* Lou Verenini

MARLEE SWITCH CO., 933-D N. Central Ave., Upland, CA 91786, Tel: 714-982-8988, FAX: 714-982-8989; Empl.: 10; *Sls. Mgr.:* LeRoy Tichy



FAX: 214-341-5212

MARLOW INDUSTRIES, INC., 10451 Vista Park Rd., Dallas, TX 75238-1645, Tel: 214-340-4900, TWX: 910-860-5161; FSC No.: 55686; Empl.: 160; *Sls. Mgr.:* John Nelson; *Dist. Mgr.:* David Marlow ..... **C•1630-1631**

MARQUARDT SWITCHES INC., 2711 Rte. 20 East, Cazenovia, NY 13035, Tel: 315-655-8050, TELEX: 703-287-UD, FAX: 315-655-8042; *Sls. Mgr.:* R. A. Philipchik, V.P. Mktg.; *Dist. Mgr.:* P. D'Addario

MARSH-MCBIRNEY, INC., 4539 Metropolitan Court, Frederick, MD 21701, Tel: 800-368-2723, 301-874-5599, TWX: 710-828-0083, FAX: 301-874-2172; Empl.: 90; *Sls. Mgr.:* K. Steiding

MARSH PRODUCTS, INC., Spectrum Companies, Intl., 336 McKee St., Batavia, IL 60510, Tel: 708-879-8008, FAX: 708-879-8072

MARTEL ELECTRONICS, 8a Industrial Way P.O. Box 897, Salem, NH 03079, Tel: 603-893-0886, FAX: 603-898-6820; *Sls. Mgr.:* David DeVries

MARTIN SOUND PRODS. INC., 28 Alpha Park, Cleveland, OH 44143-2297, Tel: 216-442-2286, FAX: 216-442-7713; Empl.: 4; *Sls. Mgr.:* Christopher Martin; *Dist. Mgr.:* Christopher Martin

MARWAY
PRODUCTS INC.

FAX: 714-973-2931

MARWAY PRODS. INC., 311 N. Clara St., Santa Ana, CA 92703, Tel: 714-973-1800; FSC No.: 60955; Empl.: 23; *Sls. Mgr.:* Tom Goreth ..... **D•2212-2213**

Local Sales Offices & Reps

AZ	Glendale, Sunbird Inds, Inc.	602-439-0134
CA	Milpitas, Ward Elctrn. Packaging Sls.	408-945-0420
CA	Santa Ana, Marway Prods., Inc.	714-973-1800
CO	Monument, Sunbird Inds., Inc.	719-481-2900
CT	Meriden, PCS-Power Conversion Sys.	203-235-4886
FL	Land O' Lakes, AJ's Power Source, Inc.	813-996-2583
MD	Landover, Sel-Tronics, Inc.	301-341-2700
MA	Hopkinton, Eastern Sys. Inc.	508-435-2151, 508-435-2517
NH	Londonderry, PCS- Power Conversion Sys.	603-434-2371
TX	Richardson, Interactive Comp. Sls.	214-669-2277
WA	Bellvue, Underwood Hanify	206-643-1793

MASTECH, INC., Lorlin Test Systems, Precision Rd., Danbury, CT 06810, Tel: 203-744-0096, TELEX: 7104565030; Empl.: 57; *Sls. Mgr.:* L. Sanders Corbit

MASTER APPLIANCE CORP., 2420 18th St., Box 68, Racine, WI 53403, Tel: 414-633-7791, TELEX: 269-505; FSC No.: 83284; Empl.: 54; *Sls. Mgr.:* Don Royer, Natl. Sls. Mgr.; *Dist. Mgr.:* F.W. Krescanko, Int'l. Sls. Mgr.

MASTER BOND, 154 Hobart St., Hackensack, NJ 07601, Tel: 201-343-8983, FAX: 201-343-2132; FSC No.: 59504; Empl.: 16; *Sls. Mgr.:* James Brenner

Distributor

MASTER DISTRIBUTORS, P.O. Box 25662, Los Angeles, CA 90025, Tel: 213-452-1229 ..... **A•1247, 1632, 1739, 1948, 2166, 2308, 2420; B•1152, 1210, 1313, 1350, 1384, 1390, 1466, 1506, 1526, 1557, 1577, 1632, 1730, 1770, 1792, 1852, 1890; C•1052, 1348, 1410, 1478, 1536, 1660, 1818** 608, 610, 611, 612, 618, 631, 632, 635, 641, 649, 651, 652, 661, 665, 667, 668, 669, 672, 689, 692, 695, 699, 700, 701, 710, 717, 720, 722, 723, 727, 731, 737, 738, 753, 755, 763, 772, 784, 789, 792, 803, 807, 808, 810, 812, 817

MEC

FAX: 213-399-8600

MASTER ELECTRONIC CONTROLS, P.O. Box 25905, Los Angeles, CA 90025, Tel: 213-452-1336, TELEX: 182041 MASTER SNM; Empl.: 74; *Sls. Mgr.:* Jamil Nizam; *Dist. Mgr.:* Belinda Valle ..... **B•1541-1544**

Local Sales Offices & Reps

CA	Los Angeles, Master Distrs.	213-829-4656
CA	Santa Monica, Master Distrs.	213-452-1229

Local Distributors

CA	Oakland, Brill Elctrns.	415-834-5888
CA	Santa Monica, Master Distrs.	213-452-1336

MATEC INSTRUMENTS, INC., 75 South St, Hopkinton, MA 01748, Tel: 508-435-9039, FAX: 508-435-5289; Empl.: 55; *Sls. Mgr.:* Harry Ives

MATERIALS RESEARCH CORPORATION, Route 303, Orangeburg, NY 10962, Tel: 914-359-4200, TELEX: 221862 MRC UR, FAX: 914-425-6075; Empl.: 780; *Sls. Mgr.:* Robert S.Kase

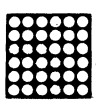
MATH ASSOCS., 2200 Shames Dr., Westbury, NY 11590, Tel: 516-334-6800, FAX: 516-334-6473

MATHEMATICAL SYSTEMS DESIGN, INC., 11835 W. Olympic Blvd., Suite 745, Los Angeles, CA 90064, Tel: 310-479-7180, FAX: 310-479-0942; *Sls. Mgr.:* Lorr Kramer

THE MATHWORKS, INC., 21 Eliot Street, So. Natick, MA 01760, Tel: 508-653-1415, TELEX: 910-240-5521, FAX: 508-653-2997

MATRIX CORP., 2260 Distributors Dr., Indianapolis, IN 46241, Tel: 317-248-2036, FAX: 317-248-8369; Empl.: 10 ..... **D•1185**

MATRIX CORP., 1203 New Hope Rd., Raleigh, NC 27610, Tel: 919-231-8000, FAX: 919-231-8001; Empl.: 65; *Sls. Mgr.:* Michael Bryant



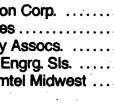
FAX: 818-222-2304

MATRIX SYSTEMS CORP., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, Tel: 818-222-2301; FSC No.: 33281; Empl.: 75; *Sls. Mgr.:* Randy Sue Rabideau ..... **B•1545**

Local Sales Offices & Reps

AL	Huntsville, Reynolds Assoc., Inc.	407-259-7000
AZ	Scottsdale, Faser Techn. Sls.	602-948-4404
CA	Huntington Beach, Scientific Devices-West	714-840-3501
CA	San Jose, Scientific Dvcs. West	408-554-0455
CO	Broomfield, Scientific Dvcs.	303-469-5145
CT	Meriden, Polytek Assocs.	203-634-4499
FL	Melbourne, Reynolds Assocs., Inc.	407-259-7000
FL	Newport Richey/Coral Springs, Reynolds Assocs.	407-259-7000
GA	Duluth, Reynolds Assoc., Inc.	407-259-7000
IL	Arlington Hgts., Comtel Midwest	708-392-4040
IN	Indianapolis, Comtel Midwest	317-253-1681
KS	Shawnee Mission, Comtel Midwest	913-268-0762
MA	Ashland, Polytek Assocs.	508-881-4741
MA	Falmouth Hgts., RJC Assocs.	508-540-8832
MI	Southfield, Comtel-Instr.	313-358-2505
MN	Wayzata, Comtel Midwest	612-476-1551
MO	Manchester, Comtel Midwest	314-227-7220
NY	Mamaroneck, Bassin Tech. Sls. Co.	914-698-9358
NC	Raleigh, Reynolds Assoc.	407-259-7000
OH	Cleveland, Comtel Instr.	216-442-8080
OH	Columbus, Comtel Instr.	614-876-8305
OH	Dayton, Comtel Instr.	513-426-5310
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Pittsburgh, Comtel Instr.	412-922-5720
SC	Greenville, Reynolds & Assocs.	407-259-7000
TX	Carrollton, Seaton Corp.	214-980-9860
UT	Scientific Devices	801-973-9411
VA	Fairfax, Schibley Assocs.	703-591-3008
WA	Bellevue, Topp Engrg. Sls.	206-747-5400
WI	New Berlin, Comtel Midwest	414-544-6042

MATROX ELECTRONIC SYSTEMS, LTD., 1055 St. Regis Blvd., Dorval, QU, Canada H9P 2T4, Tel: 514-685-2630, TELEX: 05-822798, FAX: 514-685-2853; Empl.: 450; *Sls. Mgr.:* Ed Dwyer, VP Sls.; *Dist. Mgr.:* Bruce Seidel



FAX: 714-960-6492

MATSUO ELECTRONICS, 2134 Main Street, Suite 200, Huntington Beach, CA 92648, Tel: 714-969-2491; Empl.: 854; *Sls. Mgr.:* Ted Wiltse ..... **A•1092-1097**

Local Sales Offices & Reps

AZ	Tempe, FP Sls.	602-894-5303
CA	Mission Viejo, Angle Assocs.	714-582-8858
CA	Redwood City, James S. Heaton Co.	415-367-7158
FL	Plantation, Gallagher	305-473-2101
GA	Norcross, Macro Mktg.	404-662-5580
IL	Des Plaines, ESCO Assocs.	312-298-5310
IN	Indianapolis, STB & Assocs.	317-844-9227
MD	Randallstown, Chesapeake Mktg.	301-922-5997
MA	Randolph, Hatch Assocs.	617-963-3306
MI	Grand Rapids, DEM Elctrn. Sls.	616-364-4024
MI	St. Clair Shores, DEM Elctrns.	313-777-1750
MN	St. Paul, Proud Inds.	612-646-9428
NJ	Ft. Lee, Neptune Elctrns.	201-461-2789
NM	Albuquerque, FP Sls.	505-345-5553
OH	Dayton, Dolfuss-Root & Co.	513-433-6776
OH	Strongsville, Dolfuss-Root & Co.	216-238-0300
TX	Plano, RAM Elctrns.	214-424-4455
OR	Beaverton, N. R. Schultz	503-643-1644
PA	Pittsburgh, Dolfuss-Root & Co.	412-221-4420
WA	Bellevue, N. R. Schultz	206-454-0300
Can	Scarborough, Ont., Bach-Simpson	416-288-9932

Local Distributors

CA	Garden Grove, Capacitor Supp.	714-638-0510
CA	Garden Grove, National Elctrns.	714-892-7749
CA	San Diego, Southland Comps.	619-673-3800
CA	San Jose, Passive Technlg.	408-435-5566
CA	Santa Maria, Garrett Instrs.	805-922-0594
CA	W. Covina, CSI	818-960-4761
CA	Yorba Linda, Corona Elctrns.	714-283-8185
GA	Norcross, Spectrum Elctrns.	404-448-1516
IL	Arlington Heights, Mar/Lyn	312-364-0444
IN	Carmel, Altek Elctrns.	317-848-1323
MD	Gaithersburg, Axis Elctrns.	301-840-9640
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Billerica, Baldwin Comps.	617-667-6710
MA	Wilmington, Aved Elctrns.	617-657-6310
MN	New Brighton, Parts 1	612-633-8079
NJ	Fairfield, C.H.P.S., Inc.	201-882-0997
NJ	Kenilworth, Ventronics	201-272-9262
NY	Ronkonkoma, Baldwin Comps.	516-588-5700
PA	Norristown, Century Elctrn. Comps.	215-631-5400
TX	Dallas, C & W	817-831-0395
TX	Dallas, Omni-Pro	214-233-0500
VA	Charlottesville, Virginia Elctrns.	804-296-4184
Can	Montreal, Que., Prelco	514-389-8051
Can	N. London, CM Peterson	519-434-3204
Can	Willowdale, Ont., Electro Sonic	416-494-1666

MATTHEY ELECTRONICS, Television Equipment Associates, Box 393, South Salem, NY 10590, Tel: 914-763-8893, TELEX: 493-0698, FAX: 914-763-9158; *Sls. Mgr.:* Bill Pegler

MAUELL CORP., 31 Old Cabin Hollow Rd., P.O. Box 339, Dillsburg, PA 17019-0339, Tel: 717-432-8686, FAX: 717-432-8688; Empl.: 25; *Sls. Mgr.:* Frank A. Ulrich; *Dist. Mgr.:* Frank A. Ulrich

MAUREY INSTRUMENT CORP., 4555 W. 60th St., Chicago, IL 60629, Tel: 312-581-4555, FAX: 312-581-2576; FSC No.: 03942; Empl.: 50; *Sls. Mgr.:* E. Maurey; *Dist. Mgr.:* Louis Derdzinski ..... **A•2045-2053**

Local Sales Offices & Reps

CT	Killingworth, Gallagher Assocs.	203-663-2338
MA	Framingham, Gallagher Assocs.	617-626-2346
TX	Dallas, THT Sls. Co.	214-783-1501

Local Distributors

CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	Santa Clara, Allied Elctrns.	408-727-1690
CO	Wheatridge, Allied Elctrns.	303-425-7144
CT	Ridgefield, PIC	203-451-1533
FL	Margate, Allied Elctrns.	305-973-3070
MA	Wilmington, Allied Elctrns.	617-942-0150
MI	Battle Creek, Great Lakes Elctrns.	616-963-6282
MI	Grand Rapids, SF Elctrn. Supp.	616-459-0216
MI	Westland, Allied Elctrns.	313-595-6565
MO	St. Louis, Allied Elctrns.	314-878-1229
NY	Mineola, Allied Elctrns.	516-248-2360
NC	Raleigh, Allied Elctrns.	919-821-0415
OH	Akron, Stotts-Friedman	216-253-7000
OH	Cincinnati, Stotts-Friedman	513-574-7701
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Willoughby, Allied Elctrns.	216-951-0908
OK	Tulsa, Allied Elctrns.	918-663-7630
PA	Bala Cynwyd, Allied Elctrns.	215-267-6940
TN	Knoxville, Shields Elctrns.	615-588-2421
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Allied Elctrns.	713-932-7321
VA	Alexandria, Allied Elctrns.	703-836-5002
WA	Seattle, Allied Elctrns.	206-767-5772

MAURY MICROWAVE CORP., 8610 Helms Ave., Cucamonga, CA 91730, Tel: 714-987-4715, FAX: 714-987-1112; FSC No.: 13047; Empl.: 100; *Sls. Mgr.:* M. A. Maury, Jr.

MAXIMUM STRATEGY, INC., 1650 B Berryessa Rd., San Jose, CA 95133, Tel: 408-729-1526, FAX: 408-729-7084; Empl.: 15; *Sls. Mgr.:* Wes Meador; *Dist. Mgr.:* Ernie Ohrenstien

MAXMAR CONTROLS INC., 99 Castleton St, Pleasantville, NY 10570, Tel: 914-747-3540, FAX: 914-747-3567; *Sls. Mgr.:* Julius Chastant; *Dist. Mgr.:* Julius Chastant

MAXON PRECISION MOTORS, INC., 838 Mitten Rd., Burlingame, CA 94010, Tel: 415-697-9614, FAX: 415-697-2887; *Sls. Mgr.:* Sam Robinson

MAXUS ELECTRONIC CORP., 2760 29th St, Boulder, CO 80301, Tel: 303-447-1226, FAX: 303-447-1446; Empl.: 6; *Sls. Mgr.:* Eric Slack

MAXWELL ELECTRONICS, P.O. Box 12033, Research Triangle Park, NC 27609, Tel: 919-846-1633; Empl.: 8; *Sls. Mgr.:* Joe Harrison

MAXWELL LABORATORIES, INC., 8888 Balboa Avenue, San Diego, CA 92123-1506, Tel: 619-279-5100, FAX: 619-279-1554; Empl.: 600; *Sls. Mgr.:* Michael M. Plum, V.P. Mktg.

MBD INTERNATIONAL, P.O. Box 870577, Dallas, TX 75287-0577, Tel: 214-788-5277, FAX: 214-404-0471; Empl.: 5; *Sls. Mgr.:* Robert McLeod; *Dist. Mgr.:* Robert McLeod

MB DYNAMICS INC., 25865 Richmond Rd., Cleveland, OH 44146-1483, Tel: 216-292-5850, TELEX: 510-601, FAX: 216-292-5614; Empl.: 45; *Sls. Mgr.:* Ed Peterson

MCCOY ELECTRONICS CO., A Sub. of Oak Industries, 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, Tel: 717-486-3411, TWX: 510-650-3548, FAX: 717-486-5920; FSC No.: 00136; Empl.: 450 ..... **A•1380-1387**

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Sls., Inc.	205-533-1735
AZ	Phoenix, Sunwest Mktg.	602-893-7677
CA	Chatsworth, Wes-K	818-700-0933
CA	San Mateo, Melvin Sls.	415-349-7445
CO	Grand Function, Krebill Comp. Sls.	303-243-8220
CO	Littleton, Advanced Tech Mktg.	303-798-4200
FL	Oviedo, Conley & Assocs.	407-385-3283
GA	Norcross, Elctrn. Sls., Inc.	404-448-6554
IL	Glendale Heights, Beta Technlg. Sls., Inc.	312-790-9886
IL	Northfield, Feller Assoc.	708-446-8065
IN	Kokomo, Schillinger Assoc., Inc.	317-452-4057
IA	Cedar Rapids, Jack L. Tucker & Assoc.	319-362-1019
KS	Lenexa, Mid-Tech Assoc.	913-541-0505
MD	Towson, Dickison Sls.	301-823-0923
MA	Norwood, Naton Assoc.	617-762-3224
MN	Minneapolis, Dunlop Consits.	612-544-1070
NM	Albuquerque, Sunwest Mktg.	505-898-6471
NY	Binghamton, Foster & Wager, Inc.	607-724-7093
NY	New Rochelle, Ascor Elctrns.	914-235-8838
NY	Rochester, Foster & Wager, Inc.	716-385-7744
NC	Cary, Elctrn. Sls., Inc.	919-467-8486
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
OR	Tigard, Eltech Incorp.	503-684-3458
PA	Ft. Washington, Beta Sls.	215-643-6650
TX	Austin, R. F. Kimball Co.	512-443-5284
TX	Richardson, R. F. Kimball Co.	214-231-3447
VA	Charlottesville, PDQ Sls.	804-979-7085
WA	Bellevue, Eltech. Incorp.	206-643-4330
EXP	NJ, Oradell, Sylvan Ginsbury Ltd.	201-261-3200

MCCURDY RADIO INDUSTRIES LIMITED, 108 Carnforth Road, Toronto, Ont., CAN M4A 2L4, Tel: 416-751-6262, FAX: 416-751-6455; *Sls. Mgr.:* Murray Porteous; *Dist. Mgr.:* Murray Porteous

MCE SEMICONDUCTOR, INC., 1111 Fairfield Dr., West Palm Beach, FL 33407, Tel: 407-845-2837, TELEX: 44105 (MCE UI), FAX: 407-863-8275; Empl.: 58; *Sls. Mgr.:* Thomas Munn

MCFADDEN SYSTEMS, INC., 11835 E. Smith Ave., Santa Fe Springs, CA 90670, Tel: 213-948-4414, TELEX: 677161, FAX: 213-948-1291; FSC No.: 25750; Empl.: 30

MCG ELCTRNS., 12 Burt Dr., Deer Park, NY 11729, Tel: 516-586-5125, FAX: 516-586-5120; FSC No.: 29779; Empl.: 45; *Sls. Mgr.:* Don Worden ..... **B•1375-1376**

Local Sales Offices & Reps

FL	Lake Mary, Pure Power,Inc.	407-333-3212
GA	Atlanta, On-Track Sys., Inc.	404-451-8885
IN	Indianapolis, Domino	317-841-6159

MA Woburn, EMS 617-229-6686
MI Brighton, Cesko Sls. Co. 313-227-5061
MN St. Louis Pk., Electro Midwest 612-922-7017
NJ Caldwell, RTS Data 201-228-5249
OK Oklahoma City, Computer Power 405-848-2522
OK Tulsa, Allan & Assoc. 918-663-6713
TN Alcoa, Powerforce Sys. 615-970-7584
TX Richardson, Devices, Inc. 214-991-1202
UT Salt Lake City, S&T Mktg. 801-268-8183
WV Huntington, Seco, Inc. 304-522-9732
Can Richmond Hill, Ont., Computer Power Eng. 416-764-1548

Local Distributors

GA Norcross, Alltel Supply 404-448-5210
NC Charlotte, Data Directions 704-588-5622
PA E. Oakmont, RPC Video 412-828-1414
TX Lubbock, Wesco 806-747-3256

McGILL®

FAX: 219-465-2456

MCGILL MANUFACTURING CO., INC., 909 North Lafayette Street, Valparaiso, IN 46383, Tel: 219-465-2200; Empl.: 295; *Sls. Mgr.:* Tom Morris ..... **B•1734-1736**

Local Sales Offices & Reps

AL Huntsville, James E. Heusser Agy. 205-836-3896
AR Hot Springs, Automation Supp., Inc. 501-767-5444
CA Cotati, Joseph Foster 707-792-4392
CA Oceanside, Mark Waggoner 213-904-0156
CO Northglenn, Dan Ryall 303-452-8185
CT Bristol, Eric Peterson 203-297-7464
IN Bremen, Jan Richard Stahly 219-282-3592
IA Des Moines, Jerry Bunch Electrical Sls. 515-287-7057
MI Chelsea, Rick Mayday 313-995-2965
MN Eagan, Stan Lock 612-890-9347
MS Brandon, Service Electrical Sls. 601-992-9122
MO St. Peters, Neil Klocke 314-947-2259
NJ Lauren Springs, Jim Cawood 215-359-3708
NM Albuquerque, Paul Atkinson 505-292-1222
NY Old Bethpage, Susan Razzano 718-830-5011
NY Silver Creek, Scott Earsing 716-325-3485
OH Euclid, Joe Ciulla 216-574-7164
SC Columbia, Harold Heaton 803-733-0941
TN Nashville, Richard Hardy 615-748-1150
TX Dallas, Raley Sls. Co. 214-368-1683
UT Salt Lake City, Kev Paul 801-484-9941
VA Richmond, Wynn Meredith 804-275-7970
WI Kenosha, Wally Coats 312-299-2354
Can Mississauga, Ont., Marr Elec. Ltd. 416-277-9481

MCGUIRK ELECTRONICS CO. INC., 212 So. Main St, P. O. Box 853, Middleton, MA 01949, Tel: 617-933-3500; FSC No.: 55902; Empl.: 10; *Sls. Mgr.:* R. O'Neill

MCI TRANSFORMER CORPORATION, 411 Manhattan Ave., Babylon, NY 11704, Tel: 516-587-0510, FAX: 516-587-0624; Empl.: 50; *Sls. Mgr.:* Timothy J. Williams ..... **A•2266-2276**

Local Sales Offices & Reps

MA Orange, MCI Transformer 508-544-8806
NH Nashua, Key Sls. of New England, Inc. 603-888-8742

mckENZIE
TECHNOLOGY

FAX: 415-651-1020

MCKENZIE TECHNOLOGY, 44370 Old Warm Springs Blvd., Fremont, CA 94538, Tel: 415-651-2700; Empl.: 175; *Sls. Mgr.:* Kari Trautman; *Dist. Mgr.:* Vicky Wodopianov ..... **C•1467**

Local Sales Offices & Reps

AL Huntsville, Cartwright & Bean, Inc. 205-830-1540
AZ Phoenix, Mercury Engrg. Sls., Inc. 602-265-0344
CA Pleasanton, Moulthrop Sls., Inc. 415-463-0450
CA Westminster, West Elctrn. Sls., Inc. 714-898-0120
CO Denver, Donohue Sls. Co. 303-455-1719
CT Waterbury, Compak, Inc. 203-753-6431
FL Orlando, Cartwright & Bean, Inc. 407-423-1756
GA Atlanta, Cartwright & Bean, Inc. 404-368-0160
IL Chicago, Golten Assocs., Inc. 708-512-0093
MA Boston, Compak Inc. 508-568-0331
MN Twin Cities, GP Sls. Inc. 612-831-2362
MS Jackson, Cartwright & Bean, Inc. 601-981-1170
NH Derry, Compak, Inc. 603-434-8498
NY New York, Sticom 516-724-6814
NC Charlotte, Cartwright & Bean, Inc. 704-536-0303
NC Raleigh, Cartwright & Bean, Inc. 919-876-4130
OH Dayton, Electro-Mktg. 513-890-8322
OR Portland, RTS, Inc. 503-244-4123
PA Philadelphia, TCA 215-692-6853
PA Pittsburgh, Electro-Mktg. 412-823-5400
TN Memphis, Cartwright & Bean, Inc. 901-362-8345
TX Dallas, JYS Co./Comps. 214-349-1650
WA Seattle, RTS, Inc. 206-285-1363

Local Distributors

AL Huntsville, Allied Elctrns. Inc. 800-433-5700
AL Huntsville, Century Fastners 205-883-5344
AZ Phoenix, Force Elctrns. 602-437-1060
AZ Tempe, D.C. Elctrns. 602-438-1234
CA San Diego, Force Elctrns. 619-569-9661
CA El Segundo, Force Elctrns. 213-772-1324
CA Fountain Valley, Comps Ctr., Inc. 714-979-0433
CA Fullerton, Kent 714-773-0781
CA Los Angeles, Allied Elctrns. 714-669-4190
CA Milpitas, R&D Elctrn. Parts 408-262-7144
CA San Diego, Kent 619-271-5404
CA San Francisco, Allied Elctrns. 415-487-5250
CA Santa Clara, Abacus Elctrns. 408-732-2000
CA Santa Clara, D.C. Elctrns. 408-980-1199
CA Santa Clara, Force Elctrns. 408-748-1324
CA Santa Clara, Kent Elctrns. 408-727-9810
CA Temecula, Rancho Elctrns., Inc. 714-676-6454
CA Tustin, D.C. Elctrns. 714-259-9066
CO Denver, Alliance Elctrns. 303-433-1648
CT Danbury, Heilind Elctrns. 203-797-8600
DC Allied Elctrns. Inc. 301-423-1061
FL Clearwater, Allied Elctrns. 800-433-5700
FL Largo, Electronic Precepts 813-544-3636
FL Pompano Bch., Allied Elctrns. Inc. 305-486-0500
FL Tampa, Century Fasteners, Tampa 813-802-5770
GA Atlanta, Allied Elctrns. Inc. 404-377-3555
IL Bensenville, Voyager Elctrns. Corp. 312-860-1300
IL Chicago, Allied Elctrns. 312-697-8200
MA Boston, Allied Elctrns. Inc. 617-942-3150
MA Waltham, Vector Sls.,Inc. 617-787-2790
MA Wilmington, Heilind Elctrns. 1-800-343-5004
MN Fridley, Voyager Elctrns. 612-571-7766
MN New Brighton, Parts 1 612-633-8079
MN Stillwater, Elctrn. Depot Supp. Co. 612-439-9409
NH Atkinson, Astrum Elctrns. 603-898-3399
NY Bohemia, RBD Elctrns. 516-589-7717
NY Mineola, Allied Elctrns. Inc. 516-248-2360
NC Raleigh, Allied Elctrns. 919-876-5845
NC Raleigh, Century Elctrns. Comps., Inc. 919-782-2116
OH Cleveland, CAM RPC Elctrn. 216-461-4700
OR Beaverton, Comp. Resources, Inc. 503-641-8488
PA Pittsburgh, CAM RPC Elctrn. 412-782-3770
RI Warwick, Cal-Greg Comps. 401-738-6170
TX Allen, Prime Distbg. Co. 214-231-0170
TX Austin, Kent Elctrns. 512-834-1900
TX Dallas, Allied Elctrns. 214-553-4370
TX Dallas, Kent Elctrns. 214-669-2600
TX Farmers Branch, Force Elctrns. 214-247-9955
TX Ft. Worth, Allied Elctrns. 214-265-9341
TX Ft. Worth, Allied Elctrns. 817-336-5401
TX Houston, Force Elctrns. 713-561-8677
TX Stafford, Southwest Elctrns., Inc. 713-240-4000
WA Redmond, Pyramid/Kent 206-883-7200
WA Kent, Comp. Resources, Inc. 206-454-8666

MCL, INC., 501 S. Woodcreek Rd., Bolingbrook, IL 60440-4999, Tel: 708-759-9500, TWX: 910-683-1899, FAX: 708-759-5018; FSC No.: 16469; Empl.: 127; *Sls. Mgr.:* Frank Morgan

MCLEAN ENGINEERING, Zero Corporation, 70 Washington Rd., Princeton Junction, NJ 08550, Tel: 609-799-0100, TWX: 510-685-2543, FAX: 609-799-1081; FSC No.: 03522; Empl.: 118; *Sls. Mgr.:* Craig A. Reed; *Dist. Mgr.:* Craig A. Reed ..... **C•1632-1633**

Local Sales Offices & Reps

AZ Fountain Hills, Halbar Assocs. 602-837-2464
CA San Mateo, Halbar Assocs. 415-349-4700
CA Van Nuys, Halbar Assocs. 818-906-3941
CO Aurora, Component Tech 303-680-9550
FL Orlando, Raycom 407-859-5504
GA Duluth, Raycom 404-476-2041
IL Elmhurst, Scott Assocs. 708-279-5681
MD Hunt Valley, Marktron 301-628-1111
MD Rockville, Marktron 301-251-8990
MA Chelmsford, JEBCO 508-256-5800
MI Livonia, Electro-Mktg. 313-421-7590
NY Rochester, Talty Assocs. 716-323-1210
MN Minneapolis, Scott Elctrn. Sls. 612-929-2985
MO Grandview, Harris-Hanson 816-763-6200
MO St. Louis, Harris-Hanson 314-432-3611
NJ Lebanon, Sylvester Sls. Assocs. 201-735-2488
NM Albuquerque, Fry-Gates 505-262-1525
OH Dayton, Electro-Mktg.Grp. 513-890-8322
OH N. Royalton, Electro-Mktg. Grp. 216-582-0075
PA Huntingdon Valley, Inacker Sls. 215-947-5660
PA Pittsburgh, Electro-Mktg. Grp. 412-823-5400
TX Houston, Milco Mktg. 713-469-5156
TX Plano, Milco Mktg. 214-578-1996
WA Redmond, Halbar PNW 206-882-0990
Can Guelph, Ont., Hammond Mfg. Co. 519-822-2960

Local Distributors

FL Ft. Lauderdale, Component Distrs. 305-971-4950
GA Norcross, Component Distrs. 404-441-3320
MI Ann Arbor, Wedemeyer Elctrn. Supp. Co. 313-665-8611
NC Raleigh, Component Distrs. 919-834-9465
TX Dallas, Component Distrs. 214-644-0373
Can Guelph, Ontario, Hammond Mfg. Co. .. 519-822-2960

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McLEAN MIDWEST

FAX: 612-569-0533

MCLEAN MIDWEST, Sub. of Zero Corporation, 4000 83rd Ave. N., Brooklyn Pk., MN 55443, Tel: 612-561-9400, TELEX: 29-0883; *Sls. Mgr.:* J. Buyse ..... **C•1634-1635**

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AZ Tempe, Phoenix Comp. Sls. 602-839-0248
CA Laguna Hills, Western Automation 714-859-6988
CA Oakland, Powermatic Assocs. 415-635-6825
CO Boulder, Comp. Prod. Sls. Co. 303-530-2800
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IL Elmhurst, Scott Assocs., Inc. 708-279-5681
MD Rockville, Marktron, Inc. 301-251-8990
MA Chelmsford, John E. Boeing Co. 508-256-5800
MI E. Detroit, Jack M. Thorpe Co. 313-779-6363
MN Minneapolis, Scott Elctrn. Sls. 612-929-2985
MO St. Louis, Harris-Hanson Co. 314-432-3611
NJ Totowa, R.O.I. Sls. Co. 201-812-9606
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FAX: 512-984-2211

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DC Washington 404-447-7170
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IL Chicago 800-942-3961
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MA Boston 800-851-1515
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OH Columbus 800-523-4441
PA Philadelphia 800-524-0168
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TX Houston 800-442-8046
WA Seattle 206-244-7200,206-241-2250
WI Milwaukee 800-323-4087

FAX: 512-984-6972

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Local Sales Offices & Reps

CA Campbell, Olsheski & Assoc. 408-378-6003
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CA Pleasanton, Sedlak, Mike 415-462-4547
CA Valencia, Cessing Assocs. 805-295-0225
CO Wheatridge, Cluff & Assoc. 303-425-6604
CT Chesire, The Macinnis Co. 203-372-3797
FL Apopka, Cartwright & Bean, Inc. 407-889-2168
FL Deerfield Beach, Cartwright & Bean, Inc. 305-429-3400
GA Atlanta, Wallace Elctrn. Sls. 800-334-3518
IL Lombard, RMP/McBride Corp. 312-932-9090
IN Indianapolis, M & L Elctrn. Sls. 317-359-4742
IA Cedar Rapids, T. Dowell & Assoc. 319-364-3880
KS Overland Park, T. Dowell & Assoc. 913-599-1100
LA Slidell, Wallace Elctrn. Sls. 504-643-4751
MD Lisbon, S.K. MacDonald, Inc. 301-442-1590
MA Norwood, The Macinnis Co. 617-762-8090
MI Warren, Burcaw Co. 313-573-6048
MI Wyoming, Burcaw Co. 313-573-4605
MN Edina, Restronics, Inc. 612-941-9135
MO St. Louis, T. Dowell & Assoc. 314-849-4334
NJ Cherry Hill, S.K. MacDonald, Inc. 609-482-2666
NY Hauppauge, Aurora-Schmitt Assoc. 516-434-1572
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NY Victor, T-Squared Elctrns. Co. 716-924-9101
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OH Beachwood, Elctrns. Salemasters 216-831-9555
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PA Monroeville, S.K. MacDonald, Inc. 412-373-1723
TN Tullahoma, Wallace Elctrn. Sls. 800-334-3518
TX Dallas, Elcom Mktg. 214-241-2166
TX Houston, Elcom Mktg. 713-350-8064
WA Redmond, Pacific Mktg. Specialists ... 206-882-3144
Can London, Ont., David Allen

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AL Huntsville, Powell Elctrns. 205-539-2731
AZ Phoenix, Arizona Comps. Co. 602-269-5655
AZ Phoenix, Hall-Mark 602-437-1200
AZ Tempe, Acacia/Deanco, Inc. 602-894-2874, 602-882-9054
AZ Tempe, Shelley-Ragon, Inc. 602-894-2058
CA Chatsworth, Hall-Mark 818-773-4500
CA Chatsworth, Shelley-Ragon, Inc. 818-998-3333
CA Costa Mesa, Powell Elctrns. 714-754-1717
CA Fremont, Acacia/Deanco, Inc. 415-623-7500
CA Garden Grove, Richey/Impact Elctrns. 714-895-0060
CA Irvine, Acacia/Deanco, Inc. 714-660-0834, 213-971-2428
CA Rocklin, Hall-Mark 916-624-9718
CA San Diego, Acacia/Deanco, Inc. 619-565-4365
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CA San Diego, Richey/Impact Elctrns., Inc. 619-271-4511
CA San Diego, Shelley-Ragon, Inc. 619-453-7133
CA San Jose, Hall-Mark 408-432-0900
CA San Jose, Powell Elctrns., Inc. 408-943-9020
CA San Jose, Richey/Impact Elctrns., Inc. 408-432-7100
CA San Jose, Shelley/Ragon 408-432-0600
CA Santa Clara, DC Elctrn. Supp. 408-980-1199
CA Torrance, Kent Elctrns. 213-320-2700
CA Tustin, DC Elctrns. 714-259-9066
CA Tustin, Hall-Mark 714-669-4700
CO Denver, CSID/Integrated Fastn. Inc. ... 303-292-9594
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CO Englewood, Shelley-Ragon, Inc. 303-762-0670
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CT Cheshire, Hall-Mark 203-271-1704
CT East Haven, JV Elctrns. 203-469-2321
CT Yalesville, Schaal Assocs., Inc. 203-269-3779
FL Casselberry, Hall-Mark 407-830-5855
FL Ft. Lauderdale, Powell Elctrns. 305-484-8377
FL Largo, Hall-Mark 813-541-7440
FL Pompano Beach, Hall-Mark 305-971-9280
FL Tampa, Shelley-Ragon, Inc. 813-623-6560
FL Winter Park, Deanco 305-671-5100
GA Marietta, Deanco 404-429-0126
GA Norcross, Hall-Mark 404-447-8000
IL Bensenville, Magnuson Elctrns. 312-595-7575
IL Wood Dale, Hall-Mark .. 312-860-3800,312-860-0239
IL Wood Dale, NEP Elctrns., Inc. 312-595-8500
IN Ft. Wayne, Bell Inds., Inc. 219-423-3422
IN Indianapolis, Bell Inds., Inc. 317-875-8200, 800-622-4814,
IN Indianapolis, Hall-Mark 317-872-8875
IN Indianapolis, Magnuson Elctrns., Inc. .. 317-247-5108
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MO Hazelwood, Shelley-Ragon, Inc. 314-895-1515
MO Independence, Shelley/Ragon Inc. 816-254-3410
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NY Hauppauge, Schaal Assocs., Inc. 516-434-7100
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NY Medford, Shelley-Ragon, Inc. 516-447-2000
NY Ronkonkoma, Hall-Mark 516-737-0600
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OH Solon, Hall-Mark 216-349-4632
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OR Beaverton, Acacia/Deanco, Inc. 503-646-3377
OR Beaverton, Shelley/Ragon 503-641-1691
OR Tualatin, Moore Elctrns., Inc. 503-692-5333
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TX Austin, Kent Elctrns. 512-834-1900
TX Austin, Norvell Elctrns., Inc. 512-837-5555
TX Dallas, Hall-Mark 214-553-4300
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TX Dallas, Norvell Elctrns. 214-233-0020
TX El Paso, ERA Elctrns. 915-855-3600
TX Houston, Kent Elctrns. 713-780-7770
TX Houston, Norvell Elctrns. 713-777-1666
TX Plano, Tactic Elctrns. 214-422-0777
UT W. Valley City, Hall-Mark 801-972-1008
WA Redmond, Acacia/Deanco, Inc. 206-881-5566
WA Redmond, Shelley/Ragon Elctrns. 206-883-2220
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WI Milwaukee, Elctrn. Expeditors, Inc. 414-228-8100
WI New Berlin, Hall-Mark 414-797-7844

3M PHOTODYNE PRODUCTS, Dynatel Systerms Division, 3760 Calle Tecate, Camarillo, CA 93010, Tel: 805-388-8378, 800-426-8688, TWX: 910-874-2020; FSC No.: TWX 910-874-2020; 59912; Empl.: 100

3M PRIVATE NETWORK PRODUCTS, 3M, 6801 Riverplace Blvd., Austin, TX 78769-2963, Tel: 512-984-1800, 800-745-7459, FAX: 512-984-5943; Empl.: 50; *Sls. Mgr.:* R.C. Ware

MDF PRODUCTS INC., 7 Johnson Dr., Danbury, CT 06811, Tel: 203-743-3579, TELEX: 499-8051, FAX: 203-744-2704; FSC No.: 60628 ..... **D•1293**

MDM, INC., 9601 Irondale Ave., Chatsworth, CA 91311, Tel: 818-700-8400, FAX: 818-700-1938; FSC No.: 60994; Empl.: 150; *Sls. Mgr.:* Steven J. LaLonde

MDS CALIBRATION LAB. INC., 437-H Mary Esther Cutoff, Ft. Walton Beach, FL 32548, Tel: 904-664-1234, FAX: 904-664-6789; *Sls. Mgr.:* Gerry Doiron

MEA DIV., See Mechanized Elctrn. Assembly Div., Universal Instrs. Corp.

MEASUREMENTS GROUP, INC., Box 27777, Raleigh, NC 27611, Tel: 919-365-3800, TELEX: 62919594, FAX: 919-365-3945

MEASUREMENT SYSTEMS, INC., 121 Water St., Norwalk, CT 06854, Tel: 203-838-5561, TELEX: 6813573; Empl.: 97; *Sls. Mgr.:* Gerard M. Lacrocque, Nat'l. Sls. Mgr. ..... **D•1138**

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MD Columbia, Robert Elctrn. Sls. 301-995-1900
MA Hudson, Data Rep 508-481-0333
MN Edina, Elctrn. Sls., Inc. 612-933-9070
MO St. Louis, J. S. DeWeese Co. 314-469-7350
OH Medina, J. C. Hofstetter Co. 216-241-4880
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TX Richardson, Scientific Sls. Co. 214-231-6541
VA Richmond, Robert Elctrn. Sls. 804-276-3979

MEC A/S, Industriparken 23, Ballerup, Denmark DK-2750, Tel: 011-4542973366, TELEX: 9125649, TWX: 2381-125649, FAX: 011-4542 681514; Empl.: 50

FAX: 517-782-2810

MECHANICAL PRODUCTS INC., 1824 River St. P. O. Box 729E, Jackson, MI 49204, Tel: 517-782-0391, TWX: 810-253-0827; *Sls. Mgr.:* Dave Olson .... **B•1378-1381**

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FL Tampa, Florida Comp. Sls., Inc. 813-873-3622
GA Atlanta, Electro-Mech 404-447-6478
IL Barrington, Perhats Assocs. 708-381-6360
KS Prairie Village, C. Logsdon & Assoc. .. 913-381-3833
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MI Grand Rapids, S & F Elec. Supp. Co., Inc. 616-459-0216
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Can St. Laurent, Que., Tara Inds. Corp. 514-331-6550

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FAX: 206-236-5480

MECHATRONICS INC., 2835 82nd Ave. S.E., P.O. Box 20, Mercer Island, WA 98040, Tel: 206-232-4800, TWX: 910-444-4126; Empl.: 40; *Sls. Mgr.:* Jim Innes ..... **C•1636-1639**

Local Sales Offices & Reps

WA Mercer Island, Mechatronics Inc. 206-232-4800

MECO INDUSTRIES, Mechanical Engraving Co., Inc., 4500 Bullard Ave, Bronx, NY 10470, Tel: 212-324-4455, FAX: 212-324-5500; FSC No.: 99040; Empl.: 35

MEDA, INC., Macintyre Electronics Design Assocs., 11260 Roger Bacon Dr., Ste. 202, Reston, VA 22090, Tel: 703-471-1445; Empl.: 8

MEDIA RECOVERY INC., Box 1407, Graham, TX 76046, Tel: 800-527-9497, 214-630-9625 (Texas), TELEX: 73-2561; Empl.: 130; *Sls. Mgr.:* J. Ricciardi

MEGADATA CORP., 35 Orville Dr., Bohemia, NY 11716, Tel: 516-589-6800, FAX: 516-589-6858; FSC No.: 53436; Empl.: 90

MEISSNER INDUSTRIES, 551 Rte. 10, Dover, NJ 07801, Tel: 201-366-1700; Empl.: 10

MEKTRONIX TECHNOLOGY, INC., 53 Depot Rd., Goleta, CA 93117, Tel: 805-964-9669, FAX: 805-964-0797; Empl.: 5; *Sls. Mgr.:* Gregory Mayworm

FAX: 508-881-5082

MELCHER, INC., 200 Butterfield Dr., Ashland, MA 01721, Tel: 800-828-9712, TWX: 5101003630; Empl.: 280; *Sls. Mgr.:* Joe DiPietro ..... **D•1892-1895**

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CA La Habra, West Coast Reps. 213-690-9960
AZ Scottsdale, Power Up Elctrn. Sls. 602-955-1105
CA Granada Hills, West Coast Reps. 818-368-7385
CA San Diego, West Coast Reps. 619-576-9203
FL Coral Springs, Graham Assocs. 305-341-5102
FL Largo, Graham Assocs. 813-539-6779
FL Melbourne, Graham Assocs. 407-773-6631
FL Orlando, Graham Assocs. 407-299-1001
FL Palm Beach Gardens, Graham Assocs. 407-622-4049
WA Snohomish, West Coast Reps. 206-483-5300
FL Winter Garden, Graham Assocs. 407-656-9369
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KS Olathe, Tech. Sls. Assocs. 913-829-2800
MI Troy, CB Jensen & Assocs. 313-643-0506
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NY Wantagh, Bytec Reps. 516-781-7400
NC Winston-Salem, Murcota 919-722-9445
PA Willow Grove, Tech. Sls. Assocs. 215-784-0170
TX Richardson, Jim D. Gray & Assocs., Inc. 214-699-9976
TX Richmond, Jim D. Gray & Assocs., Inc. 713-342-1710
WI Brookfield, McMahon Inc. 414-782-3335

MELCOR

FAX: 609-393-9461

MELCOR/MATERIALS ELCTRN. PRODS., 994 Spruce St., Trenton, NJ 08648, Tel: 609-393-4178, TELEX: 84-3314; FSC No.: 32333; Empl.: 220; *Sls. Mgr.:* M.A. Levine ..... **C•1641-1644**

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Distributor

FAX: 213-820-6958

MELFESS FIVE, INC., 12304 Santa Monica Blvd., No. 121, Los Angeles, CA 90025, Tel: 213-826-8133, 800-533-2297; Empl.: 7; *Sls. Mgr.:* Michael S. Fisher ..... **D•1106**

MELLES GRIOT, INC., 1770 Kettering St., Irvine, CA 92714, Tel: 714-261-5600, TELEX: 678447; Empl.: 110; *Sls. Mgr.:* Kevin Chittim, VP Mktg.

MEL-RAIN CONTROLS, 42974 M-43 Hwy., Paw Paw, MI 49079, Tel: 616-657-2527, FAX: 616-657-2528; FSC No.: 639; Empl.: 20; *Sls. Mgr.:* Howard F. Walter

MEMBRANE SWITCH & PANEL CO., INC., 1537-G McFadden, Santa Ana, CA 92705, Tel: 714-541-5775; Empl.: 8

MI

FAX: 219-356-7376

MEMCOR-TRUOHM, INC., 1320 Flaxmill Rd., Huntington, IN 46750, Tel: 219-356-4300; FSC No.: 24681; Empl.: 250; *Sls. Mgr.:* Ray Vanderspool ..... **A•1946, 2054**

Local Sales Offices & Reps

AL Huntsville, Murcota 205-539-8476
CA American Canyon, Jacobson & Assoc. 707-552-4412
CA Huntington Bch., Mil-Com Sls. 714-840-2424
FL Indialantic, Raycom 305-727-8860
GA Atlanta, Murcota 404-875-2525
IL Chicago, D. Dolin Sls. 312-286-6200
IN Ft. Wayne, Menze Sls. 219-747-5616
MI St. Clair Shores, J.M. Thorpe 313-779-6363
MO St. Charles, Hayes Elec. Sls. Co. 314-946-6677
NH Atkinson, Mark Rep Assoc. 603-382-9563
NJ Englewood Cliffs, Masin Esco 201-569-8868
NY Hauppauge, Masin Esco 516-273-3500
NY Marcellus, Mullahy Sls. Inc. 315-685-6280
NC Burlington, Murcota 919-585-1577
NC Winston-Salem, Murcota 919-723-1001
OH Cleveland, Glover Sls. 216-842-4520
PA Newtown Square, G.M. Conneen 215-353-2241
TX Dallas, SW Elctrn. Ind. 214-233-9816
TX Houston, SW Elctrn. Ind. 713-729-1670
WA Redmond, Barrett-Squibb 206-885-6991

MEMODYNE, 20 Ossipee Rd., Newton, MA 02164, Tel: 617-964-6556 (in MA), 800-255-1510, FAX: 617-964-2444; Empl.: 40; *Sls. Mgr.:* Leonard Sacon ..... **D•1100**

Local Sales Offices & Reps

AL Huntsville, Dean Assocs. 205-534-2255
AZ Scottsdale, A.M.I. 602-947-4297
CA Carson, Amasco 213-516-8561
CT Portland, BBI Elctrns. 203-342-0648
FL Orlando, DAI Sls. 305-299-7754
IL Elmhurst, Scott Assocs. 312-279-5681
MD Severna Park, Syronics 301-544-8652
MA Holbrook, McLellan Assocs. 617-767-4771
MI Detroit, EQS Sys. 313-961-3042
MI Pontiac, EQS Sys., Inc. 313-338-2280
MN Chanhassen, Jen-Ray Sys. 612-934-8607
NJ Boonton, PAF Assocs. 201-335-0680
NY Liverpool, Syronics 315-451-0968
NY Smithtown, PAF Assocs. 516-360-0940
OH Chesterland, EQS Sys. 216-729-2222
OH Columbus, EQS Sys. 614-228-3453
OH Dayton, EQS Sys., Inc. 513-236-7676
OH Huber Hgts., EQS Sys., Inc. 216-729-2222
OR Lake Oswego, Syntek 503-636-6793
PA Sellersville, Penn-Tech Sls. 215-257-2756
TX Irving, Trice Mktg. 214-255-1877
WA Kirkland, Syntek 206-488-0394

MEMORY PROTECTION DEVICES, INC., 320 Broad Hollow Rd., Farmingdale, NY 11735, Tel: 516-293-5891, FAX: 516-752-1971; *Sls. Mgr.:* Thomas Blaha ..... **D•1469**

Local Distributors

AL Huntsville, Powell Elctrns. 205-837-5300
AL Huntsville, Resistacap, Inc. 205-883-4270
AZ Phoenix, Lynntronics 602-433-0288
CA Buena Park, Cypress Elctrns. 714-521-5230
CA Costa Mesa, Battery Specialties 800-854-5759
CA Costa Mesa, House of Batteries 714-642-8222
CA Costa Mesa, Powell Elctrns. 714-754-1717
CA San Diego, Tauber Elctrns. 619-274-7242
CA San Jose, Powell Elctrns. 408-943-6438
CA San Jose, Rose Elctrns. 408-263-9700
CA Santa Clara, Cypress Elctrns. 408-980-2500
CA Van Nuys, Nesco Corp. 818-781-0522
CO Arvada, Denver Beta Wintronics 303-431-7161
CO Englewood, AVT, Inc. 303-779-8056
CO Englewood, Cypress Elctrns. 303-792-5829
FL Fort Lauderdale, Powell Elctrns. 305-484-8377
FL Tampa, MicroPrecision Inc. 813-854-2861
GA Norcross, Applied Power 404-263-0421
ID Boise, Kimball Elctrns. 208-342-3559
IL Morton Grove, Power Pak 312-966-6000
IN Indianapolis, North American Cap 317-856-3731
MD Annapolis Junction, Powell Elctrns. ... 301-880-3255
MA Andover, Generation Elctrns. 508-683-1177
MA Canton, Richey Impact Elctrns. 617-821-1500
MA Sharon, Adcour Inc. 617-784-8123
MA Sutton, Engrd. Assemblies and Comp. Corp. 508-865-0722
MI Brighton, Applied Power 313-227-3604
MN Minneapolis, Stark Elctrns. 612-332-1325
MN Thief River Falls, Digi Key Corp. 218-681-6674
NJ Camden, Gen. Radio Supp. 609-964-8560
NJ Mountainside, Mars Elctrns. 201-233-0044
NJ Teterboro, Engrd. Assemblies & Comp. Corp. 201-288-4477
NY Buffalo, Summit Distrs. 716-887-2800
NY Rome, Rome Elctrns. 315-337-5400
NC Raleigh, Engrd. Assemblies & Comps. Corp. 919-790-9700
OR Beaverton, Micro Power 503-626-7086
PA Philadelphia, Powell Elctrns. 215-365-1900
TX Dallas, Conformance Technlg., Inc. 214-233-4173
TX Dallas, Computer Comps. Corp. 214-239-0271
TX Dallas, Cypress Elctrns. 214-869-1435
TX Irving, Powell Elctrns. 214-550-0457
UT W. Valley City, Denver Beta Wintronics 801-966-0378
WI Milwaukee, Taylor Elctrns. 414-241-43321

MEMORY X, INC., 5205 Kearny Villa Way, No. 106, San Diego, CA 92123, Tel: 619-292-1151, FAX: 619-292-0774

MEMTEC CORP., 19-B Keewaydin Dr., Salem, NH 03079, Tel: 603-893-8080, FAX: 603-893-8699; Empl.: 35

MEMTRON®

FAX: 517-652-2659

MEMTRON TECHNOLOGIES, INC., 1400 Weiss St., Frankenmuth, MI 48734, Tel: 517-652-2656, 800-234-7525; FSC No.: 6 V 417; Empl.: 130; *Sls. Mgr.:* Daniel T. Ortner ..... **B•1824**

Local Sales Offices & Reps

AZ	Tucson, Intramerica Technlg.	602-326-8997
CA	San Diego, Intramerica Technlg.	619-451-3383
CA	Saratoga, Edward King & Assocs.	408-867-2111
CO	Longmont, Reliance Sls.	303-443-5660
FL	Maitland, EIR, Inc.	305-660-9600
GA	Lawrenceville, Tek-Rep Mktg., Inc.	404-963-1600
IL	Wheaton, CS Tech. Sls.	312-653-8126
IN	Indianapolis, EMCI, Inc.	317-253-1668
MA	Framingham, Stone Comp. Sls. Corp.	508-875-3266
MN	Oakdale, Complete Sls.	612-731-2923
MO	Saint Charles, Buckman & Assocs.	314-946-6201
NY	Islip, ABS Technlgs., Inc.	516-277-7010
NY	Liverpool, Syronics	315-451-0968
OH	Delaware, Bill Romine Co.	614-363-1600
PA	Southampton, Campbell Assocs.	215-322-6630
TX	Richardson, Zonk & Assocs.	214-238-7651, 214-895-9131
VA	Alexandria, Tech-Reps. Inc.	703-370-2600
WA	Renton, K. R. Jensen Sls.	206-277-2772
Can	Toronto, Ont., Reptech	416-863-9510

MENSOR CORPORATION, 2230 IH-35 South, San Marcos, TX 78666, Tel: 512-396-4200

MEPCO/CENTRALAB CORP., See Philips Components Discrete Products Division

MEP CONTROLS, Rising Sun Rd., Bordentown, NJ 08505, Tel: 609-298-7300, FAX: 609-298-1982; Empl.: 25; *Sls. Mgr.:* Thomas Thorn

MEPCOPAL

FAX: 619-481-1123

MEPCOPAL COMPANY, 11468 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-453-0332; Empl.: 160 ..... **A•2055-2057; B•1737**

Potentiometers (Cermet, Carbon) Industrial & Military

Local Sales Offices & Reps

AL	Huntsville, Over & Over, Inc.	205-837-7105
AZ	Tempe, Philips Comps.	602-820-2225
CA	Anaheim, Philips Comps.	714-441-0385
CA	Harbor City, Refrigeration Comp.	213-325-3420
CA	Mission Hills, Philips Comps.	818-891-6299
CA	San Diego, Philips Comps.	619-453-0332
CA	Santa Clara, Philips Comps.	408-748-1563
CA	Sunnyvale, Philips Comps.	408-746-2066/2808
CO	Englewood, Philips Comps.	303-779-9696
FL	Altamonte Springs, Philips Comps.	407-339-5073
FL	Ft. Lauderdale, Philips Comps.	305-485-0115
GA	Norcross, Over & Over Inc.	404-449-6205
GA	Roswell, Philips Comps.	404-992-0150
IL	Bannockburn, GMR Sls., Inc.	312-295-8440
IL	Des Plaines, Philips Comps.	312-827-4487
IN	Ft. Wayne, Corrao Marsh	219-482-2725
IN	Green Field, Corrao Marsh, Inc.	317-462-4446
IN	Kokomo, Philips Comps.	317-456-1615
IA	Cedar Rapids, Lorenz Sls. Inc.	319-377-4666
KS	Merrian, Lorenz Sls. Inc.	913-384-6556
KS	Wichita, Lorenz Sls., Inc.	316-721-0500
MD	Columbia, Delta III Assocs.	301-730-4700
MA	Woburn, Philips Comps.	617-932-4748
MI	Farmington Hills, Philips Comps.	313-553-6000
MN	Minneapolis, Elec. Comps. Sls., Inc.	612-933-2594
MO	St. Louis, Lorenz Sls. Inc.	314-997-4558
NE	Lincoln, Lorenz Sls. Inc.	402-475-4660
NJ	Englewood, Ed Glass Assoc.	201-592-0200
NY	E. Rochester, Empire Tech. Assocs.	716-381-8500
NY	Endwell, Empire Tech. Assoc., Inc.	914-336-6575
NY	Skaneateles, Empire Tech. Assocs.	315-685-5703
NC	Charlotte, Over & Over Inc.	704-542-9111
NC	Raleigh, Over & Over, Inc.	919-876-7338
NC	Raleigh, Philips Comps.	919-782-3334
OH	Dayton, Philips Comps.	513-436-0066
OH	Wickliffe, Philips Comps.	216-731-7721
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
NJ	Englewood Cliff, Ed Glass Assocs.	201-592-0200
PA	Willow Grove, Philips Comps.	215-659-6096
TX	Austin, Philips Comps.	512-331-8828
TX	Houston, Philips Comps.	713-987-0034
TX	Richardson, Philips Comps.	214-231-8274
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
WA	Spokane, Eclipse Mktg. Grp.	509-922-3972
WI	Milwaukee, Philips Comps.	414-228-7632
PR	Caparra Hgts., M. Anderson Co., Inc.	809-793-6544
Can	Scarborough, Ont., Philips Comps.	416-292-5161

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AZ	Scottsdale, Spirit Elctrns.	602-988-1533
CA	Sunnyvale, Hamilton/Avnet	408-743-3355
CO	Englewood, Shelley-Ragon	303-762-0670
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Orlando, TTI, Inc.	407-859-1000
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
IL	Chicago, Nep Elctrns.	312-595-8500
IN	Indianapolis, Marshall Inds.	317-297-0483
MD	Columbia, TTI, Inc.	301-995-1331
MA	Wilmington, Marshall Inds.	508-658-0830
MI	Livonia, Marshall Inds.	313-525-5850
MN	St. Paul, Shelley-Ragon	612-642-2828
NE	Omaha, Scott Elctrns.	402-734-6750
NJ	Mt. Laurel, TTI, Inc.	609-234-6400
NY	Ronkonkoma, TTI, Inc.	516-737-2000
NC	Raleigh, Hall-Mark	919-872-0712
OH	Independence, TTI, Inc.	216-328-9755
OK	Tulsa, Hamilton/Avnet	918-252-7297
OR	Beaverton, Marshall Inds.	503-644-5050
PA	Norristown, Century Elec. Comp.	215-631-5400
TX	Ft. Worth, TTI, Inc.	817-595-3100
WA	Bellevue, Marshall Inds.	206-747-9100
WI	Milwaukee, Marsh Elctrns.	414-475-6000
Can	Scarborough, Ont., Philips Elctrns.	416-292-5161

MERCER ELECTRONICS, Simpson Electric Co., 853 Dundee Ave., Elgin, IL 60120, Tel: 708-697-2260, TELEX: 72-2416, FAX: 708-697-2272; *Sls. Mgr.:* Ron Barrma, Adv. Mgr.; *Dist. Mgr.:* George Oskandy, Sls. Admin. Mgr.

MERCOTAC INC., 6195 Corte del Cedro E, Carlsbad, CA 92009, Tel: 619-431-7723, FAX: 619-431-0905; Empl.: 19; *Sls. Mgr.:* Bruce Enigenburg; *Dist. Mgr.:* Bruce Enigenburg ..... **B•1295**

MERCURY COMPUTER SYSTEMS, 600 Suffolk St., Lowell, MA 01854, Tel: 508-458-3100, FAX: 508-458-9580; FSC No.: 04-2741391; Empl.: 120; *Sls. Mgr.:* Graham V. Smith

MERCURY PLASTICS, A UNIT OF ZERO CORP., See Zero Plastics, A Unit of Zero Corp.

MERECO PRODUCTS DIV., Metachem Resins Corp., 1505 Main St., West Warwick, RI 02893, Tel: 401-822-9300, FAX: 401-822-9311; Empl.: 25; *Sls. Mgr.:* John E. Powell, Jr.

FAX: 213-828-7567

MERET OPTICAL COMMUNICATIONS, INC., An Amoco Co., 1800 Stewart St., Santa Monica, CA 90404-4998, Tel: 213-828-7496; FSC No.: 53071; Empl.: 120; *Sls. Mgr.:* Chris Walters ..... **B•1225**

For all states not listed call Meret Mn. Ofc. 213-828-7496

MERIAM INSTRUMENT, Scott Fetzer, 10920 Madison Ave., Cleveland, OH 44102, Tel: 216-281-1100, FAX: 216-281-0228; Empl.: 85; *Sls. Mgr.:* Russ Arslanian; *Dist. Mgr.:* Russ Arslanian

MERIX CHEMICAL CO., 2234 East 75th St., Chicago, IL 60649, Tel: 312-221-8242; Empl.: 15; *Sls. Mgr.:* E. O. Sonneman; *Dist. Mgr.:* E. O. Sonneman

MERRILL, INC., POB 308, 1316 Sumneytown Pike, Gwynedd Valley, PA 19437, Tel: 215-361-1297; FSC No.: 58624; Empl.: 10; *Sls. Mgr.:* J. Fournier

MERRIMAC INDUSTRIES, 41 Fairfield Pl., West Caldwell, NJ 07006, Tel: 201-575-1300, FAX: 201-575-0531; FSC No.: 12457; Empl.: 150; *Sls. Mgr.:* Tom Cox

J. R. MERRITT CONTROLS, INC., 320 Martin Luther King Dr., Norwalk, CT 06854, Tel: 203-855-9100, 800-333-5762, FAX: 203-855-1038; *Sls. Mgr.:* Earl Atkins ..... **D•1139**

Local Sales Offices & Reps

CA	Laguna Niguel, Simon & Co.	714-495-4583
CA	San Rafael, Bender Sys.	415-472-7033
FL	Lakeland, V-V Assocs., Inc.	813-858-3200
IL	Crestwood, Brisky Assocs., Inc.	708-385-5100
MI	Royal Oaks, J.H. Green Co.	313-543-1200
NY	Jamestown, William R. Arnold, Inc.	716-664-5402
OH	Solon, Black & Coulton, Inc.	216-349-1188
PA	Westchester, Lenape Inds.	215-696-7664
WA	Renton, SAS Fluid Power, Inc.	206-271-5363
Can	Mississauga, Ont., Patlon Inds., Inc.	416-624-5572

MESA POWER SYSTEMS, 2350 Meyers Ave., Escondido, CA 92029, Tel: 619-489-8162, FAX: 619-489-5718; FSC No.: 46937; Empl.: 20; *Sls. Mgr.:* Bob Posten

MESA TECHNOLOGY CORP., 9720 Patuxent Woods Drive, Columbia, MD 21046, Tel: 800-888-0567, FAX: 301-290-9171; Empl.: 106; *Sls. Mgr.:* Howard Parker

MES INDUSTRIES CO., LTD., Fl. No. 93 Lo-Li Rd., Taipei, Tel: 886-2-7363309, TELEX: 20801 MESICO, FAX: 886-2-7364109; Empl.: 25

MESUR-MATIC ELCTRNS., 10 Colonial Rd., Ste. 6, Salem, MA 01970-2294, Tel: 508-745-7000; Empl.: 18; *Sls. Mgr.:* Kosma L. Evangelidis

METALINK CORPORATION, P.O. Box 1329, Chandler, AZ 85244, Tel: 602-926-0797, TELEX: 4998050, FAX: 602-926-1198

METCAL, INC., 1530 O'Brien Dr., Menlo Park, CA 94025, Tel: 415-325-3291, FAX: 415-325-5932; Empl.: 86; *Sls. Mgr.:* Dan Frailey; *Dist. Mgr.:* Dan Frailey

METHODE ELECTRONICS, INC., 7444 W. Wilson Ave., Chicago, IL 60656, Tel: 708-867-9600, FAX: 708-867-9130; Empl.: 2000; *Sls. Mgr.:* S. Landeene; *Dist. Mgr.:* Randi Close

METHODE ELECTRONICS, INC., Interconnect Prods Div, 1700 Hicks Rd, Rolling Meadows, IL 60008, Tel: 708-392-3500, FAX: 708-392-9404; FSC No.: 95354; Empl.: 250; *Sls. Mgr.:* Suzi Landeene; *Dist. Mgr.:* Kathy Lindsey

METRA INSTRUMENTS, INC., 1874 Lundy Ave., San Jose, CA 95131, Tel: 408-432-1110, TELEX: 296698; Empl.: 30

METRAPLEX CORP., 5305 Spectrum Dr., Frederick, MD 21701, Tel: 301-662-8000, TELEX: 697-4248 MPX CORP, FAX: 301-695-8099; Empl.: 105

METRICOR, INC., 18800 - 142nd Ave. NE, Woodinville, WA 98072, Tel: 206-483-5577, FAX: 206-485-2592; Empl.: 50; *Sls. Mgr.:* David W. Cable

METRIC SYSTEMS, 645 Anchors St., Ft. Walton Beach, FL 32548-9990, Tel: 904-244-9600, TELEX: 70-2447; FSC No.: 12339; Empl.: 700

METRIX INSTRUMENT CO., 1711 Townhurst, Houston, TX 77043, Tel: 713-461-2131, TELEX: 77-5486, FAX: 713-461-8223; Empl.: 50; *Sls. Mgr.:* W. B. Brown

METRO CIRCUITS, PJC Technologies, Inc., 205 LaGrange Ave., Rochester, NY 14613, Tel: 716-254-2980, TELEX: 716-254-2980; Empl.: 36; *Sls. Mgr.:* Darlene Gargan

METROLAB INSTRUMENTS SA, 110,Chemin du Pont-du-Centenaire, Geneva, Switzerland CH-1228, Tel: (41-22)794 11 21, TELEX: 41-22-794 11 20

METRON OPTICS INC., P.O. Box 690, Solana Beach, CA 92075-0690, Tel: 619-755-4477, FAX: 619-755-4752; Empl.: 22

METROPOLE PRODUCTS INC., P. O. Box 309, Stafford, VA 22554, Tel: 703-659-2132, FAX: 703-659-2133; FSC No.: 55908; *Sls. Mgr.:* John DePaola

METROSONICS, INC., Box 23075, Rochester, NY 14692-3075, Tel: 716-334-7300, TELEX: 853348, FAX: 716-334-2635; FSC No.: 55381; Empl.: 80; *Sls. Mgr.:* R. Branch; *Dist. Mgr.:* S. Macioulis

METRUM INFORMATION STORAGE, P.O. Box 5227, Denver, CO 80217-5227, Tel: 303-773-4581, TELEX: 45793 DVR; Empl.: 1000; *Sls. Mgr.:* C. Miller

FAX: 908-679-3222

METUCHEN CAPACITORS, INC., 139 White Oak Ln., P.O. Box 499, Old Bridge, NJ 08857, Tel: 908-679-3366, TWX: 710-998-0892; FSC No.: 55969; Empl.: 25; *Sls. Mgr.:* George Wolter ..... **A•1098-1106, 1685-1687; C•1468-1471**

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Prods.	205-880-1156
MD	Rockville, C.E. Tech. Elctrns.	301-666-0315
MD	Rockville, Metuchen Capacitors	301-590-0094
MA	Lowell, Underwood Sls.	617-256-8191
MO	Grandview, R. R. Burton Assocs.	816-763-5385
NJ	Brielle, EMC Technlgsts.	908-223-6699
PA	Saegertown, Multi-Phase Comps.	814-763-3640
TX	Dallas, Blackburn Assocs.	214-750-8484

MEXITRONIX (WOMAN OWNED), 2305 Northern Ave., Suite C , Kingman, AZ 86401, Tel: 602-757-9798, FAX: 602-757-8741; Empl.: 4

MEYER WIRE & CABLE CO., Div. of Cole Hersee Co., 1072 Sherman Avenue, Hamden, CT 06514, Tel: 203-281-0817, FAX: 203-281-9648; Empl.: 45; *Sls. Mgr.:* Spencer G. Molloy, VP Sls.

MEYLAN CORPORATION, 543 Valley Rd., Upper Montclair, NJ 07043-1844, Tel: 201-744-6400, FAX: 201-744-1011; Empl.: 8; *Sls. Mgr.:* Stanley Mills

MFE INSTRUMENTS, Stocker & Yale, Inc., 133 Brimbal Ave., PO Box 490, Beverly, MA 01915-0490, Tel: 508-921-9104, 800-472-4633, ESYLNK: 953145, FAX: 508-921-9110; FSC No.: 6640,6685,6625,6660; *Sls. Mgr.:* Dennis A. Doscher; *Dist. Mgr.:* Dennis Doscher ..... **D•1421**

Local Sales Offices & Reps

MA	Natick, Andruss-Peskin Corp.	508-653-3919
NY	Buffalo, Lynn Assocs., Inc.	716-631-0054
OR	Beaverton, Thorson Co. N.W.	503-644-5900
WA	Bellevue, Thorson Co. N.W.	206-455-9180

MF ELCTRNS. CORP., 10 Commerce Dr., New Rochelle, NY 10801, Tel: 914-576-6570, FAX: 914-576-6570; FSC No.: 08111; Empl.: 100; *Sls. Mgr.:* Paul Huron ..... **A•1388-1393**

Local Sales Offices & Reps

AZ	Scottsdale, Haas & Assocs., Inc.	602-998-7195
CA	Irvine, Balzer-Wolf Assocs.	714-261-6877
CA	San Jose, Mac Tron	408-446-8224
AL	Madison, Benchmark Tech. Sls.	205-464-0033
CT	Southington, Orion Group	203-621-8371
GA	Norcross, Benchmark Tech. Sls.	404-446-1711
MA	Peabody, The Orion Group	508-532-6266
MD	Annapolis, Rynone Assocs.	301-263-0794
MN	Edina, Peterson Sls.	612-835-5281
NY	Smithtown, T & K Sls.	516-724-3456
MN	Minneapolis, Ferrian Sls. & Assocs.	612-721-8915
NC	Raleigh, Benchmark Tech. Sls.	919-850-0633
OR	Beaverton, Core II Mktg.	503-649-0877
OR	Portland, Core II	503-649-0871
PA	Prospect Park, Elf Sls. Co.	215-534-3340
PA	Prospect Park, ELF Sls.	215-534-3340
TX	Austin, Matthews & Assocs.	512-346-2969
TX	Dallas, Matthews & Assocs.	214-248-7881
UT	Salt Lake City, R 2 Mktg. Inc.	801-595-0631
WA	Seattle, Core II Mktg./VMI	206-882-2999

Local Distributors

CA	Burbank, Atwater Elctrns.	818-841-9050
NJ	Bellmawr, Mid Atlantic	609-931-5303
NY	Bohemia, RBD Elec.	516-589-7717
NY	Mt. Vernon, Janesway Elec.	914-699-6710

MFG, Parabarn Div., 1130 Watsoncenter Rd., Carson, CA 90745, Tel: 213-549-5044; Empl.: 85

MFI, 12304 Santa Monica Blvd., Ste. 121, Los Angeles, CA 90025, Tel: 213-826-8133, 800-533-2297, FAX: 213-820-6958 ..... **D•1106**

MFM TECHNOLOGY, INC.
An Affiliate of **UNITRODE** Corporation

FAX: 516-467-5176

MFM TECHNOLOGY, INC., Affiliate of Unitrode Corp., 200 Thirteenth Ave., Ronkonkoma, NY 11779, Tel: 516-467-5151; Empl.: 25 ..... **B•1297**

Local Sales Offices & Reps

AZ	Mesa, Motion Technlgy., Inc.	602-924-0004
MA	Quincy, Lansea Sys.	617-770-1618
IL	Barrington, Design Comps.	312-381-7842
MN	Eden Prairie, M-Tech	612-949-0847
NY	Plainview, Motion Control Sls.	516-756-5656
OH	Broadview Hts., Control Prods. Corp.	216-838-5700
OR	Portland, ControlTek, Inc.	503-641-0876
CA	Alhambra, C. E. Mello Co.	818-282-2000
CA	San Jose, Motion Control-North	408-997-0544

MG ELECTRONICS

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MHOTRONICS., INC., 960 Corporate Woods Pkwy., Vernon Hills, IL 60061, Tel: 708-913-9566, FAX: 708-913-9587; Empl.: 45; *Sls. Mgr.:* David McFadden

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MICREL SEMICONDUCTOR, 560 Oakmead Parkway, Sunnyvale, CA 94086, Tel: 408-245-2500, FAX: 408-245-4175; FSC No.: 60496; Empl.: 135; *Sls. Mgr.:* Mike O'Neal; *Dist. Mgr.:* Mike O'Neal

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MICROBAR SYSTEMS, INC., 785 Lucerne Drive, Sunnyvale, CA 94086, Tel: 408-720-9300, FAX: 408-773-9475; *Sls. Mgr.:* Alexander London

MICROCAP, INC., A MicroSemi Company, 501 South Andreasen Drive, Escondido, CA 92025, Tel: 619-480-1906, FAX: 619-480-6741; Empl.: 65; *Sls. Mgr.:* Ken Miller, Sls. Mgr.

MICROCHIP TECHNOLOGY INC., 2355 W. Chandler Blvd., Chandler, AZ 85224, Tel: 602-963-7373, FAX: 602-345-3390; Empl.: 1500; *Sls. Mgr.:* Lanny Flessas; *Dist. Mgr.:* Lanny Flessas

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MICRO-CIRCUITS CO., INC., 10800 Maudlin Rd., New Buffalo, MI 49117, Tel: 616-469-2744, FAX: 616-469-2742 ..... **C•1145**

MICROCOMPATIBLES INC., 301 Prelude Drive, Silver Springs, MD 20901, Tel: 301-593-0683, FAX: 301-593-5151; Empl.: 4; *Sls. Mgr.:* Linda Esterling

MICRO CRYSTAL/DIVISION SMH, 702 West Algonquin Rd., Arlington Heights, IL 60005, Tel: 708-806-1485, FAX: 708-593-5062; *Sls. Mgr.:* William Kaczmarski; *Dist. Mgr.:* William Kaczmarski ..... **A•1395-1398**

Local Sales Offices & Reps

AZ	Scottsdale, E D P & Assoc.	602-991-6119
FL	Pompano Bch., H H P Assocs.	407-740-0320
GA	Tucker, Mackey Smith & Assoc.	404-496-9913
IL	Arlington Heights, Greenslade Sls.	708-593-3450
NH	Nashua, Bell Controls	603-882-6984
OH	Mt. Orab, Benjenn Engrg.	513-444-3175
PA	Glenside, Koebert Assocs.	215-887-2310

MICRO DATA SYSTEMS, P.O. Box 3278, Thomasville, GA 31799, Tel: 912-226-1709, TELEX: 6503406939 MCI CW; Empl.: 5; *Sls. Mgr.:* Sid Davis; *Dist. Mgr.:* Sid Davis

MICRODIMENSIONS, INC., 7345 Production Dr., Mentor, OH 44060, Tel: 216-974-8070, FAX: 216-974-1648; Empl.: 40

MICRODOT, INTERCONNECT SYSTEMS DIVISION, 201 Progress Dr., Montgomeryville, PA 18936, Tel: 215-699-5373, FAX: 215-699-5536; FSC No.: 91886; *Sls. Mgr.:* K. A. Neumuller

MICRODRY, INC., 7450 Hwy. 329, Crestwood, Kentucky 40014, Tel: 502-241-8933, FAX: 502-241-8648; Empl.: 16; *Sls. Mgr.:* John Wiedersatz

MICRO ELECTRONIC SYSTEMS, INC., 119 Northrup St., Bridgewater, CT 06752, Tel: 203-350-5004, FAX: 203-350-6966; Empl.: 4; *Sls. Mgr.:* Janine Green, V.P. Sls.

MICRO ELECTRONIC TECHNOLOGIES, 35 South St., Hopkinoon, MA 01748, Tel: 508-435-9057, FAX: 508-435-6481; Empl.: 53; *Sls. Mgr.:* Mike Levangie

MICRO-ETCH PRODUCTS, INC., 94 Dodge Ave., P.O. Box 9712, Stratford, CT 06497, Tel: 203-378-8610, FAX: 203-375-6276; FSC No.: 24846; Empl.: 42; *Sls. Mgr.:* Frank Dichiara; *Dist. Mgr.:* Frank Dichiara

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MICRO INDUSTRIES, 691 Greencrest Drive, Westerville, OH 43081, Tel: 614-895-0404, ESYLNK: 759200, FAX: 614-882-6357

MICRO INSTRUMENT COMPANY, 2250 Micro Pl., Escondido, CA 92029, Tel: 619-746-2010, TELEX: 882205 MICROINST ESCD, FAX: 619-746-0433; FSC No.: FSCM 24836; Empl.: 40; *Sls. Mgr.:* C.Marks(East), C. Haas(West)

MICROLAB/FXR, 10 Microlab Rd., Livingston, NJ 07039, Tel: 201-992-7700, FAX: 201-992-0513; FSC No.: 00929; Empl.: 40

MICRO LAMPS, INC., 1530 Hubbard Ave., Batavia, IL 60510-1420, Tel: 708-879-0900; Empl.: 12; *Sls. Mgr.:* Edward R. Beutler

MICROMATH, INC., 2469 E. Fort Union Blvd., Salt Lake City, UT 84121, Tel: 801-943-0290, FAX: 801-943-0299; Empl.: 8

MICROMETALS, 1190 N. Hawk, Anaheim, CA 92807, Tel: 714-630-7420, 800-356-5977, FAX: 714-630-4562; FSC No.: 12856; Empl.: 80; *Sls. Mgr.:* Walt Lewis

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MICRO-MOUNTING DEVICES, 4092 Keith Dr., Campbell, CA 95008, Tel: 408-866-4626; FSC No.: 59058

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FAX: 619-727-4436

MICRONEL U.S., 2142F Industrial Ct., Vista, CA 92083, Tel: 619-727-7400; FSC No.: 61655; Empl.: 10; *Sls. Mgr.:* N. Linko ..... **C•1600, 1646-1649**

MICRO NETWORKS, Unitrode Corporation, 324 Clark St., Worcester, MA 01606, Tel: 508-852-5400, FAX: 508-853-8296; Empl.: 200; *Sls. Mgr.:* Skip Osgood

MICRONICS TECHNOLOGY INC., 7 Alexander Place, Glen Cove, NY 11542, Tel: 516-759-5600, FAX: 516-759-5603; *Sls. Mgr.:* Robert Herrmann, V.P. Oper. ... **A•1399**

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CA	Palo Alto, Microwave Mktg. Assoc.	415-941-9430
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MD	Laurel, CSDS, Inc.	301-953-7884
NY	Melville, R.F. Elctrn. Sls.	516-420-8890
MA	Wayland, High Tech Sls.	508-653-3838
WA	Iffaquah, Seaport Tech. Sls.	206-391-6714

MICRON INDUSTRIES, 4250 Madison St., Hillside, IL 60162, Tel: 708-547-0900, FAX: 708-547-0998; FSC No.: 30882; Empl.: 115; *Sls. Mgr.:* Michael Kitun; *Dist. Mgr.:* Mike Kitun

MICRO-NOW INSTR. CO., INC., 8260 N. Elmwood St., P. O. Box 1488, Skokie, IL 60076, Tel: 708-677-4700, TELEX: RCA 297214-MICRO-UR, FAX: 708-677-0394; FSC No.: 33288; Empl.: 25; *Sls. Mgr.:* C. Arnow

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AL	Huntsville, W. A. Brown Instr.	205-830-9224
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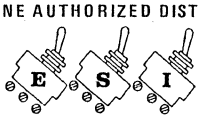

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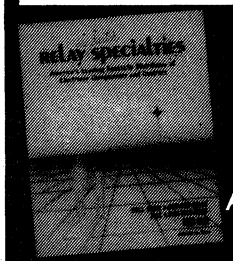

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MICRON TECHNOLOGY, INC., 2805 East Columbia Rd., Boise, ID 83706, Tel: 208-386-3900, FAX: 208-389-4617; Empl.: approx. 3,100; *Sls. Mgr.:* Jim Garrett

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IL	Lake Bluff, R & R Mktg. Assocs.	312-295-6600
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TN	Nashville, Strategic Mktg. Inc.	615-883-7882

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CA	Huntington Bch., Wyle Labs	714-891-8008
CA	San Diego, Neumann Elctrns.	619-695-3005
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Diego, Shelley-Ragon	619-453-7133
CA	San Jose, Rose Elctrns.	408-943-0255
CO	Englewood, Arrow Elctrns.	303-790-4444
MN	Minneapolis, Electronic Ctr.	612-371-5200
NH	Hampstead, Astrum Elctrns.	603-329-5656
NY	New Rochelle, Derf Elctrns.	914-235-4600
NY	Oceanside, Tritech	516-678-6222
PA	McKean, Advacom	814-476-7774
TX	Ft. Worth, Industrial Elect.	817-731-7321
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EXP	Huntingdale, Australia, Stewart Elctrn. Comps. Pty.	790-AA36908

MICROPAC INDS., INC., 905 E. Walnut St., Garland, TX 75040, Tel: 214-272-3571, FAX: 214-494-2281; Empl.: 200; *Sls. Mgr.:* Richard Schlueter

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MICROPHASE, 587 Connecticut Ave., Norwalk, CT 06856, Tel: 203-866-8000, FAX: 203-866-6727; Empl.: 230; *Sls. Mgr.:* F. S. Parin

MICROPLEX, INC., 1977 State College Blvd., Anaheim, CA 92806, Tel: 714-634-1535, FAX: 714-634-8375; Empl.: 30

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MICRO POWER SYS. INC., 3100 Alfred St., Santa Clara, CA 95056, Tel: 408-727-5350, TWX: 910-338-0154; FSC No.: 54186; Empl.: 140; *Sls. Mgr.:* Tom Hardy; *Dist. Mgr.:* Chuck Sweet

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MICROSEMI CORP. COLORADO, Microsemi Corp., 800 Hoyt St., Broomfield, CO 80020, Tel: 303-469-2161, FAX: 303-466-3775; Empl.: 140; *Sls. Mgr.:* Robert H. Werner; *Dist. Mgr.:* George Avila

MICROSEMI CORP. - SCOTTSDALE, Microsemi Corporation, 8700 E. Thomas Rd., P.O. Box 1390, Scottsdale, AZ 85252, Tel: 602-941-6300, TELEX: 4995412 MICROAZ, FAX: 602-947-1503; FSC No.: 860434040; Empl.: 300; *Sls. Mgr.:* Dean Foster (acting); *Dist. Mgr.:* George Avila

MICROSIGNALS INC., 38-42 9th St., L.I.C., NY 11101, Tel: 718-937-7955, 718-937-0391, 800-648-2252, FAX: 718-729-9140; Empl.: 40; *Sls. Mgr.:* Mr. Greg Villafana

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MICROTECH, 1420 Conchester Hwy., Boothwyn, PA 19061, Tel: 215-459-3566, FAX: 215-358-4827; Empl.: 22; *Sls. Mgr.:* H. Carter

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MICROTEC RESEARCH, INC., 2350 Mission College Blvd., Santa Clara, CA 95054, Tel: 408-980-1300, FAX: 408-982-8266; Empl.: 100; *Sls. Mgr.:* Derek Taylor; *Dist. Mgr.:* Derek Taylor

MICROTEK INTERNATIONAL/DEV. SYS. DIV., 3300 N.W. 211th Terrace, Hillsboro, OR 97124, Tel: 503-645-7333, FAX: 503-629-8460; Empl.: 120; *Sls. Mgr.:* Chris Bednarek

MICROTOUCH SYSTEMS, INC., 55 Jonspin Rd, Wilmington, MA 01887, Tel: 508-694-9900, TELEX: 530264, FAX: 508-694-9980; FSC No.: 935-0133; Empl.: 100; *Sls. Mgr.:* William Keller

FAX: 516-561-1117

MICROTRAN CO. INC., 145 E. Mineola Ave., P. O. Box 236, Valley Stream, NY 11582, Tel: 516-561-6050; FSC No.: 00348; Empl.: 75; *Sls. Mgr.:* W. Benscher ..... **A•1212, 2130, 2278-2298**

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FL	Pompano Beach, Peerless Radio Corp.	800-327-4993
IL	Northbrook, Classic Comp. Supp.	708-272-9650
IN	Indianapolis, Bell Inds.	317-875-8200
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
MA	Hingham, Sager Elec. Supp.	617-749-6700
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NJ	Kenilworth, Federated Elctrns.	201-272-0505
NM	Albuquerque, Walker Elctrn. Supp.	505-883-2992
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Hauppauge, Sager Elctrns.	516-348-1300
NY	Johnson City, Help Elctrns.	607-729-3528
NY	Lynbrook, Peerless Radio	516-593-2121
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NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Dayton, J.A. Becker Co.	513-226-1341
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MICROVISION CORP., 591 W. Hamilton Ave. Ste. 250, Campbell, CA 95008, Tel: 408-374-3158, FAX: 408-374-9394; Empl.: 15; *Sls. Mgr.:* Les Peterson

MICROWAVE APPLICATIONS GROUP, 3030 Industrial Pkwy., Santa Maria, CA 93455, Tel: 805-928-5711, TWX: 910-351-5808, FAX: 805-925-5903; FSC No.: 26357; Empl.: 63; *Sls. Mgr.:* D. W. Prigge

MICROWAVE DESIGN SVCS., INC., 437-H Mary Esther Cutoff, Ft. Walton Beach, FL 32548, Tel: 904-664-1234, FAX: 904-664-6789

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MICROWAVE FILTER COMPANY, INC.

FAX: 315-463-1467

MICROWAVE FILTER INC., 6743 Kinne St., East Syracuse, NY 13057-0486, Tel: 315-437-3953, 800-448-1666, TELEX: 249-613; FSC No.: 27834; Empl.: 95; *Sls. Mgr.:* E. Bostick, Sls. & Mktg. ..... **A•1688-1695**

Local Sales Offices & Reps

MD	Laurel, CSDS, Inc.	301-490-3800
CA	Mtn. View, Pennisula Tech. Sls.	415-968-3636

Local Distributors

AZ	Mesa, Antenna Techlg. Corp.	602-898-7667
CA	Campbell, Signal Sources	408-866-0600
CA	Torrance, Western CATV	213-539-8030
CO	Englewood, Midwest CATV	303-799-4343
FL	Boca Raton, Passive Dvcs., Inc.	407-998-0600
FL	Miami, Gendra Intl.	305-372-8845
FL	Ocala, Broadcasters Gen. Store	904-622-9058
FL	Panama City, Bay Elctrns. Supp.	904-785-7258
GA	Lawrenceville, John Weeks Entprs.	404-963-7870
IL	Skokie, Anixter Bros.	708-677-2600
IN	Richmond, Allied Broadcast Equip.	317-962-8596
KY	Highland Heights, Midwest Comms. Corp.	606-781-2200
LA	Mamou, Satellite Earth Stas.	318-468-2203
MS	Raymond, Broadcast Equip. Engrg. Sls.	601-857-8578
NE	Dakota City, ATV Research, Inc.	402-987-3771
NE	Omaha, Radio Equip. Co.	404-341-7700
NH	Bow, Earth Terminal, Inc.	603-224-5166
NJ	Union, Avanti Elctrns.	201-964-0333
NC	Pineville, S.C.M.S., Inc.	704-889-4508
PA	Horsham, Toner Cable	215-675-2053
PA	Hummelstown, Winemiller Comms.	717-566-9591
PA	Willow Grove, NCS Inds.	215-657-4690
TX	Bedford, Spectrum Megahertz	817-267-2288
UT	Salt Lake City, RIA Corp.	801-486-8822
VA	Charlottesville, Hall Elctrncs.	804-974-6466
WA	Edmonds, Glade Comms.	206-771-6891
WI	Plymouth, Hi-Tech.	414-892-6210
Can	Burnaby, B.C., Channel One Video Corp.	604-421-2288
Can	Calgary, Alberta, AVR Comms. Ltd.	403-251-0707
Can	Lavel, Que., Incospec Elctrns.	514-686-0033
Can	Markham, Ont., Cabletel Comms.	416-475-1030
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Montreal, Que., Comega Technlgs.	514-355-3105
Can	St. Leonard, Que., Trispec Comms.	514-328-2025

MICROWAVE SOLUTIONS, INC., 3200 Highland Ave., Ste 3A, National City, CA 91950, Tel: 619-474-6906, FAX: 619-474-7003; FSC No.: 65151; Empl.: 12; *Sls. Mgr.:* Edward M. Teyssier

MICROWAY INC. RESEARCH PARK, Research Park, P.O. Box 79, Kingston, MA 02364, Tel: 508-746-7341, FAX: 508-746-4678; Empl.: 49; *Sls. Mgr.:* Donald Greenbaum; *Dist. Mgr.:* Maryann Strassel

MIDAMERICA DESIGN SERVICE, Spirit of America Corp., 10206 Lima Rd., Fort Wayne, IN 46818, Tel: 219-489-2511, FAX: 219-489-2295; Empl.: 350

MIDCOM, INC., 121 Airport Dr., Watertown, SD 57201, Tel: 605-886-4385, FAX: 605-886-4486; FSC No.: 0GP22; Empl.: 300; *Sls. Mgr.:* Dean Ward ..... **A•2300-2305**

Local Sales Offices & Reps

AL	Huntsville, Twentieth Century Mktg.	205-772-9999
CA	Long Beach, Solutech	213-596-5208
CA	San Diego, Pro Sls.	619-571-1133
CA	San Jose, Veer Mktg.	408-432-1818
FL	Orlando, Richmar Elctrns. Corp.	407-352-3755
GA	Norcross, Twentieth Century Mktg.	404-446-1999
IL	Downers Grove, Richmar Elctrns. Corp.	312-968-0118
IN	Indianapolis, Richmar Elctrns. Corp.	317-577-9950
IA	Iowa City, Richmar Elctrns. Corp.	319-354-8894
MD	Hunt Valley, Eagle Sls. Corp.	301-666-3030
MN	N. Mankato, E.I. Sls.	507-345-5786
NH	Nashua, Bell Controls	603-882-6984
NJ	Medford, Champion Elctrn. Sls. Co.	609-983-0932
NC	Cary, Twentieth Century Mktg.	919-481-3370
TX	Plano, Richmar Elctrns. Corp.	214-424-8388
TX	Round Rock, Richmar Elctrns. Corp.	512-255-2551
WI	Butler, Richmar Elctrns. Corp.	414-781-1730
Can	Gloucester, Ont., True North Technlg. Ltd.	613-837-2553
Can	Rexdale, Ont., True North Technlg. Ltd.	416-744-2233

MIDDLEBERG CORPORATION/MIDDCO CONNECTORS, 95 Albany Turnpike, Canton, CT 06019, Tel: 203-693-8361, FAX: 203-693-6403; Empl.: 20; *Sls. Mgr.:* Marty Townsend

MID-EASTERN INDUSTRIES, Technology Dynamics Inc., 100 School Street, Bergenfield, NJ 07621-2915, Tel: 201-385-0500, FAX: 201-385-0702; FSC No.: 06179; Empl.: 15; *Sls. Mgr.:* Daniel Ellenback ..... **D•1896-1899**

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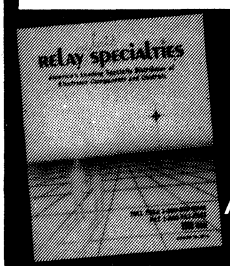
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Local Sales Offices & Reps

CA	Los Angeles, Dyna Sls.	213-806-1400
FL	Land O' Lakes, AJ'S Power Source Inc.	813-996-2583
IL	Des Plains, Marsland Assocs., Inc.	312-298-2620
IN	Indianapolis, Marsland Assocs., Inc.	317-293-5437
IA	Marion, Marsland Assocs., Inc.	319-373-0566
MN	Minneapolis, Marsland Assocs., Inc.	612-545-4481
MO	St. Louis, Marsland Assocs., Inc.	314-991-1399
NM	Albuquerque, Westahl Assocs.	505-881-0995
NY	Huntington, C.R. Mayer Co.	516-692-4221
WA	Seattle, Eicher-Richards Co.	206-LA3-7888
WI	New Berlin, Marsland	414-786-6611

MIDGET LOUVER, 800 Main Ave., Norwalk, CT 06851, Tel: 203-866-2342; Empl.: 10; *Sls. Mgr.:* Helen Monroe; *Dist. Mgr.:* Helen Monroe

MIDLAND-ROSS CORP., NEL UNIT, See NEL Frequency Controls, Inc.

Midtex Relays, Inc.

FAX: 915-772-1116

MIDTEX RELAYS, INC., 9B2 Butterfield Trail, El Paso, TX 79906, Tel: 915-772-1061, 1-800-MIDTEX1, TWX: 910-240-3407, ESYLNK: 62752541; Empl.: 275; *Sls. Mgr.:* Craig Law; *Dist. Mgr.:* Bob Walasiak ..... **B•1546-1549**

Local Sales Offices & Reps

AL	Huntsville, Twentieth Century Mktg.	205-772-9999
AZ	Phoenix, More Sls.	602-788-9181
CA	Los Altos, J.W. Wilholt	415-961-3660
CA	Tustin, Schoenbachler-Dobson	714-544-1888
CO	Longmont, Reliance Sls.	303-443-5660
FL	Orlando, Richmar Elctrns.	407-352-3755
GA	Norcross, Twentieth Century Mktg.	404-446-1999
IL	Downers Grove, Richmar Elctrns.	708-968-0118
IN	Indianapolis, Richmar Elctrns.	317-577-9950
IA	Iowa City, Richmar Elctrns.	319-354-8894
KS	Overland Park, M.I.N.K. Assocs.	913-341-3309
KS	Wichita, M.I.N.K. Assocs., Inc	316-838-0190

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MN	Minneapolis, Holmgren Assoc.	612-574-9983
MO	Bridgeton, M.I.N.K. Sls.	314-291-5454
NH	Nashua, Bell Controls	603-882-6984
NJ	Medford, Champion Elctrns.	609-983-0932
NM	Albuquerque, More Sls.	505-265-6265
NY	Rochester, Lamb Comps.	716-328-6350
NC	Raleigh, Twentieth Century Mktg.	919-790-9383
OH	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
OK	Tulsa, D.J. Sls.	918-663-8155
OR	Portland, Caruso Assocs.	503-246-5439
TX	Austin, D.J. Sls.	512-258-3002
TX	Dallas, DJ Sls.	214-783-8876
WA	Bellevue, Caruso Inc.	206-455-8811
Can	Ontario, Haltronics Ltd.	416-844-2121

Local Distributors

AL	Huntsville, Hall-Mark	205-837-8700
AZ	Phoenix, Hall-Mark	602-437-1200
AZ	Tempe, Control Design Supp.	602-829-7981
AR	Little Rock, Newark Elctrns.	501-225-8130
CA	Anaheim, Control Design Supp.	714-821-1516
CA	Bay Area, Hall-Mark	408-432-0900
CA	Irvine, Integrated Elctrns.	714-837-9960
CA	Orange County, Hall-Mark	714-669-4100
CA	San Carlos, Control Design Supp.	415-592-4806
CO	Santa Monica, Master Dists.	213-452-1229
CO	Denver, Integrated Elctrns.	303-292-5537
CT	Wallingford, Mid State Elctrns.	203-265-9900
FL	Altamonte Springs, Control Design	305-788-3220
FL	Ft. Lauderdale, Hall-Mark	305-971-9280
GA	Stone Mtn., Control Design	404-979-3500
IL	Chicago, Hall-Mark	312-860-3800
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Schaumburg, Control Design	312-307-8900
IN	Indianapolis, Control Design	317-788-4559
IA	Cedar Rapids, Dee Elctrns.	319-365-7551
KS	Kansas City, Control Design	913-362-4248
KY	Louisville, Newark	502-423-0280
LA	Shreveport, Indl. Elec. Supp.	318-222-9459
MD	Columbia, Hall-Mark	301-988-9800
MA	Boston, Hall-Mark	617-667-0902
MA	Newton, Green-Shaw Inc.	617-969-8900
MA	Woburn, Control Design Supp.	617-932-9404
MI	Oak Pk., Newark	313-967-0600
MI	St. Clair Shores, Spemco	313-771-2700
MN	Minneapolis, Control Design	612-721-1628
MN	Minneapolis, Hall-Mark	612-941-2600
MS	Jackson, Newark	601-956-3834
MO	St. Louis, Control Design Supp.	314-426-3150
NE	Omaha, Newark	402-392-1221
NV	Las Vegas, Newark	702-796-5090
NH	Nashua, Newark	603-888-5790
NY	Buffalo, Genesse Indl.	716-873-9661
NY	Long Island, Hall-Mark	516-737-0600
NJ	Oakland, Relay Specialties	201-337-1000
NJ	Paterson, Feldman Bros.	201-742-7329
NY	Rochester, Masline	716-546-5373
NY	Woodside, Switches Unltd.	718-478-5000
NC	Charlotte, Control Design	704-588-4410
NC	Raleigh, Hall-Mark	919-872-0712
OH	Cinicinnati, Schuster Elec.	513-489-1400
OH	Cleveland, CAM RPC Elctrns.	216-461-4700
OK	Tulsa, Hall-Mark	918-251-1108
OR	Portland, Integrated Elctrns.	503-641-1690
PA	Malvern, Control Design Supp.	215-296-0150
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Hall-Mark	609-235-1900
PA	Pittsburg, CMD	412-678-6020
SC	Greenville, Newark	803-288-9610
TN	Memphis, Newark	901-365-8060
TX	Dallas, Control Design Supp.	214-358-1441
TX	Dallas, Force-Heiland	214-247-9955
TX	Dallas, Hall-Mark	214-553-4300
TX	El Paso, Midtex (Export)	915-772-1061
TX	Houston, Hall-Mark	713-781-6100
UT	Salt LAke City, Hall-Mark	801-972-1008
VA	Falls Church, Newark	703-522-0880
WA	Bellevue, Integrated Elctrns.	206-455-2727
WV	Dunbar, Newark	304-768-6872
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WY	Gillette, Gifford	307-682-7203
Can	Richmond Hill, Ont., Selbar Elctrns. Ltd.	416-736-0271
Can	Scarborough, Ont., Carsten Elctrns.	416-495-7705

MIDWEC, See Industrial Midwec Capacitors

MIDWEST COMPONENTS,INC., See Therm-O-Disc, Div. Midwest Component Product Group

MIDWEST MICROWAVE, 6564 South State Rd., Saline, MI 48176-9569, Tel: 313-429-4773, 800-521-4410, FAX: 313-429-1415; FSC No.: 34078; Empl.: 180; *Sls. Mgr.:* Doug Hartje, Dir. Sls. & Mktg.

MIKRON INSTR., 445 W. Main St, Wyckoff, NJ 07481, Tel: 201-891-7330, TELEX: 361870, FAX: 201-891-1205; Empl.: 60; *Sls. Mgr.:* John Merchant

MIL-COMM DISTRIBUTORS, INC., 9400 Lurline Ave. 6C, Chatsworth, CA 91311, Tel: 818-998-3111

MIL ELECTRONICS, INC., 106 Perimeter Rd., Nashua, NH 03036, Tel: 603-882-3200, FAX: 603-881-8661; FSC No.: 07862; Empl.: 40

MILES PLATTS INC., 901 Touhy Ave., Elk Grove Village, IL 60007, Tel: 1-708-364-0363, FAX: 708-364-0614; Empl.: 7; *Sls. Mgr.:* J. L. Packwood

MILFORD RIVET & MACH., 857 Bridgeport Ave., Milford, CT 06460, Tel: 203-878-4631, TELEX: 964363, TWX: 710-462-0538, FAX: 203-878-5071; Empl.: 200

JAMES MILLEN ELCTRNS., Caywood Elec. Inc., 87 Belmont St., No. Andover, MA 01845, Tel: 508-475-7831, FAX: 508-474-8949; Empl.: 6; *Sls. Mgr.:* R. Jannini

MILLER DIAL CORP., 4400 N. Temple City Blvd., El Monte, CA 91731, Tel: 818-444-4555, TWX: 910-587-3438, FAX: 818-443-3267; FSC No.: 91345; Empl.: 200; *Sls. Mgr.:* P. J. Wener, V.P. Membrane

MILLER, J.W., CO., See Bell Inds.

MILLER, L.C., CO., 717 Monterey Pass Rd., Monterey Pk., CA 91754, Tel: 213-268-3611, FAX: 213-264-3203; Empl.: 45

MILLER, SANFORD, CORP., See Sanford-Miller Corp.

MILLER, W. A., CO., Mingo Loop, P.O. Box 337, Oquossoc, ME 04964-0337, Tel: 207-864-3344, 800-227-1415, FAX: 207-864-3344; Empl.: 15

MILLER-STEPHENSON CHEM. CO., INC., George Washington Hwy., Danbury, CT 06810-0950, Tel: 203-743-4447, TELEX: 643-711; *Sls. Mgr.:* Mrs. Fran Bodnar

MILLIFLECT, 37444 Sycamore St., Bldg. A, Newark, CA 94560, Tel: 415-791-5188, TELEX: 466465, FAX: 415-791-5237; FSC No.: 52426; Empl.: 39; *Sls. Mgr.:* Don Koijane; *Dist. Mgr.:* Alex Nilva

MILLIVAC INSTRUMENTS, INC., Box 997, Curry Rd. Ext., Schenectady, NY 12301, Tel: 518-355-8300, FAX: 518-356-5161; FSC No.: 85711; Empl.: 30; *Sls. Mgr.:* Jan B. Metzger ..... **D•1294**

Local Sales Offices & Reps

CA	San Diego, Advanced Prods. Sls.	619-530-0200
CA	Westlake Vl, Advanced Prods. Sls.	818-706-8351
MD	Laurel, CSDS Inc.	301-490-3800
MA	Needham, Addelco Corp.	617-444-4754
MA	Needham, Addelco, Co.	617-444-4754
GA	Atlanta, Saber Assocs.	800-327-0853
NY	Fayetteville, Martin P. Andrews	315-637-5291
AL	Huntsville, Saber Assocs.	800-327-0853
FL	Ft. Lauderdale, Saber Assocs.	800-327-0853
TX	Houston, Scientific Sls.	713-645-6218
TX	Richardson, Sci. Sls.	214-231-6541
VA	Fairfax, CSDS Inc.	703-385-0139
Can	Downsview, Ont., Tradeport Elctrns. Grp.	416-736-0866

MILL-MAX MANUFACTURING CORP., P.O. Box 300, Oyster Bay, NY 11771-0300, Tel: 516-922-6000, FAX: 516-922-9253; FSC No.: 3N087; Empl.: 200; *Sls. Mgr.:* Richard M. Weiner ..... **C•1473**

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Mfr's Agt.	800-633-2920
AR	Mabelvale, Erickson Sls., Inc.	501-455-0618
CA	Campbell, Patrick Conahan Assocs.	408-559-2866
CA	Dana Point, Patrick Conahan Assocs.	714-493-9822
CO	Westminister, Straube Assocs., Inc.	303-426-0890
AZ	Scottsdale, B. Breedlove	602-483-1943
FL	Boca Raton, Tech Sls. Specialists	407-391-3718
GA	Roswell, Elctrn. Mfr's Agt.	800-633-2920
IL	Elk Grove Village, Tristar Grp., Inc.	708-593-0200
IN	Indianapolis, M & L Elctrn. Sls., Inc.	317-359-4742
LA	Chalmette, Erickson Sls., Inc.	504-271-1976
MA	Scituate, Olsen Tech. Sls.	617-545-5101
MN	St. Paul, Johnson Co.	612-641-1878
NH	Nashua, Olsen Tech. Sls.	603-883-2760
NY	Bohemia, JSA Sls.	516-244-2584
NC	Raleigh, Elctrn. Mfr's Agt.	919-846-6888
OH	Kettering, Catalyst Sls. Co.	513-429-6958
OR	Milwaukie, Comtec	503-654-6626
PA	Doylestown, G. A. Recentio Assocs.	215-348-7577
PA	Pittsburgh, Catalyst Sls. Co.	412-826-3434
TX	Dallas, Erickson Sls., Inc.	214-739-5833
UT	Salt Lake City, Hendrickson Sls.	801-467-1445
WA	Bellevue, Comtec	206-453-1188
WI	Menomonee Falls, Tristar Grp., Inc.	414-628-3583
Can	Gloucester, Ont., True North Technlg., Ltd.	613-837-2553
Can	Rexdale, Ontario, True North Technlg. Ltd.	416-744-2233

FAX: 213-430-8309

MILLS RESISTOR CO., 3840 Catalina St., Los Alamitos, CA 90720, Tel: 213-598-2454; FSC No.: 34238; Empl.: 50; *Sls. Mgr.:* S. Kistner; *Dist. Mgr.:* C. Brown ..... **A•1949**

Local Sales Offices & Reps

CA	Los Altos, Frauman Assocs.	415-941-0660
CA	Sacramento, Mills Resistor Co.	916-422-5461
CT	Rocky Hill, Jim McPhail	203-721-1802
MA	Waltham, Dynasel Assocs.	617-890-6777
OR	Gaston, SPS Elctrns.	206-323-4140
PA	Montgomeryville, Quick Response Tech. Sls.	215-362-9225
TX	Houston, Ev Smith Co.	713-649-5756
WA	Seattle, SPS Elctrns.	206-323-4140

Local Distributors

FL	Ft. Lauderdale, Jaro Elctrns.	800-327-5551
PA	Harrisburg, ADTECH	717-939-8337
PA	McKean, Advacom	814-476-7774

MILROSS CONTROLS, INC., 511 Second St. Pike, Southampton, PA 18966, Tel: 215-355-0200, TWX: 510-667-1702, FAX: 215-355-6326; FSC No.: 07047; Empl.: 100; *Sls. Mgr.:* Scott R. Tate

MILTOPE BUSINESS PRODUCTS, Miltope Grp., 1770 Walt Whitman Rd., Melville, NY 11747, Tel: 516-420-0200, 516-756-7650, TWX: 510-221-1803, FAX: 516-756-7606; Empl.: 650

MILTOPE CORP., 1770 Walt Whitman Rd., Melville, NY 11747, Tel: 516-420-0200, TWX: 510-221-1803; Empl.: 750; *Sls. Mgr.:* Frederick S. Korb; *Dist. Mgr.:* William Jennings

MILWAUKEE ELECTRONICS, 7817 W. Clinton Ave., Milwaukee, WI 53223, Tel: 414-358-4000, FAX: 414-358-4001; FSC No.: 98664; Empl.: 100-150; *Sls. Mgr.:* James Scholler

FAX: 414-271-9876

MILWAUKEE RESISTOR CORP., 700 W. Virginia St., Milwaukee, WI 53204, Tel: 414-271-9900; FSC No.: 82807;15109; Empl.: 75; *Sls. Mgr.:* John Dorsha; *Dist. Mgr.:* John Dorsha ..... **A•1950-1954**

Local Sales Offices & Reps

CA	San Carlos, Electro Pacific	415-441-5541
IL	Willow Brook, PVA Corp.	708-655-3355
NC	Kernersville, Heritage Elctrl. Sls.	919-996-4484
MA	Stoughton, EECS-Mel Botsian	617-344-5139
SC	Greer, Heritage Elctrl. Sls.	803-292-1723
NY	Rochester, Gislason Sls.	716-328-7400
NY	Whitestone, M. H. Lynn co.	718-352-9233
OH	Westlake, Assocd. Elctrl. Comps.	216-835-9960

MIMIC, INC., P. O. Box 705, Islington, MA 02090-0705, Tel: 617-329-9593; Empl.: 5; *Sls. Mgr.:* S. Thurston

MINC INCORPORATED, 6755 Earl Dr., Colorado Springs, CO 80918, Tel: 719-590-1155, FAX: 719-590-7330; *Sls. Mgr.:* Mark S. A. Smith

MINCO PRODUCTS, 7300 Commerce La., Minneapolis, MN 55432, Tel: 612-571-3121, FAX: 612-571-0927; FSC No.: 09359; Empl.: 475; *Sls. Mgr.:* J. Anderson

MIN-E-CON, 3160 Pullman, Costa Mesa, CA 92626, Tel: 714-434-7312, TWX: 910-595-1144; FSC No.: 54455

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FAX: 203-283-6527

MINELCO INC. - A TALLEY IND., 135 S. Main St., Thomaston, CT 06787-0459, Tel: 203-283-8261; FSC No.: 07479; Empl.: 70; *Sls. Mgr.:* James A. Myles ... **B•1178**

Local Sales Offices & Reps

AL	Huntsville, L & D Inc.	205-837-1469
AZ	Phoenix, R. W. Riedel & Co.	213-283-7694
CA	Anaheim, M.W. Riedel & Co.	213-283-7694
CO	Centerville, West Inc.	303-477-1134
CO	Denver, West Inc.	303-477-8180
CT	Old Saybrook, FJS Assocs.	203-388-5374
FL	Longwood, Delmac	407-831-0040
GA	Atlanta, L & D, Inc.	404-395-7079
IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
KS	Wichita, Magna Eng. Sls. Co.	316-744-0851
MD	North East, Magna Eng. Sls. Co.	301-398-4215
MA	Burlington, F.J.S. Assocs.	617-273-5959
MO	St. Louis, Magna Eng. Sls. Co. Inc.	314-878-4441
MO	St. Louis, Magna Eng. Sls. Co. Inc.	314-849-6590
NJ	Hasbrouck Hgts., Comp-Tech Sls.	201-288-7400
NY	New Hyde Park, Comp-Tech Sls.	516-593-2628
NC	Raleigh, L & D, Inc.	919-876-5301
OH	Dayton, Electro Mktg. Grp.	513-890-8322
OR	Portland, Caruso & Assocs.	503-246-5439
TX	Roanoke, CMR	817-379-6540
WA	Bellevue, Caruso & Co.	206-455-8811
Can	Rexdale, Ont., Myelco, Inc.	416-674-1636

MINGSTON ELECTRONICS, INC., MEC Inc.(Taiwan), 14145 Proctor Ave. Unit 8, City of Industry, CA 91746, Tel: 818-330-2086, FAX: 818-330-9988; Empl.: 3; *Sls. Mgr.:* Johnny Chao

Mini-Circuits

FAX: 718-332-4661

MINI-CIRCUITS LAB., 13 Neptune Avenue, P.O. Box 350166, Brooklyn, NY 11235-0003, Tel: 718-934-4500, TELEX: 125460, 620156 (Int'l); FSC No.: 15542 ..... **A•1752-1819**

Local Sales Offices & Reps

AZ	Scottsdale, Thorson Desert States, Inc.	602-998-2444,FAX:602-998-1236
CA	Los Altos, Cain-White & Co.	415-948-6533, FAX:415-948-0115
CA	Tustin, Youngewirth & Olenick Assocs.	714-838-5144,FAX:714-838-5321
CO	Parker, W. Howard Assocs.	303-841-5755, FAX:303-841-9272
FL	Clearwater, Beacon Microwave & Instrmn., Inc.	813-796-2378,FAX:813-796-0075
FL	Satellite Bch., Beacon Microwave & Instrmn., Inc.	407-777-6303,FAX:407-777-9131
GA	Atlanta, Beacon Microwave & Instrmn., Inc.	404-256-9640,FAX:404-256-1398
GA	Sylvester, Beacon Microwave & Instrmn. Inc.	912-776-4100,FAX:912-776-0831
IL	Mt. Prospect, Cain-Forlaw Co., Inc.	708-253-3578, FAX:708-253-6987
IL	Mundelein, Cain-Forlaw, Inc.	708-540-9962, FAX:708-540-9974
MD	Columbia, M. Lader Co.	800-442-3177, FAX:301-381-6924
MA	Waltham, Scientific Dvcs. New England Inc.	617-890-2252,FAX:617-890-5816
NM	Albuquerque, Thorson Desert States, Inc.	505-883-4343,FAX:505-889-2999
NY	Hartsdale, Spectrum Sls., Inc.	914-472-8600, FAX:914-472-0461
NY	Skaneateles, Robtron, Inc.	315-685-5731, FAX:315-685-3717
NC	Greensboro, M. Lader Co.	800-442-3177, FAX:919-674-7655
NC	Raleigh, Beacon Microwave & Instrmn., Inc.	919-781-8118,FAX:919-781-9058
OH	Worthington, Cain-Forlaw Co. Inc.	614-436-3004, FAX:614-436-3097
OR	Aloha, Cain-Sweet, Co.	503-591-0647, FAX:503-591-0856
PA	Conshohocken, M. Lader Co.	215-825-3177, FAX:215-834-8543

TX Dallas, Beacon Microwave & Instrmn. Inc. 214-437-1505,FAX:214-437-5874
TX Richardson, Beacon Microwave & Instrn., Inc. 214-437-1505,FAX:214-437-5874
TX Round Rock, Beacon Microwave & Instrmn. Inc. 512-244-6675,FAX:512-244-1883
WA Bellevue, Cain-Sweet Co. 206-462-2118, FAX:206-451-9418
PR Santurce, Beacon Elctrns. 809-728-5040, FAX:809-728-5180
Can Ottawa, Ont., Giga-Tron Assocs., Ltd. 613-225-4090,FAX:613-225-4592
Can Vancouver, B.C., Penstock/Canada ... 604-662-3475

Local Distributors

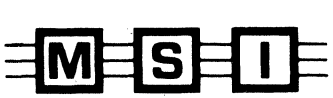
AL Huntsville, Component Distrs., Inc. 205-851-7800, FAX:205-859-2249
AZ Scottsdale, Spirit Elctrns. 602-998-1533, FAX:602-998-1427
CA Sunnyvale, Penstock, Inc. 408-730-0300, FAX:408-730-4782
FL Palm Bay, Component Distrs., Inc. 407-724-9910, FAX:407-729-6579
GA Norcross, Component Distrs., Inc. 404-441-3320, FAX:404-449-1712
IL Mt. Prospect, CFC Distrs., Inc. 708-253-3578, FAX:708-253-6987
IL Mundelein, CFC Distrs., Inc. 708-540-9962, FAX:708-540-9974
MD Columbia, MLC Distrs. 800-442-3177, FAX:301-381-6924
NC Greensboro, MLC Distrs. 919-674-8970, FAX:919-674-7655
NC Raleigh, Comp. Distrs., Inc. 919-859-3391, FAX:919-859-3396
PA Conshohocken, MLC Distrs. 215-825-3177, FAX:215-834-8543
TX Dallas, Comp. Distrs., Inc. 214-644-0373, FAX:214-644-1115
WA Bellevue, Penstock,Inc. 206-454-2371, FAX:206-451-9418

MINI COMPUTER TECHNOLOGY, 696 E. Trimble Rd., San Jose, CA 95131, Tel: 408-435-1616, TWX: 910-338-2281, FAX: 408-435-2709; Empl.: 22; *Sls. Mgr.:* John P. Lazare; *Dist. Mgr.:* John P. Lazare

MINI-SYSTEMS, INC., Electronic Package Div., 168 E. Bacon St., P.O. Box 1597, Plainville, MA 02762, Tel: 508-695-2000, TWX: 510-600-4340, FAX: 508-695-8758; *Sls. Mgr.:* Heather Edwards ..... **A•1735**

Local Sales Offices & Reps

CT Fairfield, Wexler-Court Sls. 203-334-1122
NC Raleigh, Spears & Assocs. 919-846-9711
WA Bellevue, Advanced Power Comps. ... 206-747-9127
Can Ontario, CN, Intrade Canada 613-727-1272



FAX: 508-695-6076

MINI-SYSTEMS, INC., Thick/Thin Film Division, 20 David Rd., North Attleboro, MA 02761, Tel: 508-695-0203, TWX: 710-348-0564; FSC No.: 50316; Empl.: 163 ..... **A•1955**

Local Sales Offices & Reps

AL Huntsville, Summit Mktg. Assocs. 205-721-1701, FAX:205-721-9250
AZ Tuscon, Morrison & Fern 602-296-8181, FAX:602-296-4833
CA Brea, S.C.T.S. 213-691-1114,FAX:213-690-0504
CA Mountain View, L.S. Engrg. 415-967-5880, FAX:415-967-5884
CA Woodland Hills, S.C.T.S. 818-704-9087, FAX:818-704-8632
FL Pompano Beach, J.P. Elctrns. 305-782-6830, FAX:305-782-1640
GA Norcross, Summit Mktg. Assocs. 404-498-4530, FAX:404-498-4530
IL Elk Grove, ABC Elctrns. 708-228-1204, FAX:708-228-1249
ME Bethel, Shain Assocs., Inc. 207-836-3200
MA Belmont, Shain Assocs., Inc. 617-484-4376, FAX:617-489-3598
MA Hingham, Shain Assocs., Inc. 617-740-2334, FAX:617-740-2680
MN Minneapolis, Intertec Assocs. 612-921-8443, FAX:612-929-4488
NH Nashua, Shain Assocs., Inc. 603-881-4881, FAX:603-880-8924
NJ Princeton, Wexler-Court Sls. Co. 609-452-8670, FAX:609-452-9213
NY Rockville Centre, Milano Bros. Intl. 516-764-2200, FAX:516-764-4006
OH Maineville, G.A. Barnett Inc. 513-677-0922, FAX:513-677-0922
TX Double Oak, Carolyn Bender Assocs. 214-539-9461,FAX:214-539-7027
TX Lewisville, C & J Assocs. 214-539-0140
TX Richardson, Southwest Microwave Elctrns. 214-669-1195,FAX:214-669-0353
WA Bellevue, Advanced Power Comps. 206-747-9127, FAX:206-641-8655
Can Nepean, Ont., Intrade Canada 613-727-1272, FAX:613-727-0246

MINI-SYSTEMS, INC., Sunbelt Microelectronic Division, 237 Enterprise Rd., Deltona, FL 32725, Tel: 407-574-0208, FAX: 407-574-8262

MINNESOTA WIRE & CABLE, 1835 Energy Park Drive, St. Paul, MN 55108-2721, Tel: 612-642-1800 , 1-800-258-6922(MWCC), FAX: 612-642-9201; Empl.: 155; *Sls. Mgr.:* Paul Wagner

MINOR RUBBER CO., INC., Ackerman St., Bloomfield, NJ 07003, Tel: 201-338-6800, 800-433-6886, FAX: 201-893-1399; *Sls. Mgr.:* Tom Fitzhenry

MINT SYSTEMS CORPORATION, 1633 South Main Street, Milpitas, CA 95035-6262, Tel: 408-262-7171, FAX: 408-262-5387; *Sls. Mgr.:* Rudy Juang ..... **D•1295, 1412-1413**

MIRAGE/KLM, 16890 Church St., P.O. Box 1000, Morgan Hill, CA 95037, Tel: 408-779-7363, FAX: 408-779-8845; Empl.: 50; *Sls. Mgr.:* John J. Concialdi

MISCO/MINNEAPOLIS SPEAKER CO., INC., 3806 Grand Avenue, Minneapolis, MN 55409, Tel: 612-825-1010, FAX: 612-825-7010; FSC No.: 14208; *Sls. Mgr.:* Don Ringham

MITCHELL ELECTRONICS CORP., 84 West Grand Street, Mt. Vernon, NY 10552, Tel: 914-699-3800, TELEX: 914-699-1022; Empl.: 30; *Sls. Mgr.:* Jonathan Lerner ..... **A•2306**

MITEC ELECTRONICS, 104 Gun Avenue, Pointe Claire, Quebec, Canada H9R 3X3, Tel: 514-694-6666, FAX: 514-694-3814; FSC No.: FSCM 38494; Empl.: 125; *Sls. Mgr.:* J. Robinson

MITECH ELECTRONICS CORP., 411 Washington St., Otsego, MI 49078, Tel: 616-694-9471, FAX: 616-692-2651; Empl.: 78; *Sls. Mgr.:* Kendall Meyer

MITEL SEMICONDUCTOR DIV. OF MITEL CORP., 360 Legget Dr., PO Box 13089, Kanata, Ont., Canada K2K 1X3, Tel: 613-592-2122, TELEX: 053 3221, FAX: 613-592-6909; Empl.: 1000; *Sls. Mgr.:* Howard Tweddle; *Dist. Mgr.:* Howard Tweddle

MITEQ INC., 100 Davids Drive, Hauppauge, NY 11788, Tel: 516-436-7400, TELEX: 6718148, FAX: 516-436-7430; Empl.: 275

MITRONICS, P.O. Box 2129, Rolling Hills, CA 90274, Tel: 213-377-2022

MITSUBISHI ELECTRONICS, 991 Knox Street, Torrance, CA 90502, Tel: 213-515-3993, TELEX: 06-4703-M USA LSA, TWX: 66-4787-MELA TRNC; Empl.: 423; *Sls. Mgr.:* Bob Crooks, V.P. Sls.; *Dist. Mgr.:* Bob Crooks, V.P. Sls.

MITSUBISHI ELCTRNS. AMERICA, INC., Elctrn. Device Grp., 1050 East Arques Ave., Sunnyvale, CA 94086, Tel: 408-730-5900, TELEX: 172296, TWX: 910-339-9549, FAX: 408-730-4972; Empl.: 200; *Sls. Mgr.:* John Zucker; *Dist. Mgr.:* Roger Yee

Local Sales Offices & Reps

AL Huntsville, Beacon Elctrns. 205-881-5031
AZ Scottsdale, SMS & Assocs. 602-998-0831
CA San Diego, Mitsubishi Elctrns. Reg. Sls. Off. 619-451-9618
CA San Diego, SC Cubed 619-458-5808
CA San Jose, QCI 408-432-1070
CA Sunnyvale, Mitsubishi Elctrns.-Reg. Sls. Off. 408-730-5900
CA Thousand Oaks, SC Cubed 805-496-7307
CA Tustin, SC Cubed 714-731-9206
CO Englewood, Mitsubishi Elctrns. Reg. Sls. Off. 303-220-0744
CO Littleton, Simpson Assocs. 303-794-8381
CT Yalesville, Comp. Rep Assocs. 203-269-1145
FL Boca Raton, Beacon Elctrns. 407-997-5740
FL Boca Raton, Mitsubishi Elctrns. 407-487-7747
FL Longwood, Beacon Elctrns. 407-332-1940
GA Atlanta, Beacon Elctrns. 404-256-9640
GA Norcross, Beacon Advanced Comps. 404-662-8190
GA Norcross, Mitsubishi Elctrns. Reg. Sls. Off. 404-448-1263
IL Mt. Prospect, Mitsubishi Elctrns.-Reg. Sls. Off. 708-298-9223
IL Rolling Meadows, Phase II Mktg. 708-806-1330
IN Fishers, Carter, McCormick, Pierce 317-842-8277
KS Overland Park, Gibb Tech 913-451-6788
MI Farmington Hills, Carter, McCormick .. 313-477-7700
MN Edina, Gibb Elctrns. Sls. 612-835-3370
MN Minnetonka, Gibb Elctrn. Sls. 612-935-4600
MN Minnetonka, Mitsubishi Elctrns.-Reg. Sls. Off. 612-938-7779
NJ Cherry Hill, Trinkle Sls., Inc. 609-795-4200
NJ Parsippany, METEC Sales 201-263-8898
NJ Somerset, Mitsubishi Elctrns.-Reg. Sls. Off. 201-469-8833
NY Fishkill, Mitsubishi Elctrns. Reg. Sls. Off. 914-896-0896
NY Manlius, LAMTEC 313-637-3738
NY Northport, METEC Sales 516-757-1881
NC Cary, Mitsubishi Elctrns. Reg. Sls. Off. 919-460-0404
NC Raleigh, Beacon Elctrns. 919-787-0330
OH Cincinnati, Makin & Assocs., Inc. 513-871-2424
OH Dublin, Makin & Assocs., Inc. 614-793-9545
OH Solon, Makin & Assocs. 216-248-7370
OR Portland, ES/Chase Co., Inc. 503-292-8840
TX Austin, OM Assocs., Inc. 512-794-9971
TX Carrollton, Mitsubishi Elctrns.-Reg. Sls. Off. 214-245-0047
TX Houston, OM Assocs., Inc. 713-789-4426
TX Richardson, OM Assocs., Inc. 214-690-6746
UT Midvale, Simpson 801-566-3691
VA Sterling, Beacon North 703-478-2480
WA Kirkland, ES Chase 206-823-9595
WA Kirkland, Insight Elctrns. 206-820-8100
WI Wauwatosa, Phase II Mktg. 414-771-9986
PR San Truce, Beacon Elctrns. 818-728-5440
Can Kanata, Ont., Mitsubishi Elec. Sls. Canada, Inc. 613-591-3348
Can Mississauga, Mitsubishi Elctrns.Reg. Sls. Off. 416-670-8711

Local Distributors

AZ Scottsdale, Added Value Elctrns. 602-951-9788
AZ Tempe, Insight Elctrns. 602-829-1800
CA Agoura, Insight Elctrns. 818-707-2100
CA Irvine, Insight Elctrns., Inc. 714-727-2111
CA Orange, Western Microtechnlgy. 714-637-0200
CA San Diego, Added Value Elctrns. Dists., Inc. 614-558-8890
CA San Diego, Insight Elctrns., Inc. 619-587-0471
CA San Diego, Western Microtechnlgy. ... 619-453-8430
CA San Jose, Merit Elctrns. Inc. 408-434-0800
CA San Jose, QCI Comp. Sls. 408-432-1070
CA Saratoga, Western Microtechnlg., Inc. 408-725-1660
CA Tustin, Added Value Elctrns. Dist., Inc. 714-259-8258
CO Wheat Ridge, Added Value Elctrns. Dists. Inc. 303-422-1701
CT Milford, Milgray Elctrns., Inc. 203-878-6970
CT Wallingford, Almo Elctrns. Corp. 203-269-6801
FL Ft. Lauderdale, Hammond Elctrns., Inc. 305-973-7103
FL Miami, All American 305-621-8282
FL Orlando, Hammond Elctrns., Inc. 305-841-1010
FL Winter Pk., Milgray Elctrns., Inc. 305-647-5747
GA Norcross, Beacon Advanced Comps. 404-662-8190
GA Norcross, Hammond Elctrns., Inc. 404-449-1996
GA Norcross, Milgray Elctrns., Inc. 404-446-9777
IL Arlington Heights, Milgray Elctrns., Inc. 708-253-1212
IL Bensenville, GBL/Goold Elctrns. Corp. 708-860-7171
KS Overland Pk., Milgray Elctrns., Inc. 913-236-8800
MD Columbia, Milgray Elctrns., Inc. 301-995-6169
MD Tissup, Almo Elctrns. Corp. 301-953-2566
MA Canton, Almo Elctrns. Corp. 617-821-1450
MA Hopkinton, Interface Elctrns. Corp. 617-435-6858
MA Westwood, Comp. Rep. Comps. 617-329-3454
MA Wilmington, JV Elctrns. of Boston, Inc. 617-657-6523
MN Sterling Elctrns., Indl. Comps., Inc. 612-831-2666
NJ E. Brunswick, Almo Elctrns., Inc. 201-613-0200
NJ Marlton, Milgray Elctrns., Inc. 609-983-5010
NY Farmingdale, Milgray Elctrns., Inc. 516-420-9800
NY Rochester, Milgray Elctrns., Inc. 716-235-0830
NY Rome, Rome Elctrns. 315-337-5400
NC Greensboro, Hammond Elctrns., Inc. .. 919-275-6391
OH Cleveland, Milgray Elctrns., Inc. 216-447-1520
OR Beaverton, Western Microtechnlg., Inc. 503-629-2082
PA Maris, Almo Elctrns. Corp. 412-776-9090
PA Trevose, Almo Elctrns. Corp. 215-953-2800

SC Greenville, Hammond Elctrns. 803-233-4121
TX Dallas, Milgray Elctrns. 214-248-1603
WA Redmond, Western Microtechnlg., Inc. 206-881-6737

MKC ELECTRONICS CORP., 9205 Quivira Road, Overland Park, KS 66215, Tel: 913-894-9711, FAX: 913-894-9713; Empl.: 26

MKS INSTRUMENTS, INC., Six Shattuck Road, Andover, MA 01810, Tel: 508-975-2350, TELEX: 94-9375, FAX: 508-975-0094; Empl.: 500

MLI INDUSTRIES, INC., 3 East Main Street, Apalachin, NY 13732, Tel: 607-754-5800, FAX: 607-625-2022; Empl.: 485; *Sls. Mgr.:* Michael T. Mackenzie

MMI-MIRCO MACHINES, INC., P. O. Box 242, Santa Clara, CA 95052, Tel: 408-727-0100, TWX: 910-338-0260; Empl.: 4; *Sls. Mgr.:* Frank J. Andezzone

MOBILE-TRONICS CO., INC., Box 1147, San Clemente, CA 92674, Tel: 714-361-4305, FAX: 714-361-4356; Empl.: 2

MODULAIR, 4674 Aircenter Circle, Reno, NV 89502, Tel: 702-829-2033, FAX: 702-829-2029; Empl.: 50

MODULAR AUDIO PRODUCTS, Modular Devices, Inc., Brookhaven R & D Plaza, One Roned Road, Shirley, NY 11967, Tel: 516-345-3100, FAX: 516-345-3106; *Sls. Mgr.:* C. Liptman

MODULAR DEVICES, Brookhaven R & D Plaza, 1 Roned Rd., Shirley, NY 11967, Tel: 516-345-3100, FAX: 516-345-3106; FSC No.: 52202; Empl.: 65; *Sls. Mgr.:* C. Liptman ..... **B•1302; D•1901-1906**

Local Sales Offices & Reps

CA Murrieta, MIL-COM Sls., Inc. 714-677-2097
CA San Diego, Mil-Com Sls. 619-275-0641
CA Santa Clara, Integrated Tech Sls. 408-727-3406
CT Bloomfield, Zaslow Sls. Co. 203-242-7781
KS Prairie Village, Thunderbird Tech. Sls. 913-642-7220
KS Wichita, Thunderbird Tech. Sls. 316-636-5777
MD Towson, Advanced Tech. Sls., Inc. 301-296-9360
MN St. Paul, K-Rep 612-681-9510
MO Maryland Heights, Thunderbird Tech. Sls. 314-298-8940
NY Great Neck, F & F Metro Inc. 516-482-4080
NY Williamsville, NV Elect. Assoc. 716-632-1347
PA Norristown, Rivco January Inc. 215-631-1414
TX Dallas, M-Rep Co. 214-484-5711

MODULAR DEVICES INC., 4115 Spencer St., Torrance, CA 90503, Tel: 213-542-8561, FAX: 213-371-6331; Empl.: 150; *Sls. Mgr.:* A. C. Augusta

MODULAR MINING SYSTEMS, INC., 3289 E. Hemisphere Loop, Tuscon, AZ 85706, Tel: 602-746-9127, FAX: 602-889-5790; Empl.: 60; *Sls. Mgr.:* J.Michael Canty

MODULAR SYSTEMS, INC., 905 Albemarle St., Charlottesville, VA 22901, Tel: 804-295-7882; Empl.: 5; *Sls. Mgr.:* H. N. Patel

FAX: 408-496-0204

MODUPOWER, Inc., 1400 Coleman Ave., Santa Clara, CA 95050, Tel: 408-496-5796; Empl: 3; *Sls. Mgr.:* Art Fury ..... **D•1908-1910**

MOISTURE REGISTER PRODUCTS DIV., Aqua Measure Instrument Co., 1712 Earhart Court, P.O. Box 369, LaVerne, CA 91750-0369, Tel: 714-392-5833, FAX: 714-392-5838; Empl.: 25; *Sls. Mgr.:* Gabriel Cote, Jr.

MOLDCON DIV. OF CONTEX ELECTRONICS, 221 Interstate Dr., W. Springfield, MA 01089, Tel: 413-736-0371, FAX: 413-736-9716; Empl.: 200; *Sls. Mgr.:* Robert Krzynowek

MOLDTRONICS, INC., 703 Rogers St., Downers Grove, IL 60515, Tel: 708-968-7000, FAX: 708-968-5068; Empl.: 100; *Sls. Mgr.:* J.D. Wilson

MOLECU-WIRE, P.O. Box 495, Farmingdale, NJ 07727, Tel: 201-938-9473, TWX: 710-723-6943, FAX: 201-938-3189; Empl.: 125

FAX: 708-969-1352

MOLEX, INC., 2222 Wellington Ct., Lisle, IL 60532, Tel: 708-969-4550, TELEX: 25-4069; Empl.: 6300; *Sls. Mgr.:* Bill Cox; *Dist. Mgr.:* Bill Hickey ..... **C•1474**

Local Sales Offices & Reps

CA Laguna Hills, Molex 714-586-0950
CA Milpitas, Molex 408-946-4700
CO Englewood, Molex 303-779-8321
GA Roswell, Molex 404-992-3715
IL Lisle, Molex 312-969-4550
IN Indianapolis, Molex 317-299-0099
KY Louisville, Molex 502-245-8336
MA Woburn, Molex 617-935-8983
MI Troy, Molex 313-879-7400
TX Dallas, Molex 214-931-0999

Local Distributors

AL Huntsville, Hamilton/Avnet 205-837-7210
AL Huntsville, Time Elctrns. 205-721-1133
AZ Phoenix, Force Elctrns. 602-437-1060
AZ Phoenix, Sterling Elctrns. 602-437-5565
AZ Tempe, Harper S.I.D. 602-967-1464
AZ Tempe, Time Elctrns. 602-967-2000
AR Ft. Smith, Carlton Bates 501-646-8201
AR Little Rock, Carlton Bates 501-562-9100
AR Pine Buff, Carlton Bates 501-535-1354
AR Springdale, Carlton Bates 501-756-5012
CA Chatsworth, Sterling Elctrns. 818-407-8850
CA Chatsworth, Time Elctrns. 818-998-7200
CA Compton, Harper S.I.D. 213-979-5090
CA Costa Mesa, Hamilton Electro Sls. 714-641-4100
CA El Segundo, Force Elctrns. 213-772-1324
CA Garden Grove, Richey Impact Elctrns. Ltd. 714-895-0060
CA Gardena, Hamilton Avnet 213-217-6700
CA Irvine, Integrated Elctrns. Corp. 714-837-9960
CA Roseville, Hamilton/Avnet 916-925-2216
CA S. San Francisco, Peters-de Laet 415-873-9595
CA Sacramento, Integrated Elctrns. Corp. 916-363-6030
CA San Diego, Force Elctrns. 619-569-9661
CA San Diego, Hamilton Avnet 619-571-1900
CA San Diego, Harper S.I.D. 619-578-2500
CA San Diego, Richey Impact Elctrns. Ltd. 619-271-4511
CA San Diego, Sterling Elctrns. 619-271-6555
CA San Diego, Time Elctrns. 619-586-1331
CA San Jose, Harper S.I.D. 408-943-9490
CA San Jose, Integrated Elctrns. Corp. 408-435-1000
CA San Jose, Richey Western Elctrns. Ltd. 408-432-7100
CA Santa Clara, Force Elctrns. 408-748-1324
CA Sunnyvale, Hamilton Avnet 408-743-3000
CA Sunnyvale, Time Elctrns. 408-734-9888
CA Torrance, Kent Elctrns. 213-320-2700
CA Torrance, Time Elctrns. 213-320-0880
CA Tustin, Sterling Elctrns. 714-259-0900
CA Tustin, Time Elctrns. 714-669-0100
CO Denver, Integrated Elctrns. 303-292-6121
CO Englewood, Hamilton Avent 303-799-0663
CO Englewood, Sterling Elctrns. 303-792-3939
CO Englewood, Time Elctrns. 303-799-8851
CO Wheatridge, Bell Inds. 303-424-1985
CT Danbury, Hamilton Avnet 203-743-6077
CT Danbury, Heilind Elctrns. 203-797-8600
CT Southbury, Time Elctrns. 203-271-3200
CT Wallingford, Sager Elec. Supp. Co. 203-265-4600
CT Wallingford, Sterling Elctrns. 203-265-9535
FL Ft. Lauderdale, Hamilton Avnet 305-767-6377
FL Ft. Lauderdale, NEWH for Ind. 305-772-5050
FL Ft. Lauderdale, Time Elctrns. 305-484-4778
FL Largo, LoDan 813-586-2851
FL Miami, Time Elctrns. 305-940-8231
FL Orlando, Hamilton/Avnet 407-657-3344
FL Orlando, Time Elctrns. 407-841-6565
FL St. Petersburg, Hamilton Avnet 813-573-3930
FL Winter Park, Hamilton Avnet 407-628-3888
GA Atlanta, Electro Air Corp. 404-351-3545
GA Duluth, Gateway Megatech 404-497-0799
GA Duluth, Hamilton/Avnet 404-446-0611
GA Norcross, Time Elctrns. 404-368-0969
IL Bensenville, Hamilton/Avnet 312-860-7700
IL Chicago, Waldom Elctrns. Inc. 312-585-1212
IL Crystal Lake, Sub-Sem, Inc. 815-459-4139
IL Hoffman Estates, Integrated Elctrns. Corp. 708-843-2040
IL Schaumberg, Time Elctrns. 708-303-3000
IN Carmel, Hamilton Avnet 317-844-9333
IN Carmel, Time Elctrns. 800-331-5114
IN Indianapolis, Gateway Megatech 317-298-0111
IN Indianapolis, PEI-Genesis 800-428-5081
IN South Bend, PEI-Genesis 800-348-2996
IN Valparasio, Gateway Megatech 219-477-4255
IA Cedar Rapids, Hamilton Avnet 319-362-4757
IA Cedar Rapids, Time Elctrns. 800-325-9085
KS Lenexa, Hamilton/Avnet 913-888-8900
KS Lenexa, Time Elctrns. 913-492-5406
KY Lexington, Hamilton Avnet 800-543-4783
LA Shreveport, Carlton Bates 318-636-9975
LA Westego, Sterling Elctrns. 504-436-1418
MD Baltimore, Hamilton Avnet 301-995-3500
MD Columbia, Sterling Elctrns. 301-290-3800
MD Columbus, Time Elctrns. 301-964-3090
MD Jessup, Gateway 301-792-7527
MA Canton, Richey/Impact Elctrns. Ltd. ... 617-821-1500
MA Hingham, Sager Elec. Supp. Co. 617-749-6700
MA Peabody, Hamilton Avnet 508-532-3701
MA Peabody, Time Elctrns. 508-532-6200
MA Wilmington, Heilind Elctrns. 508-657-4870
MA Woburn, Sterling Elctrns. 617-938-6200
MI Ann Arbor, Gateway Megatech 313-761-2980
MI Hamilton/Avnet, Hamilton/Avnet 616-243-8805
MI Novi, Hamilton/Avnet 313-347-4270
MI Troy, Empire Elctrns. 313-585-8130
MN Edina, Time Elctrns. 612-943-2433
MN Minneapolis, Sterling Elctrns. 612-831-2666
MN Minnetonka, Hamilton Avnet 612-932-0600
MO Chesterfield, Hamilton/Avnet 314-537-1600
MO Manchester, Time Elctrns. 314-391-6444
MO St. Charles, Lectronix 800-325-3348
NH Manchester, Hamilton/Avnet 603-624-9400
NH Salem, Sager Elec. Supp. Co. 603-898-1348
NJ Camden, GRS Elctrns. Co., Inc. 609-964-8560
NJ Cherry Hill, Hamilton Avnet 609-424-0100
NJ Edison, Sterling Elctrns. 908-417-1000
NJ Fairfield, Hamilton Avnet 201-575-3390
NJ Marlton, Time Elctrns. 609-596-6700
NJ Teterboro, EAC/JAMAR Corp. 201-772-6400
NM Albuquerque, Hamilton Avnet 505-345-0001
NM Albuquerque, Sterling Elctrns. 505-884-1900
NY Buffalo, Summit Dists. 716-887-2800
NY E. Syracuse, Time Elctrns. 315-432-0355
NY Hauppauge, Sager Elctrns. 516-348-1300
NY Hauppauge, Time Elctrns. 516-273-0100
NY Rochester, Hamilton Avnet 716-475-9130
NY Rochester, Summit Distrs. 716-334-8110
NY Syracuse, Hamilton Avnet 315-437-2641
NC Charlotte, Time Elctrns. 704-522-7600
NC Raleigh, Hamilton Avnet 919-878-0810
NC Raleigh, Sagar Elctrl. Supp. Co., Inc. ... 919-850-9550
OH Columbus, Gateway Megatech 614-447-0222
OH Columbus, Time Elctrns. 614-761-1100
OH Dayton, Gateway Megatech 513-298-6342
OH Dayton, Hamilton Avnet 513-439-6700
OH Solon, Hamilton Avnet 216-349-5100
OH Westerville, Hamilton Avnet 614-882-7004
OH Willoughby, Gateway Megatech 216-953-0333
OK Oklahoma City, Carlton Bates 405-691-4446
OK Tulsa, Carlton Bates 918-250-1626
OK Tulsa, Hamilton Avnet 918-252-7297
OK Tulsa, Sterling Elctrns. 918-663-2410
OR Beaverton, Hamilton/Avnet 503-627-0201
OR Beaverton, Integrated Elctrns. Corp. ... 503-641-1690
OR Portland, Radar Elec. 503-232-3404
OR Portland, Time Elctrns. 503-684-3780
PA McKean, Advacom 814-476-7774
PA Philadelphia, Sagar Elctrl. Supp. Co. ... 215-464-4336
PA Pittsburg, Hamilton Avnet 412-281-4150
TN Memphis, Carlton Bates 901-365-3539
TN Nashville, Carlton Bates 615-885-3232
TN Soddy-Daisy, Techni-Tronics, Inc. 615-332-2119
TX Austin, Hamilton Avnet 512-837-8911
TX Austin, Kent Elctrns. 512-834-1900
TX Austin, Sterling Elctrns. 512-836-1341
TX Austin, Time Elctrns. 512-339-3054
TX Carrollton, Sterling Elctrns. 214-243-1600
TX Dallas, Carlton Bates 214-404-9906
TX Dallas, Force Elctrns. 214-247-9955
TX Houston, Force Elctrns. 713-561-8644
TX Houston, Kent Elctrns. 713-780-7770
TX Houston, Sterling Elctrns. 713-627-9800
TX Houston, Time Elctrns. 713-530-0800
TX Irving, Harper S.I.D. 214-621-0500
TX Richardson, Kent Elctrns. 214-669-2600
TX Richardson, Time Elctrns. 214-644-4644
TX Stafford, Hamilton Avnet 713-240-7733
TX Texarkana, Carlton Bates 214-792-6923
UT Salt Lake City, Bell Inds. 801-255-9611
UT Salt Lake City, Hamilton Avnet 801-266-2022
UT Salt Lake City, Integrated Elctrns. 801-977-9750
UT Salt Lake City, Sterling Elctrns. 801-972-5444
UT Salt Lake City, Time Elctrns. 801-973-8181
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Integrated Elctrns. Corp. 206-455-2727
WA Redmond, Hamilton Avnet 206-881-6697
WA Richland, Radar Elec. 509-943-8336
WA Seattle, Radar Elec. 206-282-2511

WA Spokane, Radar Elec. 509-747-3053
WI Milwaukee, Time Elctrns. 800-331-5114
WI New Berlin, Sub Sem 800-435-6130
WI Waukesha, Hamilton Avnet 414-784-4510
PR Bayamon, NEHW for Ind. 809-798-1300

MOLI ENERGY LIMITED, 20000 Stewart Crescent, Maple Ridge, B.C., Canada V2X 9E7, Tel: 604-465-7911/1-800-663-MOLI, TELEX: 04-356708, FAX: 604-465-4398; FSC No.: 6140; Empl.: 160; *Sls. Mgr.:* Mary Connolly; *Dist. Mgr.:* Mary Connolly

MOLON MOTOR & COIL CORPORATION, 3737 Industrial Avenue, Rolling Meadows, IL 60008, Tel: 708-253-6000, FAX: 708 259-5491; *Sls. Mgr.:* William Steele

MONARCH INSTRUMENT, Monarch International Inc., Columbia Dr., Amherst, NH 03031, Tel: 603-883-3390, 800-999-3390, FAX: 603-886-3300; FSC No.: Cage Code 17500; Empl.: 24; *Sls. Mgr.:* Richard Peters, Prod. Mgr.; *Dist. Mgr.:* Myron Kasok

MONITOR PC

FAX: 619-434-0255

MONITOR PRODUCTS CO., INC., 502 Via Del Monte, Oceanside, CA 92054, Tel: 619-433-4510, ESYLNK: 629 5085; FSC No.: 54331; Empl.: 65; *Sls. Mgr.:* Robert Blasier; *Dist. Mgr.:* Robert Blasier ..... **A•1402-1407**

Local Sales Offices & Reps

AL Huntsville, CSR Elctrns. 205-533-2444
AZ Phoenix, Eltron 602-266-2164
CA Los Angeles, Monitor Prods. Co. 619-433-4510
CA Mountain View, Straube Assocs. 415-969-6060
CA Orange County, Monitor Prods. Co. ... 618-433-4510
CO Denver, Straube Assocs. 303-426-0890
CT Bloomfield, Zaslow Sls., Inc. 203-242-7781
FL Brandon, R.C. Simon & Company 813-689-6524
FL Lighthouse Pt., R.C. Simon & Company 305-941-2757
GA Atlanta, CSR Elctrns. 404-396-3720
MA Westboro, Zaslow Sls., Inc. 617-393-8150
MN Eden Prairie, Elctrn. Innovators 612-941-0830
NY Rochester, Electra Sls. 716-427-7860
NY Syracuse, Electra Sls. 315-463-1248
NC Raleigh, CSR Elctrns. 919-878-9200
PA Philadelphia, Monitor Prods. 904-725-4386
TN Knoxville, CSR Elctrns. 615-673-0222
TX Austin, Mil-Rep Assocs. 512-346-6331
TX Houston, Mil-Rep Assocs. 713-444-2557
TX Richardson, Mil-Rep Assocs. 214-644-6731

Local Distributors

AL Huntsville, Component Distrs., Inc. 205-883-7501
AL Huntsville, Resistacap, Inc. 205-883-4270
AZ Tempe, Harper SID 602-967-1464
AR Little Rock, Component Distrs., Inc. ... 501-227-6305
CA Compton, Harper SID 213-979-5090
CA San Diego, Harper SID 619-560-8545
CA San Diego, Neumann Elctrns. 619-695-3005
CA Sherman Oaks, Delay Line Distrs. 818-986-9455
CA Sunnyvale, Harper SID 408-747-0333
CA Tustin, Added Value Elctrns. 714-259-8258
CO Wheatridge, Added Value Elctrn. 303-422-1701
FL Ft. Lauderdale, Component Distrs., Inc. 305-723-8874
FL Melbourne, Rome Elctrns. 305-242-8151
GA Norcross, Component Distrs., Inc. 404-441-3320
IL Bensenville, Voyager Elctrns. 312-773-4900
MA Hudson, DSC, Inc. 617-562-6920
MN Fridley, Voyager Elctrns. 612-571-7766
NY Johnson City, Help Elctrns. 607-729-3528
NC Greensboro, Golden Elctrns. 919-294-4653
TX Dallas, Component Distrs., Inc. 214-644-0373
TX Fort Worth, C & W Supply 817-831-0395
TX Richardson, Harper SID 214-235-3177
VA Falls Church, Component Distrs., Inc. 703-241-8227

MONOLITHIC SYS. CORP., 7050 South Tuscan Way, Englewood, CO 80112, Tel: 303-790-7400, FAX: 303-790-7118; Empl.: 80; *Sls. Mgr.:* C. Edward O'Neal; *Dist. Mgr.:* C. Edward O'Neal

MONROE ELECTRONICS, INC., 100 Housel Ave., Lyndonville, NY 14098, Tel: 716-765-2254, TELEX: 756662, FAX: 716-765-9330; Empl.: 50; *Sls. Mgr.:* Brian D. Ives

MONSANTO CO., 800 N. Lindbergh Blvd., St. Louis, MO 63167, Tel: 314-694-1000, TELEX: 44-7282; Empl.: 49,197

MONTROSE PRODUCTS COMPANY, Intercole, 28 Sword Street, Auburn, MA 01501, Tel: 508-791-3161, FAX: 508-793-9862; Empl.: 250; *Sls. Mgr.:* Michael McLaughlin, OEM Sls. Mgr.; *Dist. Mgr.:* Bill Wilmot

MOODY TOOLS, INC., 43 Crompton Ave., E. Greenwich, RI 02818, Tel: 401-885-0911, FAX: 401-885-4565; Empl.: 11; *Sls. Mgr.:* J. H. Moody; *Dist. Mgr.:* D .H. Moody

MOORE PRODUCTS CO., Sumneytown Pike, Spring House, PA 19477, Tel: 215-646-7400, FAX: 215-283-6358; Empl.: 1000ò; *Sls. Mgr.:* J. McDonald

MOORE REED & CO. LTD., Southway Walworth, Andover, Hampshire SP 105AB, Tel: 0264-324155, TELEX: 47654, FAX: 0264-356561; Empl.: 150; *Sls. Mgr.:* W. North

MORGAN-MATROC, Vernitron Div., 232 Forbes Rd., Bedford, OH 44146-5478, Tel: 216-232-8600, TWX: 810-427-2274, FAX: 216-232-8731; Empl.: 100; *Sls. Mgr.:* D.W. Bacso ..... **B•1921**

Local Sales Offices & Reps

CA El Toro, Morgan Matroc, Inc. 714-768-8672
IL Des Plaines, Esco Assoc. 312-298-5310

MORRIS, J. I., CO., 372 Elm St., Southbridge, MA 01550, Tel: 508-764-4394, FAX: 508-764-7350; FSC No.: 95548; Empl.: 25

MORRIS ENTERPRISES, 16799 Schoenborn St. Sepulveda, CA 91343, Tel: 818-894-9103, TELEX: 6-74681, TWX: 910-496-1525, FAX: 818-894-5791; FSC No.: 54918; Empl.: 50; *Sls. Mgr.:* J. Dumpert

MORS ASC®

FAX: 617-245-4531

MORS/ASC, 134 Water St., PO Box 544, Wakefield, MA 01880-4444, Tel: 617-246-1007; FSC No.: 54659; Empl.: 35; *Sls. Mgr.:* Mike Palmerino; *Dist. Mgr.:* Mike Palmerino ..... **B•1745**

Local Sales Offices & Reps

CA Arcadia, HMC, Inc. 818-447-0958
CA San Jose, Vernexx 408-972-9072
CO Boulder, Stratford Grp. 303-530-3194
FL Boca Raton, Newell-Hynes 407-392-3186
GA Norcross, Mountain Electro Mktg. 404-448-5594
IL Wheaton, C-S Technical Sls. 708-653-8126
IA Marion, MSB Assocs. 319-377-6261
KS Shawnee Mission, MSB Assocs. 913-432-2131
MA Andover, Crawford Assocs. 508-470-2122
MI Farmington Hills, W. R. Hummon 313-474-0661
MN Golden Valley, Highland Sls. 612-546-2123
MO St. Charles, MSB Assocs. 314-946-5577
NY Fairport, Andres Component Sls. 716-223-2430
NY Patchogue, Optimum Metro Sls. 516-758-0644
OH Willoughby, Nationwide Comps. 216-946-3226
OR Hillsboro, Doran Sls. 503-640-4500
PA Wynnewood, Metz-Benham Assoc. ... 216-896-7300
TX Bedford, El-Tec Sls. 817-268-2896
VA Ashland, Glasscock Assoc. 804-798-2125
WA Redmond, Doran Sls. 206-885-1885
EXP CT/Litchfield, Intrade 203-567-5901

Local Distributors

AL Birmington, Forbes Distbg. 205-251-4104
AZ Phoenix, Arizona Comps. 602-269-5655
AZ Tempe, RCD Inds. 602-838-0979
CA Fremont, KEA Elctrns. 415-651-2600
CA Los Angeles, Elec. Switches 213-660-1310
CA San Jose, Rose Elctrns. 408-943-0200
CA San Jose, Sierra West 408-435-7477
CA Santa Monica, Master Dists. 213-452-1229
CA Sunnyvale, PSC 408-737-1333
CA Tustin, Western Switch & Controls 714-731-4333
CO Denver, CSID 303-292-9594
CO Englewood, Indelco 303-694-9444
CT Bridgeport, Park Dists. 203-366-7200
CT Wallingford, Mid-State Elctrns. 203-265-9900
DE New Castle, Elctrns. Exchange 302-322-5401
FL Boca Raton, Zelcon 407-451-1600
FL Ft. Lauderdale, Brothers Elctrns. 305-561-6700
FL Melbourne, GRS/Rome Elctrns. 407-242-8151
GA Norcross, Dow Elctrns. 404-448-4004
ID Spirit Lake, A-I Elctrns. 208-623-3111
IL Addison, Belford Elctrns. 708-691-1100
IL Chicago, Leeds Elctrns. 312-625-3800
IL Wheeling, Hawk Elctrns. 312-459-4030
IL Wood Dale, Nep Elctrns. 312-595-8500
IN Carmel, Altex Elctrns. 317-848-1323
IN Terre Haute, Midwest Supp. 812-232-0187
IA Cedar Rapids, Iowa Radio Supp. 319-393-4510
IA W. Des Moines, Ramco Co. 515-225-6933
KS Wichita, Radio, Inc. 316-264-2798
MD Beltsville, PSI 301-937-4960
MD Jessup, Treeko Elec. 301-470-3300
MD Kensington, Marine Air Supp. 301-949-9560
MA Marlboro, Hardware Specialties 617-481-8622
MA Westborough, In Stock Prods. 617-870-5750
MA Wilmington, North Star Elec. 617-657-5155
MI Battle Creek, Great Lakes Elctrns. 616-731-4156
MI Grand Rapids, Calder Elctrns. 616-698-7400
MI St. Clair Shores, Spemco 313-771-2700
MN Burnsville, Cassidy Elctrns. 612-895-9026
MN Fridley, Voyager Elctrns. 612-571-7766
MN Minneapolis, Tortec Corp. 612-866-3662
MO St. Louis, Wes-Garde Comps. 314-567-7776
NH Salem, Diamond Elec. 603-894-4420
NJ E. Brunswick, Brothers Elctrns. 201-238-2200
NJ Mt. Laurel, New Jersey Comps. 609-722-7108
NJ Oakland, Relay Specialties 201-337-1000
NM Albuquerque, Harrison/Int'l 505-345-8127
NY Amherst, Std. Elctrns. 716-691-3801
NY Bohemia, Key Comps. 516-567-7500
NY Hempstead, Davis Elect. 516-483-9200
NY Mt. Vernon, QAR/All American 914-699-2224
NY Rome, Rome Elctrns. 315-337-5400
NY Woodside, Switches Unltd. 718-478-5000
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
OH Dayton, Stotts-Friedman 513-298-5555
OH Willoughby, Gateway Megatech 216-953-0333
OR Beaverton, Rose Elctrns. 503-629-9288
PA Norristown, Kimberly James Co. 215-666-7286
PA Philadelphia, Shap Elctrns. 215-969-3300
RI Pawtucket, Major/Edwards 401-725-7400
TX Arlington, Bell Comp. Sls. 817-461-5303
TX Dallas, Wholesale Elctrns. 214-824-3001
TX Ft. Worth, Indl. Elctrns. 817-731-7321
TX Garland, J & S Elctrns. 214-487-8808
UT Salt Lake City, Std. Supp. Co. 801-486-3371
WA Redmond, Kent Elctrns. 206-883-7200
WA Vancouver, Interconnect Sls. 206-256-4085
WV Huntington, Elctrn. Supp. 304-523-6443
WI Mequon, Lake-View Elctrns. 414-377-8250
WI Milwaukee, Progressive Image 414-321-4722
WI New Berlin, Nep Elctrns. 414-785-9100
Can Markham, Ont., Deskin Sls. 416-475-1412
Can Montreal, Que., Versatech Elctrns. 514-481-0196
Can Quebec, A.R. Gray & Assoc. 514-694-6378
Can Surrey, B.C., Memco 604-590-1553

MORS TECHNOLOGIES INC., Mors Group-France, 225 Industrielle, Delson, Quebec, Canada J0L 1G0, Tel: 514-638-4150, FAX: 514-638-2270

MOSAIC SEMICONDUCTOR INC., Implex Inc., 7420 Carroll Rd., San Diego, CA 92121, Tel: 619-271-4565, FAX: 619-271-6058; Empl.: 45; *Sls. Mgr.:* Derek Best, Gary Brown; *Dist. Mgr.:* Derek Best

MOTION ENGINEERING, INC., 520 E. Montecito St., Santa Barbara, CA 93103, Tel: 805-962-5409, FAX: 805-962-8001; Empl.: 6; *Sls. Mgr.:* Matt Cheresh

MOTION SCIENCE INC., 830-6 Jury Ct., San Jose, CA 95112, Tel: 408-993-0300, FAX: 408-993-0123; Empl.: 27

MOTION SENSORS, INC., 12 Park Street, Cranford, NJ 07701, Tel: 908-709-0025, FAX: 908-709-1144; Empl.: 6; *Sls. Mgr.:* Arthur Bergman

MOTOR CAPACITORS, INC., 6655 N. Avondale Ave., Chicago, IL 60631, Tel: 312-631-0713, FAX: 312-774-8778; Empl.: 14

MOTOROLA CERAMIC PRODUCTS, Components Division, 4800 Alameda Blvd. N.E., Albuquerque, NM 87113, Tel: 505-822-8801; Empl.: 600; *Sls. Mgr.:* Tom Gilder

MOTOROLA INC., Auto. & Indl. Elctrns., Elctrn. Sys. Comps. Div., 4000 Commerical Ave., Northbrook, IL 60062, Tel: 708-205-2867, TELEX: 671-5420 MOT APD; Empl.: 2500

MOTOROLA SEMICONDUCTOR PRODS. SECTOR, 2100 East Elliot, Tempe, AZ 85284, Tel: 602-244-6900, TWX: 910-951-1334; FSC No.: 04713; *Sls. Mgr.:* Ted Jaros; *Dist. Mgr.:* Brian Hilton

MOTOR TECHNOLOGY, INC., 2798 Culver Ave., Dayton, OH 45429, Tel: 513-294-1041, FAX: 513-294-8336; Empl.: 35 ..... **B•1303-1305**

Local Sales Offices & Reps

OH Dayton, Motor Technology, Inc. 513-294-1041

MOTORTEST, INC., PO Box 292633, Columbus, OH 43229, Tel: 614-882-7821, FAX: 614-841-9007

MOTOR-TRONICS, INC., 2142 Industrial Ct., Bldg. 'F', Vista, CA 92083, Tel: 619-727-7430, FAX: 619-727-4436; *Sls. Mgr.:* Bill Linko

MOUSER ELECTRONICS, 11433 Woodside Ave., Santee, CA 92071, Tel: 619-449-2222, TELEX: 619-44; Empl.: 200; *Sls. Mgr.:* C. Degurse; *Dist. Mgr.:* G. Rye

MOUSER ELECTRONICS, 2401 Hwy. 287 North, Mansfield, TX 76063, Tel: 800-346-6873, FAX: 817-483-0931; Empl.: 200; *Dist. Mgr.:* G. Rye

MOXNESS PRODUCTS, INC., Versa Technologies, 1914 Indiana St., Racine, WI 53405, Tel: 414-554-5050, 800-558-5706, FAX: 414-554-2321; Empl.: 250; *Sls. Mgr.:* Ronald M. Buono; *Dist. Mgr.:* Ronald M. Buono

MPB CORP., Miniature Precision Bearings Div., Precision Park, Keene, NH 03431, Tel: 603-352-0310, TWX: 710-366-1801; FSC No.: 40920; Empl.: 1900; *Sls. Mgr.:* T. A. Rudziensky; *Dist. Mgr.:* R. F. Chartier

M P C, 150 S. Harbor Blvd. Unit J, Santa Ana, CA 92704, Tel: 714-775-0211, FAX: 714-775-1674; Empl.: 25; *Sls. Mgr.:* Sam Granat

MPC, Div. of Consulting Systems, 638 Main St., Danville, NH 03819, Tel: 603-642-5913, FAX: 603-642-5913; *Sls. Mgr.:* W. Morse ..... **D•1911**

Local Distributors

TN	Knoxville, Indl. Elctrns.	615-573-7135

MP/CAPAR, Multi Products International, 250 Lackawanna Ave., P.O. Box 737, West Paterson, NJ 07424, Tel: 201-890-1344, FAX: 201-890-1677; *Sls. Mgr.:* Leroy Gray ..... **A•1107**

Local Sales Offices & Reps

AZ	Phoenix, JBS Assocs.	602-893-2382
CA	Mission Viejo, Jay Mktg. Assoc.	714-768-7519
CA	Santa Clara, Nova-Tronix, Inc.	408-727-0261
CO	Denver, Electrophase	303-296-0443
FL	Indian Rocks Bch., Electronic Mfrs. Agt.	813-596-5053
GA	Lawrenceville, Tek Rep Mktg.	404-963-1600
IL	Des Plaines, ESCO Assocs.	312-298-5310
IN	Frankfort, CS Elctrns. Sls.	317-659-1874
IA	Marion, MSB Assocs	319-377-6261
KS	Shawnee Mission, MSB Assocs.	913-432-2131
MA	Norwood, The MacInnis Co.	617-762-8090
MI	Lathrup Village, RC Nordstrom & Co.	313-559-7373
MN	St. Paul, Proud Inds.	612-646-9428
MO	St Charles, MSB Assocs.	314-967-5577
NY	Farmingdale, BDK Mktg., Inc.	516-694-5500
NY	Rochester, Ontec Elctrn. Mktg.	716-464-8636
OH	Dayton, KW Elctrn. Sls.	513-890-2152
OR	Tigard, Eltech Inc.	503-684-3458
PA	Collegeville, Beacon North	703-478-2480
TX	Irving/Dallas, AID Elctrns	214-790-4761
WA	Bellevue, Eltech Inc.	206-643-4330

Local Distributors

AL	Huntsville, Components Resources	205-533-2862
CA	Chatsworth, Passive Comps.	818-700-8838
CA	Fountain Valley, Components Ctr.	714-979-0433
CA	Huntington Beach, Capacitor Specialists	714-843-1815
CA	Irvine, Kelex Inc.	714-863-1230
CA	Sunnyvale, Capsco Sls.	408-734-3020
CT	Wallingford, Midstate Elctrns.	203-265-9900
FL	Ft. Lauderdale, NRC Elctrns.	305-772-4500
IL	Lisle, Components Inc.	312-852-7707
IN	Carmel, Altex Elctrns.	317-848-1323
MD	Gaithersberg, Axis Elctrns.	301-840-9640
MD	Spencerville, US Elctrns.	301-384-3300
MA	Bellrica, Baldwin Comps.	508-667-6710
MA	Tyngsboro, Port Elctrns.	508-649-4880
MI	Grand Rapids, RM Elctrns. Co.	616-531-9300
MN	New Brighton, Chris Elctrns.	612-631-2647
MN	New Brighton, Parts I	612-633-8079
NJ	Rockaway, Tonar Inds.	201-986-9000
NY	Bohemia, Key Components	516-567-7500
NY	Ronkonkoma, Baldwin Comps.	516-588-5700
OR	Portland, Radar Elec.	503-232-3404
OR	Tualatim, Moore Elctrns.	503-692-5333
PA	York, E C I	717-846-5334
PA	Bristol, Aim Elctrns.	215-785-3510
RI	Pawtucket, Major Edward Elctrns.	401-725-7400
TX	Ft. Worth, Allied Elctrns.	817-336-9168
TX	Richardson, GTT	214-437-4747
WA	Seattle, Radar Elctrns.	206-282-2511
WI	Grafton, Lakeview Elctrns.	414-377-8250
Can	Montreal, Prelco Elctrns.	514-389-8051
Can	St. Laurent, Que., ZEI Elctrns.	514-342-6211

MRL, Missouri Research Labs., 3800 West Clay, St. Charles, MO 63301, Tel: 314-946-6900, 1-800-325-0223, FAX: 314-946-2860; Empl.: 100; *Sls. Mgr.:* Virgil Beer

MSC AUTOMATION, Miller Sales Co., 1111 Old Rand Rd., Wauconda, IL 60084, Tel: 708-526-9200, 800-323-5294, FAX: 708-526-9206; Empl.: 23; *Sls. Mgr.:* Paula Bilinski; *Dist. Mgr.:* Lena Nilsson

FAX: 803-393-4123

MSD, INC., Magnecraft, 700 Orange St., Darlington, SC 29532, Tel: 803-393-5421; Empl.: 210; *Sls. Mgr.:* Bob Forbes ..... **B•1551-1556**

Local Sales Offices & Reps

AL	Huntsville, BCI	205-539-4411
AZ	Tuscon, Clemick	602-749-4003
CA	Mountain View, Bridge Mktg.	415-965-8045
CA	Torrance, MG Sls.	213-533-1808
CO	Englewood, CSI	303-779-8060
CT	Bloomfield, Zaslow Sls. Co.	203-242-7781
FL	Orlando, CDM	407-240-3903
GA	Chamblee, BCI	404-455-0405
IL	Downers Grove, Rockford Controls Co.	312-960-2046
KS	Olathe, Advanced Tech Sls.	913-782-8702
MA	Millis, Zaslow Sls.	508-393-8150
MD	Towson, Bresson	301-321-0326
MI	Southfield, L.H. Dickelman Co.	313-353-8210
MN	Edina, Dunlop	612-559-9693
MO	St. Louis, Advanced Tech. Sls.	314-878-2921
NJ	West Caldwell, GSA	201-575-9300
NH	Portsmouth, Zaslow	508-393-8150
NY	Buffalo, Zang Agency	716-877-3677
OR	Tigard, Eltech	503-684-3458
OH	Cincinnati, Stegman Blaine	513-729-1969
VA	Moneta, Bresson	804-525-7445
PA	Narberth, Bresson	215-664-6460
TN	Memphis, Lesley Assocs.	901-755-9492
TX	Richardson, Texoma	214-238-8127
WA	Bellevue, Eltech, Inc.	206-643-4330
UT	Midvale, CSI	801-561-5099
WI	Sun Prairie, Rockford Controls	608-837-3350

Local Distributors

AL	Birmingham, M G Elctrns.	205-328-4525
AL	Decatur, M-G Elctrns. & Equip.	205-355-6121
AL	Huntsville, Wyle Lab.	205-837-4411
AL	Montgomery, Southern Controls, Inc.	205-277-5030
AR	Little Rock, Carlton-Bates	901-755-1249
CA	Buena Park, Cypress Elctrns.	714-521-5230
CA	Hayward, Electro Comps. Inc.	415-783-5800
CA	Hayward, Western Electro Sls.	415-489-2211
CA	Los Angeles, Master Distrs.	213-452-1229
CA	Oakland, Brill Elctrs.	415-834-5888
CA	San Diego, Johnstone Supply	619-298-7168
CA	Santa Ana, Norstan Elctrns. Inc.	714-540-4165
CA	Woodland Hills, Cypress Elctrns., Inc.	818-710-7730
CO	Aurora, Comp. Specialties, Inc.	303-341-0160
CO	Denver, Newark-Denver Elctrns.	303-757-3351
CT	Wallingford, Sager Elec Supp. Co.	203-265-4600
CT	West Hartford, HESCO	203-236-6363
FL	Lakeland, A-A Elec. Inc	813-665-6941
FL	Orlando, T & T Prods., Inc.	407-857-2282
GA	Atlanta, Brownell-Electro, Inc.	404-762-5181
GA	Norcross, A-A Elec. Inc.	404-449-8670
IL	Bensenville, Voyager Elctrns.	312-860-1300
IL	Chicago, Newark Elctrns. Corp.	312-784-5100
IL	Hinsdale, Whiteco,Inc.	312-654-3326
IL	Peoria, Klaus Radio, Inc.	309-691-4840
IN	Ft. Wayne, Bell Inds., Inc.	219-423-3422
IA	Cedar Rapids, The Van Meter Co.	319-366-5301
KS	Kansas City, Kornfeld-Thorp Elec.	913-321-7070
LA	Baton Rouge, Menard Elctrns. Inc.	504-355-0323
MA	Harrahan, M-G Electrns. & Equip. Co.	504-733-0070
LA	Lafayette, Ralph's of Lafayette Inc.	318-233-0105
LA	Shreveport, Ind. Elctr. Supp.	318-222-9459
ME	lakeland Engrg. Equiq.	
MD	Baltimore, Whitney Distrs. Inc.	301-944-8080
MA	Springfield, T.F. Cushing Inc.	413-788-7341
MA	Woburn, Apparatus Svce. Co.	617-933-5999
MI	Battle Creek, Kendall Elec. Supp.	616-963-5585
MI	Oak Park, Newark-Detroit Elctrn.	313-967-0600
MI	Troy, Teal Elec. Co.	313-689-3000
MN	Fridley, Voyager Elctns. Corp.	612-571-7766
MN	Hibbing, Jasper Engnrg. & Equip.	218-262-3421
MO	Maryland Hgts., L Comp. Inc.	314-291-6200
NJ	Audubon, Universal Elctrns. Supp.	800-327-3529
NJ	E. Hanover, State Elctrn. Parts	201-887-2550
NJ	Oakland, Relay Specialties, Inc.	201-337-1000
NM	Albuquerque, Summit Elec. Supp.	505-884-4400
NY	Buffalo, L.A. Wooley Co.	716-821-1200
NY	Buffalo, Summit Dists.	716-887-2800
NY	Plainview, A.C.I. Elctrns.	516-293-6630
NY	Rochester, Requa Elec. Co.	716-475-1600
NY	Rome, Rome Elctrns., Inc.	315-337-5400
NY	Woodside, Switches Unlimited	718-478-5000
NC	Goldsboro, Shepherd Elec. Supp.	919-735-1701
OH	Akron, Aesco Elctrns., Inc.	216-762-8818
OH	Cincinnati, Hughes-Peters, Inc.	614-294-5351
OH	Cincinnati, Wesco	513-542-4300
OH	Columbus, E & M Equip.	614-236-0888
OH	Toledo, F.N. Cuthbert, Inc.	419-385-0881
OH	Warren, REM Elctrns.	216-373-1300
OK	Tusla, Radio, Inc.	918-587-9123
OR	Portland, Johnstone Supp., Inc.	503-231-4833
PA	McKean, Advacom Inc.	814-476-7774
PA	McKeesport, Barno Radio Co.	412-751-5966
PA	Murrysville, Wesco	412-733-6800
PA	Philadelphia, PEI/Genesis	215-673-0400
PA	St. Marys, B & R Elec. Co.	814-834-2814
PA	West Chester, West Chester Elec.	215-696-7500
PA	York, E.C.I. Inc.	717-846-5334
SC	Charleston, Cameron & Barkley Co.	803-745-2900
SC	Greenville, Emsco	803-233-4121
TN	Chattanooga, Electr. Motor Sls. & Supp.	615-899-1126
TN	Kingsport, WESCO	615-247-6190
TN	Nashville, Electra Distrbg. Co.	615-256-0800
TX	Dallas, Assocd. Aircraft	214-331-4381
TX	Dallas, Wholesale Elctr. Supp.	214-824-3001
TX	Fort Worth, Allied Elctrs.	817-595-3500
TX	Houston, Lenert Co.	713-225-1465
UT	Salt Lake City, Stuart Elec. Supp.	801-466-8603
WA	Redmond, EIL Insts. Inc.	206-882-3222
WV	Huntington, State Elec. Supp. Co.	304-523-7491
WV	South Charleston, Allied Controls Co.	304-768-7313
WI	Cedarburg, Automation Engrg.	414-377-7500
WI	Milwaukee, Marsh Elctrs.	414-475-6000
IA	Cedar Rapids, Advanced Tech. Sls.	319-393-8280

MSI ELECTRONICS, INC., 34-32 57th St., Woodside, NY 11377, Tel: 718-672-6500, TELEX: 426407, FAX: 718-397-0972; FSC No.: 18518; Empl.: 18; *Sls. Mgr.:* A. Lederman

M. SYSTEM TECHNOLOGY, INC., 15028 Beltway Dr., Dallas, TX 75244, Tel: 800-544-3181, FAX: 214-385-2299; Empl.: 10; *Sls. Mgr.:* Chuck Seifert

MTE CORP., W147 N 9525 Held Dr., Menomonee Falls, WI 53051, Tel: 414-253-8200, FAX: 414-253-8222; FSC No.: 5950; Empl.: 120; *Sls. Mgr.:* John Houdek; *Dist. Mgr.:* John Houdek

M-TEK, 2419 Smallman St., Pittsburgh, PA 15222, Tel: 800-245-5101 , 412-261-9030, TELEX: 812-569, FAX: 412-261-7220; FSC No.: 56452; Empl.: 20; *Sls. Mgr.:* John Hartnett

M-tron

FAX: 605-665-1709

M-TRON INDUSTRIES, P.O. Box 630, E. Hwy. 50, Yankton, SD 57078, Tel: 605-665-9321, TWX: 910-668-3603; FSC No.: 23875; Empl.: 150; *Sls. Mgr.:* Larry Barbary; *Dist. Mgr.:* Les Willman ..... **A•1408-1409**

Local Sales Offices & Reps

AL	Huntsville, Group 2000 Sls. Inc.	205-536-2000
AZ	Phoenix, Howe & Howe Sls., Inc.	602-264-7971
CA	Mountain View, Bridge Mktg.	415-965-8045
CA	Torrance, Universal Comps. Co.	213-783-0220
CO	Englewood, Comp. Sls; Inc.	303-779-8060
CT	Fairfield, Comptech/NRG Ltd.	203-384-1112
FL	Ft. Lauderdale, QXI of Florida Inc.	305-978-0120
FL	Melbourne, QXI of Fl, Inc.	407-723-4384
FL	Orlando, QXI of Florida Inc.	407-872-2321
FL	St. Petersburg, QXI of Florida Inc.	813-894-4556
GA	Norcross, Group 2000 Sls. Inc.	407-729-1889
IL	Arlington Hgts., KMA Sales	708-398-5300
IN	Ft. Wayne, Alpha Tech, Inc.	219-447-0040
MD	Columbia, Robert Electronic Sales	301-995-1900
MD	Hunt Valley, Eagle Sls. Corp.	301-666-3930
MA	Tyngsboro, Comptech, Inc.	508-649-3030
MI	Farmington Hills, Tritech Sales, Inc.	313-553-3370
MN	Edina, OHMS Technology Inc.	612-932-2920
NJ	E. Brunswick, Winch Sales Associates	201-613-1515

NJ Marlton, Naudain Associates, Inc. 609-983-5300
NY Farmingdale, Milgray Int'l 516-420-9800
NY Pittsford, James E. Zimmerman Sales 716-381-3186
NY Plainview, Winch Sales Associates ... 516-681-3163
NC Raleigh, Robert Electronic Sales 919-878-4465
NC Sapphire, Robert Electronics Sales ... 704-877-3280
OH Dayton, Lyons Corporation 513-278-0714
OH Richfield, Lyons Corporation 216-659-9224
OH Westerville, Lyons Corporation 614-895-1447
OR Portland, K-Tek Intl. Inc. 503-624-0315
TX Austin, Ram Electronics Sales, Inc. 512-250-5082
TX Houston, Ram Electronics Sales, Inc. 713-955-0768
TX Plano, Ram Electronic Sales, Inc. 214-424-4455
UT Midvale, Component Sales, Inc. 801-561-5099
WA Lynnwood, Quadra Sales 206-743-2633
WI Milwaukee, KMA Sales 414-259-1771
Can Burnaby, BC., Kaytronics 604-294-2000
Can Concord, Ont., Kaytronics 416-669-2262
Can Kantata, Ont., Kaytronics 613-564-0080
Can Ville St. Laurent, Que., Kaytronics 514-745-5800

Local Distributors

AL Huntsville, Bell Industries 205-837-1074
AL Huntsville, Pioneer Electronics 205-837-9300
AZ Phoenix, Sterling Electronics 602-437-5565
AZ Tempe, Acacia 602-894-2874
AZ Tempe, Bell Industries 602-966-7800
AR Little Rock, Carlton-Bates 501-562-9100
CA Agoura Hills, Bell Industries 818-706-2608
MA Auburn, Dove Electronics 508-832-2730
WI Brookfield, Pioneer 414-784-3480
CA Chatsworth, Sterling Electronics 818-407-8850
CA Cypress, Bell Industries 714-895-7801
CA Fremont, Acacia 415-623-7500
CA Gardena, Bell Industries 213-515-1800
CA Huntington, Wyle Kitting 714-373-9944
CA Irvine, Acacia 714-660-0834
CA Los Angeles, Bell Industries 213-826-6778
CA Rocklin, Bell Industries 916-652-0414
CA San Diego, Acacia 619-597-0577
CA San Diego, Bell Industries 619-268-1277
CA San Diego, Pyramid Electronics/Kent 619-271-5404
CA San Diego, Sterling Electronics 619-271-6555
CA San Jose, All American 403-943-1200
CA San Jose, Compass Components 408-432-7525
CA Santa Clara, Pyramid/Kent Elect. 408-727-9810
CA Sherman Oaks, DLDI 213-283-2058
CA Stanton, Inductive Comp/Crystal 714-828-3420
CA Sunnyvale, Bell Industries 408-745-0400
CA Sunnyvale, Bell Industries 408-734-8570
CA Torrance, All American 213-320-0240
CA Torrance, Pyramid/Kent Electronics .. 714-773-0781
CA Tustin, Sterling Electronics 714-259-0900
CO Englewood, Component Sales, Inc. ... 303-779-8060
CO Englewood, Sterling Electronics 303-792-3939
CO Lakewood, Acacia 303-232-2882
CO Wheatridge, Bell Industries 303-424-1985
CT E. Haven, J.V. Electronics 203-469-2321
CT Norwalk, Pioneer Electronics 203-853-1515
FL Altamonte Springs, Bell Industries 407-339-0078
FL Altamonte Springs, Pioneer 407-834-9090
FL Clearwater, All American 813-536-0445
FL Miami, All American 305-621-8282
CA Santa Fe Springs, Bell Industries 213-921-3611
GA Norcross, Bell Industries 404-662-0923
GA Norcross, Pioneer Electronics 404-623-1003
IL Addison, Pioneer Electronics 708-495-9680
IL Elk Grove Vl., Bell Industries 312-640-1910
IL Rosemont, Advent Electronics 708-297-6200
IL Schaumburg, Sterling Electronics 707-303-9900
IN Ft. Wayne, Bell Industries 219-423-3422
IN Indianapolis, Advent Electronics 317-872-4910
IN Indianapolis, Bell Industries 317-875-8200
IN Indianapolis, Pioneer Electronics 317-573-0880
IA Cedar Rapids, Advent Electronics 319-363-0221
IA Cedar Rapids, Bell Industries 319-395-0730
CA San Jose, Pioneer Technologies 408-954-9100
FL Sunrise, All American 305-572-7999
MD Baltimore, Resco Baltimore 301-931-8200
MD Beltsville, Resco/Washington 301-937-9100
MD Gaithersburg, Pioneer Electronics 301-921-0660
MA Andover, Bell Industries 508-474-8880
MA Billerica, A. W. Mayer Co. Inc. 508-229-2255
FL Clearwater, Pioneer/Tampa 813-536-0445
MA Lexington, Pioneer Electronics 617-861-9200
MD Rockville, All American 301-251-1205
MA Wakefield, All American 617-246-2300
MA Wilmington, J.V. Electronics 508-833-0700
MA Winchester, Bell Industries 617-729-5800
MI Ann Arbor, Bell Industries 313-347-6633
MI Farmington Hills, Advent Industries ... 313-477-1650
MI Grand Rapids, Pioneer Electronics 616-698-1800
MI Livonia, Pioneer Electronics 313-525-1800
MN Eden Prairie, All American 612-944-2151
MN Eden Prairie, Pioneer 612-944-3355
MN Hibbing, Minntech Electronics 218-262-5228
NJ Hopeland, Dove Electronics 201-324-7830
MN Minneapolis, Stark Electronics 612-332-1325
MO St Louis, Ric-tronics 314-997-0747
MO St. Louis, Pioneer Electronics 314-432-4350
NH Hudson, Bell Industries 603-882-1133
NH Nashua, Brevan Electronics 603-889-7230
NJ Fairfield, Pioneer Electronics 201-575-3510
NJ W. Berlin, GCI 609-768-6767
NM Albuquerque, Bell Industries 505-292-2700
NM Albuquerque, Sterling Electronics 505-884-1900
NJ Berlin, P.A.C. Electronics 609-768-5180
NY Binghamton, Pioneer Electronics 607-722-9300
NY Bohemia, Key Components Inc. 516-567-7500
NY Fairport/Rochester, Pioneer 716-381-7070
NY Farmingdale, Bell Industries 516-752-9303
NY Ronkonkoma, All American 516-981-3935
NY Ronkonoma, M-tron Components 516-467-5100
NY Stony Brook, Dove Electronics 516-689-7733
NY Woodbury, Pioneer Electronics 516-921-8700
NC Charlotte, Pioneer Electronics 704-527-8188
NC Durham, Pioneer Electronics 919-544-5400
NC Raleigh, Century Electronics 919-782-2116
NC Raleigh, Sterling 804-226-2190
OH Cleveland, Pioneer Electronics 216-587-3600
OH Dayton, Bell Inds. (Industrial) 513-435-8660
OH Dayton, Bell Inds. (Military) 513-434-8231
OH Dayton, Pioneer Electronics 513-236-9900
OK Oklahoma City, Radio Inc. 405-789-0741
OK Tulsa, Altair 918-252-5781
OK Tulsa, Radio Inc. 918-587-9123
OR Beaverton, Acacia 503-646-3377
OR Lake Oswego, Bell Industries 503-635-6500
NM Betatron, Albuquerque 505-821-1122
PA Horsham, Pioneer Electronics 215-674-4000
PA Norristown, Century Electronics 215-631-5400
PA Pittsburgh, Pioneer Electronics 412-782-2300
TX Austin, Altair 512-837-4970
TX Austin, Pioneer Electronics 512-835-4000
TX Dallas, Pioneer Electronics 214-386-7300
TX Ft. Worth, Carlton Bates 800-456-0314
TX Houston, Altair 713-462-3029
TX Houston, Pioneer Electronics 713-495-4700
TX Houston, Pyramid/Kent 713-978-5896
TX Houston, Sterling 713-627-9800
TX Richardson, Altair 214-231-5166
TX Richardson, Bell Industries 214-690-0466
UT Midvale, Bell Industries 801-255-9611
UT Salt Lake City, Standard Supply 801-486-3371
UT Salt Lake City, Sterling Electronics 801-972-5444
VA Herndon, Sterling Electronics 703-742-8400
VA Richmond, Sterling Electronics 804-226-2190
WA Redmond, Bell Industries 206-885-9963
WA Redmond, Priebe Electronics 206-881-2363
WA Redmond, Pyramid/Kent Electronics 206-883-7200
WA Redwood, Acacia 206-881-5566
WI Brookfield, Pioneer 414-784-3480
WI Milwaukee, Marsh Electronics 414-475-6000
TX Richardson, All American 214-231-5300
WI Waukesha, Bell Industries 414-547-8879
Can Burnaby, BC, ITT/R-A-E Ltd. 604-291-8866
Can Calgary, Alb., Electrosonic 403-255-9550
Can Calgary, AB, Cardinal Electronics Ltd. 306-934-3443
Can Calgary, AB, Zentronics 403-295-8838
Can Concord, Ont, ITT/R-A-E Ltd. 416-736-1144
Can Dartmouth, NS, ITT/R-A-E Ltd. 902-465-2350
Can Don Mills, Ont., Saynor Varah 416-445-0723
Can Edmonton, Alb; Zentronics 403-484-1669
Can Edmonton, ALB., Cardinal Electronics 403-483-6266
Can Mississauga, Ont., Zentronics 416-564-9600
Can Moncton, NB, ITT/R-A-E Ltd. 506-857-8011
Can Nepean, Ont., ITT/R-A-E Ltd. 613-596-6980
Can Nepean, Ont., Zentronics 613-226-8840
Can Ottawa, Ont., Electrosonic Inc. 613-728-8333
Can Richmond, B.C., Zentronics 604-273-5575
Can Richmond, BC, Electrosonic Inc. 604-273-2911
Can Saskatoon, SK, Cardinal Electronics Ltd. 306-934-3443
Can St. Foy,Que., Zentronics 418-654-1077
Can St. Laurent, Que., Zentronics 514-437-9700
Can St. Laurent, QB, ITT/R-A-E Ltd. 514-335-7697
Can Willowdale, Ont., Electrosonic Inc. 416-494-1666
Can Winnepeg, Man., Zentronics 204-694-1957
Can Winnipeg, Electrosonic Inc. 204-783-3105
Can Winnipeg, MN, ITT/R-A-E Ltd. 204-786-8401

MTS SYSTEMS, Box 24012, Minneapolis, MN 55424, Tel: 612-937-4000, TELEX: 163548 MULAM DL, FAX: 214-333-3533; Empl.: 1300; *Sls. Mgr.:* Ted Beaudoin

MUELLER ELEC. CO., 1583 E. 31st St., Cleveland, OH 44114, Tel: 216-771-5225, FAX: 216-771-3068; Empl.: 156; *Sls. Mgr.:* J. E. Wisneski

MULTI-AMP CORP., TBG, 4271 Bronze Way, Dallas, TX 75237, Tel: 214-333-3201, TELEX: 163548 MULAM DL, FAX: 214-333-3533; Empl.: 350; *Sls. Mgr.:* Hermann Michaeli

MULTICOMP., INC., 3005 S.W. 154th No. 3, Beaverton, OR 97006, Tel: 503-626-4200, FAX: 503-643-4889; Empl.: 150 ..... **A•1108, 2307**

Local Sales Offices & Reps

OR Portland, Intertech Sls. 503-775-7885

MULTI-CONTACT USA, 610 Davis St., Santa Rosa, CA 95401, Tel: 707-575-7575, FAX: 707-575-7573; *Sls. Mgr.:* Walter Roberts, Gen. Mgr.; *Dist. Mgr.:* Walter Roberts ..... **C•1475-1477**

Local Sales Offices & Reps

IL Chicago, Multi-Contact 312-286-1666

MULTICORE SOLDERS, 1751 Jay Ell Drive, Richardson, TX 75081, Tel: 214-238-1214; Empl.: 1000

MULTICORE SOLDERS, 400 Post Ave. Ste., 306, Westbury, NY 11590, Tel: 516-334-7997, FAX: 516-334-7098

MULTIPOWER, INC., Spectrum Electronics Corp., 3005 S.W. 154th Terrace No. 1, Beaverton, OR 97006, Tel: 503-646-4700, FAX: 503-643-4889; FSC No.: 75498; Empl.: 33 ..... **D•1912**

Local Sales Offices & Reps

OR Beaverton, MultiPower, Inc. 503-646-4700

MULTI PRODUCTS INTERNATIONAL, 250 Lackawanna Ave., West Paterson, NJ 07424, Tel: 201-890-1344, TELEX: 219289, FAX: 201-890-1677; Empl.: 28; *Sls. Mgr.:* LeRoy Gray ..... **A•2309; D•1913**

Local Sales Offices & Reps

AZ Phoenix, JBS Assocs. 602-893-2382
CA Mission Viejo, Jay Mktg. 714-768-7519
CA Santa Clara, Nova Tronix 408-727-9530
CA Westminster, West Elctrn. Sls. 714-898-0120,
CO Denver, Electrophase 303-296-0443
FL Longwood, Elctrn. Mfgs. Agt. 305-682-1202,
GA Lawrenceville, Tek Rep Mktg. 404-963-1600
IL Des Plaines, Esco Assocs. 312-298-5310
IN Frankfort, C-S Elctrns. Sls. 317-659-1874
KS Shawnee Mission, MSB Assocs. 913-432-2131
MD Sterling, Beacon North 703-478-2480
MA Norwood, Mac Innis Co. 617-762-8090
MI Lathrup Vl., R. C. Nordstrom & Co. 313-559-7373
MN St. Paul, Proud Inds. 612-646-9428
MO St. Charles, MSB Assocs. 314-967-5577
NJ Cedar Grove, Legtonics Assocs. 201-239-4098
NY Rochester, Ontec Elctrns. 714-464-8636
OH Dayton, K.W. Elctrn. 513-890-2150
PA Langhorne, Beacon North 703-478-2480
PA Pittsburgh, KW Elctrns. 412-366-9396
TX Dallas, AID Elctrns. 214-790-4761
WA Bellevue, Eltech 206-643-4330
Can Lachine, Bytewide Mktg. 514-636-4121

MULTISENS INC, 2633 Blv. Le Corbusier, Laval, Que., Canada H7S 2E8, Tel: 514-629-5646, FAX: 514-629-6801; Empl.: 20; *Sls. Mgr.:* Jean-Franqois Olivier

MULTI-TECH SYSTEMS, INC., 2205 Woodale Dr., Mounds View, MN 55112, Tel: 612-785-3500, 800-328-9717, FAX: 612-785-9874; Empl.: 210; *Sls. Mgr.:* Thomas Heimerman; *Dist. Mgr.:* Peter Hanlon/Jan Hubbard/Jim Stacklie

MUPAC CORP., Carlo Gavazzi Co., 10 Mupac Dr., Brockton, MA 02401, Tel: 508-588-6110, FAX: 508-588-0498; Empl.: 180; *Sls. Mgr.:* James L. Gallagher

muRata ERIE

FAX: 404-436-3030

MURATA ERIE NORTH AMERICA, INC., 2200 Lake Park Dr., Smyrna, GA 30080, Tel: 404-436-1300, TELEX: 54-2329, TWX: 810-766-1531; Empl.: 1800; *Sls. Mgr.:* Jack Driscoll; *Dist. Mgr.:* Kenneth O'Connor ..... **A•1109-1113, 1213, 1410-1415, 1696-1698, 1736-1738, 1820, 1957, 2058-2060; B•1323, 1853, 1922-1923; D•1045-1047**

Local Sales Offices & Reps

AL Madison, Jack Harvey & Assoc., Inc. .. 205-461-8591
AZ Scottsdale, Thom Luke Sls. 602-941-1901
CA Chatsworth, Murata Erie 818-701-9702
CA Fountain Valley, Bager Elctrns.,Inc. 714-957-3367
CA Los Altos, Recht Assocs. 415-964-6321
CA San Diego, CK Assocs. 619-279-0420
CA Tustin, Murata Erie 714-832-9972

CA Woodland Hills, Bager Elctrns., Inc. ... 818-712-0011
CO Boulder, Promotional Technlg. Corp. .. 303-447-2474
FL Deerfield Besch, Glen White Assocs. ... 305-570-8545
FL Maitland, Murata Erie ... 407-644-0954
FL Satellite Beach, Glen White Assoc. 407-773-3514
FL Tarpon Springs, Glen White Assoc. ... 813-938-7557
GA Norcross, Jack Harvey & Assocs. 404-449-4643
IL Park Ridge, Metcom Assoc. Corp. 708-696-1490
IN Carmel, Jack Harvey & Assocs., Inc. .. 317-575-4900
IN Kokomo, Jack Harvey & Assoc., Inc. .. 317-453-4260
IA Cedar Rapids, Stan Clothier Co., Inc. .. 319-393-1576
KS Olathe, Stan Clothier Co., Inc. 913-829-0073
KY Prospect, Jack Harvey & Assoc., Inc. .. 502-228-4100
NY Ithaca, Technlg. Sls., Inc. 607-257-7070
MD Towson, Glen White Assoc. 301-321-7235
MD Towson, Murata Erie 301-494-0405
MA Wakefield, Murata Erie 617-245-7880
MI W. Bloomfield, Jack Harvey & Assoc., Inc. ... 313-737-9122
MN Eden Prairie, Stan Clothier Co., Inc. ... 612-944-3456
MO St. Charles, Stan Clothier Co., Inc. 314-928-8078
NJ Springfield, Radix, Inc. 201-467-4970
NY Fairport, Technology Sls., Inc. 716-223-7500
NY Ithaca, Technlg. Sls., Inc. 607-257-7070
NC Raleigh, Glen White Assoc. 919-848-1931
OH Dayton, KW Electrn. Sls., Inc. 513-890-2150
OH Shaker Hgts., KW Elctrn. Sls., Inc. 216-491-9177
OR Beaverton, Murata Erie 503-646-4973
OR Beaverton, Westmark Elec., Inc. 503-641-8780
PA Pittsburg, KW Elctrn. Sls., Inc. 412-366-9396
TN Knoxville, Jack Harvey & Assoc., Inc. ... 615-694-7541
TX Austin, RAM Elec. Sls., Inc. 512-345-2982
TX Houston, RAM Elec. Sls., Inc. 713-955-0768
TX Plano, RAM Elec. Sls., Inc. 214-424-4455
UT Midvale, Promotional Technlg. Corp. .. 801-566-8919
VA Lynchburg, Glen White Assocs. 804-385-6110
WA Bellevue, Westmark Elect., Inc. 206-454-1944
WI West Allis, Metcom Assoc. Corp. 414-476-1300
PR Hato Rey, Semtronic Assocs., Inc. 809-766-0700
Can Mississauga, Ont., Gidden Morton Assocs. ... 416-671-8111
Can Richmond, Ont., Gidden Morton Assocs. ... 613-838-4480
Can St. Laurent, Que., Gidden Morton Assocs. ... 514-335-9572

Local Distributors

AL Huntsville, Future Elctrns. 205-830-2322
AZ Phoenix, Future Elctrns. 602-968-7140
AZ Phoenix, Sterling Elctrns. 602-437-5565
AZ Tempe, Acacia Sls./Deanco 602-894-2874, 602-882-9054
AZ Tempe, Time Elctrns. 602-967-2000
CA Agoura Hills, Time Elctrns. 818-707-2890
CA Camarillo, Milgray Elctrns. 805-484-4055
CA Chatsworth, Future Elctrns. 818-772-6240
CA Chatsworth, Passive Technlg. 818-882-2277
CA Chatsworth, Sterling Elctrns. 818-407-8850
CA Chatsworth, Time Elctrns. 818-998-7200
CA Compton, Harper Sid 213-979-5090
CA Fremont, Acacia/Deanco 415-623-7500
CA Garden Grove, Natl. Elctrns. Corp. 800-854-2451
CA Inglewood, Newark Elctrns., Inc. 213-671-7377
CA Irvine, Acacia Sls./Deanco 213-971-2428, 714-660-0834
CA Irvine, Future Elctrns. 714-250-4141
CA San Diego, Acacia Sls./Deanco 619-565-4365
CA San Diego, Future Elctrns. 619-278-5020
CA San Diego, Sterling Elctrns. 619-271-6555
CA San Diego, Time Elctrns. 619-586-1331
CA San Jose, Future Elctrns. 408-434-1122
CA San Jose, Future Elctrns. 408-434-1114
CA San Jose, Passive Technlg. 408-435-5566
CA Sunnyvale, Capsco Sls., Inc. 408-734-3020
CA Sunnyvale, Time Elctrns. 408-734-9888
CA Torrance, Time Elctrns. 213-320-0880
CA Tustin, Sterling Elctrns. 714-259-0900
CA Tustin, Time Elctrns. 714-669-0100
CO Denver, Newark Elctrns. 303-757-3351
CO Englewood, Sterling Elctrns. 303-792-3939
CO Englewood, Time Elctrns. 303-799-8851
CO Lakewood, Acacia Sls./Deanco 303-232-2882
CO Westminister, Future Elctrns. 303-421-0123
CT Bethel, Future Elctrns. 203-743-9594
CT Milford, Milgray Elctrns. 203-878-5538
CT Wallingford, Cronin Elctrns. 203-265-3134
CT Wallingford, Sterling Elctrns. 203-265-9535
FL Altamonte Springs, Future Elctrns. 407-767-8414
FL Clear Water, Future Elctrns. 813-578-2770
FL Orlando, Time Elctrns. 407-841-6565
FL Winter Park, Milgray Elctrns. 407-647-5747
GA Augusta, Dixie Elctrns. 404-722-2055
GA Concord, Dixie Elctrns. 404-495-5916
GA Norcross, Future Elctrns. 404-441-7676
GA Norcross, Milgray Elctrns. 404-446-9777
GA Norcross, Time Elctrns. 404-448-4448
IL Arlington Hgts., Milgray Elctrns. 708-253-1212
IL Bensenville, Goold Elctrns. Corp. 708-860-7171
IL Chicago, Newark Elctrns. 312-784-5100
IL Rosemont, Advent Elctrns., Inc. 708-297-6200
IL Schaumburg, Future Elctrns. 708-882-1255
IL Schaumburg, Time Elctrns. 708-303-3000
IN Indianapolis, Advent Elctrns., Inc. 317-872-4910
IA Cedar Rapids, Advent Elctrns., Inc. 319-363-0221
KS Lenexa, Sterling Elctrns. 913-492-5406
KS Overland Park, Milgray Elctrns. 913-236-8800
MD Baltimore, Resco(Baltimore) 301-981-8200
MD Beltsville, Resco(Washington) 301-937-9100
MD Columbia, Future Elctrns. 301-290-0600
MD Columbia, Milgray Elctrns. 301-621-8169
MD Columbia, Sterling Elctrns. 301-290-3800
MD Columbia, Time Elctrns. 301-964-3090
MA Hopkinton, Interface Elctrns. Corp. 508-435-6858
MA Needham, Cronin Elctrns. 617-449-5000
MA Peabody, Time Elctrns. 508-532-9900
MA Westborough, Future Elctrns. 508-366-2400
MA Wilmington, Milgray Elctrns. 508-657-5900
MA Woburn, Sterling Elctrns. 617-938-6200
MI Farmington Hills, Advent Elctrns., Inc. ... 313-477-1650
MI Livonia, Future Elctrns. 313-261-5270
MI Oak Park, Newark Elctrns. 313-967-0600
MN Eden Prairie, Future Elctrns. 612-944-2200
MN Edina, Time Elctrns. 612-835-1250
MN Minneapolis, Aero Space Computer Supp. ... 612-884-4725
MN Minneapolis, Newark Elctrns. 612-331-6350
MN Minneapolis, Sterling Elctrns. 612-831-2666
MO St. Louis, Future Elctrns. 314-469-6805
MO St. Louis, Time Elctrns. 314-391-6444
NH Manchester, Cronin Elctrns. 603-624-0105
NJ Edison, Sterling Elctrns. 908-417-1000
NJ Maritan, Time Elctrns. 609-596-6700
NJ Mariton, Milgray Elctrns. 609-983-5010
NJ Mt. Laurel, Future Elctrns. 609-778-7600
NJ Parsippany, Future Elctrns. 201-299-0400
NJ Parsippany, Milgray Elctrns. 201-335-1766
NJ Pine Brook, Time Elctrns. 201-882-4611
NJ Rockaway, Tonar Inds. 201-586-9000
NM Albuquerque, Sterling Elctrns. 505-884-1900
NY E. Syracuse, Time Elctrns. 315-432-0355
NY Farmingdale, Milgray Elctrns. 516-420-9800
NY Hauppauge, Future Elctrns. 516-234-4000
NY Hauppauge, Time Elctrns. 516-273-0100
NY Liverpool, Future Elctrns. 315-451-2371
NY Rochester, Future Elctrns. 716-272-1120
NC Charlotte, Dixie Elctrns. 704-377-4338
NC Charlotte, Elctrn. Mktg. Corp. 704-394-6195
NC Charlotte, Time Elctrns. 704-522-7600
NC Oxford, Time Elctrns. 919-693-5166
NC Raleigh, Future Elctrns. 919-790-7111
NC Raleigh, Milgray Elctrns. 800-562-3118, 919-790-8094
OH Cleveland, Milgray Elctrns. 216-447-1520
OH Columbus, Elctrn. Mktg. Corp. 614-299-4161
OH Dublin, Time Elctrns. 614-761-1100
OH Highland Hgts., Elctrn. Mktg. Corp. 216-442-3441
OH Kettering, Elctrn. Mktg. Corp. 513-439-4711
OH Valleyview, Newark Elctrns. 216-447-8860
OK Tulsa, Sterling Elctrns. 918-663-2410
OR Beaverton, Acacia Sls./Deanco 503-646-3377
OR Beaverton, Future Elctrns. 503-645-9454
OR Portland, Time Elctrns. 503-684-3780
OR Tualatin, Moore Elctrns. 503-692-5333
PA Malvern, Interface Elctrns. 215-889-2060
SC Columbia, Dixie Elctrns. 803-779-5332
SC Greenville, Dixie Elctrns. 803-297-1430
SC N. Charleston, Dixie Elctrns. 803-552-2671
TN Gray, Dixie Elctrns. 615-477-2131
TN Oak Ridge, Dixie Elctrns. 615-481-3393
TX Austin, Sterling Elctrns. 512-836-1341
TX Austin, Time Elctrns. 512-339-3051
TX Carrollton, Sterling Elctrns. 214-243-1600
TX Dallas, Milgray Elctrns. 214-248-1603
TX Garland, Newark Elctrns. 214-487-8144
TX Houston, Newark Elctrns. 713-270-4800
TX Houston, Sterling Elctrns. 713-623-6600
TX Irving, Harper Sid 214-621-0500
TX Richardson, Future Elctrns. 214-437-2437
TX Richardson, Time Elctrns. 214-644-4644
UT Salt Lake City, Future Elctrns. 801-972-8489
UT Salt Lake City, Milgray Elctrns. 801-272-4999
UT Salt Lake City, Sterling Elctrns. 801-972-5444
UT Salt Lake City, Time Elctrns. 801-973-8181
VA Richmond, Sterling Elctrns. 804-226-2190
WA Redmond, Acacia/Deanco 206-881-5566
WA Redmond, Future Elctrns. 206-881-8199
WA Redmond, Time Elctrns. 206-882-1600
WI Mequon, Taylor Elec. Co., Inc. 414-241-4321
WI Yaukesha, Future Elctrns. 414-786-1884
Can Alberta, AB Calgary, Zentronics 403-295-8838
Can Downsview, Ont., Future Elctrns. 416-638-4771
Can Edmonton, AB, Zentronics 403-484-1669
Can Manitoba-Winnipeg, MB, Zentronics ... 204-694-1957
Can Mississauga, Ont., Time Elctrns. 416-672-5300
Can Mississauga, Ont., Zentronics 416-564-9600
Can Montreal,PA, Future Elctrns. 514-694-7710
Can Nepean, Ont., Carsten 613-726-9250
Can Nepean, Ont., Zentronics 613-226-8840
Can Ottawa, Ont., Future Elctrns. 613-820-8313
Can Scarborough, Ont., Carsten 416-495-9999
Can St. Foy, Que., Zentronics 418-654-1077
Can St. Laurent, Zentronics 514-737-9700
Can St. Laurent, PQ, Carsten 514-334-8321
Can St. Laurent, PQ, Toner Industries 514-286-4061
Can Vancouver, BC, Future Elctrns. 604-294-1166
Can Vancouver, BC, Zentronics 604-273-5575
Can Willowdale, Ont., Milgray Elctrns./Toronto ... 416-756-4481

MURATA MANUFACTURING CO., LTD., 26-10-2-chome-Tenjin, Nagaoka-Kyo-Shi, Kyoto, Japan 617, Tel: 075-951-9111, TELEX: J64270, FAX: 075-955-6526; Empl.: 21,561; *Sls. Mgr.:* O. Otaka

MμShield®

FAX: 603-666-4013

THE MUSHIELD CO. INC., P.O. Box 439, 5 Springfield Rd., Goffstown, NH 03045, Tel: 603-666-4433, TELEX: 95-5439; FSC No.: 57284; Empl.: 8 ..... **C•1700**

MUTUAL INDUSTRIES, INC., 707 West Grange Street, Philadelphia, PA 19120, Tel: 215-927-6000, FAX: 215-927-3388

MWS Wire Industries

FAX: 818-706-0911

MWS WIRE INDUSTRIES, 31200 Cedar Valley Dr., Westlake Village, CA 91362, Tel: 818-991-8553; FSC No.: 51668; Empl.: 65; *Sls. Mgr.:* Greg Fancon ..... **C•1772-1775**

H. WM. MYERS & ASSOCS., 361 Virginia St., Crystal Lake, IL 60014, Tel: 815-459-0100; Empl.: 5; *Sls. Mgr.:* L. Peter Baenziger

NAMCO CONTROLS, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060, Tel: 216-946-9900, TELEX: 24-1566, FAX: 216-946-1228; Empl.: 200; *Sls. Mgr.:* Jon Slayburgh, Pres., Gen. Mgr.

NAMIKI, Precision of America, Inc., 201 West Passaic St., Rochelle Park, NJ 07662, Tel: 201-368-0123, FAX: 201-368-2244; FSC No.: 201-343-3172

NANO PULSE INDUSTRIES, 440 Nibus St., Brea, CA 92670, Tel: 714-529-2600, FAX: 714-671-7919; FSC No.: 57222; Empl.: 250; *Sls. Mgr.:* Michael J. Schubert

NATEL

FAX: 805-584-4357

NATEL ENGINEERING CO., INC., 4550 Runway St., Simi Valley, CA 93063-3449, Tel: 805-581-3950, TWX: 910-494-1959; Empl.: 170; *Sls. Mgr.:* Tom Guerriere ..... **D•1186-1187**

Local Sales Offices & Reps

AL Huntsville, Saber Assocs. 800-327-0853
CA Solana Bch., Cerco 619-792-5555
CO Parker, Howard Assocs. 303-841-5755
IL Itasco, Beta Technlg. Sls., Inc. 708-250-9586
IA Cedar Rapids, Midwest Tech. Sls., Inc. ... 319-393-5115
KS Goddard, Midwest Tech. Sls., Inc. 316-794-8565
KS Lenexa, Midwest Tech. Sls., Inc. 913-888-5100
MD Eldersburg, Natel Engrg. Co., Inc. 301-795-1115
MA Topsfield, Natel Engrg. Co., Inc. 508-887-7939
MO Earth City, Midwest Tech. Sls., Inc. 314-298-8787
NY Bohemia, Natel Engrg. Co., Inc. 516-563-4911

OH Dayton, Rixan Assocs., Inc. 513-222-0011
OH Stow, Rixan Assocs., Inc. 216-686-2909
TX Houston, Lear Assocs. 713-488-7893
TX Richardson, Lear Assocs. 214-231-5388
WA Mercer Island, Eagle Entprs., Inc. 206-232-7401
WI Milwaukee, Beta Technlg. Sls., Inc. 414-543-6609

NATIONAL ELECTRONICS CORP., 11731 Markon Dr., Garden Grove, CA 92641, Tel: 714-892-7749, 800-854-2451, FAX: 714-898-6769; Empl.: 50

NATIONAL CONTROLS CORP., 1725 Western Dr., W. Chicago, IL 60185, Tel: 312-231-5900, FAX: 312-231-1377; Empl.: 250; *Dist. Mgr.:* Cy Pfeifer

NATIONAL INFORMATION SYSTEMS, INC., 4040 Moorpark Ave., San Jose, CA 95117-1852, Tel: 408-985-7100, 800-441-5758, FAX: 408-246-3127; Empl.: 50

NATIONAL INSTRUMENTS®
The Software is the Instrument™

FAX: 512-794-8411

NATIONAL INSTRUMENTS CORP., 6504 Bridge Point Pkwy., Austin, TX 78730-5039, Tel: 512-794-0100, TELEX: 756737 Nat Inst Aus; Empl.: 3000; *Sls. Mgr.:* Melodie Summersett, Natl. Sls. Mgr.
..... **D•1124, 1188-1189, 1296-1297**

Local Sales Offices & Reps

CA Milpitas, Natl. Instrs. 408-453-3120
CO Colorado Springs, Natl. Instrs. 719-542-2815
GA Marietta, Natl. Instrs. 404-499-0505
IL Oak Brook, Natl. Instrs. 708-574-0050
MA Boston, Natl. Instrs. 617-938-8508
MA Norwell, Natl. Instrs. 617-659-9444
MN Shoreview, Natl. Instrs. 612-482-9930
NJ Rutherford, Natl. Instrs. 201-460-7883
NY Levittown, Natl. Instrs. 516-822-3074
OH Mogadore, Natl. Instrs. 216-325-3156
TX Richardson, Natl. Instrs. 214-699-7474
VA Herndon, Natl. Instrs. 703-709-9874

Local Distributors

CA Riverside, Innovation Products., Inc. ... 714-682-8506
WA Woodenville, Team, Inc. 206-485-1111
Can Mississauga, Ont., Allan Crawford Assocs. 416-890-2010

NATIONAL LAMINATION CO., National Material Ltd., 555 Santa Rosa Dr., Des Plaines, IL 60018, Tel: 708-298-7676, FAX: 708-635-8624; Empl.: 210

NATIONAL MANUFACTURING CO., INC., 12 River Rd., Chatham, NJ 07928, Tel: 201-635-8846, FAX: 201-635-7810; Empl.: 150; *Sls. Mgr.:* Otto Stahl, Jr.

NATIONAL MICRONETICS, 71 Smith Ave., Kingston, NY 12401, Tel: 914-338-0333, TWX: 510-247-8046, FAX: 914-338-0377; Empl.: 700; *Sls. Mgr.:* Richard Carlton

NATIONAL POWER TECHNLG., See Intelligence Power Technology

NATIONAL SEMICONDUCTOR, 2900 Semiconductor Dr., Santa Clara, CA 95052, Tel: 408-721-2641, FAX: 408-245-9655; Empl.: 30,000

NATIONAL SEMICONDUCTORS, LTD., See Silonex Inc.

NATIONAL-STANDARD CO., 1618 Terminal Rd., Niles, MI 49120, Tel: 616-683-8100, TELEX: 295187, FAX: 616-683-6249; Empl.: 2800; *Sls. Mgr.:* A. Osos; *Dist. Mgr.:* D. M. Wedsworth

NATIONAL TELEPHONE & ELECTRONICS INC., 2350 N.W. 96 Avenue, Miami, FL 33172, Tel: 305-592-0551, FAX: 305-599-0948; Empl.: 50

FAX: 213-225-4630

NATIONAL WIRE & CABLE CORP., 136 San Fernando Rd., Los Angeles, CA 90031-1780, Tel: 213-225-5611, TELEX: 181409, TWX: 910-321-4155; FSC No.: 04569; Empl.: 225 ..... **C•1704, 1776-1797**

Local Sales Offices & Reps

AZ Mesa, System Sls. 602-464-9989
AR Cotter, P.M.I. Sls. Co. 501-430-5525
CA San Diego, C.K. Sales 619-279-0420
CA Santa Clara, Ross Mktg. 408-988-8111
CO Arvada, Arrowhead/CSI Sls. 303-423-5597
FL Altamonte Springs, Gugel Assocs. 407-788-0845
GA Lawrenceville, Tek-Rep Mktg. 404-963-1600
HI Hilo, Kirco Corp. 808-959-3888
IL Northfield, H. S. Tollaksen 708-441-6644
MD Glen Burnie, Faion Lott 301-744-4611
MA Norwood, Tom Maguire Assocs., Inc. .. 617-551-0500
MI Farmington Hills, Luebbe Sls. 313-489-8828
MN Minnetonka, Producton Automation ... 612-935-1414
MO St. Louis, P.M.I. Sls. Co. 314-963-0001
NJ Wayne, GT Assoc. 201-694-6040
NY Sodus, S.W. Woolard 315-655-8145
OH Cincinnati, Luebbe Sls. 513-530-0600
OH Dayton, Luebbe Sls. 513-294-0426
OH Westlake, Luebbe Sls. 216-899-0071
PA Hatboro, Jacobsen Assocs. 215-674-2937
PA Pittsburgh, Luebbe Sls. Co. 412-364-0490
TX Ft. Worth, Tesco, Inc. 214-553-1200
WA Redmond, Halbar Assocs. 206-882-0990

NATIONWIDE ELECTRONIC SYSTEMS, See Weschler/NES Instruments

NAUGLER ENGINEERING, INC., Off Dunham Rd., Beverly, MA 01915, Tel: 617-922-5634, FAX: 617-468-1272; FSC No.: 05222; Empl.: 10; *Sls. Mgr.:* Kristen N. Bonnette

NAVAN CORPORATION, 20 West Front Street, Media, PA 19063, Tel: 215-543-8066, FAX: 215-543-2151; FSC No.: 6695; Empl.: 6; *Sls. Mgr.:* Howland St. Clair

NAZ-DAR/K.C., Thrall Enterprises, 1087 N. Branch St., Chicago, IL 60622, Tel: 312-943-8338, FAX: 312-943-8215; Empl.: 53; *Sls. Mgr.:* Kent Schnese; *Dist. Mgr.:* Kent Schnese

NCE:NATIONAL CUSTOM ENTERPRISES, INC., 400 Gateway Blvd., Burnsville, MN 55337-2559, Tel: 612-890-1360, FAX: 612-890-1014; FSC No.: 1FS75; Empl.: 25; *Sls. Mgr.:* J. A. Carlson

NCGI/STRUTHERS-DUNN, INC., INDUSTRIAL/COMMERICAL RELAYS, See MSD, Div. of Magnecraft

NCI, 6438 University Drive, Huntsville, AL 35806, Tel: 205-837-6667, FAX: 205-837-5221; Empl.: 8; *Sls. Mgr.:* Hal Newcomb; *Dist. Mgr.:* David Newcomb

NCR COMTEN, INC., NCR Corp., 2700 Snelling Avenue N., St. Paul, MN 55113, Tel: 612-638-7777, TELEX: 6879018 Comten, FAX: 612-638-8573; FSC No.: 7025-0010; Empl.: 1000; *Sls. Mgr.:* Gerry Fisher; *Dist. Mgr.:* Gerry Fisher

NCR POWER SYSTEMS, 3200 Lake Emma Rd., Lake Mary, FL 32746, Tel: 407-323-9250, FAX: 407-333-8312; Empl.: 156; *Sls. Mgr.:* Rick Ullinger

NDK

FAX: 415-623-6590

NDK AMERICA, INC., 47671 Westinghouse Dr., Fremont, CA 94539, Tel: 415-623-6500; Empl.: 28; *Sls. Mgr.:* Mike Kurihara, VP ..... **A•1416-1423**

Local Sales Offices & Reps

AL Huntsville, Elctrn. Mktg. Assoc. 205-880-8050
AZ Scottsdale, Carefree 602-951-9121
TX Dallas, SW Tech. 214-369-0977
CA Irvine, Quad-Rep South, Inc. 714-727-4222
CA Orangevalle, I Square, Inc. 916-989-0843
CA San Diego, Quad-Rep. 619-560-8330
CA Santa Clara, I Square, Inc. 408-988-3400
CO Englewood, CSI 303-779-8060
CT Woodbury, Anacon 203-266-0707
DE Medford, Jack McCoy 609-953-0770
GA Atlanta, Elctrn. Mktg. Assoc. 404-448-1215
ID Boise, Intermountain Tech. 208-888-6071
IL Chicago, M. Gottlieb & Assocs. 312-775-1151
IN Carmel, Fred A. Dorsey & Assocs. 317-844-4842
IA Davenport, Rush & West Assocs. 319-388-9494
KS Olathe, Rush & West Assocs. 913-764-2700
MD Annapolis, E.E.S Assoc. 301-269-4234
MA Burlington, Anacon Sls. Assocs., Inc. .. 617-272-9080
MI Grand Rapids, Miltimore Sls. 616-942-9721
MI Novi, Miltimore Sls. 313-349-0260
MO St. Louis, Rush & West Assocs. 314-965-3322
MT Boise, Inter-Mtn. Tech. 208-888-6071
NE Davenport, Rush & West 319-388-9494
NV Santa Clara, I Squared 408-988-3400
NY Syracuse, Rep Tech., Inc. 315-437-2845
NJ Fairfield, Tech. Applications & Mktg. ... 201-575-4130
NJ Medford, Jack McCoy, Inc. 609-953-0770
NM Albuquerque, Nelco Elctrns. 503-293-1399
NY Fairfield, TAM 201-575-4130
NC Raleigh, Elctrn. Mktg. Assoc. 919-847-8800
OH Cincinnati, Makin Assocs. 513-871-2424
OH Columbus, Makin Assocs. 614-848-5424
OH Solon, Makin Assocs. 216-248-7370
OR Tigard, Comps. West 503-684-1671
PA Medford, Jack McCoy, Inc. 609-953-0770
PA Solon, Makin Assocs. 216-248-7370
SC Greenville, Elctrn. Mktg. Assoc. 803-233-4637
TX Austin, Southwestern Tech. Sls. 512-440-0499
TX Dallas, Southwestern Tech. Sls. 214-369-0977
TX Houston, Southwestern Tech. Sls. 713-440-9200
UT Boise, Inter-Mtn Tech. 208-888-6071
VT Wilmington, Anacon 617-270-3712
WA Redmond, Comps. West 206-885-5880
WI Chicago, M. Gottlieb Assocs. 312-775-1151

Local Distributors

AL Huntsville, Lex Elec. 205-895-0480
AL Huntsville, Time Elctrns. 214-721-1134
AZ Tempe, Lex Elec. 602-431-0030
AZ Tempe, Time Elctrns. 602-967-2000
CA Calabassas, Lex Elec. 818-880-9686
CA Chatsworth, Time Elctrns. 818-988-7200
CA Irvine, Lex Elec. 714-987-0404
CA San Diego, Time Elctrns. 619-986-0129
CA San Jose, Lex Elec. 408-432-7171
CA Sunnyvale, Time Elctrns. 408-734-9888
CA Torrance, Time Elctrns. 213-320-0880
CO Englewood, Lex Elec. 303-799-0258
CO Englewood, Time Elctrns. 303-721-8882
CT Danbury, Lex Elec. 203-264-4700
FL Deerfield, Lex Elec. 305-977-7511
FL Ft. Lauderdale, Time Elctrns. 305-484-7778
GA Norcross, Lex Elec. 404-449-9170
GA Norcross, Time Elctrns. 404-448-4488
IL Schaumburg, Lex Elec. 708-330-2888
IL Wood Dale, Time Elctrns. 312-350-0610
KS Overland Pk., Lex Elec. 913-492-2922
MD Columbia, Lex Elec. 301-996-7800
MD Columbia, Time Elctrns. 301-964-3090
MA Peabody, Time Elctrns. 508-532-9900
MA Wilmington, Lex Elec. 508-694-0962
MI Livonia, Lex Elec. 313-525-8100
MN Eden Prairie, Lex Elec. 612-941-5280
MN Edina, Time Elctrns. 612-943-2433
MO Manchester, Lex Elec. 314-391-6444
MO St. Louis, Time Elctrns. 314-391-6444
NH Manchester, Lex Elec. 603-625-2250
NJ Marlton, Time Elctrns. 609-996-6700
NJ Pinebrook, Lex Elec. 201-227-7880
NY E. Syracuse, Time Elctrns. 315-432-0355
NY Hauppauge, Lex Elec. 516-231-2900
NY Hauppauge, Time Elctrns. 516-434-3344
NY Rochester, Lex Elec. 716-424-2222
NY Westbury, Lex Elec. 516-876-4000
NC Raleigh, Lex Elec. 919-876-0000
NC Raleigh, Time Elctrns. 919-847-9650
OH Beachwood, Lex Elec. 216-464-2970
OH Columbus, Time Elctrns. 614-794-3309
OH Dayton, Lex Elec. 513-439-1800
OK Tulsa, Lex Elec. 918-622-8000
OR Portland, Time Elctrns. 503-684-3782
PA Pittsburgh, Lex Elec. 412-963-6804
TX Austin, Lex Elec. 512-339-3051
TX Austin, Time Elctrns. 512-346-7346
TX Dallas, Lex Elec. 214-247-6300
TX Houston, Lex Elec. 713-784-3600
UT West Valley City, Time Elctrns. 801-973-8494
WA Kirkland, Time Elctrns. 206-820-1525
WI New Berlin, Lex Elec. 414-784-9451
Can Ontario, Time Elctrns. 416-672-5300

NEC

FAX: 415-965-6272

NEC ELECTRONICS, INC., 401 Ellis Street, P.O. Box 7241, Mountain View, CA 94039, Tel: 415-960-6000, TWX: 910-379-6985; Empl.: 1200; *Sls. Mgr.:* Mike Despotes, Sls. V.P.; *Dist. Mgr.:* Michael Kelly ..... **A•1115-1119; B•1100-1102, 1324-1332, 1558-1564**

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-772-9999
AZ	Phoenix, Oasis Sls., Inc.	602-277-2714
CA	Cardiff, Mission Technlg.	619-753-5092
CA	Mtn. View, NEC Elctrns.	415-965-6000
CA	San Jose, Exis	408-456-1650
CA	Santa Ana, NEC Elctrns.	714-546-0501
CO	Aurora, NEC Elctrns.	303-755-6353
CO	Boulder, Promotional Technlg.	303-447-2474
CO	Parker, Promotional Technlg.	303-841-4664
CT	Cheshire, Datatrack Engrg., Inc.	203-271-1311
FL	Altamonte Springs, V.G. Sls., Inc.	407-831-8688
FL	Ft. Lauderdale, V.G. Sls. Inc.	305-938-4333
FL	Largo, V.G. Sls. Co., Inc.	813-536-7787
FL	Maitland, NEC Elctrns.	407-875-1145
GA	Norcross, NEC Elctrns.	404-447-4409
GA	Norcross, 20th Century Mktg. Inc.	404-446-1999
IL	Arlington Hgts., NEC Elctrns.	312-577-9090
IL	Schaumburg, Martan Inc.	312-303-5660
IN	Carmel, Technlg. Mktg. Corp.	317-844-8462
IN	Ft. Wayne, Technlg. Mktg. Corp.	219-432-5553
IA	Cedar Rapids, Stan Clothier Co.	319-393-1576
KS	Overland Pk., AME Sls.	913-492-3971
KY	Louisville, Technlg. Mktg. Corp.	502-893-1377
MD	Glen Burnie, TRI-MARK Inc.	301-761-6000
MA	Natick, NEC Elctrns.	508-650-4100
MA	Woburn, Compass Technlg.	617-933-3336
MI	Grand Rapids, Miltimore Sls.	616-942-9721
MI	Novi, Miltimore Sls.	313-349-0260
MI	Troy, NEC Elctrns.	313-680-0506
MN	Bloomington, NEC Elctrns.	612-854-4443
MN	Minneapolis, Stan Clothier Co.	612-944-3456
MO	St. Charles, AME Sls.	314-928-2599
NJ	Bellmawr, TAI Corp.	609-778-5353
NJ	Saddle Brook, Metro Logic Corp.	201-575-5585
NY	Fishkill, NEC Elctrns.	914-897-2101
NY	Melville, NEC Elctrns.	516-753-7526
NY	Pittsford, Elcom Sls.	716-385-1400
NY	Skaneateles, Elcom Sls.	315-685-8245
NC	Charlotte, Quantum Mktg. Inc.	704-523-8822
NC	Durham, NEC Elctrns.	919-544-4132
NC	Raleigh, Quantum Mktg. Inc.	919-846-5728
OH	Columbus, NEC Elctrns.	614-436-1778
OH	Pepper Pike, NEC Elctrns.	216-831-0067
OR	Portland, Venture Elctrns.	503-624-0617
OR	Tigard, NEC Elctrns.	503-671-0177
PA	Allentown, NEC Elctrns.	215-391-9094
TX	Austin, TL Mktg., Inc.	512-837-7272
TX	Dallas, NEC Elctrns.	214-931-0641
TX	Dallas, TL Mktg., Inc.	214-484-6800
TX	Houston, NEC Elctrns.	713-955-2191
TX	Houston, TL Mktg., Inc.	713-589-2763
UT	Midvale, Promotional Technlg. Corp.	801-566-8919
WA	Bellevue, Venture Elctrns.	206-454-4594
WI	Mequon, Martan Inc.	414-241-4955
PR	Mayaguez, V. G. Sls. Co., Inc.	809-831-4150
Can	Concord, Ont., Kaytronics	416-669-2262
Can	Kanata, Ont., Kaytronics	613-592-6606
Can	Surrey, BC, Kaytronics Western	604-294-2000
Can	Ville St-Laurent, Que., Kaytronics	514-745-5800

NEARFIELD SYSTEMS, INC., 1330 E. 223rd St. 524, Carson, CA 90745, Tel: 213-518-4277, FAX: 213-518-4279; Empl.: 6

NECOA, INC., Nittoku Engineering Group, 9321A Philadelphia Rd., Baltimore, MD 21237, Tel: 301-574-4960, FAX: 301-574-7083; *Sls. Mgr.:* Larry Whyte

NEC TECHNOLOGIES, INC., 1414 Massachusetts Ave., Boxborough, MA 01719, Tel: 508-264-8000, TELEX: 910-997-0594; Empl.: 2700; *Sls. Mgr.:* Richard Gilbert/Jim Gregg

NEDAP N.V., P.O. Box 6, Groenlo, Holland 7140 AA, Tel: ò31-5440-71111, TELEX: 44253, FAX: ò31.5440.62745; Empl.: 420; *Sls. Mgr.:* W. Bonnemeier

NEDCO ELECTRONICS, INC., 8246 LeHigh, Morton Grove, IL 60053, Tel: 312-967-0500, FAX: 312-967-0505; Empl.: 10

NEEDHAM'S ELECTRONICS, 4539 Orange Grove Ave., Sacto, CA 95841, Tel: 916-924-8037, FAX: 916-972-9960; Empl.: 5

NEFF INSTR., 700 S. Myrtle Ave., Monrovia, CA 91016, Tel: 818-357-2281, TWX: 910-585-1833, FAX: 818-303-2286; Empl.: 125; *Sls. Mgr.:* Louis P. Lang

NEL FREQUENCY CONTROLS, INC., 357 Beloit St., Burlington, WI 53105, Tel: 414-763-3591, FAX: 414-763-2881; FSC No.: 00815; Empl.: 160; *Sls. Mgr.:* Dick Griebel, VP Sls. & Mktg.; *Dist. Mgr.:* Boyd Recknagel ... **A•1425**

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-772-9999
FL	Valrico, Richmar Elctrns.	813-654-8032
CA	Burlingame, Wm. J. Purdy Co.	415-347-7701
CA	Westlake Vlg., Elkin & Assoc.	818-597-1075
CO	Parker, A5 Co.	303-841-3651
FL	Orlando, Richmar Elctrns.	407-352-3755
GA	Norcross, 20th Century Mktg.	404-446-1999
IL	Downers Grove, Richmar Elctrns.	708-968-0118
IN	Indianapolis, Richmar Elctrns.	317-577-9950
IA	Iowa City, Richmar Elctrns.	319-354-8894
MI	Adrian, Elctrn. Salesmasters	517-263-2500
MI	Wixom, Elctrn. Salesmasters	313-669-0015
NH	Nashua, Bell Controls	603-882-6984
NY	Glen Cove, DynoRep	516-676-1598
NJ	Medford, Champion Elctrn. Sls. Assoc.	609-983-0932
NJ	Somerville, DynoRep	201-874-4670
NY	Attica, PSR Co.	716-591-1219
NY	Auburn, PSR Co.	315-253-4109
NY	Endicott, PSR Co.	607-754-7846
NY	Port Jefferson Sta., DynoRep	516-928-5135
NC	Raleigh, 20th Century Mktg.	919-790-9383
OH	Beechwood, Elctrn. Salesmasters	216-831-9555
OR	Tigard, RTS, Inc.	503-244-4123
TX	Plano, Richmar Elctrns.	214-424-8388
TX	Round Rock, Richmar Elctrns.	512-255-2551
WA	Edmonds, RTS Inc.	206-745-5445
WA	Vashon, RTS, Inc.	206-285-1363
WI	Butler, Richmar Elctrns.	414-781-1730
EXP	San Juan, Puerto Rico, Elctrn. Tech. Sls.	809-798-1300

Local Distributors

AZ	Tempe, Time Elctrns.	602-967-2000
CA	Chatsworth, Time Elctrns.	818-998-7200
MA	Auburn, Dove Elctrns.	508-832-2730
CA	Canoga Pk., Tim-Co Sls.	818-992-5040
CA	Irvine, Integrated Elctrns.	714-837-9960
NH	Manchester, Glynn Elctrns.	603-622-8131
CA	Milpitas, Sierra West	408-945-1050
MN	New Brighton, Chris Elctrns.	800-356-6599
CA	Sacramento, Integrated Elctrns.	916-363-6030
CA	San Jose, All American	408-943-1200
CA	San Jose, Integrated Elctrns.	408-435-1000
CA	Sunnyvale, Target	408-733-0384
CA	Torrance, All American	800-669-8300
CA	Torrance, Time Elctrns.	213-320-0880
CA	Tustin, Time Elctrns.	714-669-0100
CA	Van Nuys, C. W. Swift	818-989-1133
CA	Westlake Village, Sertek	818-707-2872
CA	Yorba Linda, Target Elctrns.	714-692-1630
CO	Denver, Integrated Elctrns.	303-292-6121
CT	Yalesville, Glynn	203-265-2498
FL	Miami, All American	305-621-8282
FL	Sunrise, All American	800-327-6237
IL	Hoffman Estates, Integrated Elctrns.	708-843-2040
IL	Lisle, Components Inc.	312-852-7707
IL	Northbrook, Classic Comps.	708-272-9650
IL	Rosemont, Advent	800-323-1270
IN	Indianapolis, Advent	317-872-4910
IA	Cedar Rapids, Advent	319-363-0221
MD	Jessup, Treeko Elctrns.	301-792-0112
MD	Rockville, All American	800-426-0420
MA	Billerica, Mayer Elctrns.	617-229-2255
MA	Middleboro, Glynn Elctrns.	800-225-8684
MA	Wakefield, All American	800-874-2834
MI	Farmington Hills, Advent	313-477-1650
MN	Eden Prairie, All American	612-944-2151
MN	Minneapolis, Bergquist	612-835-2322
NJ	Hopelawn, Dove Elctrns.	908-324-7830
NY	Buffalo, Genesee Indl.	716-873-9661
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Ronkonkoma, All American	800-874-2830
NY	Stony Brook, Dove Elctrns.	516-689-7733
OH	Englewood, Argent	513-836-8633
OH	Solon, Repco Elctrns.	216-248-8900
OK	Tulsa, Altair	918-252-5781
OR	Beaverton, Integrated Elctrns.	503-641-1690
TX	Austin, Altair Co.	512-837-4970
TX	Dallas, Off The Shelf	214-247-0052
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, All American	800-541-1435
TX	Richardson, Altair Co.	214-231-5166
TX	Richardson, Off The Shelf	214-238-0808
UT	Salt Lake City, Integrated Elctrns.	801-977-9750
WA	Bellevue, Integrated Elctrns.	206-455-2727
WI	Mequon, Taylor Elec.	800-242-8914
WI	New Berlin, Classic Comps.	800-242-7408
Can	Calgary, Alberta, Memco	403-258-3399
Can	Surrey, B.C., Memco	604-590-1553

NEMETH ENGINEERING ASSOCIATES, INC., 5901 West Highway 22, Crestwood, KY 40014, Tel: 502-241-1502, FAX: 502-241-5907; Empl.: 36

NEPENTHE, INC., 2479 E. Bayshore Rd. 800, Palo Alto, CA 94303, Tel: 415-496-6666, FAX: 415-856-8650; FSC No.: 415.856 8650; Empl.: 50; *Sls. Mgr.:* Kirk Feyerabend

NESCO BATTERY SYSTEMS, National Electro-Sales Corp., 7110 Gerald Ave., Van Nuys, CA 91406-7840, Tel: 818-781-0505, 1-800-423-2664, FAX: 818-786-2758

NESHAMINY TRANSFORMER CORP., Edison-Furlong Road, Furlong, PA 18925, Tel: 215-794-7411, FAX: 215-794-3894; Empl.: 70; *Sls. Mgr.:* Tom Linton

NES, INC.(NATIONWIDE ELECTRONIC SYSTEMS), See Weschler Instruments

N.E.S., INC., 502 Union St., Box 29, W. Springfield, MA 01090, Tel: 413-734-6491; FSC No.: 3439; Empl.: 10; *Sls. Mgr.:* Sandy Saffer

NETCOM, INC, 3000 Commerical Ave.,P.O.Box 3025, Northbrook, IL 60065-3025, Tel: 708-564-5100, FAX: 708-564-2279; FSC No.: 57193; Empl.: 105; *Sls. Mgr.:* Wayne Roeder

NETWORKS INTERNATIONAL CORPORATION, 13924 W. 108th St., Lenexa, KS 66215, Tel: 913-469-6494, FAX: 913-469-6495; Empl.: 20; *Sls. Mgr.:* Abhay Bisarya; *Dist. Mgr.:* Abhay Bisarya

NETWORK SOFTWARE ASSOCIATES, INC., 39 Argonaut, Laguna Hills, CA 92656, Tel: 714-768-4013, FAX: 714-768-5049; Empl.: 50; *Sls. Mgr.:* Raymond Chan; *Dist. Mgr.:* Raymond Chan

NETWORK TECHNOLOGIES INC., 7322 Pettibone Rd., Chagrin Falls, OH 44022, Tel: 216-543-1646, FAX: 216-543-5423

NEURAL SYSTEMS INC., 2827 West 43rd Ave., Vancouver, BC, Canada V6N 3H9, Tel: 604-263-3667, FAX: 604-263-3667; Empl.: 2; *Sls. Mgr.:* Gary Josin

NEURON ELECTRONICS, INC., 3914 Del Amo Blvd., Ste. 902, Torrance, CA 90503, Tel: 213-793-1300, 1-800-FON-4-NEI, FAX: 213-793-1304; Empl.: 4; *Sls. Mgr.:* Steve Stone

NEUTRIK PRODUCTS, See Kulka Smith

NEW ENGLAND KEYBOARD INC., 191 Cleghorn St., Fitchburg, MA 01420, Tel: 508-345-8332, FAX: 508-345-4329; Empl.: 16; *Sls. Mgr.:* Mark A. Yates ..... **B•1825**

NEW HAMPSHIRE BALL BEARING, INC., Corp. Hdgtrs & Hitech Div., Rte. 202, Peterborough, NH 03458, Tel: 603-924-3311, FAX: 603-924-6632; Empl.: 1200; *Dist. Mgr.:* Alan Paynter

NEW HAMPSHIRE BALL BEARINGS, INC., 9727 DeSoto Ave., Chatsworth, CA 91311, Tel: 818-407-9300, FAX: 818-407-5020; FSC No.: 50294; Empl.: 245; *Sls. Mgr.:* Paul M. Spencer; *Dist. Mgr.:* Alan H. Paynter

NEWMAN, M. M., CORP., Heli-Tube Div., P.O. Box 615, Marblehead, MA 01945, Tel: 617-631-7100, FAX: 617-631-8887; FSC No.: 09106; *Sls. Mgr.:* C. Loutrel; *Dist. Mgr.:* C. Loutrel ..... **C•1798**

NEW MEDIA GRAPHICS CORP., 780 Boston Rd., Billerica, MA 01821, Tel: 508-663-0666, FAX: 508-663-6678; Empl.: 50

FAX: 714-546-3022

NEWPORT ELECTRONICS, 2229 S.Yale St., Santa Ana, CA 92704-4426, Tel: 714-540-4914, 800-NEWPORT, TWX: 910-595-1787; Empl.: 120; *Sls. Mgr.:* Chris Salzer; *Dist. Mgr.:* Chris Salzer ..... **D•1363-1364, 1366**

Local Sales Offices & Reps

AL	Birmingham, Richardson Co.	205-823-2200
CO	Denver, AKI Entprs.	303-388-4488
IA	Davenport, H & H Vega Sls. Assocs.	319-326-5664
KS	Shawnee Mission, H & H Vega Sls.	913-432-6363
MD	Joppa, Electra-Tech	301-877-0344
MI	Livonia, Amtech Reps.	313-474-8300
MN	Eden Prairie, Rockmore Sls. Corp.	612-941-1390
NJ	Parlin, JMR Sls.	201-525-8000
NY	Albany, Expert Indl. Sys.	518-869-3355
NY	Wading River, JMR Sls., Inc.	516-929-5756
NC	Charlotte, SPK Instrmn.	704-535-2345

PA Valley Forge, J. E. Cuesta & Co., Inc. .. 215-935-0400
TN Memphis, Southeastern Marketing 901-794-1230
TX Richardson, ADI Instrs., Inc. 214-680-2222
VA Dumfries, Electra-Tech 703-670-6962

Local Distributors

AL Birmingham, Brownell Instrs. 205-332-3374
AZ Tempe, Metermaster 602-431-0880
AR Little Rock, Brownell Instrs. 501-562-2061
CA Costa Mesa, FLW, Inc 714-751-7512
CA Foster City, Therm-X 415-571-1166
CA Fremont, FLW, Inc. 415-651-6511
CA Hayward, Coast Instr. 415-786-9300
CA Los Angeles, EIL Instrs., Inc. 213-685-7020
CA S. San Francisco, Steven Engrg. 415-588-9200
CA Yorba Linda, Metermaster 714-921-2101
CO Denver, Brownell 303-333-3541
CT Middletown, EIL Instrs., Inc. 203-346-6646
FL Orlando, FLW, Inc. 407-894-9671
GA Atlanta, Inotek/Sesco, Inc. 404-458-6423
GA Atlanta (Hapeville), Brownell Electro .. 404-362-9009
GA Marietta, FLW Southeast 404-424-1731
HI Kailua, FLW, Inc. 808-262-0818
IL Chicago, Data Elctrns. Co. 708-283-0300
IL Countryside, Inotek 708-352-3500
IL Glendale Heights, Crompton Metermaster 708-351-4554
IN Evansville, Electro-Lab Svcs. 812-423-5211
IA Davenport, Interstate Indl. 319-355-5959
KS Kansas City, Process Measurement .. 913-384-2064
KY Louisville, EIL Instrs. 502-454-3420
LA Baton Rouge, SIA, Inc. 504-756-4631
MD Sparks, EIL Instr. 301-771-4800
MA Waltham, Calibron Instrs. 617-894-6440
MI Royal Oak, George Instr. 313-280-1111
MN Minneapolis, Instrmn. Svcs. 612-544-8916
MN Minneapolis, Process Meas. 612-544-4035
MO Kansas City, ISL Corp. 816-587-5400
MO St. Louis, Universal Precision Inst. 314-394-4693
NE Omaha, Interstate Indl. 402-331-3535
NJ Edison, Brownell 201-287-2030
NJ Newfoundland, Hosica Labs. 201-697-6111
NY Buffalo, EIL 716-634-8500
NY Buffalo, KOM Lamb 716-874-3530
NY Hauppauge, Brownell Electro 516-234-8600
NC Charlotte, EIL 704-376-2237
OH Cincinnati, Schlemmer 513-522-8340
OH Cleveland, Pioneer Instr. 216-248-8710
OH Cleveland, Weschler Elec. 216-238-2550
OH Dayton, Pioneer Instr. 513-236-9900
PA Philadelphia, Shelby-Jones 215-446-6600
OK Tulsa, Inotek 918-627-1500
OR Portland, Branom 503-283-2555
OR Portland, Westcon 503-283-0132
PA Philadelphia, Sunshine Scientific 215-673-5600
PA York, Trola Inds. 717-848-3700
SC Columbia, Brownell Instrs. 803-772-6111
TN Knoxville, Brownell 615-966-3441
TX Dallas, EIL Instrs. 214-357-0297
TX Dallas, Inotek 214-243-7000
TX Houston, American Analog 713-941-7265
UT N. Salt Lake, Western Controls 801-292-5900
VA Richmond, Metermetrics 804-275-1431
WA Redmond, EIL Instruments 201-882-3222
WA Seattle, Branom Instrs. 206-762-6050
WI Milwaukee, E-M Instrs. 414-272-7799

NEW WAVE INSTRUMENTS, 128 W 3100 N., Provo, UT 84604, Tel: 801-373-4909, FAX: 801-373-4909; *Sls. Mgr.:* Larry Christensen

THE J. M. NEY COMPANY, Ney Industrial Park, Bloomfield, CT 06002, Tel: 203-242-2281, TELEX: 9-9238, FAX: 203-242-5688; *Sls. Mgr.:* Terrence P. Dunn

NF ELECTRONIC INSTRUMENTS, 3303 Harbor Blvd., Ste.G-14, Costa Mesa, CA 92626, Tel: 714-557-1684, FAX: 714-549-9742; Empl.: 250; *Sls. Mgr.:* Jeff Dwyer; *Dist. Mgr.:* Jeff Dwyer

NH RESEARCH

FAX: 714-474-7062

NH RESEARCH, INCORPORATED INSTRUMENTATION PRODUCTS DIVISION, 16601 Hale Ave., Irvine, CA 92714, Tel: 714-474-3900, TELEX: 67-8377; Empl.: 120; *Sls. Mgr.:* Fred Sabatine ..... **D•1299**

Local Sales Offices & Reps

FL Treasure Island, NH Research 813-367-5101

NH RESEARCH, 16601 Hale Avenue, Irvine, CA 92714, Tel: 714-474-3900, TELEX: 67-8377, FAX: 714-474-7062; FSC No.: 24862; Empl.: 125; *Sls. Mgr.:* Gary Pollard ..... **D•1299**

Local Sales Offices & Reps

CA Irvine, NH Research, Inc. 714-474-3900
IL Naperville, NH Research, Inc. 312-355-5991
NJ Totowa, NH Research, Inc. 201-785-2261

NIC COMPONENTS CORP., 6000 New Horizons Blvd., N. Amityville, NY 11701, Tel: 516-226-7500, TELEX: 221-228, FAX: 516-226-6262; Empl.: 50; *Sls. Mgr.:* Robert Schatz; *Dist. Mgr.:* Nancy Lamendola

NICHICON (AMERICA) CORP., 927 E. State Pkwy., Schaumburg, IL 60173, Tel: 708-843-7500, TELEX: 20-6577, FAX: 312-843-2798/7125; *Sls. Mgr.:* Russ Edwards; *Dist. Mgr.:* Buddy Black

NICHIFU AMERICA, INC., 60 Robinson St, Pottstown, PA 19464, Tel: 215-323-7120, FAX: 215-970-2096; *Sls. Mgr.:* Roy Allen

NICOLET INSTRUMENT CORP., Test Instrument Division, 5225 Verona Rd, Madison, WI 53711, Tel: 608-271-3333, TELEX: 608-273-5061, TWX: 910-286-2737; Empl.: 700; *Sls. Mgr.:* Robert Terrio

NICOLET COMPUTER GRAPHICS DIV., See Bruning Computer Graphics

NIDEC CORPORATION, 318 Industrial Lane, Torrington, CT 06790, Tel: 203-482-4422, FAX: 203-489-7201; Empl.: 350; *Sls. Mgr.:* John Mills; *Dist. Mgr.:* Richard Bagg

NIEC-BASISTA, 3401 Brecksville Rd 110, Richfield, OH 44286, Tel: 216-659-9287, FAX: 216-659-3580; Empl.: (NIEC-Japan) 1200 230M Sales

NIEC, See QMI/NIEC

NISSEI DENKI AMERICA, INC., 7873 S.W. Nimbus Ave., Beaverton, OR 97005, Tel: 503-646-1434, FAX: 503-641-9594; Empl.: 6; *Sls. Mgr.:* T. Watanabe

Nissei Electronics

FAX: 415-961-7259

NISSEI ELECTRONICS, 460 E. Middlefield Rd., Mountain View, CA 94043, Tel: 415-969-1100 ..... **B•1103-1105**

NITTANY PIEZO CERAMICS, See Piezo Kinetics, Inc.

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NY Hauppauge, Sager Elctrns. 516-348-1300
NY Mt. Vernon, Q.A.R. Indl. 914-699-2244
NY Rochester, CAM-RPC Elctrns. 716-427-9999
NY Rochester, Summit Distrs. 716-334-8110
NY Ronkonkoma, Arrow Elctrns. 516-467-1000
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Sager Elctrns. 919-850-9550
OH Cleveland, CAM-RPC Elctrns. 216-461-4700
OH Columbus, CAM-RPC Elctrns. 614-895-5449
OH Dayton, Bell Inds.-Commercial 513-435-8660
OH Dayton, CAM-RPC Elctrns. 513-433-5551
OH Dayton, Stotts-Friedman 513-298-5555
OH Worthington, Reptron Elctrns. 614-436-4285
OK Tulsa, Sterling Elctrns. 918-663-2410
OR Lake Oswego, Bell Inds. 503-635-6500
PA Braddock, Leff Elctrns. 412-351-5000
PA McKean, Advacom Inc. 814-476-7774
PA Montgomeryville, Pyttronic Inds. 215-643-2850
PA Pittsburgh, CAM-RPC Elctrns. 412-782-3770
PA Reading, Barbey Elctrns. 215-376-6116
SC Greenville, Hammond Elctrns. 803-233-4121
TX Austin, Sterling Elctrns. 512-836-1341
TX Dallas, Sterling Elctrns. 214-243-1600
TX El Paso, International Elctrns. 915-598-3406
TX Grapevine, Mechatronics 817-488-6634
TX Houston, Newark Elctrns. 713-270-4800
TX Houston, Sterling Elctrns. 713-623-6600
TX Richardson, Bell Inds. 214-690-0466
UT Midvale, Bell Inds. 801-255-9611
UT Salt Lake City, Sterling Elctrns. 801-972-5444
UT West Valley City, Denver Beta Wintronic Co. 801-966-0378
VA Herndon, Sterling Elctrns. 703-742-8400
VA Richmond, Sterling Elctrns. 804-226-2190
WA Bellevue, Newark Elctrns. 206-641-9800
WA Mercer Island, Mechatronics SAB, Inc. 206-232-4800
WA Redmond, Bell Inds. 206-885-9963
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Classic Comps. 414-786-5300
WI Waukesha, Bell Inds. 414-547-8879
Can Pointe Claire, Que., Future Elctrns. 514-694-7710

NMC FASTENING SYSTEMS, Nylon Molding Corp., 1617 S. California, Monrovia, CA 91016, Tel: 818-357-0901, FAX: 818-303-6085; Empl.: 45; *Sls. Mgr.:* Gary Fraze

NOBLE U.S.A., INC., 5450 Meadowbrook Ct., Rolling Meadows, IL 60008, Tel: 708-364-6038, TELEX: 206745, FAX: 1-708-364-6045; *Sls. Mgr.:* Robert K. Burdick ..... **A•2061**

Local Sales Offices & Reps

AL Huntsville, Electro Mech Sls. 205-880-0592
AZ Phoenix, RF Mayo Assoc. 602-945-9363
AZ Scottsdale, RF Mayo Assoc. 602-953-1295
CA Los Gatos, Stewart-Fullerton Assocs. 408-376-0368
CA Mtn. View, Stewart-Fullerton Assocs. 415-964-7870
CA Napa, Stewart-Fullerton Assoc. 707-258-1160
CO Boulder, RF Mayo Assoc. 303-442-2155
FL Plantation, Gallagher & Assocs. 305-473-2101
GA Norcross, Electro Mech Sls. 404-447-6478
IL Chicago, BNI Elctrns. 312-775-1717
IN Carmel, Fred A. Dorsey Assoc. 317-844-4842
KY Jamestown, Fred A. Dorsey Assoc. 502-343-4624
MA Randolph, Hatch Assoc. 617-963-3306
MI Plymouth, M Rep 313-420-2233
MN Minneapolis, Holmgren Assoc. 612-574-9983
MO St. Louis, R.E.P.S. 314-429-3111
NY Hilton, ST Sls. 716-392-9242
NY Rochester, CAM/RPC Elctrns. 716-427-9999
NC Raleigh, Electro Mech Sls. 919-790-9300
OH Akron, Tim Nachtigal 216-745-8890
OH Cincinnati, PMR - Privett Mfr's. 513-825-0022
OH Powell, Lee Gier 614-548-5143
OK Bethany, Design Mktg. 405-789-5911
OR Beaverton, Quest Mktg. 503-641-7377
PA Flourtown, C.G.M. Inc. 215-233-0333
TN Greenville, Lamons, Sls. Co. 615-639-8711
TX Austin, Design Mktg. 512-263-9151
TX Dallas, Design Mktg. 214-480-8151
TX Houston, Design Mktg. 713-550-3318
WA Bellevue, Quest Mktg. 206-747-9424
Can Edmonton,Alberta, Deskin Sls. 403-466-2106
Can Markham, Ont., Deskin Sls. 416-475-1412
Can Nepean, Ont., Deskin Sls. 613-228-1201
Can St. Laurent,P.Q., Deskin Sls. 514-331-2860
Can Transcona, Man., Deskin Sls. 403-466-2106
Can Vancouver,B.C., Deskin Sls. 604-324-8343

Local Distributors

CA Irvine, ITT Multicomps. 714-727-4001
CA San Jose, ITT Multicomps. 408-453-1404
CO Westminster, ITT Multicomps. 303-451-8740
IL Addison, Belford Elctrns. 708-691-1100
IL Addison, Belford Elctrns. 708-691-1118
MA Billerica, Baldwin Comps. 508-667-6710
MO St. Louis, Franklin Elctrns. 314-429-3111
NY Ronkonkoma, Baldwin Comps. 516-588-5700
OH Cleveland, CAM/RPC Elctrns. 216-461-4700

NOHAU CORPORATION, 51 E. Campbell Ave., Campbell, CA 95008, Tel: 408-866-1820, 408-866-4493, FAX: 408-378-7869 ..... **D•1300-1303**

Local Sales Offices & Reps

CA San Diego, Microware Technlg. Inc. 619-693-4280
CT Old Saybrook, AD Elctrns. 203-388-2204
NY Suffern, Information Automation 914-357-7575
NY White Plains, Information Automation 914-948-4300
PA Hatboro, Delta Tech. Sls. 215-957-0600
TX Austin, Techtools 512-454-9027
WA Bothell, Exectronics 206-947-2115
Can Laval,Que., Techmation Instrs. 514-689-5889

NOISE COM INC., E. 49 Midland Ave., Paramus, NJ 07652, Tel: 201-261-8797, FAX: 201-261-8339; FSC No.: 65185; Empl.: 18; *Sls. Mgr.:* Gary Simonyan ..... **A•1821; D•1304-1305**

Local Sales Offices & Reps

CA Los Angeles, McDougall/Mc Laughlin 213-477-8556
CA San Jose, Allis Assocs., Inc. 408-252-2883
FL Clearwater, Beacon Microwave 813-796-2378
MD Columbia, Creative Mktg. Assoc. 301-880-4161
MA Reading, Geder Assoc. 617-944-3105
MN Minneapolis, Baltz Assocs. 612-546-8520
NY Plainview, Bertram D Aaron & Co. 516-349-7399
OH Centerville, Extensive Entprs. 513-434-5078
WA Kirkland, Allis Northwest 206-828-0444
EXP Palo Alto, Ca, Radar Systems 415-322-7448
Can Ottawa, Giga-Tron Assocs. Ltd. 613-225-4094

NOLATRON, P.O. Box 4042, Harrisburg, PA 17111, Tel: 717-564-3398, FAX: 717-939-5831; Empl.: 5

NOLL, J. A. CO., P.O. Box 312, Monroeville, PA 15146, Tel: 412-856-7566; *Sls. Mgr.:* P. Carson; *Dist. Mgr.:* P. Carson

NON-LINEAR SYSTEMS/DIV. OF KAYPRO CORP., 4174 Sorrento Valley Blvd., San Diego, CA 92121, Tel: 619-535-2155, FAX: 619-535-2169; FSC No.: 03626; Empl.: 55; *Sls. Mgr.:* Jeanne Simmons; *Dist. Mgr.:* Jeanne Simmons

NORDION INTERNATIONAL, 447 March Rd., Kanata, Ontario, Canada K2K 1X8, Tel: 613-592-2790, TELEX: 053-4162, FAX: 613-592-6937

NORELCOM INDS., 63 Marine St., Farmingdale, NY 11735, Tel: 516-249-7245, FAX: 516-249-3745; Empl.: 30

NOREN PRODUCTS INC., 1010 O'Brien Drive, Menlo Pk., CA 94025, Tel: 415-322-9500, TELEX: 17-1410 Noren MNPK, FAX: 415-324-1348; *Sls. Mgr.:* Jim Blair

NORGREN, 5400 South Delaware, Littleton, CO 80120-1663, Tel: 303-794-2611, TELEX: 45541; Empl.: 661; *Sls. Mgr.:* Mark Shellenbarge

NORITAKE CO., INC., Noritake Co., Limited (Japan), 23820 Hawthorne Blvd., Ste. 100, Torrance, CA 90505, Tel: 213-373-6704; FSC No.: 213-772-3918; Empl.: 7; *Sls. Mgr.:* Y. Tatsuta

NORMA MESSTECHNIK OPTIK, Elektronik GmbH., Eumigweg 7, Wr. Neudorf, Austria 2351, Tel: 02236 61530, TELEX: 79316, FAX: 02236 63080; Empl.: 250; *Sls. Mgr.:* Hr. Weber; *Dist. Mgr.:* Hr. Kohlhauser

NORPLEX OAK INC., P.O. Box 1448, La Crosse, WI 54602-1448, Tel: 608-784-6070, TELEX: 59-2257; Empl.: 2,200

NORTH AMERICAN PHILIPS CONTROLS CORP., See Airpax Corporation, Cheshire Div.

NORTH AMERICAN PHILIPS LIGHTING, 200 Franklin Sq. Dr., Somerset, NJ 08875, Tel: 201-563-3000, TWX: 510-685-5651; Empl.: 600; *Sls. Mgr.:* C. J. Lehmann

NORTH ATLANTIC INDUSTRIES, 60 Plant Ave., Hauppauge, NY 11788, Tel: 516-582-6500, TWX: 510-227-9660, FAX: 516-582-8079; FSC No.: 07342; Empl.: 320; *Sls. Mgr.:* Ken Salz ..... **D•1306**

Local Sales Offices & Reps

AL Huntsville, Teqspec, Inc. 205-883-6699
FL Cape Canaveral, TeqSpec 407-783-3444
FL Palm Harbor, Teqspec 813-942-6006
GA Snellville, Teqspec 404-972-7955
IL Chicago, Pat Lind Elctrns. 312-726-3513
IN Indianapolis, Pat Lind Elctrns. 317-632-7444
IA Cedar Rapids, Palatine Engrg. 319-365-8071
MA Burlington, Intersell 617-273-3844
MI Madison Heights, WKM Assoc. 313-588-2300
MN Circle Pines, Pat Lind Elctrns. 612-786-5770
MO Florissant, Palatine Engrg. 314-839-0800
NY Saugerties, Beckpep, Inc. 914-246-3031
NC Winston-Salem, Teqspec III 919-765-5553
OH Dayton, WKM Assoc. 513-434-7500
OR Wilsonville, Syntek 503-682-2750

PA Horsham, Pennsylvania Sci. Dvcs. 215-956-0700
TX Houston, Scientific Sls. 713-645-6218
TX Richardson, Scientific Sls. 214-231-6541
WI Milwaukee, Pat Lind Elctrns. 414-224-0146

NORTHEAST INNOVATIONS, INC., PO Box 1214, Concord, NH 03302, Tel: 603-736-8260, FAX: 603-736-4506; Empl.: 10; *Sls. Mgr.:* Ryan Irving

NORTHERN AMPOWER CORP., 47087 Grand River, Novi, MI 48374, Tel: 313-349-4860, FAX: 313-349-5692; Empl.: 30; *Sls. Mgr.:* Ronald Kirsch .... **D•1914**

NORTHERN MAGNETICS INC., 16124 Wyandotte, Van Nuys, CA 91406, Tel: 818-997-8675, FAX: 818-997-3935; Empl.: 12

NORTHERN PRECISION LABS., 11 Madison Rd, Fairfield, NJ 07006, Tel: 201-227-4800, FAX: 201-575-5973; Empl.: 95; *Sls. Mgr.:* P. Pytal

NORTHERN TECHNOLOGIES CORP., 35 Rivera Dr., Unit No. 5, Markham, Ont., CAN L3R 8N4, Tel: 416-475-9320, 1-800-456-1875, FAX: 416-475-5719; Empl.: 30; *Sls. Mgr.:* Alan Pett

North Hills
A Porta Systems Company

FAX: 516-759-3327

NORTH HILLS ELECTRONICS, 1 Alexander Pl, Glen Cove, NY 11542, Tel: 516-671-5700, TELEX: 46-6886; FSC No.: 98821; Empl.: 100; *Sls. Mgr.:* Steve Muth .... **A•2310-2313**

Local Sales Offices & Reps

AZ Phoenix, Mercury Eng. Sls. 602-265-0344
CA Campbell, Sedillo Co., Inc. 408-374-5222
CA North Palo Alto, Tri-Rep 415-965-1822
CA Palo Alto, Tri Rep 415-965-1822
CA South El Toro, Par Mktg. 714-768-6021
CO Littleton, Mercier & Assoc. 303-770-0666
CT Wethersfield, Underwood Sls. Corp. 203-563-3046
FL Clearwater, Brennan Assocs. 813-446-5006
MD Baltimore, Stemler Assocs. Inc. 301-944-4840
IL Wheaton, Vine Tech. Sls. 913-642-7220
MD Laurel, CSDS 301-953-7884
MA Hingham, Northeast Rep. 617-749-8700
MA Lowell, Underwood Sls. Corp. 617-256-8191
MN Eden Prairie, COM-TEK Sls. 612-941-7181
MN Minneapolis, Hei-Lite Sls. 612-861-6051
MO St. Louis, Alpha Tech. Sls. 314-537-2647
MO St. Louis, Thunderbird Tech. Sls. 314-298-8984
NY Whitney Point, T.A.E. Reps 607-692-3705
NY Albertson, DOL Engrg. 516-747-3944
OH Dayton, Mid-Con Elctrns. 513-837-2643
OR Portland, Evergreen Mktg. Grp. 503-643-8020
TX Dallas, Milestek, Inc. 817-455-7444
TX Houston, Milestek, Inc. 713-376-6776
WA Seattle, Evergreen Mktg. Grp. 206-633-3160
WI Genoa City, Vine Tech. Sls. 414-279-3871
Can Montreal, Componetics Ltd. 514-331-9930

Local Distributors

MD Laurel, Rayma 1-800-447-2962
TX Argyle, Miles Tek, Inc. 817-455-7444

NORTH HILLS ELECTRONICS INC., Power Products Div., 1 Alexander Place, Glen Cove, NY 11542-3796, Tel: 516-671-5700, TELEX: 46-6886 NOHILL CI, FAX: 516-759-3327; Empl.: 135; *Sls. Mgr.:* Jay M. Mohr

NORTHLAKE ENGINEERING, INC., 999 Anita Ave, Antioch, IL 60002, Tel: 708-395-5710, FAX: 708-395-9101; FSC No.: 50638; Empl.: 120; *Sls. Mgr.:* W. A. Hardt

NORTHWEST ANALYTICAL INC., 520 N. W. Davis St, Portland, OR 97209, Tel: 503-224-7727, FAX: 503-224-5236; Empl.: 14

NORTHWEST MICROCIRCUITS, INC., 211 S. 9th - P.O. Box 1199, Philomath, OR 97370, Tel: 503-929-6424, FAX: 503-929-6428; Empl.: 15; *Sls. Mgr.:* Matt Granam

NORTON ASSOCIATES, INC., 557 Oak St., Copiague, NY 11726, Tel: 516-842-4666, FAX: 516-842-4667; FSC No.: 08739

NORWESCO, INC., See Norwesco Interconnect Devices

NORWESCO INTERCONNECT DEVICES, 2633 Plastics Drive, Gastonia, NC 28053, Tel: 704-868-3581, FAX: 704-867-0577; Empl.: 80; *Sls. Mgr.:* Frank Pellatt

NOVA ELECTRIC CORP., Technology Dynamics, Inc., 100 School St, Bergenfield, NJ 07652, Tel: 201-385-0500, FAX: 201-385-0702; FSC No.: 29019; Empl.: 50; *Sls. Mgr.:* Kenneth Niovitch .... **D•2214-2215**

Local Sales Offices & Reps

AZ Phoenix, CPS Assoc. 602-246-1097
CA Flintridge, Synertek Mktg. 818-915-1439
CA Los Altos, Jay Stone Assoc. 415-948-4563
CO Englewood, Odyssey 1 303-773-8176
CT W. Hartford, Power Factor Assoc. 203-233-0600
FL Orlando, Truex Assoc. 407-859-2160
KS Kansas City, Harris-Hansen Co. 816-763-6200
MD Rockville, Marktron 301-251-8990
MA Whitinsville, Power Factor Assoc. 508-234-6415
MI Detroit, Comtel 313-358-2505
MN Minneapolis, White Sls. Co. 612-553-1818
MO St. Louis, Harris-Hansen Co. 314-432-3611
NJ Westfield, Metro-Mics 201-233-6116
NM Albuquerque, Fry-Gates Assoc. 505-262-1525
NY Hauppauge, Metro-Mics 516-361-6134
OH Cleveland, Comtel Assoc. 216-442-8080
TN Knoxville, Southern Automation Sls. 615-690-8488
TX Dallas, Carey McMahill Assoc. 214-681-1414
UT Odyssey 1. 801-485-4728
WA Bellevue, Topp 206-747-5400
Can Ottawa, Ont., Subtec 613-723-7720

NOVATEK CORPORATION, 3700 NW 124th Ave., Coral Springs, FL 33065, Tel: 305-341-7700, TELEX: 522600 AAA EXECT, FAX: 305-345-9334; Empl.: 15; *Sls. Mgr.:* Joe DiBrigida

NOVA TRAN CORPORATION, Union Carbide Corporation, 100 Deposition Dr., Clear Lake, WI 54005, Tel: 715-263-2333, FAX: 715-263-3189; Empl.: 85; *Sls. Mgr.:* Bill Henry

NOVATRONICS INC., 677 Erie St., P.O. Box 610, Stratford, Ontario, Canada N5A 6V6, Tel: 519-271-3880, TELEX: 06-955394, FAX: 519-271-9781; Empl.: 100; *Sls. Mgr.:* Laraine Murray

NOVOTECHNIK U.S., INC., 237 Cedar Hill St, Marlborough, MA 01752, Tel: 508-485-2244, FAX: 508-485-2430; FSC No.: MULTIPLE; Empl.: 8

NRD INC., Subsidiary of Mark IV Inds., Inc., 2937 Alt Blvd. N., Grand Island, NY 14072, Tel: 716-773-7634, TELEX: 91578 NRD GRDI, FAX: 716-773-7744; Empl.: 100; *Sls. Mgr.:* James Curtis; *Dist. Mgr.:* Larry Keating .... **D•2238**

Local Sales Offices & Reps

AZ Tempe, Frank Steinmetz & Assoc. 602-829-0654
CA Santa Clara, Tech-Ser, Inc. 408-496-1004
CA Torrance, Tech-Ser, Inc. 213-370-7200
FL St. Cloud, Kurt Whitlock Assoc., Inc. 407-892-9876
IL Chicago, MGA Kokomo 312-775-1151
FL Kokomo, MGA Kokomo 317-455-0444
KS Lenexa, MIDTEC Assoc., Inc. 913-541-0505
MA Salem, Alpha-Stat 508-744-1100
MI Southfield, M. Gottlieb Assoc.,Inc. 313-358-4151
MN Edina, Omni-Tec 612-881-4447
MO St. Louis, Midtec Assoc., Inc. 314-275-8666
NY Fairport, Rod Patterson Assocs. 716-425-2738
NC Charlotte, Electro-Rep Assocs. 704-527-2530
PA Feasterville, ARC Assocs. 215-364-1050
TX Dallas, Scalon, Hughes & Assocs. 214-739-2888

NTE ELECTRONICS, INC., 44 Farrand St, Bloomfield, NJ 07003, Tel: 201-748-5089, FAX: 201-748-6224; FSC No.: 7T184; Empl.: 60; *Sls. Mgr.:* Cindy Habick; *Dist. Mgr.:* Mary Damiano

NTK

FAX: 708-390-6482

NTK TECHNICAL CERAMICS, NGK Spark Plugs (USA), 1200 Business Ctr. Dr., Suite 300, Mt. Prospect, IL 60056, Tel: 708-824-1133; FSC No.: 95-246-1286; *Sls. Mgr.:* Mark Ota; *Dist. Mgr.:* Chuck Ito .... **A•1699-1704, 1822**

Local Sales Offices & Reps

AZ Mesa, NTK Tech. Ceramic 602-820-4900
CA San Jose, NTK Tech. Ceramic 408-727-5180
FL Longwood, D-Assocs. 407-321-9594
FL Maitland, D. J. Ellis & Assocs., Inc. 305-645-1101
GA Atlanta, L&D Inc. 404-455-3483
IL Mt. Prospect, NTK Tech. Ceramic 708-824-1133
IN Ft. Wayne, T.X. Sls. 219-489-4447
IA Chanhassen, Barnes Sls. Assocs. 612-934-2907
MA Farmingham, NTK Tech. Ceramic 508-820-0220
MI Ann Arbor, Jordan-Elliott Sls. Inc. 313-662-4087
MI Jackson, Jordan-Elliottt Inc. 517-788-8353
MN Chanhassen, Barnes Sales Assocs. 612-934-2907
NJ Springfield, NTK Tech. Ceramic 201-376-6070
TX Dallas, NTK Tech. Ceramic 214-404-1173
Can Ontario, NGK Spark Plugs Canada 416-291-9746
Can Scarborough, Ont., NGK Spark Plugs Canada Ltd. 416-291-1927

NUCLEAR RESEARCH CORP., 125 Titus Ave., Box H, Warrington, PA 18976, Tel: 215-343-5900, TELEX: 510-665-8525 NRC WNTN, FAX: 215-343-4670; FSC No.: 96696; Empl.: 130; *Sls. Mgr.:* Tom O'Malley; *Dist. Mgr.:* Tom O'Malley

NUCLEONIC PRODS., See Thomson-CSF Comps. Corp., Passive Comps. Div.

NU-CONCEPT SYSTEMS, 2725 Advance La.,P. O. Box 587, Colmar, PA 18915, Tel: 215-822-8400, FAX: 215-822-1427; FSC No.: 58561; Empl.: 10; *Sls. Mgr.:* Robert F. Scheuerle

NU DATA, INC., 32 Fairview Ave., Little Silver, NJ 07739, Tel: 908-842-5757, TELEX: 271139, FAX: 908-842-5757; Empl.: 20; *Sls. Mgr.:* Richard A. Previte; *Dist. Mgr.:* George Serbe

NUMERIX CORP., 20 Ossipee Rd., Newton, MA 02164, Tel: 617-964-2500, TELEX: 948032, FAX: 617-969-4380

NWL CAPACITORS, NWL Transformers, 1 Industrial Drive, Snow Hill, NC 28580, Tel: 919-747-5943; Empl.: 55 .... **A•1120-1122**

Local Sales Offices & Reps

NJ Haddonfield, M&S Mesa Inc. 609-429-7055
NM Albuquerque, Westfahl & Assocs. 505-268-1433
NY Canandaigua, Jones/Sudder 716-384-2628
NY Nassau, Dave Jones(Jones/Sudder) 518-766-9575
OH Maineville, George Barnet 513-677-0922
VT White River Junction, Gary Jones(Jones/Sudder) 802-295-5260

NWL TRANSFORMERS, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, Tel: 609-298-7300, FAX: 609-298-1982; Empl.: 225; *Sls. Mgr.:* Helmut Herder .... **A•1120-1121, 2314-2315; D•1915**

WILLIAM F. NYE, INC., P.O. Box G-927, New Bedford, MA 02742-0927, Tel: 508-996-6721, TELEX: 940807, FAX: 508-997-5285; Empl.: 27; *Sls. Mgr.:* Donald R. Fairbanks .... **C•1146**

Local Sales Offices & Reps

MI Pleasant Ridge, Brian C. Holley 313-542-2720

NY GLASS PLASTICS, Calnetics Corp., 7314 E. Madison St., Paramount, CA 90723, Tel: 213-636-1035, FAX: 213-531-0693; Empl.: 60; *Sls. Mgr.:* Chris Ward

NYTRON INDUCTORS, INC., 700 Orange St., Darlington, SC 29532, Tel: 803-393-5421, TWX: 810-665-2182, FAX: 803-393-4123; FSC No.: 83125; Empl.: 450; *Sls. Mgr.:* John Elliot .... **A•1214-1235; B•1023**

OAKGRIGSBY

FAX: 708-556-4216

OAKGRIGSBY INC., 88 N. Dugan Rd, Sugar Grove, IL 60554, Tel: 708-556-4200; FSC No.: 76854; Empl.: 300 .... **B•1633, 1754-1759**

Local Sales Offices & Reps

AL Huntsville, Electramark, Inc. 205-830-4400
AZ Scottsdale, Carefree Elctrns. Sls. 602-951-9121
CA Laguna Hills, Fitch Assocs. 714-951-0196
CA Los Gatos, Stewart/Fullerton 408-376-0368
CA Mountain View, Stewart/Fullerton 415-964-7870
CA Napa, Stewart Fullerton & Assoc. 707-258-1160
CO Englewood, Krebill Comp. Sls. 303-771-0955
CO Grand Junction, Krebill Comp. Sls. 303-243-8220
FL Altamonte Springs, Electramark FL 407-830-0844
GA Norcross, Electramark, Inc. 404-446-7915

IL Cary, Golbeck/Milota 708-639-3424
IL Crystal Lake, Oak Switch Sys. Inc. 815-459-5000
IA Cedar Rapids, Pattison Sls. 319-395-9866
KS Parker, S.W. Wollard Assocs. 913-898-6552
MA Acton, Boston Elctrns. Assocs. 508-264-4456
MI White Pigeon, Jim Wells & Assoc. 616-483-7179
MN Bloomington, Murnco & Assocs. 612-854-4161
FL Boca Raton, Electramark FL 407-392-1763
NV Henderson, Carefree Elctrns. Sls. 702-386-8858
NJ Mountainside, Henry G. Richter 201-233-4615
NJ Mt. Laurel, Eastern Elctrns. 609-778-3106
FL Tampa, Electramark FL 813-889-7775
NY Pittsford, A.C.S. 716-381-3818
NC Raleigh, Eastern Elctrns. 919-876-7591
OH Cincinnati, JMK Elctrns. 513-271-3860
OH Middlebury Heights, JMK Elctrns. 216-234-1202
OR Tigard, Rep-West 503-639-0325
PA Phoenixville, Henry G. Richter 215-495-6176
TX Dallas, Dal/Tex Rep., Inc. 214-991-7799
WA Seattle, Rep-West 206-283-8351
Can Mississauga. Ont., GMA (Toronto) 416-671-8111
Can Richmond, Ont., GMA(Ottowa) 613-838-4480
Can St. Laurent, Que., GMA (Montreal) 514-335-9572

Local Distributors

AL Huntsville, Component Distr. 205-883-7501
AZ Scottsdale, Harper SID 800-442-7737
CA Compton, Harper SID 213-979-5090
CA San Diego, Harper SID 619-578-2500
CA San Jose, Harper SID 408-943-9490
CO Denver, CSID 303-292-9594
CO Englewood, Component Distrs. 303-799-4916
FL Melbourne, Component Distr. 407-724-9910
FL W. Palm Bch., Wings Electro Sls. Co. 407-798-6606
GA Norcross, Component Distr. 404-441-3320
IL Crystal Lake, Sub-Sem, Inc. 815-459-4139
IL Rosemont, Advent Elctrns. 708-297-6200
IA Cedar Rapids, Advent Elctrns. 319-363-0221
IN Indianapolis, Advent Elctrns. 317-872-4910
MA Canton, Impact Sls. 617-821-1500
MA Westborough, In-Stock Prods. 508-870-5750
MA Westwood, Semad 617-329-7373
MA Wilmington, North Star Elctrns. 508-657-5155
MI Farmington Hills, Advent Elctrns. 313-477-1650
MN Minneapolis, Berquist 800-328-3882
NY Hauppauge, Fairmont Elec. 516-231-3313
NY Jamaica, Calson Co. 718-525-5900
NY Northport, Coke-el Aerospace Co. 516-754-2233
NC Raleigh, Component Distr. 919-787-7311
OH Centerville, IPD 513-435-2086
TX Dallas, Component Distr. 214-644-0373
TX Irving, Harper S. I. D. 214-621-0500
WI Milwaukee, Progressive Image, Inc. 414-321-4722
Can Burnaby, B.C., Semad Elctrn. Dist. 604-420-9889
Can Calgary, Alberta, Semad Elctrn. Dist. 403-252-5664
Can Concord, Ontario, Westburne Elec. Supp. 416-660-3545
Can Markham, Ont., Semad Elctrn. Dist. 416-475-3922
Can Ottawa, Ont., Semad Elctrn. Dist. 613-727-8325
Can Pointe Claire,Quebec, Semad Elctrn. Dist. 514-694-0860
AZ Tucson, Carefree Elctrns. Sls. 602-882-8642

OAK SWITCH SYSTEMS, See OakGrigsby, Inc.

OAKTRON CORPORATION, Mtx, 704 30th St., Monroe, WI 53566, Tel: 608-328-5560, FAX: 608-328-5575; FSC No.: 07109; Empl.: 100; *Sls. Mgr.:* J. F. Disch

OAL ASSOCIATES, INC., P.O. Box J, Escondido, CA 92033, Tel: 619-743-7143, FAX: 619-743-2460; Empl.: 18; *Sls. Mgr.:* Mark Lohkemper

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Local Sales Offices & Reps

CO Denver, Control Agcy., Inc. 303-694-9214
UT Salt Lake City, Control Agcy. 801-268-9880, FAX:801-268-9924

OCEAN STATE THERMOTICS, INC., 27 Thurber Blvd., Smithfield, RI 02917, Tel: 401-231-4640, FAX: 401-231-4641; Empl.: 50; *Sls. Mgr.:* Stephen R. Hecht; *Dist. Mgr.:* Stephen R. Hecht

OCE' GRAPHICS, 385 Ravendale Dr., Mountain View, CA 94039, Tel: 415-964-7900, FAX: 415-961-6152; *Sls. Mgr.:* Bill Manos; *Dist. Mgr.:* Bill Manos

OCTAGON SYSTEMS, 6510 W. 91st Ave., Westminster, CO 80030, Tel: 303-430-1500, FAX: 303-426-8126

OCULAR INC., 610 Presidential, Ste. 100, Richardson, TX 75081, Tel: 214-437-2561, FAX: 214-437-2562; Empl.: 110; *Sls. Mgr.:* Ben Kwong ..... **B•1106-1107**

Local Sales Offices & Reps

CA San Dimas, A-F Sls. Engrg. 714-599-4412
CO Arvada, Arrowhead Sls. 303-423-5556
FL Hollywood, Advantage Comps. 305-962-2255
IL Arlington Hgts., Coombs & Assocs. 708-439-9810
IN Fort Wayne, Menze Sls. 219-747-5616
MA Swansen, Wm. Poisson & Assocs. 508-677-3655
MN Corcoran, Mktg. Assocs. 612-420-2506
MO Kansas City, EPI, Inc. 816-523-8911
NJ Wayne, Paul Breen Assocs. 201-696-8683
NC Durham, Advantage Comps. 919-383-0933
PA Newton, Indl. Sls. Assoc. 215-860-2076
TX Dallas, Component Technlg. 214-783-8831
WA Renton, K.R. Jensen Sls. Co. 206-277-2772
WI Milwaukee, Coombs & Assocs. 414-351-6123

ODU-USA, INC., ODU-KONTAKT GmbH, 4620 Calle Quetzal, Camarillo, CA 93012, Tel: 805-484-0981, FAX: 805-484-7458; Empl.: 1; *Sls. Mgr.:* Ralf Eberlein

OECO CORP., 4607 S.E. International Way, Milwaukie, OR 97222, Tel: 503-659-7932, TELEX: 36-0350, FAX: 503-653-6310; FSC No.: 95266; Empl.: 700; *Sls. Mgr.:* Dave Fuller, VP Sls.

OGALLALA ELCTRNS., Div. Arnold Engrg. Co., Box 59, Ogallala, NE 69153, Tel: 308-284-4093, FAX: 308-284-4740; Empl.: 41; *Sls. Mgr.:* H. L. Harrington

OGDEN MANUFACTURING CO., 48 W. Seegers Road, Arlington Heights, IL 60005, Tel: 708-593-8050, FAX: 708-593-8062; Empl.: 250; *Dist. Mgr.:* Gordon D. Hollander

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FAX: 614-486-0743

OHIO SEMITRONICS, INC., 1205 Chesapeake Ave., Columbus, OH 43212, Tel: 614-486-9561; FSC No.: 12066; Empl.: 47; *Sls. Mgr.:* G. Clagett ..... **B•1925-1944**

Local Sales Offices & Reps

AL Huntsville, Datarep Inc. 205-881-0361
AZ Tucson, Sheldon Equip. 602-722-1452
CA Arcadia, Van Gott & Assocs. 818-445-9728
CA Fremont, FLW, Inc. 415-651-6511
CO Denver, MC Squared Inc. 303-286-1414
DC Dumfries, Electra-Tech 703-670-6962
FL Margate, Datarep 305-968-6568
FL Orlando, Datarep 407-843-5224
GA Marietta, FLW 404-424-1731
IL Columbia, R.L. Weisheimer & Assocs. 314-487-7328
IL Park Ridge, Elctrn. Instr. Assocs. 708-298-2290
IN Indianapolis, Electronic Instr. Assocs. 317-257-7231
KS Kansas City, R.L. Weisheimer & Assocs. 816-561-1711
MD Edgewood, Electra-Tech, Inc. 301-676-2254
MI Milford, TMS 313-360-1514
MN Minneapolis, The Mark Co. 612-933-3026
NJ Garwood, E.R. Mertz, Inc. 201-232-4643
NJ Haddonfield, G.L. Williams & Assoc. 609-428-6060
NM Albuquerque, MC Squared Inc. 505-293-9090
NY Latham, L-Tron Corp. 518-489-7810
NC Charlotte, Zelco Assocs. 704-541-6122
OH Columbus, Ohio Semitronics Inc. 614-486-9561
OH Dayton, Mohawk Intronics 513-434-8873
OH No. Ridgeville, TMS, Inc. 216-327-3527
OK Stillwater, Acudata Inc. 405-743-1886
OR Portland, Topp Engrg. Sls. Corp. 503-244-7265
PA Pittsburg, TMS 412-221-2338
RI Narragansett, Pat Assocs. 401-783-9598
TX Austin, Acudata Inc. 214-424-3561
TX Houston, Acudata Inc. 713-580-2451
TX Plano, Acudata Inc. 512-478-1018
UT Salt Lake City, MC Squared, Inc. 801-298-3388
VA Waverly, Electra-Tech 804-834-2417
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400
Can Brossard, Ont., CTH Industrial Controls. 514-671-2181
Can Edmonton, Alb., CTH Instrs. 403-466-2900
Can Sarnia, Ont., Armatek Controls 519-332-0100
Can Toronto, Ont., Armatek Controls 416-251-3111

FAX: 708-675-1505

OHMITE MANUFACTURING CO., 3601 W. Howard St., Skokie, IL 60076, Tel: 708-675-2600, TELEX: 72-4433; FSC No.: 44655; *Sls. Mgr.:* Kim Youngblood; *Dist. Mgr.:* Ed Kason ..... **A•1958-1964**

Local Sales Offices & Reps

AL Huntsville, Over & Over 205-837-7105
AZ Tempe, Elctrn. Dev. Sls. 602-438-1547
CA Los Angeles, Wiley Co. 213-666-1611
CA Santa Clara, Ross Mktg. 408-492-0197
CO Wheat Ridge, Cluff & Assocs. 303-425-6604
FL Altamonte Spgs., Over & Over 407-332-1222
GA Norcross, Over & Over 404-449-6205
IL Mt. Prospect, Dombrow Co. 708-253-3326
IN Indianapolis, Leslie M. DeVoe Co. 317-842-3245
IA Cedar Rapids, Spectrum Sls. 319-366-0576
KS Overland Pk., Spectrum Sls. 913-648-6811
MA Norwood, MacInnis Co. 617-762-8090
MI Farmington Hills, R.C. Merchant Co. 313-476-4600
MN Minneapolis, Elec. Comp. Sls. 612-933-2594
MO Florissant, Spectrum Sls. 314-921-1313
NJ Englewood Cliffs, Ed Glass Assocs. 201-592-0200
NY Victor, Net Sls. 716-924-1844
NC Charlotte, Over & Over 704-542-9111
NC Raleigh, Over & Over 919-876-7338
OH Westlake, Baehr Greenleaf & Assoc. 216-892-1770
OR Beaverton, Eclipse Mktg. 503-642-1661
PA Narbeth, Bresson Assocs. 215-664-6460
PA Warrendale, Baehr Greenleaf & Assoc. 412-934-3088
TX Richardson, Pro-Comp Sls. 214-669-1500
WA Redmond, Eclipse Mktg. 206-885-6991
EXP Skokie, IL, Ohmite Mfg. Co. 708-675-2600
Can Pickering, Ont., A.C. Simmonds & Sons 416-839-8041

Local Distributors

AR Ft. Smith, Carlton Bates 501-646-8201
CA El Monte, Kimball & Stark 818-444-2594
CA Fountain Valley, Component Ctr. 800-879-3550
CA Oakland, Brill Elctrns. 415-834-5888
FL Orlando, Hammond Elctrns. 407-849-6060
IL Chicago, Newark Elctrns. 312-784-5100
IL Palatine, Ohm Elctrns. 708-359-5500
IN Indianapolis, Bell Inds. 317-875-8200
MA Hingham, Sager Elctrns. 617-749-6700
MI Livonia, RS Elctrns. 313-525-1155
MN St. Paul, Gopher Elctrns. 612-490-4900
NJ Camden, GRS Elctrns. 609-964-8560
NY Buffalo, Summit Distrs. 716-887-2800
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rome, Rome Elctrns. 315-337-5400
OH Akron, AESCO Elctrns. 216-762-8818
OH Dayton, Stotts-Friedman Co. 513-298-5555
OH Warren, REM Elctrns. Supp. 216-373-1300
SC Columbia, Dixie Elctrns. 803-779-5332
TX Richardson, Altair Co. 214-231-5166
TX Stafford, Harrison Equip. 713-879-2600
WA Richland, Radar Elec. 509-943-8336
WI Milwaukee, Marsh Elctrns. 414-475-6000
Can Don Mills, Ont., Saynor Varah 416-445-2340
Can Willowdale, Ont., Electro-Sonic 416-494-1666

OHMTEK INC., Vishay, 2160 Liberty Dr., Niagara Falls, NY 14304, Tel: 716-283-4025, FAX: 716-283-5932; FSC No.: 57489; Empl.: 205; *Sls. Mgr.:* William Cuviello ..... **A•1965-1967**

Local Sales Offices & Reps

AL Huntsville, JWL Assocs. 205-883-1712
AZ Chandler, Mission Mktg. Grp. 602-786-0804

AZ	Phoenix, Howe & Howe Sls., Inc.	602-264-7971
CA	Glendale, Mission Mktg. Grp.	818-247-9110
CA	Redwood City, James S. Heaton Co.	415-367-9000
CA	San Diego, V.E.C.	619-690-5112
CA	Tustin, V.E.C.-Los Angeles	714-544-7024
CO	Loveland, V.E.C.-Rocky Mtn.	303-667-7500
CT	Wallingford, Comp Rep Assoc., Inc.	203-269-1145
FL	Altamonte Springs, Semtronic Assoc., Inc.	407-831-8233
FL	Clearwater, Semtronic Assoc., Inc.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assoc., Inc.	305-731-2484
GA	Roswell, JWL Assocs.	404-993-0100
IL	Skokie, IRI-Illinois	312-967-8430
IN	Ft. Wayne, Scott Elctrns.	219-489-5690
IN	Indianapolis, Scott Elctrns.	317-841-0010
KS	Olathe, Tech. Sls. Assoc., Inc.	913-829-2800
MD	Lutherville, J.A. Dougherty Sls., Inc.	301-321-7890
MA	Sterling, Compatable Comps. Inc.	508-422-7641
MA	Westwood, Comp. Rep. Assoc., Inc.	617-329-3454
MI	Plymouth, Jay Mktg. Assoc.	313-459-1200
MN	Bloomington, IRI of MN.	612-854-8027
MN	Edina, Dunlop Consultants	612-933-9070
MN	Minneapolis, Dunlop Consits.	612-544-1070
MO	St. Louis, Tech. Sls. Assoc., Inc.	314-521-2044
NJ	Flanders, K & R Eng. Sls., Inc.	201-584-5235
NM	Albuquerque, Nelco Electronix	505-293-1399
NY	Rochester, L-Mar Assocs.	716-381-9100
NC	Charlotte, JWL Assocs.	704-541-5750
NC	Raleigh, JWL Assocs.	919-787-4826
OH	Aurora, EMA, Inc.	216-562-6104
OH	Centerville, EMA, Inc.	513-433-2800
OH	Worthington, EMA, Inc.	614-436-9452
OR	Beaverton, N.R. Schultz Co.	503-643-1644
PA	Horsham, TMI, Inc.	215-441-4300
TX	Dallas, Edward F. Avmond Co.	214-826-7620
TX	Houston, Edward F. Avmond Co.	713-943-3149
WA	Bellevue, UniComp	206-868-5124
WI	Milwaukee, IRI-Wisconsin	414-789-9393
PR	Caguas, Comp. Rep. Assoc., Inc.	809-746-6550
Can	Concord, Ont., Kaytronics, Inc.	416-669-2262
Can	Kanata, Ont., Kaytronics, Inc.	613-564-0080
Can	Ville St. Laurent, Que., Kaytronics, Inc.	514-745-5800

OK INDUSTRIES, INC., 4 Executive Plaza, Yonkers, NY 10701, Tel: 914-969-6800, TELEX: 12-5091, FAX: 914-969-6650; Empl.: 200; *Sls. Mgr.:* John Malboeuf

OLEKTRON CORP., Signal Technology Corp., 61 Sutton Road, Webster, MA 01570, Tel: 508-943-7440, FAX: 508-949-1804; FSC No.: 32252; Empl.: 160; *Sls. Mgr.:* Michael Smith

OLFLEX WIRE & CABLE, INC., 30 Plymouth Street, Fairfield, NJ 07004, Tel: 201-575-1101, FAX: 201-575-7178; Empl.: 25; *Sls. Mgr.:* Peter Deschner

OLIVER ADVANCED ENGINEERING, 320 W. Arden St., Glendale, CA 91203, Tel: 818-240-0080, FAX: 818-240-6131; Empl.: 28

OLYMPIC WIRE & CABLE, 1 Madison Rd., Fairfield, NJ 07006, Tel: 201-227-7996, FAX: 201-227-1606; FSC No.: 63830; Empl.: 35; *Dist. Mgr.:* Yvette Archer

OLYMPUS CORPORATION, Industrial Fiberoptics Division, 4 Nevada Dr., Lake Success, NY 11042-1179, Tel: 516-488-3880, FAX: 516-488-3973

OMATION INC., 801 Presidental Dr., Richardson, TX 75081, Tel: 214-231-5167, 800-553-9119, FAX: 214-783-9072; Empl.: 15; *Sls. Mgr.:* Nancy James

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OMEGA ENGINEERING, Box 4047, Stamford, CT 06907, Tel: 800-826-6342; Empl.: 500; *Sls. Mgr.:* Peter Casiraghi & Nelson Hart ..... **B•1760, 1854-1855, 1945-1946; C•1799; D•1013, 1101, 1142, 1191, 1307, 1368-1369, 1422**

OMICRON ELECTRONIC, Ang-Kauffmann-Str. 8, Hohenems, Austria A-6845, Tel: ò/5576/4010-0, FAX: ò/5576/5153; Empl.: 10; *Sls. Mgr.:* Marc Andreas Vogg; *Dist. Mgr.:* Marc Andreas Vogg

OMNICOMP GRAPHICS CORP., 1734 W. Sam Houston Pkwy N., Houston, TX 77043, Tel: 713-464-2990, TELEX: 285801, FAX: 713-827-7540; Empl.: 40; *Sls. Mgr.:* Richard A. Jones

OMNIBYTE CORP., 245 W. Roosevelt Rd., Bldg. 1-5, W. Chicago, IL 60185, Tel: 708-231-6880, FAX: 708-231-7042; Empl.: 30; *Sls. Mgr.:* Peter Czuchra

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FAX: 408-747-0358

OMNIPRINT, INC., 1188 Elko Drive, Sunnyvale, CA 94089, Tel: 408-745-6400; Empl.: 12 ..... **D•1102-1105**

Local Sales Offices & Reps

CA	Irvine, OBI Distrs.	714-250-9003
IL	Arlington Heights, Coombs Assoc., Inc.	312-439-9810
NJ	Fords, Marlin Data	201-738-7200

OMNI SWITCH USA, INC., 21630 N. 19th Ave., Ste. B-16, Phoenix, AZ 85027, Tel: 602-582-0629, FAX: 602-582-0665; Empl.: 100; *Sls. Mgr.:* Peggy Ann Wenzel, V.P.

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FAX: 708-893-9991

OMNI VISION INC., 168 N. Brandon Dr., Glendale Heights, IL 60139, Tel: 708-893-1720; *Sls. Mgr.:* Walt Kowalski ..... **B•1109**

OMRON ELECTRONICS, INC., Control Components Division, 1 East Commerce Dr., Schaumburg, IL 60173, Tel: 708-843-7900, FAX: 708-843-8081; Empl.: 300; *Dist. Mgr.:* Mac Rowell

OMRON ELECTRONICS, INC., F A Systems Div., One E. Commerce Dr., Schaumburg, IL 60173, Tel: 708-843-7900, FAX: 708-843-7787; Empl.: 300; *Sls. Mgr.:* Sal Scafidi

OMUTEC, Odetics, Inc., 1515 S. Manchester Ave., Anaheim, CA 92802, Tel: 714-758-0200, TWX: 910-594-1461; *Sls. Mgr.:* Robert Asher

ONAN POWER/ELECTRONICS, 9713 Valley View Rd., Minneapolis, MN 55344, Tel: 612-943-4600, FAX: 612-943-4627; FSC No.: 3Z577; Empl.: 500; *Sls. Mgr.:* Jim Vogt

ONEAC CORPORATION, 27944 N. Bradley Rd., Libertyville, IL 60048, Tel: 708-816-6000,800-327-8801, TWX: 757024 ONEAC USA; Empl.: 250; *Sls. Mgr.:* John Jeter; *Dist. Mgr.:* Herb Goldstein

ONSET COMPUTER CORP., 199 Main St., PO Box 1030, N. Falmouth, MA 02556, Tel: 508-563-9000, FAX: 508-563-9477; Empl.: 10; *Sls. Mgr.:* Lon Hocker

ONSHORE TECHNOLOGY, 1917 W. 3rd St., Tempe, AZ 85281, Tel: 602-921-3000

ONTRACK DATA RECOVERY, INC., Ontrack Computer Systems, Inc., 6321 Bury Drive, Ste.15-19, Eden Prairie, MN 55346, Tel: 800-872-2599, FAX: 612-937-5750

OPAMP LABS, INC., 1033 N. Sycamore Ave., Los Angeles, CA 90038, Tel: 213-934-3566, FAX: 213-462-6490; FSC No.: 24699; Empl.: 18 ..... **D•1014**

OPHIR TECHNOLOGY INC., 4001 Via Oro Ave., Long Beach, CA 90810, Tel: 213-834-0202, FAX: 213-834-7730; Empl.: 26

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FAX: 214-323-2396

OPTEK TECHNOLOGY INC., 1215 West Crosby Rd., Carrollton, TX 75006, Tel: 214-323-2200; Empl.: 2000; *Sls. Mgr.:* Larry Newman; *Dist. Mgr.:* Kas Kunz ..... **B•1333**

Local Sales Offices & Reps

AZ	Scottsdale, Pinnacle Comp. Sls.	602-994-0441
CA	Torrance, Detomas;& Grupp Inc.	213-618-8898
AZ	Tucson, Pinnacle Comp. Sls.	602-886-1726
CA	Escondido, Uni Rep Co.	619-746-5131
CA	Mission Hills, Detomas; & Grupp Inc.	818-365-5300
CA	Mountain View, Marcon	415-964-8046
CO	Wheat Ridge, Waugaman Assoc.	303-423-1020
CT	Stratford, VISTAssociates	203-375-5456
FL	Boca Raton, S. Atlantic Comp. Sls.	407-391-1034
FL	Orlando, South Atlantic Comp. Sls.	407-857-3650
FL	Winter Haven, S. Atlantic Comp. Sls.	813-423-0953
GA	Norcross, South Atlantic Comp. Sls.	404-447-6154
IL	Arlington Heights, KMA Sls. Co.	708-398-5300
IN	Indianapolis, Elctrns Sls. & Engrg.	317-849-4260
KS	Parker, S.W. Assoc.	913-898-6552
IA	Cedar Rapids, C.H. Horn & Assoc.	319-393-8703
MA	Marlborough, VISTAssociates	617-481-9277
MI	Brighton, A.P. Assocs.	313-229-6550
MN	Bloomington, Tecteam	612-854-6616
MO	St. Louis, John G. Macke	314-432-2830
NJ	West Caldwell, Technical Mktg. Grp.	201-226-3300
NM	Albuquerque, S.W. Sls.	505-899-9005
NY	Clark Mills, KLM Garner	315-853-6126
NY	Melville, Technical Mktg. Grp.	516-351-8833
NY	Pittsford, KLM Garner	716-381-8350
NC	Raleigh, South Atlantic Comp. Sls.	919-852-4676
OH	Dayton, Midwest Mktg. Assocs.	513-433-2511
OR	Beaverton, Earl & Brown Co. Inc.	503-643-5500
PA	Broomall, L.D. Lowery Inc.	215-356-5300
TX	Austin, Ion	512-331-7251
TX	Grand Prairie, Ion	214-647-8225
TX	Houston, Ion	713-537-7717
UT	Salt Lake City, Waugaman	801-261-0802
WA	Redmond, Earl & Brown Co. Inc.	206-885-5064
WI	Milwaukee, KMA	414-259-1771
Can	Richmond, Ont., Renmark Elctrns. Ltd.	416-881-8844

Local Distributors

CA	Compton, Harper-S.I.D.	213-979-5090
CA	Culver City, Hamilton-Avnet	213-558-2000
CA	Los Angeles, Bell Inds.	213-826-6778
CA	Tustin, Added Value	714-259-8258
CA	Tustin, AVED	714-259-8258
FL	Orlando, Chip Supp.	407-298-7100
IL	Chicago, Newark Elctrns.	312-784-5100
MD	Gaithersburg, Pioneer-Technlg.	301-921-0660
MA	Norwood, Gerber Elctrns.	617-769-6000

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WA Belleview, Bell Inds. 206-747-1515
Can Pointe Claire, Que., Future Elctrns. 514-694-7710

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FAX: 301-948-6357

OPTELECOM, INC., 15930 Luanne Dr., Gaithersburg, MD 20877, Tel: 301-840-2121; FSC No.: 59338; Empl.: 50; *Sls. Mgr.:* Pam Imes ..... **B•1227-1229**

OPTICAL & CONDUCTIVE COATINGS, Meridian Inds., Inc., 428 N. Buchanan Cir., 68, Pacheco, CA 94553, Tel: 415-798-6066, FAX: 415-798-4789; FSC No.: 9U775; Empl.: 8; *Sls. Mgr.:* Glenn G. Grupe

OPTICAL CABLE CORP., P.O. Box 11967, Roanoke, VA 24022-1967, Tel: 1-800-622-7711, TELEX: 705-290, FAX: 703-265-0724; FSC No.: 6Y528; Empl.: 50; *Sls. Mgr.:* Luke J. Huybrechts, VP/Sls.; *Dist. Mgr.:* Chuck Surat, Natl. Accts. Exec.

OPTICS FOR RESEARCH, INC., P.O. Box 82, Caldwell, NJ 07006, Tel: 201-228-4480, TELEX: 497-4643, FAX: 201-228-0915; Empl.: 27; *Sls. Mgr.:* Donald K. Wilson

OPTIMA ELECTRONIC PACKAGING SYSTEMS, 2166 Mountain Industrial Blvd, Tucker, GA 30084-5088, Tel: 404-496-4000, FAX: 404-496-4041; FSC No.: 10110; Empl.: 150; *Sls. Mgr.:* Don Southwell ..... **C•1064-1069**

Local Sales Offices & Reps
AZ Scottsdale, Arcom Sls., Inc. 602-947-5745
CA Garden Grove, Elsco Elctrns., Inc. 714-891-4621
CA Santa Clara, Nova-Tronix 408-727-9530
CO Denver, Promotech, Inc. 303-692-8484
FL Oviedo, Conley & Assocs., Inc. 407-365-3283
GA Roswell, Acurep Associates, Inc. 404-998-5008
GA Tucker, Optima Elctrn. Packaging 404-496-4000
IL Arlington Heights, Berndt Assocs., Inc. 708-632-0900
MA Millis, Selmark Assocs., Inc. 508-376-2914
MI Madison Hgts., DEM Electronic Sls., Inc. 313-583-1500
MN Minneapolis, Holmgren Assocs., Inc. .. 612-574-9983
MO Bridgeton, BC Elctrn. Sls. 314-739-6683
NJ Berkeley Heights, Cambridge Allen & Assocs. 908-464-0203
NC Raleigh, Godwin Assocs. 919-878-8000
OH Cleveland, C.A. Robinson Co., Inc. 216-473-6044
UT Salt Lake City, Sierra Technical Sales 801-566-9719
VA Sterling, Beacon North, Inc. 703-478-2480
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PACIFIC MAGNETICS CORP., 2602 Transportation Ave., Ste. G, National City, CA 92050, Tel: 619-474-8216, FAX: 619-474-3979; *Sls. Mgr.:* Mary Hill

PACIFIC MICROCOMPUTERS, Signal Technology, 5855 Oberlin Dr. Ste. B, San Diego, CA 92121, Tel: 619-453-8649; Empl.: 15; *Sls. Mgr.:* Guy Halac

PACIFIC
POWER SOURCE CORP

FAX: 714-891-1928

PACIFIC POWER SOURCE CORP., 15122 Bolsa Chica St, Huntington Bch., CA 92649, Tel: 714-898-2691, 800-854-2433; FSC No.: 57148; Empl.: 50; *Sls. Mgr.:* Russ Engle ..... **D•2216-2221**

Local Sales Offices & Reps

AL	Huntsville, W A Brown Instrs.	205-830-9224
CA	San Jose, Arnasco Corp.	408-262-1500
CA	Torrance, Arnasco Corp.	213-781-9494
CO	Denver, Aztec Entprs.	303-779-5285
AZ	Tempe, Aztec Entprs.	602-431-8401
FL	Ft. Lauderdale, W. A. Brown Instrs.	305-581-6444
FL	Melbourne, W.A. Instrs.	407-723-0766
FL	Orlando, W.A. Brown Instrs.	407-648-9660
GA	Norcross, W.A. Brown Instrs.	404-449-7160
IL	Arlington Hgts., Comtel Midwest	708-392-4040
IN	Indianapolis, Comtel Midwest	317-253-1681
KS	Shawnee Mission, Comtel Midwest Co.	913-268-0762
MA	Hopkinton, Eastern Sys. Inc.	508-435-2151
MI	Plymouth, EQS Sys.	313-455-7920
MO	St. Louis, Comtel Midwest Co.	314-227-7220
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Liverpool, Northern Tech. Sls. Assocs., Inc.	315-451-1091
NY	Wantagh, Bytec Reps.	516-781-7400
NC	Cary, W.A. Brown Instrs.	919-460-1120
OH	Chesterland, EQS Sys.	216-729-2222
OH	Dayton, EQS Sys.	513-236-7676
OR	Portland, Westcon	503-283-0132
NJ	Fairfax, Sci. Reps.,Inc.	609-662-5222
PA	Huntingdon Valley, Sci-Rep Inc.	215-322-6500
PA	Pittsburgh, EQS Sys.	800-729-8084
TX	El Paso, Aztec Entprs.	505-262-1688
VA	Fairfax, Sci-Rep, Inc.	703-385-0600
WA	Kent, Westcon, Inc.	206-824-8922
Can	Ottawa, Ont., Multitest Midwest Elctrns.	613-727-0848
UT	Salt Lake City, Aztec Entprs., Inc.	801-467-4675
WI	New Berlin, Comtel Midwest Co.	414-544-6042
Can	Scarborough, Ont., Multitest Elctrns.	416-609-8396
Can	St. Laurent, PQ, Multitest Elctrns.	514-337-0723

PACIFIC RESISTOR CO., 18300 Oxnard St., Tarzana, CA 91356, Tel: 818-345-7811, FAX: 818-345-1507; FSC No.: 06416; *Sls. Mgr.:* Douglas Trewhitt ... **A•1968-1970**

Local Sales Offices & Reps

CA	San Jose, Comtech Mktg.	408-294-5448

Local Distributors

CA	San Jose, Comtech Mktg.	408-294-5448

PACIFIC SCIENTIFIC CO., 4301 Kishwaukee, Rockford, IL 61109, Tel: 815-226-3100, TELEX: 386743, FAX: 815-226-3122; Empl.: 400; *Dist. Mgr.:* Steve Earley

PACIFIC SCIENTIFIC, Electro Kinetics Division, 402 E. Gutierrez St., Santa Barbara, CA 93101, Tel: 805-963-2055, TWX: 910-334-1177; Empl.: 220; *Sls. Mgr.:* Robert E. Lynch

PACIFIC TRANSDUCER CORP., 2301 Federal, Los Angeles, CA 90064-1482, Tel: 213-478-1134, FAX: 213-312-0826; Empl.: 22; *Sls. Mgr.:* Laura Barba

PACIFIC TRANSFORMER CORP., 4750 Wesley Dr., Anaheim, CA 92807, Tel: 1-800-325-0501, FAX: 714-779-0718; Empl.: 75

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PACTEC, LaFrance Corp., Enterprise & Executive Avenues, Philadelphia, PA 19153, Tel: 215-365-8400; Empl.: 503; *Sls. Mgr.:* J. Singer .... **C•1002, 1070-1076**

Local Sales Offices & Reps

AL	Huntsville, Scott Ray	205-883-2159
CA	Anaheim, Jonathan Winters	714-779-8092
CA	San Jose, Michael Bennett	408-943-0360
FL	Palm Harbor, Roger Hauck	813-784-7895
IL	Lisle, Jim McCloskey	708-969-8821
MA	Burlington, Jim Craig	617-221-4824
EXP	Philadelphia, PA, PacTec Export Sls. Dept.	215-365-8400
NJ	Merchantville, Bill Boucot	609-488-9086
NC	Thomasville, Keith Pierce	919-472-2030
OH	Perrysburg, Bruce Brown	419-874-1110
TX	Dallas, Craig LaDue	214-340-6288
WA	Seattle, Mike Werttemberger	206-363-9899
WI	Appleton, Ed Sabish	414-731-7212

Local Distributors

AL	Birmingham, American Elctrns. Supp.	205-942-4656
AZ	Tempe, Circut Specialists, Inc.	602-966-0764
CA	Anaheim, R&D Elctrns.	714-773-0240
CA	Burbank, Electronic City	213-842-5275
CA	Canoga Park, Sandy's Elctrns. Supp.	213-346-8353
CA	Carpenteria, Electronic Resources	805-684-5439
CA	Costa Mesa, Marvac	714-540-3280
CA	El Segundo, Force Elctrns.	213-772-1324
CA	El Toro, R-Vac	714-586-1210
CA	Gardena, California Switch & Signal	213-538-9830
CA	Milpitas, Zack Elctrns.	408-942-5432
CA	San Diego, Southland Comps.	619-673-3800
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Rose Elctrns.	408-943-0200
CA	Santa Clara, Force Elctrns.	408-435-1324
CA	Sunnyvale, Fry's Elctrns.	408-733-1770
CA	Vallejo, Zackit (Vallejo)	707-644-6676
CO	Aurora, Jet Elctrn. Supp.	303-364-1000
CO	Littleton, Display's Plus	303-730-7333
CT	Wallingford, Midstate Elctrns.	203-265-9900
CT	Wallingford, Sager Elctrl. Supp.	203-265-4600
CT	Wallingford, Utronics, Inc. Coghlin	203-265-2724
DE	Wilmington, Wholesale Elctrns. Inc.	302-656-9988
FL	Largo, Electronic Precepts of FL	813-544-3636
FL	Longwood, Intertec Comps.	305-834-7777
FL	Tampa, Sunex Elctrns.	813-885-4074
FL	West Palm Beach, Nurmi Elctrns.	305-686-8553
GA	Norcross, American Elctrn. Supp.	800-562-8740
GA	Norcross, Dow Elctrns., Inc.	404-448-4004
GA	Norcross, EMSCO	404-925-8366
HI	Honolulu, Precision Radio, Ltd.	808-537-5291
ID	Boise, Radar Elec.	208-336-2227
IL	Berwyn, BB & W Inc.	312-242-1533
IL	Champaign, Klaus Radio	217-356-1896
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Elk Grove, Martec Assocs.	312-956-8090
IL	Mt. Prospect, Tri State Elctrns.	312-255-0600
IL	Northbrook, Classic Comps.	312-291-0019
IL	Peoria, Klaus Radio	309-691-4840
IL	Rosemont, Advent Elctrns.	312-298-4210
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Meunier Elctrns.	317-635-3511
IA	Cedar Rapids, Iowa Radio Supply	319-393-4510
MD	Beltsville, P.S.I.	301-937-4960
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Westborough, In-Stock Products Co.	508-870-5750
MI	Grand Rapids, S. F. Elctrns.	616-459-0216
MI	Livonia, RS Elctrns.	313-525-1155
MI	Taylor, Tel Van Elctrn. Supp.	313-291-3515
MN	Minneapolis, AEI Elctrn. Parts	612-338-4754
MN	Minneapolis, Berquist	612-835-2322
MN	New Brighton, Parts I	612-633-8079
MO	Kansas City, Walters Indl. Elctrns.	816-531-7015
NE	Lincoln, Scott Elctrns.	402-466-8221
NH	Salem, Sager Elctrl. Supp.	603-898-1348
NJ	Rockaway, Tonar Inds., Inc.	201-586-9000
NM	Albuquerque, Walker Elctrns. Supp.	505-883-2992
NY	Buffalo, Summit Distr.	716-887-2800
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Hauppauge, Sager Elctrns.	516-348-1300
NY	Rochester, Masline Elctrns., Inc.	716-546-5373
NY	Rochester, Summit Distr.	716-334-8110
NC	Raleigh, Sager Svc. Plus Elctrns.	919-850-9550
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, R. S. Elctrns.	513-793-2450
OH	Cleveland, Roberts Elctrns.	216-238-1711
OH	Columbus, Hughes-Peters	614-294-5351
OK	Tulsa, Radio Inc.	918-587-9123
OR	Beaverton, Rose Elctrns	503-629-9288
OR	Portland, Radar Elec.	503-232-3404
PA	Exton, VSH Elctrns.	215-363-2250
PA	Mars, Sager Elctrns.	412-772-2233
TX	Austin, Wofford Elctrns.	512-339-1131
TX	Dallas, Force Elctrns.	214-247-9955
TX	Dallas, Off-the-Shelf Comps.	214-247-0052
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Ft. Worth, Tandy Natl. Pts.	817-870-5600
TX	Houston, Force Elctrns.	713-561-8644
TX	Houston, Wofford Elctrns.	713-847-3583
TX	Richardson, Off-the-Shelf Comps.	214-238-0808
UT	Salt Lake City, Standard Supp.	801-486-3371

VA Charlottesville, Virginia Elctrn. Comps. 804-296-4184
WA Seattle, Radar Elec. 206-282-2511
WI Grafton, Lake View Elctrns. Corp. 414-377-8250
WI Milwaukee, Industrial Elctrns., Inc. 414-276-1212
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Classic Comps. Supp., Inc. 414-786-5300
WI Oshkosh, Electronic Inds., Inc. 414-235-8930
Can Burnaby, BC, Intek Elctrns. 604-294-8100
Can Mississauga, Ont., Rush Elctrns. 416-677-7280
Can Pointe Claire, Future Elctrns. 514-694-7710
Can Pointe Claire, Que., Future Elctrns. 514-694-7710
Can Vancouver, BC, Future Elctrns. 604-294-1166
Can Victoria, BC, Queale Elctrns., Ltd. 604-388-6111

PAINE CORPORATION, 2401 S. Bayview St, Seattle, WA 98144, Tel: 206-329-8600, 800-426-0366, FAX: 206-329-1615; FSC No.: 13624; Empl.: 93; *Sls. Mgr.:* John Sagvold

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PAK-TRONIC, See Tracor Paktronics

PAKTRONICS CONTROLS, INC., P.O. Box 185669, Ft Worth, TX 76181, Tel: 817-284-5241, FAX: 817-284-1712; Empl.: 30; *Sls. Mgr.:* D. R. Sundberg, Acting

PALADIN CORP., 3543 Old Conejo Rd., No.101-102, Newbury Park, CA 91320, Tel: 805-499-0318, FAX: 805-499-4006; Empl.: 20; *Sls. Mgr.:* Scott Allen

PALOMAR ENGINEERS, Box 455, Escondido, CA 92033, Tel: 619-747-3343, FAX: 619-747-3346; Empl.: 9

PAMRAN INC., 1900 Williams St., Young Ind. Pk., Racine, WI 53404, Tel: 414-637-7999, FAX: 414-637-2303; FSC No.: K 8-67203; Empl.: 28; *Sls. Mgr.:* R. C. Pfeil

PANAMETRICS, 221 Cresent St., Waltham, MA 02154-3497, Tel: 617-899-2740, TELEX: 6817337, TWX: 951006, FAX: 617-899-1552; Empl.: 200; *Sls. Mgr.:* Bob Mel

PANASONIC FACTORY AUTOMATION CO., Matsushita Elect. Corp. of America, 9401 W. Grand Ave., Franklin Park, IL 60131, Tel: 708-452-2410, 708-452-2650, FAX: 708-452-2575; *Sls. Mgr.:* Art Hagiwara

Panasonic

FAX: 201-392-4782

PANASONIC INDUSTRIAL CO., Battery Sales GP, Box 1511, Secaucus, NJ 07096-1511, Tel: 201-348-5266; Empl.: 25 ..... **D•1470-1475**

Local Sales Offices & Reps

AZ Scottsdale, Dar-C 602-948-2240
CA Glendale, Halbar Assocs. Inc. 818-246-8263
CA Pleasanton, Moulthrop Sls. Inc. 415-463-0450
CA San Diego, Tauber & Assocs. 619-274-7242
MA Burlington, Conti-Younger Assocs. Inc. 617-273-1582
MN Eden Prairie, Electro Mark Inc. 612-944-5850
OH Beachwood, Elctrn. Salesmasters Inc. 216-831-9555
OR Beaverton, Advanced Power Prods. ... 503-646-0994

Local Distributors

AL Huntsville, Resistacap Inc. 205-883-4270
AZ Scottsdale, Electro Mktg. 602-991-0110
CA San Diego, Tauber Elctrns. Inc. 619-274-7242
CA San Jose, Rose Elec. Distrbg. Co. 408-943-0440
CA Santa Clara, Cypress Elctrns. Inc. 408-980-2500
CA Van Nuys, NESCO 818-781-0505
CO Englewood, AVT 303-779-8056
CT Woodbury, Cell Technlg. 203-575-1103
FL St. Petersburg, Micro Precision 813-854-2861
GA Norcross, Applied Power, Inc. 404-263-0421
IL Morton Grove, Power Pak Inc. 312-966-6000
IL Palatine, Ohm Elctrns. 708-359-9686
IN Indianapolis, Bell Inds. 317-634-8200
MD Beltsville, Mark Elctrns. 301-792-0072
MA Canton, Impact Sls. Co. Inc. 617-821-1500
MI Danvers, Generation Elctrns. Inc. 508-683-1177
MI Brighton, Applied Power Inc. 313-227-3604
MN Thief River Falls, Digi-Key 800-344-4539
MN Minneapolis, Stark Elctrns. Supp. Inc. 612-332-1325
NJ Camden, Gen. Radio 609-964-8560
NJ Clifton, Engineered Assem. 201-288-4477
NC Raleigh, Engrd. Assemblies Inc. 919-790-9700
NC Winston Salem, Kirkman Elctrns. 800-334-0158
OH Columbia, Promark Elctrns. Inc. 614-876-8885
OH Columbus, Hughes-Peters 614-294-5351
OR Beaverton, Micro Power 503-626-7086
TX Dallas, Computer Comps. Corp. 214-239-0271
TX Dallas, Norvell Elctrns. Inc. 214-233-0020
TX Fort Worth, Allied Elctrns. 817-336-5401
WI Mequon, Taylor Elec. Co. 414-241-4321

PANASONIC INDUSTRIAL COMPANY, Custom Peripheral Dept., Two Panasonic Way, Secaucus, NJ 07094, Tel: 201-392-6313, FAX: 201-348-7849; *Dist. Mgr.:* Edmund Silvia Jr., Prod. Mgr.

PANASONIC INDUSTRIAL CO., 1616 McCandless Dr., Milpitas, CA 95035, Tel: 408-946-7200, FAX: 408-946-3753

PANAVISE PRODUCTS, INC., 1485 Southern Way, Sparks, NV 89431, Tel: 702-353-2900, FAX: 702-353-2929; Empl.: 35; *Sls. Mgr.:* Mark Thorsell; *Dist. Mgr.:* Mark Thorsell

PANDUIT CORP., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981, Tel: 800-777-3300, FAX: 708-532-1811; FSC No.: ;06383; Empl.: 2000 .... **C•1480-1482, 1800-1802**

Local Sales Offices & Reps

AL Birmingham, Frank Parker & Assocs. 205-655-4801
AL Mobile, Frank Parker & Assocs. 205-675-7213
AK Anchorage, Bar Elec. Agt. 907-562-0011
AZ Phoenix, Maddox Sls. 602-437-1002
AR Little Rock, Byron Carson Co. 501-663-6870
CA Los Altos, Ewing-Foley, Inc. 415-941-4525
CA Los Angeles, Maddox Sls. 213-949-7400
CA Sacramento, Ewing-Foley, Inc. 916-885-6591
CO Denver, Panduit Corp. 800-777-3300
CT Glastonbury, Panduit Corp. 203-657-4105
DC Washington, Agency Group, Inc. 301-858-1600
FL Ft. Lauderdale, Panduit Corp. 800-282-9209
FL Orlando, Panduit Corp. 800-282-9209
GA Atlanta, Panduit Corp. 404-256-5940
HI Honolulu, PEFCO, Inc. 808-832-0000
IL Burr Ridge, Panduit Corp. 708-887-1000
IN Indianapolis, Panduit Corp. 800-777-3300
KS Kansas City, Panduit Corp. 800-777-3300
KY Louisville, A. L. Pickens Co. 502-491-4215
LA Baton Rouge, Wells-Keown & Assocs. 504-292-6578
LA New Orleans, Wells- Keown & Assocs. 504-733-0301
LA Shreveport, Wells-Keown & Assocs. .. 318-688-6040
MD Baltimore, Agency Group, Inc. 301-793-0023
MA N. Andover, Panduit Corp. 508-681-0451
MI Fraser, Panduit Corp. 313-791-1700
MI Grand Rapids, Panduit Corp. 800-777-3300
MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO St. Louis, Panduit Corp. 314-894-7800
NE Omaha, Panduit Corp. 402-391-0452
NV Las Vegas, Maddox Sls. 702-870-1151
NJ Leonia, Panduit Corp. 201-461-7790
NM Albuquerque, F P Sls. 505-345-5553
NY Buffalo, Panduit Corp. 800-777-3300
NY Rochester, Panduit Corp. 800-777-3300
NY Schenectady, Panduit Corp. 800-777-3300
NY Syracuse, Panduit Corp. 800-777-3300
NC Raleigh, L. G. White Southern 919-872-6049
NC Winston-Salem, L. G. White Southern 919-725-3612
OH Cincinnati, Panduit Corp. 800-777-3300
OH Cleveland, Panduit Corp. 800-777-3300
OH Columbus, Panduit Corp. 614-888-6224
OK Oklahoma City, Elctrl. Prods. of Okla. 405-842-8371
OR Portland, Panduit Corp. 503-654-9455
PA Philadelphia, Kunz, Powell & Assoc. .. 215-296-9490
PA Pittsburgh, Cody Assocs., Inc. 412-787-5336
SC Greenville, L. G. White Southern 803-271-0630
TN Memphis, Byron Carson Co. 901-276-0614
TN Nashville, Panduit Corp. 800-777-3300
TX Dallas, Panduit Corp. 214-518-0004
TX Houston, Panduit Corp. 713-686-5600
UT Salt Lake City, Ray Walker Co. 801-973-7454
VA Richmond, L. G. White Southern 804-752-7055
WA Seattle, Panduit Corp. 800-777-3300
WA Spokane, Lighting, Inc. 509-467-6650
WI Appleton, H. Mercer Co. 414-739-6223
WI Milwaukee, Panduit Corp. 800-777-3300
PR Santurce, L. Gandia & Assocs. 809-725-3473
Can Markham, Ont., Panduit Canada Ltd. .. 416-475-6922

PANEL COMPONENTS CORPORATION

FAX: 707-578-5478

PANEL COMPONENTS CORP., P.O. Box 6626M, Santa Rosa, CA 95406, Tel: 707-523-0600; Empl.: 25 ..... **A•2316; B•1382-1383; C•1484-1492, 1804-1809; D•2222**

Local Sales Offices & Reps

AL Huntsville, DHR Mktg. Inc. 205-722-0440
CA Santa Clara, Ross Mktg. Assoc. 408-988-8111
CA Tustin, Schoenbachler-Dobson Co. ... 714-544-1888
CO Englewood, Omega Ltd. 303-762-1921
GA Duluth, DHR Mktg., Inc. 404-564-0529
IL Northbrook, Raines & Assocs. 708-498-0890
IA Marion, M-S-B Assocs., Inc. 319-377-6261
KS Roeland Park, M-S-B Assocs., Inc. 913-432-2131
MA Scituate, Olsen Tech. Sls. 617-545-5101
MN St. Paul, Arkco Sls. 612-777-7454
MO St. Louis, M-S-B Assocs., Inc. 314-946-5577
NJ Kenvil, CFE/Gray 201-927-6662
NY Victor, Net Sls. 716-924-1844
NC Raleigh, DHR Mktg., Inc. 919-829-1970
OH Medina, Rockford Controls 216-725-3705
OR McMinnville, Electro-Design 503-472-0481
PA Philadelphia, Eastern Sci. Mktg. 215-368-4570
SC Greenville, DHR Mktg. Inc. 803-235-3594
TX Lewisville, Jim Hughes Co. 214-221-1536
WA Redmond, Electro-Design 206-867-9300
EXP Burnaby, B.C., Darmac Agencies, Ltd. 604-520-7121
Can Ottawa, Ont., Ellam & Assoc. 613-727-3892

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PAN INTERNATIONAL (USA), INC., 9477 E. Archibald Ave., Rancho Cucamonga, CA 91730, Tel: 714-945-1365; Empl.: 21; *Sls. Mgr.:* Barry Park; *Dist. Mgr.:* Barry Park, Natl. Sls. Mgr. ..... **C•1810-1812; D•1107**

Local Sales Offices & Reps

CA	San Jose, Enhance Sls.	408-293-2425
CO	Littleton, Taylor Mktg.	303-850-0207
NH	Londonderry, RJR Assoc.	603-437-6343
TX	Garland, Hamilton & Savarese	214-271-4003
UT	Ogden, Taylor Mktg.	801-546-9570

Local Distributors

CA	San Jose, Enhance Sls.	408-293-2425
NH	Londonderry, RJR Assoc.	603-437-6343

PAN-MAGNETICS, See Tamura Corp. of America

PAPST

FAX: 401-849-4640

PAPST MECHATRONIC CORP., Aquidneck Indl. Pk., Newport, RI 02840, Tel: 401-849-8810; Empl.: 30 ..... **C•1654-1659**

Local Sales Offices & Reps

AL	Huntsville, Over & Over, Inc.	205-837-7105
AZ	Phoenix, Jr. Engrg. Sls., Inc.	602-956-4670
CA	Foster City, Papst Mechatronic Corp.	415-571-9591
CA	Los Gatos, Luscombe Engrg. Co of San Francisco	408-370-2020
CA	Montrose, Luscombe Engrg. Co. of So. Calif.	818-249-9000
CA	San Diego, Luscombe Engrg. Co. of So. Calif.	619-549-9699
CO	Englewood, Quorum 3	303-799-8100
CT	Hartford, Sturgeon Co.	203-249-7800
FL	Altamonte Springs, Over & Over, Inc.	407-332-1222
GA	Norcross, Over & Pver, Inc.	404-449-6205
IL	Arlington Heights, Brainard-Wilson Mktg; Inc.	708-437-2700
IL	Arlington Heights, Papst Mechatronic Corp.	708-981-1404,FAX:708-981-1642
IL	Arlington Hgts., Brainard-Wilson Mktg.	708-437-2700
IN	Indianapolis, Elctrn. Mktg. Consits.	317-921-3450
IA	Marion, MSB Assocs. Inc.	319-377-6261
KS	Shawnee Mission, MSB Assocs., Inc.	913-432-2131
MA	Needham, Sturgeon Tech. Sls.	617-444-6603
MN	Edina, Mel Foster Tech. Sls., Inc.	612-941-9790
MO	St. Charles, MSB Assocs.	314-946-5577
NJ	Cherry Hill, Trinkle Sls., Inc.	609-795-4200
NJ	Englewood, Harold Gray Assocs., Inc.	201-894-0894
NY	Johnson City, Tech-Mark, Inc.	607-729-6340
NY	Mendon, Tech-Mark, Inc.	716-624-3840
NY	Utica, Tech-Mark, Inc.	315-733-0575
NC	Charlotte, Over & Over, Inc.	704-542-9111
OH	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
OR	Portland, Venture Elctrns.	503-624-0617
PA	Knoxville, Trinkle Sls., Inc.	215-922-2080
RI	Newport, Papst Mechatronic Corp.	401-849-8810
TX	Dallas, JYSCO/Comps., Inc. (except El Paso)	214-349-1650
WA	Bellevue, Venture Elctrns.	206-454-4594
WI	Waukesha, Brainard-Wilson Mktg.	414-797-7940
Can	Pickering, Ont., A.C. Simmonds & Sons, Ltd.	416-839-8041

PARAGON ELECTRIC CO., INC., 606 Parkway Blvd., Two Rivers, WI 54241, Tel: 414-793-1161, TELEX: 26-3450, FAX: 414-793-3736; Empl.: 500; *Sls. Mgr.:* Don Karman

PARALINE

FAX: 818-281-5867

PARA-LINE TRANSFORMER CO., INC., 511 South Palm Ave., Alhambra, CA 91803, Tel: 818-281-0222; FSC No.: 59465 ..... **A•2317**

PARKER HANNIFIN CORP., 17325 Euclid Ave., Cleveland, OH 44112-1290, Tel: 800-272-7537, 800-C-PARKER, TELEX: 980636; Empl.: 33,225

PARKER HANNIFIN CORP., Compumotor Div., 5500 Business Park Dr., Rohnert Pk., CA 94928, Tel: 707-584-7558, FAX: 707-584-8015

PARKER HANNIFIN CORP., Daedal Div., P.O. Box 500, Sandy Hill Road, Harrison City, PA 15636, Tel: 412-744-4451, FAX: 412-744-7626

PARKER HANNIFIN CORP., Filter Division, 16810 Fulton County Rd. No.2, Metamora, OH 43540, Tel: 419-644-4311, FAX: 419-644-6205

PARKER HANNIFIN CORP., Fluidpower Pump Division, 100 Parker Drive, Ostego, MI 49078-1495, Tel: 616-694-9411, FAX: 616-694-4638

PARKER HANNIFIN CORP., Hose Products Division, 30240 Lakeland Blvd., Wickliffe, OH 44092, Tel: 216-943-5700, FAX: 216-943-7088

PARKER HANNIFIN CORP., Hydraulic Valve Division, 520 Ternes Ave., Elyria, OH 44035, Tel: 216-366-5100, FAX: 216-366-5253

PARKER HANNIFIN CORP., Instrumentation Connectors Div., 9400 S. Memorial Pkwy., Huntsville, AL 35802, Tel: 205-881-2040, FAX: 205-881-5730

PARKER HANNIFIN CORP. PARFLEX DIVISION, 1300 N. Freedom Street, Ravenna, OH 44266, Tel: 216-296-2871, FAX: 216-296-8433

PARKER HANNIFIN CORP. PNEUMATIC DIV., 8676 E M-89, Richland, MI 49083, Tel: 616-694-9411, FAX: 616-629-5385

PARKER HANNIFIN CORP., Refrigerating Specialties Division, 2445 South 25th Ave., Broadview, IL 60153, Tel: 708-681-6300, FAX: 708-681-6300 Ext.315

PARKER HANNIFIN CORP., Rotary Actuator Division, 135 Quadral Drive, Wadsworth, OH 44281-0450, Tel: 216-336-3511, FAX: 216-334-3335

PARKER HANNIFIN CORP., Schrader Bellows Division, 200 W. Exchange Street, Akron, OH 44309-0631, Tel: 216-375-5202, FAX: 1-800-446-7451

PARKER HANNIFIN CORP., Seal Group, 18321 Jamboree Rd., P.O. Box C-19510, Irvine, CA 92713, Tel: 714-851-3763, FAX: 714-851-2127

PARKER HANNIFIN CORP., Tube Fittings, 3885 Gateway Blvd., Columbus, OH 43228, Tel: 614-279-7070, FAX: 614-279-7685

PARKER MCCRORY MFG. CO., 2000 Forest Ave., Kansas City, MO 64108, Tel: 816-221-2000, FAX: 816-221-9879; *Sls. Mgr.:* Ken Turner; *Dist. Mgr.:* Ken Turner

PARKER SEAL GROUP, 18321 Jamboree Road, Irvine, California 92715, Tel: 714-851-3763, FAX: 714-851-2127; Empl.: 2,200; *Sls. Mgr.:* Joe Vicic; *Dist. Mgr.:* John Dick

Local Sales Offices & Reps

CA	Arcadia, Van Gott & Assocs.	818-445-9728
TX	Dallas, Glitsh Special Prods.	214-631-0120

Local Distributors

AL	Birmingham, Alabama Seal & Packing	205-879-7225
AZ	Phoenix, State Seal Co.	602-437-1532
CA	Garden Grove, Cal-State Seal & Fluid Comps., Inc.	714-554-9080
CA	La Mirada, Ad-Tech Seal, Inc.	213-921-6608
CA	San Leandro, Nor-Cal Seal Co.	415-568-7371
CA	Woodland Hills, Valley Seal Co.	213-873-3630
CO	Englewood, Aspen Seal & Packing	303-761-9049
CT	Newington, Niantic Rubber Co.	203-666-5661
GA	Atlanta, United Seal & Rubber	404-729-8880
GA	Hapeville, Go-Air, Inc.	404-768-1121
IN	Indianapolis, Seal Prods., Inc.	317-633-7277
MA	Northborough, Hope Co.	508-393-7660
MA	Woburn, Seal Distrbn. Ctr.	617-491-0100
MI	Farmington Hills, Roger Zatkoff Co., Inc.	313-478-2400
MI	Grand Rapids, Roger Zatkoff Co., Inc.	616-698-6880
MI	Kalamazoo, Depatie Fluid Power Co.	616-381-4590
NY	Rochester, Web Seal, Inc.	716-546-1320
NC	Raleigh, Smith Seal of North Carolina	919-790-1000
OH	Holland, Roger Zatkoff Co.	419-866-1600
OR	Portland, Air-Oil Prods.	503-234-0866
PA	Allentown, Staver Hydraulics Co., Inc.	215-837-1818
PA	Exton, Staver Hydraulics Co., Inc.	215-594-0540
PA	Newton, D.B.R. Inds.	215-968-6100
RI	Cranston, Niantic Rubber Co.	401-942-0900
TX	Arlington, Texas Seal Supp. Co.	817-640-1193
TX	Houston, Parker Seal Distrbn. Ctr.	713-649-7592
Can	Mississauga, D & D Packing & Seals	416-625-2033
Can	Mississauga, Sealtech Supply, Inc.	416-238-5885
Can	Port Credit, Seals Unlimited, Inc.	416-278-1326
Can	Ville St. Laurent, Les Joints & Garnitures D & D	514-745-4044
Can	Ville St. Laurent, Les Joints Entanches R.B	514-334-2220

Since 1922

FAX: 718-774-0583

PAR METAL PRODUCTS, INC., Par Industrial Complex, 1246 Atlantic Ave., Brooklyn, NY 11216, Tel: 718-774-5900, TELEX: 424 823 SNDS UI ATTN:PAR; FSC No.: 3449;3469; Empl.: 100; *Sls. Mgr.:* J. Troiano ..... **C•1077**

PARSONS MANUFACTURING, 1055 O'Brien Dr., Menlo Park, CA 94025-1476, Tel: 415-324-4726, FAX: 415-324-3051; Empl.: 45; *Sls. Mgr.:* S. Wurzer

PARSYTEC INC., Bldg. 9, Unit60, 245 W. Roosevelt Rd., West Chicago, IL 60185, Tel: 708-293-9500, FAX: 708-293-9525; Empl.: 8; *Sls. Mgr.:* Reinhard Rinn

PARVEX SERVO SYSTEMS, GEC Alsthom International, Inc., Two Ram Ridge Road, Spring Valley, NY 10977, Tel: 914-425-6908, FAX: 914-425-6314

PASO SOUND PRODUCTS, 14 First St, Pelham, NY 10803, Tel: 914-738-4800, FAX: 914-738-3954; Empl.: 18; *Sls. Mgr.:* Ken O'Brien

PASS & SEYMOUR/LEGRAND, Pass & Seymour/Inc., P.O. Box 4822, Syracuse, NY 13221, Tel: 315-468-6211, TELEX: 93-7232, FAX: 315-468-6305; Empl.: 1700; *Sls. Mgr.:* Sergio Palluci, Sls. Mgr./Kristin Northrop, Prod. Mgr.

PASTERNACK ENTERPRISES, P.O. Box 16759, Irvine, CA 92713, Tel: 714-261-1920, FAX: 714-261-7451; FSC No.: 53919; *Sls. Mgr.:* Elayne Wilson

PATTON-MACGUYER INC., 17 Virginia Ave., Providence, RI 02905, Tel: 401-941-6000, FAX: 401-941-5290; FSC No.: 77147; Empl.: 45; *Sls. Mgr.:* F. Spunzo

PAVE TECHNOLOGY CO., INC., 2751 Thunderhawk Ct., Dayton, OH 45414-3445, Tel: 513-890-1100, FAX: 513-890-5165

PAYNE ENGINEERING, Box 70, Scott Depot, WV 25560, Tel: 304-757-7353, TELEX: 88-5452, FAX: 304-757-7305; Empl.: 40; *Sls. Mgr.:* R. B. Vogelbach

PCA ELECTRONICS, 16799 Schoenborn St., Sepulveda, CA 91343, Tel: 818-892-0761, TWX: 910-496-1525, FAX: 818-894-5791; FSC No.: 97722; Empl.: 45; *Sls. Mgr.:* Nand Aggarwal ..... **A•1589-1594, 2318-2322**

Local Sales Offices & Reps

AZ	Phoenix, Toward Engrg. Assocs.	602-955-3193
CA	Irvine, Ramsey & Assocs.	714-851-2340
CA	San Diego, Ramsey & Assocs.	619-451-8865
CA	San Jose, Arnold Techn. Sls.	408-954-0400
FL	Ft. Lauderdale, Sunland Assoc.	305-561-1303

FL Goldenrod, Sunland Assocs. 305-365-9533
IL Westchester, Emtronics, Inc. 312-345-6500
IL Wheaton, Emtronics, Inc. 708-665-6222
IN Carmel, Emtronics, Inc. 317-848-2016
MA Sudbury, KSA of New England 508-443-5881
MN Bloomington, Bill Deming and Assocs. 612-888-5000
MS Meridan, Southeast Tech. Grp. 601-485-7055
AL Huntsville, Southeast Tech. Grp. 205-534-2376
GA Lawrenceville, Southeast Tech. Grp. .. 404-979-2055
NC Zebulon, Southeast Tech. Grp. 919-269-5589
OH Beavercreek, Electro-Com 513-299-0864
OH Dayton, Electro-Com 513-898-5140
OR Tigard, Elctrn. Comp. Sls. 503-245-2342
PA Exton, Linear Sls. 215-524-8080
TX Dallas, Blackburn Assocs. 214-750-8484
UT Salt Lake City, Sage Sls. 801-467-5451
WA Mercer Island, Elctrn. Comp. Sls. 206-232-9301

Local Distributors

CA Buena Pk., Cypress Elctrns. Inc. 714-521-5230
CA San Diego, Cypress Elctrns. Inc. 619-535-0011
CA San Jose, Cypress Elctrns. 408-980-2500
CA Santa Clara, Cypress Elctrns. Inc. 408-980-8400
CA Sherman Oaks, DLDI-Delay Lines Distrs. 818-986-9455
CO Englewood, Cypress Elctrns. 303-792-5829
CO Wheatridge, Cypress Elctrns. Inc. 303-431-2622
MA Sudbury, ASK Elctrns. 508-443-5880
NJ Rockaway, NASCO Elctrns. 201-625-7777
OR Beaverton, Cypress Elctrns. 503-641-2233
OR Portland, Cypress Elctrns. 503-223-8900
PA Exton, VSH Elctrns. 215-363-2250
WA Bothwell, Cypress Elctrns. 206-483-1140

P.C. BOARDS, INC., 210 West Main, Chanute, KS 66720, Tel: 316-431-0406, FAX: 316-431-2013; Empl.: 43; *Sls. Mgr.:* Greg Bilyeu

PCB PIEZOTRONICS, 3425 Walden Ave., Depew, NY 14043-2495, Tel: 716-684-0001, TWX: 710-263-1371, FAX: 716-684-0987; Empl.: 210; *Sls. Mgr.:* John Lally

PCD, 2 Technology Dr., Peabody, MA 01960, Tel: 508-532-8800, FAX: 508-532-6800; FSC No.: 58982; *Sls. Mgr.:* A. Arcisz

P C EXPRESS, INC., 15103 U.S. Hwy. 19, Hudson, FL 34667, Tel: 813-863-6114; Empl.: 15

PCI, INC., 1530 Parkmoor Ave.-Ste. A, San Jose, CA 95128, Tel: 408-282-0200, FAX: 408-282-0216; Empl.: 2500; *Sls. Mgr.:* Mike Clarke; *Dist. Mgr.:* Jane Campbell

PCK ELASTOMERICS, INC., See Elastomeric Technologies, Inc.

PC TRANSFORMER CORP., 64 D Nancy St., West Babylon, NY 11704, Tel: 516-491-3300, FAX: 516-491-3689; FSC No.: 62281; Empl.: 15; *Sls. Mgr.:* Stanley L. Goldstein ..... **A•2324-2331**

PDS TECHNOLOGIES, See Power-Pac

PEARL TECHNOLOGY, 1000 E. William St.-Ste. 100, Carson City, NV 89701, Tel: 702-883-1979, FAX: 702-883-4874

PEARSON ELECTRONICS, INC., 1860 Embarcadero Rd., Palo Alto, CA 94303, Tel: 415-494-6444, TELEX: 171-412, FAX: 415-494-6716; FSC No.: 05280; Empl.: 23; *Sls. Mgr.:* Michelle Kelsey ..... **A•2332**

PECA, INC., 592 Winks Lane, Bensalem, PA 19020, Tel: 215-245-1550, FAX: 215-639-3545; Empl.: 30; *Sls. Mgr.:* Jean Douglass

THE PEDRO COMPANIES, 104 E. 10th St., St. Paul, MN 55101, Tel: 612-224-9491, FAX: 612-224-8674; Empl.: 100ò; *Sls. Mgr.:* Douglas Bieniek

PEERLESS, 19 Wilbur St., Lynbrook, NY 11563, Tel: 516-593-2121, 1-800-645-2268

PEER PROTOCOLS, 3176 Pullman, Ste. 101, Costa Mesa, CA 92626, Tel: 714-662-1929, FAX: 714-662-1437; Empl.: 10; *Sls. Mgr.:* Don Bergis

PENBERTHY, INC., De Vlieg-Bullard, P.O. Box 112, Locust St., Prophetstown, IL 61277, Tel: 815-537-2311, TWX: 257-339 PMCO PRWN, FAX: 815-537-5764; Empl.: 160; *Sls. Mgr.:* Craig Hagel

PENFIELD, INC., 8 West St., Plantsville, CT 06479, Tel: 203-621-9141, TWX: 5101003285, ESYLNK: 6287757, FAX: 203-621-2380; Empl.: 77; *Sls. Mgr.:* Gary Zoccolante; *Dist. Mgr.:* Gary Zoccolante

PENN ENGINEERING & MANUFACTURING CORP., 5190 Old Easton Rd. PO Box 1000, Danboro, PA 18916, Tel: 215-766-8853, 800-237-4736, FAX: 215-766-0143; FSC No.: CAGE 46384; Empl.: 850; *Sls. Mgr.:* John E. O'Brien

PENN KEYSTONE CORP., 30 N. Plains Ind. Ste.13, Wallingford, CT 06492, Tel: 203-294-0537, FAX: 203-294-0361; FSC No.: 03034; *Sls. Mgr.:* Robert Ginter

PENN-TRAN CORP.,SUB. OF SPECTRUM ELCTRNS. INC., Box 1321, Rte. 144N, Wingate, PA 16880, Tel: 814-355-1521, FAX: 814-355-1524; FSC No.: 50783; Empl.: 80; *Sls. Mgr.:* Jeffrey Krauss ..... **D•1918**

Local Sales Offices & Reps

CA Los Altos, Cain-White & Co. 415-948-6533
CA Pasadena, A-F Sls. Engrg., Inc. 213-681-5631
MN Minneapolis, International Sls. Co. 612-831-8423
OR Portland, Intertech Sls. 503-775-7885
PA Glenside, Koebert Assocs., Inc. 215-887-2310
TX Dallas, Seaton Corp. 214-980-9860

PENNY & GILES, 1640 Fifth Street, Suite 224, Santa Monica, CA 90401, Tel: 213-393-1497, TELEX: 65-2337; *Dist. Mgr.:* Rose Riedel Prod. Mgr.

FAX: 404-740-0420

PENNY & GILES DATA SYSTEMS, INC., 1250 Northmeadow Pkwy., Ste. 114, Roswell, GA 30076, Tel: 404-740-0415, FAX: 404-740-0420 ..... **D•1310**

Local Sales Offices & Reps

AZ Tempe, Scientific Dvcs.-West 602-730-9774
GA Atlanta, Magard & Assocs. 404-451-8862
CA Huntington Bch., Scientific Dvcs.-West 714-840-3501
CA San Jose, P & M Elctrns. 408-287-0402
CO Denver, Scientific Dvcs.-West 303-469-5145
IL Chicago, Sector Eng. 312-530-7850
IN Indianapolis, Sector Eng. 317-253-9221
MD Annapolis, Blackwood Associates 301-269-1676
MA Andover, Saret Assocs. 508-475-9332
MN Minneapolis, Sector Eng. 612-378-2123
NM Albuquerque, Scientific Dvcs.-West ... 505-883-3668
NC Raleigh, Lee Assoc./Carolinas 919-848-8818
OH Columbus, Robert Cloon Assocs. 614-459-2890
PA Philadelphia, G.L. Williams Assocs. 609-428-6060
TX Dallas, Scientific Dvcs.-Southwest 214-231-8106
WA Seattle, Scientific Dvcs.-West 206-637-0945
WI Milwaukee, Sector Eng. 414-352-8280
Can Ontario, Giga-Tron Assocs. Ltd. 613-225-4090

PENRIL DATACOMM NETWORKS, 1300 Quince Orchard Blvd., Gaithersburg, MD 20878, Tel: 301-921-8600, TWX: 710-828-0522; Empl.: 200

PENSTOCK ENGINEERING LABS., Penstock, Inc., 520 Mercury Dr., Sunnyvale, CA 94086-4018, Tel: 408-730-0300, 800-PENSTOCK, FAX: 408-730-4782; Empl.: 46; *Sls. Mgr.:* Steve Ulett; *Dist. Mgr.:* Steven Ulett

Local Sales Offices & Reps

CA Sunnyvale, Penstock, Inc. 800-PENSTOCK

Local Distributors

AZ Phoenix, Penstock Desert Sls. 800-PENSTOCK
CA Anaheim, Penstock, Inc. 800-PENSTOCK
CA Beverly Hills, Penstock, Inc. 800-PENSTOCK
CA San Diego, Penstock, Inc. 800-PENSTOCK
CA Sunnyvale, Penstock Intl. 800-PENSTOCK
CA Sunnyvale, Penstock, Inc. 800-PENSTOCK
CO Denver, Penstock, Inc. 800-PENSTOCK
IL Palatine, Penstock Midwest 800-PENSTOCK
IN Indianapolis, Penstock, Inc. 800-PENSTOCK
NJ Fairfield, Penstock East 800-PENSTOCK
NJ Teterboro, Penstock East 800-PENSTOCK
OR Portland, Penstock Northwest 800-PENSTOCK
UT Salt Lake City, Penstock, Inc. 800-PENSTOCK
WA Bellevue, Penstock Northwest 800-PENSTOCK
EXP CA/Sunnyvale, Penstock Intl. 800-PENSTOCK
Can Vancouver, BC, Penstock Canada 604-662-3475

PERCEPTICS CORP., 725 Pellissippi Parkway, Knoxville, TN 37922, Tel: 615-966-9200, FAX: 615-966-9330; Empl.: 90; *Sls. Mgr.:* J.R. Johnson; *Dist. Mgr.:* J.R. Johnson

PENTICA SYSTEMS, INC., One Kendall Sq., Bldg. 200, 4th Floor, Cambridge, MA 02139, Tel: 617-577-1101, FAX: 617-494-9162; Empl.: 4

PERCON, INC., 1710 Willow Creek Circle, Ste. 37, Eugene, OR 97402-9153, Tel: 1-800-8-PERCON, 503-344-1189, FAX: 503-344-1399; Empl.: 26; *Sls. Mgr.:* Nonie Mansfield, Sls.; *Dist. Mgr.:* Dean VanPeursem, V.P. Mktg/Sls.

PERFECT GEAR & INSTRUMENT, Designatronics, Inc., 2101 Jericho Tpk., New Hyde Park, NY 11040, Tel: 516-328-3300, TWX: 510-223-0642, FAX: 516-326-8827; Empl.: 210; *Sls. Mgr.:* Murray Ores

PERFECTION MICA CO., See Magnetic Shield Corp.

PERFORMANCE CONTROLS, INC., 433 Caredean Drive, Horsham, PA 19044, Tel: 215-675-6500, TELEX: 88-1478, FAX: 215-674-8714; FSC No.: 61773; Empl.: 40

PERIPHERALS, 1363 Logan Ave., Costa Mesa, CA 92626, Tel: 714-540-4925, 800-468-6888, FAX: 714-540-2026; Empl.: 20; *Sls. Mgr.:* Elizabeth O'Rouke

PERKIN-ELMER CORP., Elctrn. Prods. Dept., 761 Main Ave., Norwalk, CT 06859-0132, Tel: 203-762-4786, TWX: 710-468-3213; Empl.: 70; *Sls. Mgr.:* D. P. Duggan

PERMALUSTER, INC., 1844 N. Keystone St., Burbank, CA 91504, Tel: 213-849-4543, 213-849-6454, FAX: 818-566-4232; Empl.: 6; *Sls. Mgr.:* J. Ross

PERMA POWER ELCTRNS., 5601 W. Howard Ave., Chicago, IL 60648, Tel: 312-763-0763, FAX: 312-763-8330; Empl.: 80/100; *Sls. Mgr.:* Michael Shatz; *Dist. Mgr.:* Michael Shatz

Local Distributors

CA Los Angeles, Marshall Ind. 800-522-0084
IL Chicago, Newark Elctrns. 800-367-3573
TX Ft. Worth, Allied Elctrns. 800-433-5700

PERRY AMPLIFIER, 138 Fuller St., Brookline, MA 02146, Tel: 617-734-0844; Empl.: 18; *Sls. Mgr.:* N. Geskos

PERX,INC., 525 Tamal Plaza, Corte Madera, CA 94925, Tel: 415-927-0155, FAX: 415-927-0159; Empl.: 5

PETER PARTS & ASSOCS., 82 E. Main St., Webster, NY 14580, Tel: 716-265-2540, FAX: 716-265-2542; *Sls. Mgr.:* Peter Parts

PFC, See Southern Elctrns. Co. Inc.

P.G. ELECTRONICS LTD., 800 Arrow Rd., 8, Weston, Ont., Canada M9M2Z8, Tel: 416-741-7682, FAX: 416-741-9927; FSC No.: 38243

PHASE CONTROL ELECTRONICS, 87-27 Myrtle Ave., Glendale, NY 11385, Tel: 718-441-4278; Empl.: 16; *Sls. Mgr.:* Jack Stanley

PHELPS DODGE MAGNET WIRE, P.O. Box 600, Ft. Wayne, IN 46801, Tel: 219-458-4444, 800-255-CLIC (2542), TWX: 810-332-1506, FAX: 219-422-1667; *Sls. Mgr.:* G. H. Guyer

PHENIX TECHNOLOGIES, Central Garrett Ind'l. Pk., Accident, MD 21520, Tel: 301-746-8118, FAX: 301-895-5570; Empl.: 35; *Sls. Mgr.:* Bill Robeson

PHILADELPHIA INSULATED WIRE CO. INC., 333 New Albany Rd., Moorestown, NJ 08057, Tel: 800-257-8357, 609-235-6700, FAX: 609-235-5480; Empl.: 150; *Sls. Mgr.:* Glenn McCleery

PHILIPS AUDIO VIDEO SYS. CORP., See AKG Acoustics

PHILIPS CIRCUIT ASSEMBLIES:A DIVISION OF NORTH AMERICAN PHILIPS CORP., 2601 S. Moorland Rd., New Berlin, WI 53151, Tel: 414-785-6506, TWX: 910-262-3032, FAX: 414-785-6516

PHILIPS CIRCUIT ASSEMBLIES, 3602 W. Waters Avenue, Tampa, FL 33614-2797, Tel: 813-933-5113, TELEX: 3727509, FAX: 813-932-1373; *Sls. Mgr.:* C. Maslona

PHILIPS CIRCUIT ASSEMBLIES:NORTH AMERICAN PHILIPS CORP., 100 Providence Pike, Slatersville, RI 02876-2078, Tel: 401-762-3800, FAX: 401-762-2324

Philips Components
Discrete Products Division
A North American Philips Company

FAX: 407-881-3300

PHILIPS COMPONENTS DISCRETE PRODUCTS DIVISION, A North American Philips Company, 2001 W. Blue Heron Blvd., Riviera Beach, FL 33404, Tel: 407-881-3200, TELEX: 136461, TWX: 810-848-0228; *Dist. Mgr.:* Jess Hall ..... **A•1124-1128, 1286-1287, 1289-1292, 1972-1974, 2100-2116; B•1026-1027, 1112-1113, 1336-1338, 1856-1857**

Local Sales Offices & Reps

AL	Huntsville, Over & Over Inc.	205-837-7105
AZ	Tempe, Philips Comps.	602-820-2225
CA	Anaheim, Philips Comps.	714-441-0385
CA	Folsom, Webster Assocs.	916-989-0843
CA	Harbor City, Refrigeration Comp.	213-325-3420
CA	Mission Hills, Philips Comps.	818-891-6299
CA	San Diego, Philips Comps.	619-453-0332
CA	Santa Clara, Philips Comps.	408-748-1563
CA	Sunnyvale, Philips Comps.	408-746-2066/2808
CO	Englewood, Philips Comps.	303-779-9696
FL	Altamonte Springs, Philips Comps.	407-339-5073
FL	Ft. Lauderdale, Philips Comps.	305-485-0115
GA	Norcross, Over & Over, Inc.	404-449-6205
GA	Roswell, Philips Comps.	404-992-0150
IL	Bannockburn, GMR Sls., Inc.	312-295-8440
IL	Rolling Meadows, Philips Comps.	708-670-9494
IN	Fort Wayne, Corrao Marsh, Inc.	219-482-2725
IN	Green Field, Corrao Marsh, Inc.	317-462-4446
IN	Kokomo, Philips Comps.	317-456-1615
IA	Cedar Rapids, Lorenz Sls., Inc.	319-377-4666
KS	Merriam, Lorenz Sls., Inc.	913-384-6556
KS	Wichita, Lorenz Sls., Inc.	316-721-0500
MD	Columbia, Delta III Assocs.	301-730-4700
MA	Woburn, Philips Comps.	617-932-4748
MI	Farmington Hills, Philips Comps.	313-553-6000
MN	Minneapolis, Electric Comp. Sls., Inc.	612-933-2594
MO	St. Louis, Lorenz Sls., Inc.	314-997-4558
NE	Lincoln, Lorenz Sls., Inc.	402-475-4660
NJ	Englewood Cliffs, ED Glass Assocs.	201-592-0200
NJ	Parsippany, Philips Comps.	201-455-1507
NY	Binghamton, Empire Tech. Assoc., Inc.	607-772-0651
NY	East Rochester, Empire Tech. Assoc., Inc.	716-381-8500
NY	Port Ewen, Empire Tech. Assoc., Inc.	914-331-5553
NY	Skaneateles, Empire Tech. Assoc., Inc.	315-685-5703
NC	Charlotte, Over & Over, Inc.	704-542-9111
NC	Raleigh, Over & Over, Inc.	919-876-7338
NC	Raleigh, Philips Comps.	919-782-3334
OH	Dayton, Philips Comps.	513-436-0066
OH	Wickliffe, Philips Comps.	216-731-7721
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
PA	Willow Grove, Philips Comps.	215-659-6069
TX	Austin, Philips Comps.	512-331-8828
TX	Houston, Philips Comps.	713-987-0034
TX	Richardson, Philips Comps.	214-231-8274
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
WA	Spokane, Eclipse Mktg. Grp.	509-922-3972
WI	Milwaukee, Philips Comps.	414-228-7632
PR	Caparra Hgts., M. Anderson Co. Inc.	809-793-6544
Can	Scarborough, Ont., Philips Comps.	416-292-5161

PHILIPS COMPONENTS DISCRETE PRODUCTS DIV., A North American Philips Co., 5083 Kings Hwy., Saugerties, NY 12477, Tel: 914-246-2811, TWX: 510-247-5410, FAX: 914-246-2811(Ext 427); FSC No.: 02114; *Sls. Mgr.:* B. Grindle ..... **A•1286-1292**

Local Distributors

CA	Canoga Park, Philips Comps. Magnetic Prods.Svc.Ctrs.	1-800-343-1370
IL	Rolling Meadows, Philips Comps. Magnetic Prods. Svc. Ctrs	1-800-241-7667
MA	Norwood, Philips Comps. Magnetic Prods.Svc.Ctrs.	1-800-367-8083
NY	Woodstock, Elna Ferrite	914-246-5861
PA	West Conshohocken, Eastern Comps.	215-825-8610

PHILIPS COMPONENTS DISCRETE PRODUCTS DIV., A North American Philips Co., 5900 Australian Avenue, W. Palm Bch., FL 33407, Tel: 407-863-1800, TELEX: 820677, FAX: 407-863-1811 ..... **A•1124**

PHILIPS COMPONENTS DISCRETE PRODUCTS DIV., A North American Philips Co., 6071 St. Andrews Rd., Columbia, SC 29212-3198, Tel: 803-772-2500, TELEX: 805024, FAX: 803-772-2445; *Sls. Mgr.:* Bill Cvirko ..... **A•1125-1126**

DC Aluminum Electrolytic Capacitors(Computer Grade, Radial)Indl. & Consumer AC Motor Starts, Film Capacitors (Film/Foil, Metallized) Tantalum Capacitors (Foil) Film Trimmer Capacitors

PHILIPS COMPONENTS DISCRETE PRODUCTS DIV, A North American Company, 6-D Founders, El Paso, TX 79906, Tel: 915-775-4200, FAX: 915-775-4249 ..... **A•1128**

See Philips Components, Riviera Beach

PHILIPS COMPONENTS DISCRETE PRODUCTS DIVISION, Airport Road, P.O. Box 760, Mineral Wells, TX 76067, Tel: 817-325-7871, FAX: GPR 817-325-1052 SPR 817-325-8397; *Sls. Mgr.:* Tom McKelvy ... **A•1972-1973**

PHILIPS COMPONENTS DISCRETE PRODUCTS DIV., A NORTH AMERICAN PHILIPS CO., Professional Components Grp, 100 Providence Pike, Slatersville, RI 02876, Tel: 401-762-3800, FAX: 401-762-4497(mktg); FSC No.: 73445 ..... **B•1112-1113**

PHILIPS COMPONENTS DISCRETE PRODUCTS DIV., A NORTH AMERICAN PHILIPS CO, Discrete Semiconductor Group, 100 Providence Pike, Slatersville, RI 02876-2078, Tel: 401-762-3800, FAX: 401-767-4497 ..... **A•2100-2109, 2111-2116; B•1112-1113, 1336-1338**

PhilipsECG
A North American Philips Company

FAX: 717-323-4691

PHILIPS ECG, North American Philips Co., 1025 Westminster Dr., Williamsport, PA 17701, Tel: 717-323-4691; *Sls. Mgr.:* L.R. Brophy, Gen. Mgr. Mktg.; *Dist. Mgr.:* E. H. Frost ..... **A•2118-2119**

Local Sales Offices & Reps

CA	Anaheim, Philips ECG	714-441-0385
CA	Santa Clara, Philips ECG	408-727-6132
FL	Maitland, Hutto Hawkins Assoc.	407-831-2474
FL	Tampa, Hutto Hawkins Assoc.	813-251-2970
GA	Atlanta, Millar Elctrns.	404-634-3350
MA	Woburn, Philips ECG	617-932-4748
MI	Farmington Hills, R.C. Merchant & Co.	313-476-4600
MO	Kansas City, Philips ECG	816-741-4019
NY	Seneca Falls, Philips ECG	315-568-5432
NC	Raleigh, Millar Elec., Inc.	919-828-8840
OH	Dayton, Philips ECG	513-436-0066
PA	Willow Grove, Philips ECG	215-659-6096
TX	Richardson, Philips ECG	214-231-8274
Can	Dorval, Que., ECG Canada Inc.	514-685-5800

For distributor information, call 1-800-225-8326. (In Massachusetts, call 1-890-6107.)

Local Distributors

MA	For Distributor information,call	800-526-9354

PHILMORE MANUFACTURING, 2240 15th St. P.O. Box 6386, Rockford, IL 61125-1386, Tel: 815-229-7773, FAX: 815-229-7785; Empl.: 18

PHI TECHNOLOGIES, INC., 4605 North Stiles, Oklahoma City, OK 73105, Tel: 405-521-9000, TWX: 910-831-3286, FAX: 405-524-4254; Empl.: 40; *Sls. Mgr.:* Robert P. Gelernter ..... **D•1048-1049**

Local Sales Offices & Reps

CA	North Hollywood, Martin & Assocs.	213-872-1990
DC	Gans & Pugh Assoc.	703-527-3262
MA	Wenham, Ellis Assoc.	508-468-4990

PHOENIX CONTACT INC., P.O. Box 4100, Harrisburg, PA 17111, Tel: 717-944-1300, FAX: 717-944-1625; *Sls. Mgr.:* Howard C. Minnick, Jr.; *Dist. Mgr.:* Mark F. Gilliford

PHOENIX DATA, INC., 3384 W. Osborn Rd., Phoenix, AZ 85017, Tel: 602-278-8528, 800-828-4327, FAX: 602-278-8679; Empl.: 55; *Sls. Mgr.:* David Norgord

PHOENIX MICROSYSTEMS, 991 Discovery Dr., Huntsville, AL 35806, Tel: 205-922-1200, TELEX: 752592, FAX: 205-837-1256; Empl.: 180

PHOENIX WIRE, INC., 100 Teflon Ave., S. Hero, VT 05486, Tel: 802-372-4561; Empl.: 25; *Sls. Mgr.:* Ohmer Corbin; *Dist. Mgr.:* Ohmer Corbin ..... **C•1813**

PHONON CORPORATION, 7 Herman Drive, P.O. Box 549, Simsbury, CT 06070, Tel: 203-651-0211, TELEX: 294705, FAX: 203-651-8618; FSC No.: 6Y858; Empl.: 24

PHOTON, INC., 1115 Space Park Dr., Santa Clara, CA 95054-3432, Tel: 408-492-9449, FAX: 408-492-9659; *Sls. Mgr.:* J. M. Darchuk

PHOTON SOURCES, INC., See Lumonics Material Processing Corp.

PHOTO RESEARCH:KOLLMORGEN, 9330 DeSoto Ave./PO Box 2192, Chatsworth, CA 91313-2192, Tel: 818-341-5151, TELEX: 69-1427; FSC No.: 92434; Empl.: 90; *Sls. Mgr.:* M. L. Woolsey

PHO-TRONICS DIV., E. R. Wagner Mfg. Co., 8701 W. Bradley Rd., Milwaukee, WI 53224, Tel: 414-355-6704, FAX: 414-355-0593; Empl.: 155; *Sls. Mgr.:* Steven J. O'Brien, Sls./Mktg. Mgr.

PHYSICS INTERNATIONAL CO., Olin Defense Systems Grp., 2700 Merced St, San Leandro, CA 94577, Tel: 415-577-7236, TWX: 910-366-7033; Empl.: 360

PIC DESIGN, Remington Technologies, Inc., P.O. Box 1004, Middlebury, CT 06762, Tel: 203-758-8272, TWX: 910-997-0989, FAX: 203-758-8271; FSC No.: 00141; Empl.: 105; *Sls. Mgr.:* Gary Hampton

PICO Electronics, Inc.

FAX: 914-699-5565

PICO ELECTRONICS, INC., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, Tel: 914-699-5514, 800-431-1064; FSC No.: 31669; *Sls. Mgr.:* Joe Sweeney ..... **A•1236-1246, 2333-2366; D•1919-1959**

Local Sales Offices & Reps

CA	Santa Clara, Fisher Assocs.	408-733-7350
IN	Ft. Wayne, Denton Mktg., Inc.	219-486-0665/1264
WA	Seattle, W. Spaulding Co.	206-282-9173

FAX: 508-649-9643

PICONICS, INCORPORATED, 26 Cummings Road, Tyngsboro, MA 01879, Tel: 508-649-7501, TELEX: 754759; FSC No.: 26618; Empl.: 48; *Sls. Mgr.:* V. Dibiase ..... **A•1248-1249, 1975**

Local Sales Offices & Reps

AL	Huntsville, Murcota Corp.	205-539-8476
AZ	Scottsdale, Semper-Fi Sls.	602-730-9553
CA	N. Hollywood, Jewett Co.	818-789-8103
CA	Palo Alto, J/M Assocs.	415-857-1260
CO	Parker, Mikro Sls. Co.	303-841-4131
FL	Lighthouse Point, R.C. Simon & Co.	305-941-2757
IL	No. IL.& WI, R.H.I. Sls.	708-888-0099
IN	Huntington, Ellet Sls.	219-356-1866
MD	Kensington, Koebert Assocs.	301-493-8924
MA	Natick, Wayland Engrg. Sls. Co.	508-655-6080
MN	Minneapolis, Peterson Sls. Assocs.	612-835-5281
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NY	Huntington, Regulus Indl. Sls. Co.	516-673-6252
NY	Rochester, Welch/Mulgahy Inc.	716-244-1100
NC	Winston-Salem, Murcota Corp.	919-722-9445
OH	Cincinnati, G & H Sls. Co.	513-272-0580
PA	Glenside, Koebert Assocs. Inc.	215-887-2310
TX	Ft. Worth, El-Tec Sls.	817-268-2896
WA	Belleview, Reptronix	206-820-0833
WV	Inwood, Koebert & Assocs., Inc.	304-229-8401

PICOSECOND PULSE LABS, INC., P.O. Box 44, Boulder, CO 80306, Tel: 303-443-1249, FAX: 303-447-2236; Empl.: 6; *Sls. Mgr.:* J.R. Andrews; *Dist. Mgr.:* J.R. Andrews

PIEZO CRYSTAL CO., 100 K St., Box 619 , Carlisle, PA 17013, Tel: 717-249-2151, FAX: 717-249-7861; FSC No.: 74306; Empl.: 250; *Sls. Mgr.:* Glenn R. Kurzenknabe

PIEZO ELECTRIC PRODUCTS, INC., 212 Durham Ave., Metuchen, NJ 08840, Tel: 908-548-2800, TWX: 710-998-0592, FAX: 908-548-3625; Empl.: 75; *Sls. Mgr.:* M.R. Scarillo

PIEZO KINETICS INC., P.O. Box 756, Pine and Mill Streets, Bellefonte, PA 16823, Tel: 814-355-1593, FAX: 814-355-4342; FSC No.: 5Y690; Empl.: 28; *Sls. Mgr.:* Harry D. Shirey

PIEZO TECHNOLOGY INC., 2525 Shader Rd., Orlando, FL 32804, Tel: 407-298-2000, TWX: 810-850-4136, FAX: 407-293-2979; FSC No.: 25120; *Sls. Mgr.:* Paul Dechen

PIHER INTERNATIONAL CORP., 903 Feehanville Dr., Mt. Prospect, IL 60056, Tel: 708-390-6680, 800-323-6693, FAX: 708-390-9866; FSC No.: 54869; Empl.: 25; *Sls. Mgr.:* Kimberly Mack, Sls. Supp. Mgr.

PILLAR INDUSTRIES, INC., 1780 Evergreen Street, Duarte, CA 91010, Tel: 818-358-1337, FAX: 818-358-0398; Empl.: 3 ..... **D•1960-1961**

Local Sales Offices & Reps

CA	Los Angeles, Power Partner, Inc.	213-215-0800
CA	Santa Cruz, LEREP	408-458-0667

PIND TESTERS INC., 19-B Thomas, Irvine, CA 92718, Tel: 714-380-1551, FAX: 714-951-1269; FSC No.: 66; Empl.: 25; *Sls. Mgr.:* J. Baker

PINE INSTRUMENT CO., 101 Industrial Dr., Grove City, PA 16127, Tel: 412-458-6391, FAX: 412-458-4648; Empl.: 60

PIONEER COMPONENTS, 2352 E. 66th St., Brooklyn, NY 11234, Tel: 718-444-3880; Empl.: 3; *Sls. Mgr.:* Michael R. Verter; *Dist. Mgr.:* Michael R. Verter

Pioneer Magnetics

FAX: 213-453-3929

PIONEER MAGNETICS, 1745 Berkeley St., Santa Monica, CA 90404, Tel: 213-829-6751, TELEX: 182-093, TWX: 910-343-6249; FSC No.: 08676; Empl.: 475; *Sls. Mgr.:* A. Hagiwara, V.P. of Mktg. ..... **D•1963-1965**

Local Sales Offices & Reps

AL	Huntsville, Pen-Tech Assocs.	205-881-9298
AZ	Scottsdale, Williams Assocs.	602-947-4297
CA	Santa Monica, Pioneer Magnetics, Inc.	213-829-6751
CO	Commerce City, Williams Assocs.	303-289-5647
FL	Boca Raton, Pen-Tech Assocs.	305-394-7400
GA	Marietta, Pen-Tech Assocs.	404-424-1931
MD	Columbia, Stein Instrmn.	301-596-3748
MA	Needham Hts., Kanan Assoc.	617-449-7400
MI	Ann Arbor, KRW Sls., Inc.	313-769-0056
MN	St. Paul, Cahill, Schmitz & Cahill	612-636-7217
MO	Lee's Summit, Omni Tech. Sls.	816-578-4221
NJ	Glen Gardner, Daner-Hayes Inc.	201-537-4534
NM	Albuquerque, Williams Assocs.	505-255-1368
NY	Brewster, Daner-Hayes Inc.	914-279-2168
NY	E. Norwich, Daner-Hayes Inc.	516-922-0080
NC	Greensboro, Pen-Tech Assocs.	919-852-6000
OH	Dublin, KRW Sls. Inc.	614-885-2598
OH	Westlake, KRW Sales	216-871-7521
OR	Lake Oswego, RTS, Inc.	503-244-4123
PA	Cheltenham, Stein Instrm.	215-379-1990
PA	Oakmont, KRW Sls. Inc.	412-828-1490
TX	Dallas, Kruvand	214-437-3355
UT	Salt Lake City, Williams Assocs.	801-485-6511
WA	Vashon, RTS, Inc.	206-285-1363
Can	LaSalle, Electrodesign Ltd.	514-363-0245

PIONEER RESEARCH, INC., 1745 Berkeley St., Santa Monica, CA 90404, Tel: 213-829-6751, FAX: 213-453-3929; Empl.: 450; *Sls. Mgr.:* A. Hagiwara

PIRELLI CABLE CORP., See Specialty Cable Corp.

PITTMAN®

FAX: 215-256-1338

PITTMAN, Penn Engrg. & Mfg. Corp., 343 Godshall Dr., Harleysville, PA 19438, Tel: 215-256-6601; FSC No.: 98938; Empl.: 165 ..... **B•1308-1309**

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Leucadia, Halbar Assocs.	619-942-4075
CA	San Mateo, Halbar North, Inc.	415-349-4700
CA	Van Nuys, Halbar Assocs.	818-906-3941
CO	Englewood, Integrated Motion Sys.	303-792-5516
CT	Bristol, M. L. Assocs., Inc.	203-589-2856
FL	Fort Lauderdale, Motion Controls, Inc.	305-434-4197
IL	Mount Prospect, K-W Assocs.	708-253-6680
IN	Elkhart, Shaum Mfg., Inc.	219-264-0771
MA	Wayland, M. L. Assocs.	508-358-5540
NY	Glen Head, Marcus Sls. Assocs., Inc.	516-671-6820
NY	Rochester, Application Spec.	716-586-6226
OH	Cleveland, Servo-Mark	216-871-2353
OK	Edmond, Motion Reps, Inc.	405-340-8100
PA	Exton, Kiley Elect. Co., Inc.	215-363-8550
TX	Austin, Motion Reps, Inc.	512-288-5758
TX	Denton, Motion Reps, Inc.	817-382-4159
TX	Houston, Motion Reps, Inc.	713-981-8700
WA	Redmond, Halbar PNW, Inc.	206-882-0990
Can	Downsview, Ont., Electomate Indl. Sls. Ltd.	416-665-0221

PIXELWORKS, INC., 7 Park Ave., Hudson, NH 03051, Tel: 603-880-1322, FAX: 603-880-6558; Empl.: 30; *Sls. Mgr.:* Rattan Dhar; *Dist. Mgr.:* Rattan Dhar

PLAINVIEW BATTERIES, INC., 23 Newtown Rd., Plainview, NY 11803, Tel: 516-249-2873, FAX: 516-249-2876; *Sls. Mgr.:* B. Erde ..... **D•1476-1479**

PLAINVIEW ELECTRONICS, See Plainview Battieries, Inc.

PLANAR SYSTEMS, INC., 1400 N.W. Compton Dr., Beaverton, OR 97006-1992, Tel: 503-690-1100, TELEX: 551961 Planer Syst, FAX: 503-645-7024; FSC No.: 5Z179; Empl.: 121; *Sls. Mgr.:* Jeff Hopkins

PLANT SPECIALTIES, INC., P.O. Box 110537, Carrollton, TX 75011-0537, Tel: 214-245-9673, FAX: 214-245-9673; *Sls. Mgr.:* J. E. Bryer

PLASMA RESEARCH CORP., 5675 Chappell Pl., Oakland, CA 94619, Tel: 415-530-1468, FAX: 415-530-2811; FSC No.: 8Y067; Empl.: 7

PLASTIC CAPACITORS, INC., 2623 N. Pulaski Rd., Chicago, IL 60639, Tel: 312-489-2229, FAX: 312-489-0496; FSC No.: 99120; Empl.: 90; *Sls. Mgr.:* Thomas J. Brown; *Dist. Mgr.:* Thomas J. Brown

PLASTIC FORMING, 20 S. Bradley Rd., Woodridge, CT 06525, Tel: 203-397-1338, TELEX: 963437, FAX: 203-389-0420; Empl.: 80; *Sls. Mgr.:* Bruce J. Dokurno

PLASTICORP, 24105 S. Frampton Ave., Harbor City, CA 90710, Tel: 213-539-9530, FAX: 213-539-8325; Empl.: 120; *Sls. Mgr.:* Robert Hurley

PLASTIMATIC, INC., Glynwed Int'l., 3 Oak Rd., Fairfield, NJ 07004, Tel: 201-575-0038, FAX: 201-575-8748; Empl.: 95; *Sls. Mgr.:* Art Lappine

PLASTOID CORPORATION, 45 Gingerbread Castle Rd., Hamburg, NJ 07419, Tel: 201-827-7141, FAX: 201-827-7141 (ext 52); Empl.: 200

PLASTRON CORP., 429 S. Evergreen St., Bensenville, IL 60106, Tel: 708-595-2212, FAX: 708-595-2599; Empl.: 245; *Sls. Mgr.:* Don Hennings

PLATO PRODUCTS, INC., 2120 Auto Center Dr., Glendora, CA 91740, Tel: 818-967-3821, TELEX: 287291, FAX: 714-592-7062; FSC No.: 32399; Empl.: 75; *Sls. Mgr.:* Walter Schaub

PLESSEY ELECTRIC SYSTEMS CORP., See GEC-Marconi

PLETRONICS, INC., 19015 36th Ave. West, Ste. H, Lynnwood, WA 98036, Tel: 206-776-1880, FAX: 206-776-2760; Empl.: 11; *Sls. Mgr.:* Les Podgorny; *Dist. Mgr.:* Les Podgorny ..... **A•1437-1443**

Local Sales Offices & Reps

AL	Huntsville, MacKay, Smith & Assocs.	205-539-8000
AZ	Phoenix, Sanford Sls. Assocs.	602-957-3570
CA	Mission Viejo, Jay Mktg. Assocs.	714-768-7519
CA	Pleasanton, Moulthrop	415-463-0450
CA	Pleasanton, Moulthrop Sls.	415-463-0450
CO	Aurora, Electrodyne	303-695-8903
FL	Ft. Lauderdale, MacKay, Smith & Assocs.	305-973-3324
CT	N. Haven, Radix	203-239-3611
FL	Madeira Beach, MacKay, Smith & Assocs.	813-530-1873
FL	Orlando, MacKay, Smith & Assoc.	407-423-4353
FL	Orlando, MacKay, Smith & Assocs.	407-423-4353
GA	Tucker, MacKay, Smith & Assoc.	404-496-9913
GA	Tucker, MacKay, Smith & Assocs.	404-496-9913
IL	Downers Grove, Golten Assocs.	708-512-0093
MD	Baltimore, Chesapeake Ind. Mktg.	301-653-0476
MA	Randolph, Bengal	617-961-4120
MN	St. Paul, Countryman	612-645-9151
NJ	Springfield, Radix	201-467-4970
NC	Raleigh, MacKay, Smith & Assocs.	919-847-2277
OH	Centerville, Omega	513-434-5507
OH	Cleveland, Omega Sls.	216-360-9400
OH	Shaker Hgts., Omega	216-751-9600
OR	Oregon City, Halbar PNW, Inc.	503-656-3714
TX	Austin, Sage Mktg.	512-335-0300
TX	Bedford, Sage Mktg.	817-267-7781
UT	Salt Lake City, Electrodyne	801-264-8050
WA	Redmond, Halbar	206-882-0990

Local Distributors

AZ	Phoenix, Arizona Comps	602-269-5655
CA	El Segundo, Force	213-772-1324
CA	San Diego, Kent Elctrns.	619-471-9561
CA	Santa Clara, Force	408-748-1324
CA	Santa Clara, Kent Elctrns.	408-727-9810
CA	Santa Clara, Pyramid	408-727-9810
CA	Sunnyvale, Capsco	408-734-3020
CA	Sunnyvale, Target	408-733-0384
CA	Torrance, Kent Elctrns.	213-320-2700
CA	Yoriba Linda, Target Elctrns.	714-692-1630
CT	Norwalk, Cobra Comps.	203-847-6442
GA	Norcross, Century Elctrns.	404-729-2522
FL	Sunrise, All American	800-432-6838
IL	Downers Grove, Golten Assocs.	708-512-0093
MD	Beltsville, PSI	301-937-4960
MD	Gaithersburg, Axis Elctrns.	301-840-9640
MA	Norwood, Gerber Elctrns.	619-796-6000
MA	Wakefield, All American	617-246-2300
MN	Fridley, Voyager	612-571-7766
NJ	Hopelawn, Dove Elctrns.	201-324-7830
NY	Mt. Vernon, All American	800-926-6668
NY	Mt. Vernon, QAR/All American	1-800-456-2626
NY	Stony Brook, Dove Elctrns.	516-689-7733
NC	Raleigh, Century Elctrns.	919-782-2116
OH	Cincinnati, Schuster Elctrns.	513-489-1400
OH	Twinsburg, Schuster Elctrns.	216-425-8134
PA	Norristown, Century Elctrns.	215-631-5404
TX	Richardson, Ewing	800-966-9738
WA	Redmond, Kent Elctrns.	206-883-7200
WA	Redmond, Priebe	206-881-2363
WA	Woodinville, Capsco	206-885-5283

PLITRON, 250 Wildcat Rd., Downsview, Ont., CAN M3J 2N5, Tel: 416-667-9914, FAX: 416-667-8928; Empl.: 25; *Sls. Mgr.:* Brad Jolly ..... **A•2368-2369**

Local Sales Offices & Reps

CA	Burbank, De Angelo, Rothman & Co.	818-504-2425
FL	Oviedo, Comps. Co.	407-366-7399
FL	Tamarac, Southtech Instrs.	305-762-5120
NJ	Rahway, R.E. Breuer	201-388-5045
IL	Schaumberg, McNulty & Assocs.	708-980-9868
NC	Raleigh, Eastern Elctrns.	919-876-7591
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
PA	Pittsburg, J. C. Hofstetter	513-296-1010
Can	Toronto, Plitron	416-667-9914

PLUMER PRECISION OPTICS, 601 Montgomery Ave., Pennsburg, PA 18073, Tel: 215-679-6272, FAX: 215-679-2277; Empl.: 180; *Sls. Mgr.:* Joe Tiberii

PMC/BETA LTD. PARTNERSHIP, 4 Tech Circle, Natick, MA 01760, Tel: 617-237-6920, FAX: 508-651-9762; Empl.: 25; *Sls. Mgr.:* Jack Newton

PMI MOTION TECHNOLOGIES, Kollmorgen Corporation, 49 Mall Dr., Commack, NY 11725-5703, Tel: 516-864-1000, FAX: 516-864-2084; Empl.: 175; *Sls. Mgr.:* Peter Dougherty

PMT DIVISION, Ametek, Inc., 820 Pennsylvania Blvd., Feasterville, PA 19053, Tel: 215-355-6900, FAX: 215-355-2937; Empl.: 125; *Sls. Mgr.:* James Snyder

POCO SLS., Porter Co., 8925 Fullbright St., Chatsworth, CA 91311, Tel: 818-700-8727, FAX: 818-700-8453; FSC No.: 69-1603; Empl.: 8

POINT 4 DATA CORP., 15442 Del Amo Ave., Tustin, CA 92680, Tel: 714-259-0777, FAX: 714-259-0921; Empl.: 50; *Sls. Mgr.:* Mr. Ted Cooper; *Dist. Mgr.:* Mr. Ted Cooper

POLARA ENGINEERING INC., 4115 W. Artesia Ave., Fullerton, CA 92633, Tel: 714-521-0900, TELEX: 688489, FAX: 714-522-8001; Empl.: 62

POLAROID CORPORATION, Polarizer Div., 1 Upland Rd., Norwood, MA 02062, Tel: 800-225-2770, FAX: 617-446-4600

POLE/ZERO CORPORATION, 4480 Lake Forest Dr. Ste. 308, Cincinnati, OH 45242, Tel: 513-563-1133, FAX: 513-563-4345; *Sls. Mgr.:* Joseph J. Janning

POLYCASE PRODS., ECP Corp., 4726 Superior Ave, Cleveland, OH 44103, Tel: 216-391-0444, FAX: 216-391-2891; Empl.: 14 ..... **C•1078**

Local Distributors

AL	Huntsville, Allied Elctrns.	205-721-3500
AZ	Phoenix, Allied Elctrns.	602-437-9080
CA	Fremont, Allied Elctrns.	415-770-0590
CA	Torrance, Allied Elctrns.	213-373-8828
CO	Englewood, Allied Elctrns.	303-790-1664
CT	Cheshire, Allied Elctrns.	203-272-7730
FL	Casselberry, Allied Elctrns.	407-831-3331
FL	Pompano Beach, Allied Elctrns.	305-978-3008
GA	Norcross, Allied Elctrns.	414-446-8595
IL	Des Plaines, Allied Elctrns.	312-803-1040
IN	Indianapolis, Allied Elctrns.	317-875-0448
MD	Columbia, Allied Elctrns.	301-381-1560
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POLYPHASE INSTRUMENT, 175 Commerce Dr., Ft. Washington, PA 19034, Tel: 215-643-6950, FAX: 1-215-643-5237; FSC No.: 98330; Empl.: 160; *Sls. Mgr.:* Paul Stevens

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NH	Manchester, Assocd. Sys.	603-472-2297
TX	Rowlett, Horizon Comm. Sls. Co.	214-475-1179
WA	Kirkland, Manon Engrg.	206-827-7449

Local Distributors

CA	Hayward, Talley Elctrns.	415-783-2111
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CO	Aurora, Electro-Comm Distrs.	303-343-8937
FL	Melbourne, Technical Equip. Dist., Inc.	407-259-2711
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IL	Libertyville, Harger Lightning Protection	708-362-4848
MD	Hunt Valley, Tessco	301-785-5300
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AR	Little Rock, Erickson Sls., Inc.	501-455-0618
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CO	Broomfield, Connors Co.	303-466-9628
FL	Maitland, EIR Inc.	407-660-9600
IL	Palatine, W. M. Linz	708-705-8555
IN	Indianapolis, Blind Elctrn. Sls. Co.	317-241-3742
IA	West Des Moines, Nevco	515-225-9866
LA	Chalmette, Erickson Sls., Inc.	504-271-1976
MD	Baltimore, David S. Linz, Inc.	301-882-6289
MA	Burlington, Gerber Sls. Corp.	617-229-1150
MI	Jenison, C. A. Geer Co.	616-534-9449
MI	Kentwood, C. A. Geer Co.	616-534-9449
MN	Minneapolis, Hei-lite Sls., Inc.	612-550-0506
OH	Cleveland, Marlow Assocs.	216-831-8232
MO	Crestwood, Nevco, Inc.	314-843-7406
NJ	Franklin, D. F. Tobias & Co.	201-209-7255
OR	Beaverton, Eclipse Mktg. Grp. Ltd.	503-642-1661
PA	Philadelphia, David S. Linz, Inc.	215-379-0734
NC	Raleigh, Pinnacle Mktg.	919-878-4658
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TX	Houston, Erickson Sls., Inc.	713-266-1604
TX	Round Rock, Erickson Sls., Inc.	512-244-3068
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MI	Warren, Frank E. Kahsar Sls.	313-795-3530
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TX	Dallas, Advance Tech. Sls.	214-340-1300

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VA Ashland, Glasscock Assocs. 804-798-2125
WA Redmond, Interstate Elctrns. 206-885-5257
WI Brookfield, Rendell Sls. Co. 414-785-8948

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GA Atlanta, Naylor Assocs., Inc. 404-373-5036, FAX:404-373-5052
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NY Great Neck, F & F Metro, Inc. 516-482-4080, FAX:516-482-4589
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NC Cornelius, Naylor Assocs., Inc. 704-892-1366, FAX:704-892-9758
NC Durham, Naylor Assocs., Inc 919-544-6630, FAX:919-544-7211
OH Dayton, Five Star Elctrns., Inc. 513-299-1718, FAX:513-299-1345
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OK Tulsa, Comptech Sls. 918-622-7744, FAX:918-660-0340
OR Albany, Henry Sharpe 503-928-9221, FAX:503-928-5604
TX Austin, Comptech Sls. 512-343-0300, FAX:512-345-2530
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TX Houston, Comptech Sls. 713-492-0005, FAX:713-492-6116
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CO Denver, Cargo Batteries 303-296-8763, FAX:303-295-7125
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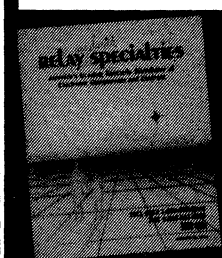
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CA	Palo Alto, O'Halloran Assocs.	415-969-1600
CA	Santa Clara, EIL Instrs.	408-727-0396
CO	Denver, EIL Instrs.	303-534-4160
CT	Middletown, EIL Instrs.	203-346-6646
FL	Palm Bay, EIL Instrs.	305-725-8300
GA	Atlanta, U.S. Instr. Rentals	404-955-4473
IL	Chicago, EIL Instrs.	312-430-2292
IN	Indianapolis, EIL Instrs.	317-545-1373
KS	Kansas City, U.S. Instr. Rentals	913-677-0011
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MD	Sparks, EIL Instrs.	301-771-4800
MA	Burlington, EIL Instrs.	617-272-9450
MI	Detroit, U.S. Instr. Rentals	313-493-1919
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MO	St. Louis, U.S. Instr. Rentals	314-454-0210
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NJ	Rockaway, A&J Assocs.	201-625-3169
NM	Albuquerque, U.S. Instr. Rentals	505-884-0529
NY	Great Neck, The Instr. Mart	516-487-7430
NY	Hauppauge, EIL Instrs.	516-231-6333
OH	Cincinnati, U.S. Instr. Rentals	513-863-4446
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OK	Oklahoma City, U.S. Instr. Rentals	405-525-2659
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CA	San Diego, David Budge Assocs.	619-272-8630
CA	San Jose, Ruppert Sls.	408-998-8717
CO	Denver, West Inc.	303-477-1134
FL	Ft. Lauderdale, Stock Elctrns.	305-978-9875
GA	Lilburn, Adams Elctrns.	404-925-9115
IL	Palatine, Golbeck & Milota Assocs., Inc.	312-705-0602
IN	Indianapolis, L.M. DeVoe Assocs.	317-842-3245
KS	Shawnee Mission, Microtronics, Inc.	913-262-1444
MI	Grand Rapids, R.P. Urban Assocs.	616-245-0511
MN	Bloomington, Horizon Technlgs.	612-884-6515
MO	St. Charles, Microtronics, Inc.	314-946-8500
NH	Amherst, D.A. Crowley & Assocs	603-673-7050
NJ	Audubon, DAS Assocs.	609-546-1133
NJ	Pt. Pleasant, Jade Mktg.	201-899-8108
NJ	Audubon, D.A.S. Assocs.	609-546-1133
NY	Marcellus, Mullahy-Welch Sls.	315-673-3891
NY	Rochester, Mullahy-Welch Sls.	716-244-1100
NC	Raleigh, Barker Assocs.	919-876-0282
OH	Dayton, Shamrock Sls. Inc.	513-258-1227
OH	Worthington, Shamrock Sls. Inc.	614-888-7638
OR	Tigard, Electronic Comp. Sls.	503-245-2342
MI	Detroit, R.P. Urban Assocs.	313-535-2355
TX	Dallas, Rem-Air Comp.	214-234-1069
UT	Murray, Aspen Sls., Inc.	801-265-8365
UT	Salt Lake City, Aspen Sls., Inc.	801-467-2401
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
Can	Downsview, Tienkay, Inc.	416-736-1221

Local Distributors

AR	Ft. Smith, Radio, Inc.	501-646-5200
CA	El Segundo, Force Elctrns.	714-522-1324
CA	Livermore, Fuse-Com	415-449-1313
CA	San Diego, Fuses Unlimited/Western Fuse	619-569-9620
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Jose, Rose Elctrns.	408-943-0200
CA	Santa Clara, Force Elctrns.	408-748-1324
CA	So. San Francisco, Peters-DeLaet, Inc.	415-873-9595
CA	Van Nuys, Fuses Unlimited	818-786-8111
CO	Arvada, Denver Wintronics	303-431-7161
CT	Hamden, Connector Co.	203-288-0044
CT	Wallingford, Sager Elect. Supp. Co.	203-265-4600
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Ft. Lauderdale, Stock Elctrns.	305-978-9875
GA	Atlanta, KSM Elctrns.	404-458-2013
IL	Cary, Gama Elctrns.	708-639-3322
IL	Crystal Lake, Sub-Sem	312-782-3954
MA	Canton, Impact Sls.	617-821-1500
MA	Hingham, Sager Elect. Supp. Co.	508-749-4700
MA	Marlboro, Now Elctrns.	508-460-0187
MN	Hibbing, Minn Tech Elctrns.	218-262-5228
TX	Dallas, Wofford Elec.	214-320-0294
NH	Salem, Sager Elctr.	603-898-1348
NJ	Kenilworth, Federated Purchaser Co.	201-272-0505
NY	Hauppauge, Sager Elctrns	516-348-1300
NY	Johnson City, Help Elctrns.	607-729-3528
NY	Pennyan, Advcom Technlg.	716-396-9050
NC	Raleigh, Sager Svc. Plus Elctrns.	919-850-9550
OH	Cincinnati, Schuster Elctrns	513-489-1400
OH	Twinsburg, Schuster Elctrns	216-425-8134
OK	Oklahoma City, Radio, Inc.	405-789-0741
OK	Tulsa, Radio, Inc	918-587-9123
OR	Beaverton, Micro Power Elctrns.	503-626-7086
PA	Bristol, Aim Elctrns	215-785-3500
TX	Austin, Wofford Elctrns.	512-339-1131
OR	Beaverton, Rose Elctrns.	503-629-9288
TX	Dallas, Off The Shelf Comps.	214-247-0052
TX	Farmers Branch, Force Elctrns.	214-247-9955
TX	Houston, Force Elctrns.	713-561-8644
TX	Houston, Wofford Elctrns.	713-847-3583
TX	Richardson, Off The Shelf Comps.	214-238-0808
WI	Milwaukee, Progressive Image	414-321-4722
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
WA	Redmond, Energy Sls.	206-883-2343
WA	Redmond, Fuse-Com	206-881-2442
Can	Downsview, Ont., PS Comps.	416-665-9546

POWER ELECTRONIC COMPONENTS, INC., PEC, Inc, 3408 Kamer Miller Rd., New Albany, IN 47150, Tel: 812-941-9205, 800-245-0193, FAX: 812-941-9205; *Dist. Mgr.:* Brenda DeSpain

POWEREX

FAX: 412-925-4393

POWEREX, Westinghouse, GE, Mitsubishi, Hillis St., Youngwood, PA 15697, Tel: 412-925-7272, TWX: 510-468-2840; Empl.: 550; *Dist. Mgr.:* Kathy Cullen ..... **A•2117**

Local Sales Offices & Reps

AZ	Chandler, Lindberg Co.	602-786-9115
CA	Agoura Hills, Westpower Assocs.	818-706-2550
CA	Laguna Hills, Westpower Assocs.	714-582-6716
CA	Santa Clara, Engineering Assocs. Corp.	408-988-5001
CO	Denver, Lindberg Co.	303-758-9033
CO	Westminster, Jerry Wolfgang	303-252-0215
CT	Southington, The Orion Grp.	203-621-8371
FL	Maitland, EIR, Inc.	407-660-9600
GA	Alpharetta, Southeast Power Comps.	404-664-5460
GA	Norcross, Southeast Power Comps.	404-448-2458
IL	Naperville, L&W Power Corp.	708-416-8838
IN	Carmel, Giesting & Assocs.	317-844-5222
IA	Cedar Rapids, Dy-Tronix, Inc.	319-377-8275
KS	Leawood, Dy-Tronix, Inc.	913-339-6333
KS	Wichita, Dy-Tronix, Inc.	316-838-0884
KY	Versailles, Giesting & Assocs.	606-873-2330
MA	Newton, Ed Freeley	617-630-9512
MA	Peabody, The Orion Grp.	508-532-6266
MI	Plymouth, L&W Power Corp.	313-451-1150
MN	Minneapolis, PSI Co.	612-944-8545
MO	Bridgeton, Dy-Tronix, Inc.	314-291-4777
NJ	Ringwood, J&L Sls. Assocs., Inc.	201-962-6315
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NY	Ronkonkoma, J&L Sls. Assocs., Inc.	516-737-2801
NY	Wappinger Falls, Bob Dean, Inc.	914-297-6406
NC	Charlotte, Southeast Power Comps.	704-846-8532
NC	Greensboro, Southeast Power Comps.	919-854-9410
NC	Henderson, Southeast Power Comps.	919-438-4450
OH	Cincinnati, Giesting & Assocs.	513-385-1105
OH	Cleveland, Giesting & Assocs.	216-261-9705
OH	Columbus, Giesting & Assocs.	614-459-4800
OK	Tulsa, NOVA Mktg.	918-660-5105
OR	Tigard, Vantage Corp.	503-620-3280
PA	Hatboro, Delta Tech. Sls., Inc.	215-957-0600
PA	Pittsburgh, Bear Mktg.	412-531-2002
PA	Youngwood, Bob Hirche	412-925-4468
PA	Youngwood, Powerex, Inc.-USA/Intl.	412-925-7272
TX	Austin, NOVA Mktg., Inc.	512-343-2321
TX	Dallas, NOVA Mktg., Inc.	214-750-6082
TX	Houston, NOVA Mktg., Inc.	713-988-6082
VA	Roanoke, Southeast Power Comps.	703-774-8478
WA	Bellevue, Vantage Corp.	206-455-3460
WI	Elm Grove, L&W Power Corp.	414-782-0799
Can	Montreal, Que., GMA Assocs.	514-335-9572
Can	Ottawa, Ont., GMA Assocs.	613-838-4480
Can	Toronto, Ont., GMA Assocs	416-671-8111
Can	Vancouver, B.C., Blakewood Elec. Sys., Inc.	604-273-9910

Local Distributors

AL	Birmingham, Industrial Elec. Supp. Co.	205-951-4601
AL	Huntsville, Hamilton/Avnet	205-837-7210
AL	Huntsville, Time Elctrns.	205-721-1133
AZ	Chandler, Hamilton/Avnet	602-961-6411
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Agoura Hills, Almo Elctrns.	818-991-3984
CA	Agoura Hills, Time Elctrns.	818-707-2890
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Costa Mesa, Hamilton Electro Corp.	714-754-6097
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4100
CA	Culver City, Hamilton Electro Sls.	213-558-2000
CA	Gardena, Hamilton/Avnet	213-217-6888
CA	Roseville, Hamilton/Avnet	916-781-6614
CA	San Diego, All American	619-268-1505
CA	San Diego, Hamilton/Avnet	619-571-7510
CA	San Diego, Time Elctrns.	619-586-1331
CA	San Jose, All American	408-943-1200
CA	San Jose, Almo Elctrns.	408-436-8822
CA	Santa Ana, Almo Elctrns.	714-757-0444
CA	Sunnyvale, Hamilton/Avnet	408-743-3610
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, All American	213-320-0240
CA	Torrance, Time Elctrns.	213-320-0880
CA	Tustin, Time Elctrns.	714-669-0100
CA	Woodland Hills, Hamilton/Avnet	818-594-0404
CO	Englewood, Hamilton/Avnet	303-799-7800
CO	Englewood, Time Elctrns.	303-799-8851
CT	Cheshire, Time Elctrns.	203-271-3200
CT	Danbury, Hamilton/Avnet	203-797-2800
CT	East Haven, J. V. Elctrns.	203-469-2321
CT	Wallingford, GRS Midan Elects.	203-265-2077
FL	Ft. Lauderdale, Hamilton/Avnet	305-971-2900
FL	Ft. Lauderdale, Time Elctrns.	305-484-7778
FL	Miami, All American	305-621-8282
FL	Orlando, Time Elctrns.	407-841-6565
FL	St. Petersburg, Hamilton/Avnet	813-573-3930
FL	Winter Park, Hamilton/Avnet	407-628-3888
GA	Norcross, Hamilton/Avnet	404-447-7507
GA	Norcross, Time Elctrns.	404-448-4448
IL	Bensenville, Hamilton/Avnet	312-860-7700
IL	Chicago, Newark Elctrns.	312-784-5100
IL	Elmhurst, Semiconductor Specialists, Inc.	708-279-1000
IL	Schaumberg, Time Elctrns.	708-308-3000
IL	Schaumburg, QPS Elect., Inc.	708-884-6620
IN	Carmel, Hamilton/Avnet	317-844-9333
IN	Ft. Wayne, Bell Inds.	219-423-3422
IN	Hammond, WESCO	312-454-6970
IN	Indianapolis, Bell Inds.	317-875-8200
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
IA	Cedar Rapids, Hamilton/Avnet	319-362-4757
KS	Lenexa, Hamilton/Avnet	913-888-1055
KY	Lexington, Hamilton/Avnet	606-259-1475
MD	Columbia, GRS Elctrns.	301-995-6744
MD	Columbia, Hamilton/Avnet	301-995-3500
MD	Columbia, Time Elctrns.	301-964-3090
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Peabody, Hamilton/Avnet	508-531-7430
MA	Peabody, Time Elctrns.	508-532-6200

MI Grand Rapids, Hamilton/Avnet 616-243-8805
MI Madison Heights, Galco Elctrns. 313-542-9090
MI Novi, Hamilton/Avnet 313-347-4270
MN Edina, Time Elctrns. 612-835-1250
MN Minnetonka, Hamilton/Avnet 612-932-0600
MO Chesterfield, Hamilton/Avnet 314-537-1600
MO Manchester, Time Elctrns. 314-391-6444
NJ Camden, GRS Elctrns. 609-964-8560
NJ Cherry Hill, Hamilton/Avnet 609-424-0100
NJ East Hanover, Delburn Elctrns., Inc. 201-884-0800
NJ Fairfield, Hamilton/Avnet 201-575-3390
NJ Marlton, Time Elctrns. 609-596-6700
NJ Wayne, Time Elctrns. 201-882-4611
NM Albuquerque, Hamilton/Avnet 505-345-0001
NM Albuquerque, Harrison Equip. Co. 505-291-9951
NY East Syracruse, Time Elctrns. 315-432-0355
NY Fairport, Time Elctrns. 716-383-8853
NY Freeport, Semtex Inds. Corp. 516-223-0200
NY Hauppauge, Hamilton/Avnet 516-231-9800
NY Hauppauge, Time Elctrns. 516-273-0100
NY Plainview, ACI Elctrns. 516-293-6630
NY Rochester, Hamilton/Avnet 716-475-9130
NY Rome, Rome Elctrns. 315-337-5400
NY Syracruse, Hamilton/Avnet 315-437-2641
NY Westbury, Hamilton/Avnet 516-997-6868
NC Charlotte, Electronics Mktg. Corp. 704-394-6195
NC Charlotte, Time Elctrns. 704-522-7600
NC Raleigh, Hamilton/Avnet 919-878-0810
OH Cincinnati, Hughes Peters 513-351-2000
OH Cleveland, CAM/RPC Elctrns. 216-461-4700
OH Cleveland, Darrah Elec. 216-631-0912
OH Columbus, Electronics Mktg. Corp. 614-299-4161
OH Columbus, Hughes Peters 614-294-5351
OH Dayton, Electronics Mktg.Corp. 513-439-4711
OH Dayton, Hamilton/Avnet 56 513-439-6732
OH Dayton, Hamilton/Avnet 64 513-439-6700
OH Dublin, Time Elctrns. 614-761-1100
OH Highland Heights, Electronics Mktg.Corp. 216-442-3441
OH Solon, Hamilton/Avnet 216-349-5100
OH Westerville, Hamilton/Avnet 614-882-7004
OK Tulsa, Altair Co. 918-252-5781
OK Tulsa, Hamilton/Avnet 918-252-7297
OR Beaverton, Hamilton/Avnet 503-627-0201
OR Portland, Dunn Elctrns. 503-285-0214
OR Portland, Time Elctrns. 503-684-3780
PA Pittsburgh, CAM/RPC Elctrns. 412-782-3770
PA Pittsburgh, Hamilton/Avnet 412-281-4150
TX Addison, Hamilton/Avnet 214-308-8140
TX Austin, Hamilton/Avnet 512-837-8911
TX Austin, Harrison Equip. Co. 512-258-1320
TX Austin, Time Elctrns. 512-339-3051
TX Brownsville, Harrison Equip. Co. 512-548-2376
TX Dallas, Harrison Equip. Co. 214-239-2750
TX El Paso, Harrison Equip. Co. 915-598-3406
TX Houston, Altair Co. 713-462-3029
TX Richardson, Altair Co. 214-231-5166
TX Stafford, Hamilton/Avnet 713-240-7733
TX Stafford, Harrison Equip. Co. 713-879-2750
UT Salt Lake City, Hamilton/Avnet 801-972-2800
UT West Valley, Time Elctrns. 801-973-8181
VA Charlottesville, Virginia Elec. Comps. 804-296-4184
WA Redmond, Hamilton/Avnet 206-881-6697
WA Redmond, Time Elctrns. 206-882-1600
WV Charleston, McJunkin Corp. 304-348-5211
WI Mequon, Taylor Elec. Co. 414-241-4321
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI Waukesha, Hamilton/Avnet 414-784-4510
WY Gillette, WESCO 307-687-0014
Can Burnaby, BC, Hamilton/Avnet 604-420-4101
Can Burnaby, BC, ITT/Multicomps. 604-291-8866
Can Calgary, Alberta, Hamilton/Avnet 403-250-9380
Can Calgary, Alberta, ITT/Multicomps. 403-273-2780
Can Concord, Ont., ITT/Multicomps. 416-736-1144
Can Dartmouth, Nova Scotia, ITT/Multicomps. 902-465-2350
Can Edmonton, Alberta, ITT/Multicomps. 403-438-4982
Can Mississauga, Ont., Hamilton/Avnet 416-677-7432
Can Mississauga, Ont., Time Elctrns. 416-672-5300
Can Nepean, Ont., Hamilton/Avnet 613-226-1700
Can Nepean, Ont., ITT/Multicomps. 613-596-6980
Can St. Laurent, Que., Hamilton/Avnet 514-335-1000
Can St. Laurent, Que., ITT/Multicomps. 514-335-7697
Can Stoney Creek, Ont., Westinghouse Canada, Inc. 416-664-3300
Can Willowdale, Ont., Electro Sonic, Inc. 416-494-1666
Can Winnipeg, Manitoba, ITT/Multicomps. 204-786-8401

POWER FUNCTIONS ENGINEERING, 3831 Cavalier Dr., Garland, TX 75042, Tel: 214-278-0996; Empl.: 9

POWER GENERAL
A SUBSIDIARY OF UNITRODE CORPORATION

FAX: 617-828-3215

POWER GENERAL, Unitrode Corp., 152 Will Dr., Canton, MA 02021, Tel: 617-828-6216; Empl.: 300; *Sls. Mgr.:* Steve Forrester ..... **D•1987**

Local Sales Offices & Reps

AL Huntsville, Elec. Mktg. Assoc., Inc. 205-880-8050
AZ Tempe, Westrep 602-820-9932
CA Anaheim, Westrep 714-527-2822
CA Buena Park, Cypress Elctrns. 714-521-5230
CA San Diego, Cypress Elctrns. 619-535-0018
CA San Diego, Westrep 619-566-6580
CA Santa Clara, Westrep 408-988-8833
CO Englewood, Delltron Co. 303-741-2122
CT Wallingford, APEX Assocs. 203-267-6914
FL Altamonte Springs, Vantage Comp. 407-682-1199
FL Margate, EPM Corp. 305-977-0331
FL Orlando, EPM Corp. 407-425-6149
GA Atlanta, Elec. Mktg. Assoc., Inc. 404-448-1215
IL Itasca, Beta Technlg. Sls. 708-250-9586
IN Indianapolis, Schuster Elctrns. 317-253-9065
IA Cedar Rapids, Dee Elctrns. 319-365-7551
IA Cedar Rapids, Spectrum Sls. 319-366-0576
KS Overland Pk, SPECTRUM Sls. 913-648-6811
MD Columbia, Sager 301-995-6580
MA Canton, Power Gen. 617-828-6216
MA Westwood, APEX Assocs. 617-444-8070
MI Brighton, Applied Power 313-227-3604
MI Flint, RS Elctrns. 313-472-5000
MI Livonia, Leading Edge Sls. 313-478-6700
MN Eden Prairie, Com-Tek Sls. 612-941-7181
MO Florissant, Spectrum Sls. 314-921-1313
MO Hazelwood, Spectrum Sls. 314-921-1313
NJ Clifton Parks, Net Sls. 518-371-6864
NY Cortland, Net Sls. Co. 607-756-6592
NY Great Neck, F & F Metro, Inc. 516-482-4080
NY Victor, Net Sls. Co. 716-924-1844
NC Raleigh, Elec. Mktg. Assoc., Inc. 919-847-8800
OH Cincinnati, RS Elec. 513-793-2450
OH Cleveland, Schuster Elctrns. 216-425-8134
OH Cleveland, Schuster Elec. 216-425-8134
OH Columbus, McFadden Sls. 614-761-3177
OH Toledo, RS Elec. 419-893-0721
OR Portland, Venture Elctrns., Inc. 503-624-0617
PA Mars, Sager 412-772-2233
SC Greenville, EMA, Inc. 803-233-4637
TX Austin, Tesco, Inc. 512-834-8374
TX Dallas, Tesco, Inc. 214-553-1200
TX Houston, Tesco, Inc. 713-690-4909
TX Stafford, Southwest Elctrns. 713-240-4000
UT American Fork, Delltron Co. 801-263-9413
VA Sterling, Beacon North .. 800-877-3747,703-478-2480
WA Bellevue, Venture Elctrns. 206-454-4594
WI Milwaukee, Beta Technlg. Sls., Inc. 414-543-6609
Can Burnaby, B.C., Kaytronics Vancouver 604-294-2000
Can Concord, Ont., Kaytronics Inc.-Toronto 416-669-2262
Can Edmonton, I.T.T. Multicomp. 403-436-9555
Can Kanata, Ont., Kaytronics Inc.-Ottawa 613-564-0080
Can Montreal, Que., Kaytronics 514-745-5800
Can Ottawa, I.T.T. Multicomp. 613-596-6980
Can Winnipeg, I.T.T. Multicomp. 204-697-2300

Local Distributors

AL Huntsville, Cypress Elctrns. 800-526-6231
AZ Tempe, Cypress Elctrns. 602-966-2256
CA Buena Park, Cypress Elctrns. 714-521-5230
CA San Diego, Cypress Elctrns. 619-535-0018
CA Santa Clara, Cypress Elctrns. 408-980-2500
CO Englewood, Cypress Elctrns. 303-792-5829
CT Wallingford, Sager 203-265-4600
FL Deerfield Beach, Vantage Comps., Inc. 305-429-1001
FL Orlando, Sager 407-240-3114
GA Norcross, Applied Power 404-263-0421
IL Bensenville, Cypress Elctrns. 708-350-2005
IL Wood Dale, N. E. P. Elctrns. 708-595-8500
IA Cedar Rapids, Dee Elctrns. 319-365-7551
KS Kansas City, Olive Elctrns 913-362-1923
KS Overland Park, RS Elctrns. 913-362-1923
MD Columbia, Vantage Comp. 301-720-5100
MA Andover, Vantage Comp. 508-687-3900
MA Hingham, Sager 617-749-6700
MI Grand Rapids, RS Elctrns. 616-241-3483
MI Livonia, RS Elctrns. 313-525-1155
MN Eden Prairie, Cypress Elctrns. 612-934-2104
MO St. Louis, Olive Elctrns. 314-997-7709
NH Salem, Sager 603-898-2741
NY Buffalo, Summit Distrs. 716-887-2800
NY Hauppauge, Fairmont Elec. 516-231-3313
NY Hauppauge, Sager 516-348-1300
NC Raleigh, Sager 919-850-9550
OH Cincinnati, Schuster Elctrns. 513-489-1400
OR Beaverton, Cypress Elctrns. 503-223-8900
PA Philadelphia, Sager 215-464-4336,609-964-0830
TX Dallas, Cypress Elctrns. 214-255-0065
TX Stafford, Southwest Elctrns. 713-240-4000
WA Bothell, Cypress Elctrns. 206-483-1144
WI New Berlin, NEP Elctrns. 414-785-9100
Can Burnaby, B.C., I.T.T. Multicomps. 604-291-8866
Can Calgary, Alb., I.T.T. Multicomps. 403-273-2780
Can Concord, Ont., I.T.T. Multicomps. 416-736-1144
Can Montreal, I.T.T. Multicomp. 514-335-7697

POWER INTEGRITY CORP., 1834 Pembroke Rd., Greensboro, NC 27429-0682, Tel: 919-379-9773, 800-237-6260, TELEX: 919-379-1301; *Sls. Mgr.:* James T. Fesmire

POWERLINE,INC., Chloride Power Elctrns., 200 Butterfield Dr., Ashland, MA 01721, Tel: 508-881-7329, TELEX: 5161003630, FAX: 508-879-8669

POWER MAGNE-TECH CORPORATION, 441 High Street, Perth Amboy, NJ 08861, Tel: 908-826-4700, FAX: 908-826-4706; Empl.: 65; *Sls. Mgr.:* Arthur Zuckerman; *Dist. Mgr.:* Arthur Zuckerman ..... **A•2371**

POWERMARK, See Topaz, Inc., 9192 Topaz Way, San Diego, CA 92123

POWER/MATE CORPORATION, 2727 Kurtz St., San Diego, CA 92110, Tel: 800-843-8544, 619-299-3800, TWX: 910-335-1241, FAX: 619-291-2584; Empl.: 175

POWER MEASUREMENT LTD., 6702 Rajpur Place, Victoria, BC, Canada V8X 3X1, Tel: 604-652-5118, FAX: 604-652-0411; Empl.: 25; *Sls. Mgr.:* William I. McMillan, Gen. Mgr.

POWERNETICS LTD., Clarence St. Loughborough, Leics, ENG LE11 1DX, Tel: 0509 214153, TELEX: 34306, FAX: 0509 262460; Empl.: 66; *Sls. Mgr.:* Margaret A. Foggon, Export Sls. Mgr.

power-one
D.C. POWER SUPPLIES

FAX: 805-388-0476

POWER-ONE, INC., 740 Calle Plano, Camarillo, CA 93012, Tel: 805-987-8741, TWX: 910-336-1297; FSC No.: 54407; Empl.: 320; *Dist. Mgr.:* Julius Hirsch,V.P. Sls. ..... **D•1988-1999**

Local Sales Offices & Reps

AZ Huntsville, Capstone Elctrns. 602-437-0172
AZ MESA, Sys. Sls. of AZ 602-464-9989
CA Escondido, Eagle Tech. Sls. 619-743-6550
CA Santa Clara, Nova-Tronix, Inc. 408-727-9530
CA Woodland Hills, Varigon, Inc. 818-594-5080
CO Denver, Quorum 3 303-799-8100
CT Hamden, Datcom 203-288-7005
FL Boca Raton, Electrocraft 407-394-9686
FL Clearwater, Electrocraft 813-573-2277
GA Norcross, Montgomery Mktg. Inc. 404-447-6124
IL Chicago, M. Gottlieb & Assocs. 312-775-1151
IN Carmel, Technlg. Mktg. Corp. 317-844-8462
MN Edina, G.P. Sls., Inc. 612-831-2362
IN Ft. Wayne, Technlg. Mktg. Corp. 219-432-5553
IA Cedar Rapids, J.R. Sls. Engrg. 319-393-2232
KS Lenexa, Midwest Tech. Sls. 913-888-5100
KY Louisville, Technlg. Mktg. Corp. 502-893-1377
MD Baltimore, Eastern Comps. Sls. 800-223-3851
MA Waltham, Datcom, Inc. 617-891-4600
MI Farmington Hills, Rathsburg Assocs., Inc. 313-489-1500
MI Grand Rapids, Rathsburg Assocs. Inc. 616-949-7400
MO Earth City, Midwest Tech. Sls. 314-298-9843
NM Albuquerque, Sys. Sls. of AZ 505-889-2901
NY Great Neck, Trionic Assocs. 516-466-2300
NY Syracuse, Nycom, Inc. 315-437-8343
NC Cary, Montgomery Mktg. Inc. 919-467-6319
NC Raleigh, Montgomery Mktg. Inc. 919-851-0010
OH Columbus, Tom Mulligan Co. 614-457-2242
OK Tulsa, Advance Tech. Sls. 918-664-0482
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TX Ft. Worth, Allied Elctrns. 800-433-5700
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WA Redmond, Energy Sls. 206-883-2343

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WA Vancouver, Northwest Comp. Sls. 206-695-1331

POWER SYSTEMS & CONTROLS, INC., 3206 Lanvale Ave., Richmond, VA 23230, Tel: 804-355-2803, FAX: 804-358-0498; Empl.: 55

POWER SYS. GRP., Rantec Div., Emerson Elec. Co., 9401 Oso Ave., Chatsworth, CA 91311, Tel: 818-885-8223, TWX: 910-493-1247; FSC No.: 04971; Empl.: 265; *Sls. Mgr.:* Fred Silver

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POWER TEN, INC., 486 Mercury Dr., Sunnyvale, CA 94086, Tel: 408-738-5959, FAX: 408-738-4326; FSC No.: 61987; *Sls. Mgr.:* Vince Mutascio ..... **D•2013**

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POWERTREND, INC., 1111 Rancho Conejo Blvd., Ste. 401, Newbury Pk., CA 91320-1415, Tel: 805-496-2945, FAX: 805-498-6880; *Sls. Mgr.:* R. Jones

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NM Albuquerque, J. Smith & Assocs. 505-345-6501
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PRECISION EXTRUSIONS, INC., Box 120, Bensenville IL 60106, Tel: 708-766-0340, FAX: 708-766-0495; Empl. 185; *Sls. Mgr.:* Richard Ziehm

PFT

FAX: 219-253-6570

PRECISION FABRICATION TECHNOLOGIES INC., State Road 16 W., Monon, IN 47959, Tel: 1-800-558 7297, 219-253-6666; Empl.: 100; *Sls. Mgr.:* Joseph Rogers; *Dist. Mgr.:* Duane Nagel ..... **C•1081-108**

Local Sales Offices & Reps

CA	Saratoga, Edward King & Assocs.	408-741-0434
CT	Old Saybrook, FJS Assocs.	203-388-5374
MI	Livonia, Amtech Reps.	313-474-8300
FL	Orlando, Aurora-Schmitt Assoc.	800-232-9005
IL	Cary, Bob Burns & Assocs.	708-516-3322
MA	Burlington, FJS Assocs.	617-273-5959
NJ	Medford, Champion Elctrn. Sls.	609-983-0932
NY	Hauppauge, Schmitt Mktg. Corp.	516-434-1313
OR	Portland, Caruso & Co.	503-620-0375
TX	Austin, S.W. Mktg. Assoc.	512-255-8010
TX	Dallas, S.W. Mktg. Assocs.	214-341-8631
TX	Houston, S.W. Mktg. Assocs.	713-537-8166
WA	Bellevue, Caruso & Co.	206-455-8811
WI	Colgate, Rep One & Assocs.	414-628-4016
WI	Madison, Rep One & Assoc.	608-246-8889

Local Distributors

CA	Chatsworth, Marshall Inds.	818-407-4150
CA	Costa Mesa, Marvac Elctrns.	714-540-3280
CA	Irvine, Marshall Inds.	714-458-5394
CA	Milpitas, Zack Elctrns.	408-942-5432
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Santa Clara, Context Engrg.	408-748-8676
IL	Champaign, Klaus Radio	217-356-1896
MD	Rockville, Capitol Radio	301-881-2270
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Northboro, Papi Supp.	508-393-8564
MI	Grand Rapids, S F Elctrn. Supp.	616-459-0216
MI	Livonia, LWC Distributors	313-464-7700
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NY	New York City, Martin Audio	212-541-5900
OR	Portland, Radar Elec.	503-232-8353
TX	Austin, Altex Elctrns.	512-832-9131
TX	Fort Worth, Allied Elctrns.	817-595-3500
TX	San Antonio, Altex Elctrns.	512-828-0503
VA	Annandale, Arcade Elctrns.	703-256-4610
VA	Richmond, Norfolk Wire	804-355-1100
VA	Virginia Beach, Norfolk Wire	804-449-3449
WA	Seattle, Radar Elec.	206-282-2511
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	New Berlin, NEP Elctrns.	414-785-9100

PRECISION FILTERS, INC.

FAX: 607-277-4466

PRECISION FILTERS, 240 Cherry St., Ithaca, NY 14850, Tel: 607-277-3550, TELEX: 646846; FSC No.: 66-II-F & 66-II-I; Empl.: 95; *Sls. Mgr.:* D. F. Chandler
A•1650, 1706-1707; D•1015, 1192-1193

Local Sales Offices & Reps

AZ	Tempe, Hannah-Hill	602-431-1771
CA	Chatsworth, Technologies West	818-349-2001
IL	Matteson, Instrumentation Sls. Inc.	708-720-0705
CA	Pleasonton, SECCO Sales, INc.	415-484-1030
CO	Denver, Hannah-Hill, Inc.	303-424-5390
AZ	Tempe, Hannah-Hill, Inc.	602-431-1771
DC	Arlington, Gans & Pugh	703-527-3262
FL	Orlando, Microspec	407-898-3504
GA	Lilburn, Microspec	404-921-3840
IL	Matteson, Instrumentation Sales. Inc.	708-720-0705
IN	Indianapolis, RDP Corp.	317-243-8788
MD	W. Friendship, Gans & Pugh Assocs.	301-442-2189
MA	Boston, Ellis Assocs.	617-367-2170
MI	Farmington Hills, RDP Corp.	313-471-0685
NH	Manchester, Ellis Assocs.	603-623-0185
NM	Albequerque, Hannah-Hill, Inc.	505-268-0950
NY	Amherst, Reliable Measurement	716-892-9484
NY	Port Chester, Radiation Elctrns.	914-937-2300
OH	Dayton, RDP Corp.	513-253-6175
OH	Richfield, RDP Corp.	216-659-3138
OK	Oklahoma City, Abcor, Inc.	405-749-1600
PA	North Wales, Gans & Pugh Associates, Inc.	215-699-6655
PA	Pittsburg, RDP Corp.	412-487-2217
SC	Rock Hill, Microspec	803-366-3015
TN	Nashville, Microspec	615-383-4064
TX	Houston, ABCOR, Inc.	713-486-9251
UT	West Valley City, Hannah-Hill, Inc.	801-364-0606
VA	Herndon, Gans & Pugh Assocs.	703-709-0305
WA	Bellevue, Syntek	206-462-7700

PRECISION GRAPHICS INC., 59 La Grange St., Raritan, NJ 08869, Tel: 908-707-8880, FAX: 908-707-8884; Empl.: 36; *Sls. Mgr.:* David K. Weissman

PRECISION IMAGE CORPORATION, 501 Chesapeake Dr., Redwood City, CA 94063, Tel: 415-366-8900, 1-800-338-3377, FAX: 415-366-2149; Empl.: 70; *Sls. Mgr.:* Mr. Rene Carillo; *Dist. Mgr.:* Mr. Rene Carillo

PRECISION INTERCONNECT, 16640 SW 72nd Ave., Portland, OR 97224, Tel: 503-620-9400, TELEX: 36-0963; FSC No.: 60381; Empl.: 295; *Sls. Mgr.:* Alex Guletsky

PRECISION LAMP, INC., 681 Portal St., Cotati, CA 94931, Tel: 707-792-0333, FAX: 707-792-2738; FSC No.: FSCM 58451; Empl.: 65

PRECISION MECHANISMS, 50 Bond St., Westbury, NY 11590, Tel: 516-ED3-5955, FAX: 516-333-5956; FSC No.: 08127; Empl.: 25; *Sls. Mgr.:* Leon N. Canick

PRECISION METAL PRODUCTS CO., Centennial Indl. Pk., Peabody, MA 01961-6026, Tel: 508-532-5500, FAX: 508-532-9403; FSC No.: 86577; Empl.: 54; *Sls. Mgr.:* Robert A. Degnan

PRECISION MONOLITHICS INC. SUBSIDIARY OF BOURNS INC., 1500 Space Park Dr. PO Box 58020, Santa Clara, CA 95052-8020, Tel: 408-727-1500, 800-843-1515, TELEX: 71-371-9541, ESYLNK: 408-727-1550; Empl.: 1000; *Sls. Mgr.:* Peter Smyth; *Dist. Mgr.:* Cindy Joyce

PRECISION PAPER TUBE CO., 1033 South Noel Ave, Wheeling, IL 60090, Tel: 708-537-4250, FAX: 708-537-5777; Empl.: 250

PRECISION POWER SYSTEMS, 1840 Industrial Circle, Longmont, CO 80501, Tel: 303-443-6250, FAX: 303-678-8360; Empl.: 110; *Sls. Mgr.:* Linda Tholen

FAX: 319-394-9280

PRECISION RESISTIVE PRODUCTS, INC., P.O. Box 189, Highway 61 South, Mediapolis, IA 52637, Tel: 319-394-9131; Empl.: 65; *Sls. Mgr.:* Oscar Cline; *Dist. Mgr.:* Oscar Cline **A•1976-1977**

Local Sales Offices & Reps

AL	Huntsville, Hughes & Assocs.	205-533-9108
CA	Burbank, Darco	818-504-2425
CA	Mountain View, Frauman Assoc.	415-964-9464
CA	San Diego, Darco	714-639-5698
CO	Grand Junction, Krebil Comp. Sls.	303-243-8220
MA	Lexington, Jesco, Inc.	617-893-1598
MN	Minneapolis, Intl. Sls. Co.	612-831-8423
TX	Rowlett, Campion Sls. Co.	214-475-8313

FAX: 813-546-9515

PRECISION RESISTOR CO., INC., 10601 75 St. N., Largo, FL 34647-1421, Tel: 813-541-5771, TELEX: 821788; FSC No.: 48615; Empl.: 45; *Sls. Mgr.:* Arleen Reid **A•1978-1981**

PRECISION SPECIALTIES, INC., 19414 Londelius St., Northridge, CA 91324, Tel: 818-349-9774, FAX: 818-349-4367; FSC No.: 66785; Empl.: 10

PRECISION TECH. SEWING, 921 E. Charleston Rd., Palo Alto, CA 94303, Tel: 415-856-2128, FAX: 415-856-1638

PRECISION TUBE, Church Rd. & Wissahickon, N. Wales, PA 19454, Tel: 215-699-5801, FAX: 215-699-0761; FSC No.: 82413; Empl.: 240; *Sls. Mgr.:* William J. McNeil

PREFERRED ELECTRONICS, INC., Main Line Dr., P.O. Box 248, Westfield, MA 01086, Tel: 413-568-2301, 1-800-553-6374, TELEX: 955-329, FAX: 413-562-7275; Empl.: 225

PREH ELECTRONIC INDUSTRIES, INC., 470 E. Main St., Lake Zurich, IL 60047-2578, Tel: 708-438-4000, FAX: 708-438-5522; FSC No.: 36-3193682; Empl.: 7; *Sls. Mgr.:* Ken Wood; *Dist. Mgr.:* Bob Van Orden **B•1765, 1827-1829; C•1508-1509**

Local Sales Offices & Reps

AL	Huntsville, Hughes Assocs.	205-533-9108
AZ	Phoenix, More Sls., Inc.	602-788-9181
CA	Irvine, Balzer/Wolf Assocs.	714-261-6877
CA	Mtn. View, Bart Budge Assocs.	415-961-0940
CO	Arvada, Arrowhead CSI/ Sls.	303-423-5597
CT	Cheshire, MacInnis	203-272-8877
FL	Miami, Indl. Comps.	305-477-0387
GA	Norcross, Hughes Assocs.	404-662-1587
IL	Des Plaines, Essco Assocs.	708-298-5310
MD	Columbia, L. D. Lowery, Inc.	301-381-0225
MA	Norwood, MacInnis Co.	617-762-8090
MI	Farmington Hills, R.C. Merchant	313-476-4600
MN	Bloomington, Electronic Sls. Agy.	612-884-8291
MS	Corinth, Hughes Assocs.	601-287-2915
MO	St. Louis, Jim Amberg	314-946-5777
NJ	Berkley Heights, Cambridge/Allen	201-464-0203
NC	Cary, Hughes Assocs.	919-467-7029
OH	Cincinnati, Bob Gilbert & Assocs.	513-574-1932
OR	Portland, SPS Elctrns.	503-297-6919
PA	Broomall, L.D. Lowery Inc.	215-356-5300
TN	Jonesboro, Hughes Assocs.	615-753-2719
TX	Round Rock, Encore Tech. Comps.	214-418-0188
UT	Salt Lake City, Arrowhead CSI/Sls.	801-268-8440
WA	Redmond, SPS Elctrns.	206-885-5257
Can	Markham, Ont., Avotronics Ltd.	416-475-2024

Local Distributors

AL	Huntsville, Hammond Elctrns.	205-830-4764
CA	Belmont, LoDan Elctrns. Inc.	415-592-4600
CA	Compton, Harper S.I.D.	213-979-5090
CA	Gardena, California Switch & Signal	213-770-2330
CA	San Carlos, LoDan Elctrns.	415-592-4600
CA	San Diego, California Switch	619-231-6740
CA	San Diego, Harper S.I.D.	619-578-2500
CA	San Jose, Harper S.I.D.	408-943-9490
CO	Arvada, Denver Beta Wintronic	303-431-7161
CT	Norwalk, Cobra Comps.	203-847-6442
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Largo, LoDan Elctrns., Inc.	813-586-2851
FL	Orlando, Hammond Elctrns.	407-849-6060
GA	Norcross, Hammond Elctrns.	404-449-1996
IL	Arlington Hgts., LoDan Elctrns.	312-398-5311
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Indianapolis, P.E.I. Genesis	317-879-0700
MA	Hingham, Sager Elctrl. Supp. Co.	617-749-6700
MA	Westborough, In Stock Prods. Co.	617-870-5750
MN	New Brighton, Parts 1	612-633-8079
MO	Jackson, Rapco Inds.	314-243-1433
NJ	Camden, Gen. Radio Supp. Co.	609-964-8560
NY	Bohemia, Key Comps.	516-567-7500
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Rochester, Whirlwind Music Distrs.	716-663-8820
NC	Greensboro, Hammond Elctrns.	919-275-6391
OR	Beaverton, Component Resources	503-641-8488
PA	Harrisburg, Cumberland Elctrns.	717-232-5999
PA	Philidelphia, P.E.I. Genesis	215-673-0400
SC	Greenville, Hammond Elctrns.	803-232-0872
TX	Richardson, Off The Shelf Comps.	214-238-0808
WA	Seattle, Radar Elec.	206-282-2511
Can	London, Ont., C. M. Peterson Co. Ltd.	519-434-3204
Can	Scarborough, Ont., Carsten Elctrns. Ltd.	416-495-9999
Can	Willowdale, Ont., Electrosonic Inc.	416-494-1666

PREMA PRECISION ELECTRONICS, INC., 4650 Arrow Hwy. Suite E-5, Montclair, CA 91763, Tel: 714-621-7292, FAX: 714-625-2098

FAX: 212-993-9211

PREMIER METAL PRODS. CO., 381 Canal Pl., Bronx, NY 10451, Tel: 212-993-9200; Empl.: 75; *Sls. Mgr.:* Anthony E. Bozza **C•1090-1091**

Local Sales Offices & Reps

AZ	Tempe, Scientific Dvcs.	602-730-9774
CA	Fontana, Premier Metal	714-829-3089
CA	Huntington Bch., Scientific Dvcs.	714-840-3501
CA	San Jose, Scientific Dvcs.	408-554-0455
CO	Denver, AKI Enterprises	303-338-4488
CT	East Haven, Eagle Assocs.	203-467-6542
GA	Marietta, Adams & Assocs.	404-973-0853
IL	W. Chicago, May Assocs.	708-293-7763
KS	Kansas City, Delltron Co.	816-436-6445
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MA	Needham, Eagle Assocs.	617-444-3446
MI	Brighton, Electronic Sources	313-227-3598
MN	Minneapolis, J.E.M. Anderson Co.	612-823-6459
MO	Florissant, Delltron Co.	314-839-0033
NM	Albuquerque, Brytec-Scientific Devices	505-883-3668

NY	New Hyde Park, Harris & Aldrich Sls.	516-488-2622
NY	Yonkers, Sonkin Assocs.	914-968-8282
NC	Greenboro, Adams & Assocs.	919-272-6838
OH	Cleveland, Del Steffen & Assoc.	216-461-8333
PA	Penndel, Delta Mktg.	215-750-1440
TX	Richardson, Spectra Sls. Corp.	214-234-3600
WA	Redmond, Scientific Dvcs	206-885-0004
EXP	FL, Ft. Lauderdale, GM Intl.	305-434-6617
	Local Distributors	
AZ	Phoenix, Dalis Elctrns.	602-275-2885
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Jose, Quement Elctrns.	408-998-5900
CA	San Jose, Rose Elctrns.	408-943-0255
CT	Wallingford, Sager Elctrl. Supp.	203-265-4600
ID	Boise, Radar Elec.	208-336-2227
IL	Skokie, Anixter	708-677-2600
LA	Baton Rouge, Menard Elctrns.	504-355-0323
MD	Baltimore, Resco	301-823-0070
MA	Hingham, Sager Electrical Supp.	617-749-6700
MI	Ann Arbor, Purchase Radio Supp.	313-668-8696
MO	St. Louis, Gateway Elctrn. Supp.	314-427-6116
NJ	Cranford, Garden State Indl. Elec.	201-272-6400
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Hauppauge, Broadline Elec. Dist.	516-231-4100
NY	Hempstead, Davis Elctrn. Corp.	516-483-9200
NY	LIC, H. L. Dalis Inc.	212-361-1100
NY	New York, Martin Audio/Video Corp.	212-541-5900
NY	Portchester, Wise Comps.	914-939-8600
NY	Rochester, Simcona Elctrn. Corp.	716-328-3230
NY	Rochester, Summit Elctrns.	716-334-8110
NC	Raleigh, Southeastern Radio	919-828-2311
OH	Warren, Rem Elctrns.	216-248-1636
OR	Portland, Radar Elec.	503-232-3404
PA	Horsham, Toner Cable Equip.	215-675-2053
PA	West Chester, West Chester Elec. Supp.	215-696-7500
SC	Charleston, Wholesale Indl. Elec.	803-722-2634
TN	Clarksville, Randolph Hale & Matthews	615-647-2325
TN	Cookeville, Randolph & Parks	615-526-6184
TN	Nashville, Randolph & Rice	615-255-5601
TN	Tullahoma, Randolph Rice & Williams	615-455-4531
TX	Ft. Worth, Swieco Inc.	817-335-6521
TX	Houston, Lenert Co.	713-225-1465
VA	Arlington, Arlington Elctrns.	703-524-2412
WA	Richland, Radar Elec.	509-943-8336
WA	Seattle, Radar Elec. Co.	206-282-2511

PREMIER MICROWAVE, 35 New Broad St, Port Chester, NY 10573, Tel: 914-939-8900, FAX: 914-939-9239; FSC No.: 15870; Empl.: 65; *Sls. Mgr.:* Mel Radner

PREM

FAX: 815-385-8578

PREM MAGNETICS, INC., 3521 N. Chapel Hill Rd., McHenry, IL 60050, Tel: 815-385-2700; FSC No.: 20462; Empl.: 180; *Sls. Mgr.:* D. Hertel ..... **A•1250-1253, 2372-2383**

PRES-AIR-TROL CORP., 1009 Boston Post Rd., Mamaroneck, NY 10543, Tel: 914-698-2026, 800-431-2625 (outside NY), FAX: 914-698-9456; Empl.: 25; *Sls. Mgr.:* Doug Robinson ..... **B•1766**

PRESCO, INC., 8 Lunar Drive, Woodbridge, CT 06525, Tel: 203-397-8722, FAX: 203-389-1129; Empl.: 11

PRESIDIO COMPONENTS, INC., 7185 Construction Ct, San Diego, CA 92121, Tel: 619-578-9390, FAX: 619-578-6225; FSC No.: 60212

PRESS-ON PRODUCTS, 21 Factory Rd., Addison, IL 60101, Tel: 708-628-2255, FAX: 708-543-4414; Empl.: 20; *Sls. Mgr.:* T. Cummins

PRESSURE CONTROLS, INC., 406 Cortlandt St, Belleville, NJ 07109, Tel: 201-751-5002, FAX: 201-751-9653; FSC No.: 52193; Empl.: 15; *Sls. Mgr.:* P. Emmarco

PRESSURE SYSTEMS, INC., 34 Research Dr., Hampton, VA 23666, Tel: 804-865-1243, TELEX: 901406, FAX: 804-766-2644; Empl.: 98; *Sls. Mgr.:* J. S. Yakshe

PRIMELINE, Soltec Corporation, P. O. Box 670, San Fernando, CA 91341-0670, Tel: 818-365-0101, TELEX: 494-3094 SOLTEC UI, FAX: 818-365-7839; *Sls. Mgr.:* Byron McIntire

PRIME POWER, A Prime Technology Co., Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092, FAX: 203-481-8937; *Sls. Mgr.:* J. L. Jamieson

PRIME TECHNOLOGY, INC., See General Resistance, A Prime Technology Co.

PRIMO COMPANY LIMITED, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan 181, Tel: 0422-43-3121; FSC No.: 0422 49 8865; Empl.: 391; *Sls. Mgr.:* H. Ikoma; *Dist. Mgr.:* S. Mizutani

PRINCETON CASE CO., INC., 667 Lehigh Ave., Union, NJ 07083, Tel: 908-687-1750, FAX: 908-687-1755; Empl.: 60; *Sls. Mgr.:* S. E. Parker

PRINCETON ELECTRONIC PRODUCTS, 2549 U.S. Highway 1, North Brunswick, NJ 08902, Tel: 908-297-4448, FAX: 908-821-5950; Empl.: 29; *Sls. Mgr.:* H. Center; *Dist. Mgr.:* H. Center

PRINCO INSTRUMENTS, INC., 1020 Industrial Hwy., Southampton, PA 18966; FSC No.: 48620; Empl.: 70; *Sls. Mgr.:* G. G. Pfaff

PRINTER PRODUCTS, 25 Denby Road, Boston, MA 02134, Tel: 617-254-1200, FAX: 617-254-6848; Empl.: 200; *Sls. Mgr.:* Bruce Burgess; *Dist. Mgr.:* Bruce Burgess

PRO BATTERY, INC., 3941 Oakcliff Indl. Ct., Atlanta, GA 30340, Tel: 800-451-7171, FAX: 404-449-5457; Empl.: 35; *Sls. Mgr.:* Neal A. Zucker

PROBE MASTER, INC., 4898 Ronson Ct, San Diego, CA 92111, Tel: 619-560-9676, 800-772-1519, FAX: 619-560-7354; *Sls. Mgr.:* Dick Press

PROBE-RITE, INC., P.O. Box 242, Santa Clara, CA 95052, Tel: 408-727-0100, FAX: 408-243-7219; *Sls. Mgr.:* Frank J. Ardezzone

PRO COM TECHNOLOGY INC., 28 Commerce Dr., Farmingdale, NY 11735, Tel: 516-293-4443, 800-762-3785, FAX: 516-293-4456; Empl.: 11; *Sls. Mgr.:* Alan Spiegel

PRODELIN CORPORATION, P.O. Box 368, Conover, NC 28613, Tel: 704-464-4141, FAX: 704-464-5725; Empl.: 100; *Sls. Mgr.:* Dan Johnson

PRODIGIT ELECTRONICS, 9301-101 Jordan Ave., Chatsworth, CA 91311, Tel: 818-341-6987, FAX: 818-341-5726; Empl.: 100; *Sls. Mgr.:* Daniel Erb ..... **D•2003**

PRODUCTION AUTOMATION, INC., 3160 De la Cruz Blvd. Ste. 210, Santa Clara, CA 95054, Tel: 408-980-9880, FAX: 408-980-8018; Empl.: 4; *Sls. Mgr.:* Bill Minnick; *Dist. Mgr.:* Bill Minnick

PRODUCTRONICS INC., 7616 Disalle Blvd., Fort Wayne, IN 46825, Tel: 219-489-8201, FAX: 219-489-6573; Empl.: 4; *Sls. Mgr.:* Bernard James

PRODUCTS ENGRG. CORP., 503 S. Vincent Ave., Azusa, CA 91702, Tel: 818-969-5879, TELEX: 910-587-1559, FAX: 818-969-9381; FSC No.: CAGE 3S621; Empl.: 45; *Sls. Mgr.:* Richard Mitchell

PRODUCTS FOR RESEARCH, 88 Holten St., Danvers, MA 01923, Tel: 508-774-3250, FAX: 617-245-1628; Empl.: 17; *Sls. Mgr.:* Skip Moccia

PTI PRODUCT TECHNOLOGY INC.

FAX: 714-474-1340

PRODUCT TECHNOLOGY, INC., 2811-B McGaw Avenue, Irvine, CA 92714, Tel: 714-474-8998; FSC No.: 1Z295; Empl.: 45 ..... **C•1661, 1684**

	Local Sales Offices & Reps	
AL	Huntsville, Mec-Elec	205-881-1522
AZ	Tempe, Integrated Tech. Sls.	602-968-5118
CA	San Diego, Qualtronics	619-695-0118
OH	Cincinnati, Bob Gilbert & Assocs.	513-574-1932
TX	Dallas, Passive Comps. Assocs.	214-824-6162
UT	Salt Lake City, Sierra Tech. Sls.	801-566-9719
	Local Distributors	
AZ	Scottsdale, Added Value	602-951-9788
CA	San Diego, Added Value	619-558-8890
CA	Tustin, Added Value	714-259-8258
CA	Visalia, Added Value	209-734-8861
CA	Westlake Village, Added Value	818-889-2861
CO	Wheat Ridge, Added Value	303-422-1701
TX	Austin, Added Value	512-454-8845
TX	Dallas, Added Value	214-404-1144
UT	West Valley City, Added Value	801-975-9500

PROF. A/V & SPECIALTY PROD. DIV., 223-5N-01, St. Paul, MN 55144-1000, Tel: 612-733-7644, FAX: 612-737-5583; Empl.: 38,351

PROFESSIONAL ENGINEERING SYSTEMS, 425 Parkway Dr., Erie, PA 16511-1051, Tel: 814-453-5452

PROGRAMMABLE DEVICES, INC., 155-T New Boston St, Woburn, MA 01801, Tel: 617-935-9530, FAX: 617-935-3654; Empl.: 10

PTS FREQUENCY SYNTHESIZERS

FAX: 508-486-4495

PROGRAMMED TEST SOURCES, 9 Beaver Brook Road, P.O. Box 517, Littleton, MA 01460, Tel: 508-486-3008; FSC No.: 66381; Empl.: 30 ..... **D•1312**

PRB LINE®

FAX: 1-800-635-8101

PROJECTOR RECORDER BELT CORP., Route 3 Highway 59 P.O. Box 176, Whitewater, WI 53190, Tel: 1-800-533-9654; Empl.: 30; *Sls. Mgr.:* Ed Wetzel; *Dist. Mgr.:* Nancy Smith ..... **C•1597**

	Local Sales Offices & Reps	
CA	Burlington, William Purdy Co.	415-347-7701
CA	Santa Ana, Mike Roth Sls.	714-647-0606
CO	Colorado Springs, Norris & Co.	303-576-8697
FL	Maitland, Hawkins-Frederickson Assocs., Inc.	407-831-2474
GA	Roswell, HW Phillips	404-992-3070
IL	Addison, Elctrn. Specialists	708-250-9080
IA	W. Des Moines, Nevco	515-225-9866
MA	Milford, Jonel Sls. Assoc.	508-478-4650
MI	Southfield, Robert Milsk Co.	313-354-3310
MN	Excelsior, Procon	612-937-6024
NY	Victor, Imco	716-924-3671
OH	Stow, J.W. Lehner Co.	216-686-1965
OR	Beaverton, Pacific Mktg. Grp.	503-641-9373
TX	Rowlett, Campion Sls.	214-475-8313
VA	Charlottesville, Crown Assocs.	804-293-6373
Can	Dorval, Quebec, ECG Canada	514-685-5800

PROJECT RESOURCES INC., 16 Kendrick Rd., Wareham, MA 02571, Tel: 508-295-7444, FAX: 508-295-7497; FSC No.: OEF11; Empl.: 18; *Sls. Mgr.:* T.R.Egan

PROJECTS UNLIMITED, 3680 Wyse Rd., Dayton, OH 45414, Tel: 513-890-1918, FAX: 513-890-4911; Empl.: 61; *Sls. Mgr.:* Greg Kimpton ..... **D•1050-1052**

	Local Sales Offices & Reps	
AL	Huntsville, ElectroSales, Inc.	205-830-2715
AZ	Scottsdale, Williams Assocs.	602-947-4297
CA	Irvine, Cal Rep	714-250-0567
CA	San Jose, Comtech Mktg.	408-294-3330
CO	Commerce City, Williams Assocs.	303-289-5647
CT	Seymour, Sturdy Corp.	203-888-1480
FL	Lakeland, Munday Sls. Co.	813-858-5606
GA	Atlanta, ElectroSales, Inc.	404-394-1122
IL	Downers Grove, Golten Assocs. Inc.	708-512-0093
IN	Indianapolis, The J. C. Hofstetter Co.	317-897-7914
KS	Overland Park, Thomas L. Dowell	913-599-1100
MA	Wellesley Hills, Sturdy Corp.	617-235-2330
MN	Edina, G.P. Sls.	612-831-2362
MO	St. Louis, Thomas L. Dowell	314-849-4234
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Patchogue, Optimum Sls.	516-758-0644
NC	Raleigh, Tingen Tech. Sls., Inc.	919-870-6670
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
PA	Valley Forge, Providence Mktg.	215-935-3300
TX	Richardson, Eagle Mktg.	214-238-5385

IA Cedar Rapids, Thomas L. Dowell & Assocs. 319-364-3880
WA Redmond, Doran Sls. Assocs., Inc. 206-885-1885
Can Islington, Ont., D.T. Shaw Co., Ltd. 416-231-3494
Can Montreal, Que., D.T. Shaw Co. Ltd. 514-332-1163
Can Vancouver,B.C., F.D. Bolton, Ltd. 604-736-0351
Can Winnipeg, Man., F.D. Bolton, Ltd. 204-774-5708

Local Distributors
CA San Jose, Speakers Unlimited 408-453-5698
CA Santa Clara, Pyramid Elctrns. 408-727-9810
CA Torrance, Pyramid Elctrns. 213-320-2700
CO Commerce City, Waco Elctrns. 303-289-4743
FL Lakeland, A-A Elec. 813-665-6941
GA Norcross, A-A Elec. 404-449-8670
IL Bensonville, Voyager Elctrns. Corp. ... 708-860-1300
MA Hingham, Hingham Bay 617-740-1900
MO St. Louis, Beckwith Elctrns. 314-343-6463
NY Rochester, Ray Baker Elctrns. 716-586-9164
MN Fridley, Voyager Elctrns. Corp. 612-571-7766
OH Dayton, Electro Supp. 513-299-5020
PA McKean, Advacom 814-476-7774
TX Austin, Southwest Elctrns. 512-837-8971
TX Stafford, Southwest Elctrns. 713-240-4000
TX Dallas, S.W. Elctrns. 214-234-3050
WA Redmond, Pyramid Elctrns. 206-883-7200
Can Willowdale, Ont., Electro Sonic 416-494-1666

PRO-LOG CORP., 2555 Garden Road, Monterey, CA 93940, Tel: 408-372-4593, TWX: 910-360-7082; Empl.: 120; *Sls. Mgr.:* Dick Thomas; *Dist. Mgr.:* Pat Laughlin

PROLOGIC SYSTEMS, 557-0 Burbank St, Broomfield, CO 80020, Tel: 303-460-0103, FAX: 303-469-5565; Empl.: 9

PROMAX-JOHNTON ELECTRONIC CORP., 17935 Sky Park Circle, Ste. H, Irvine, CA 92714, Tel: 714-975-1245, FAX: 714-975-1390; Empl.: 12; *Sls. Mgr.:* Dave Cooper

PROTEK INC., P.O. Box 59, Norwood, NJ 07648, Tel: 201-767-7242, FAX: 201-767-7343; *Sls. Mgr.:* Alex Orloff

PROTO STAMPING CORP., 811 Kaynyne St, Redwood City, CA 94063, Tel: 415-365-0498, FAX: 415-366-6329; Empl.: 35; *Sls. Mgr.:* Dave Anstead

PROTO SYSTEMS, 625 Sims Industrial Blvd, Alpharetta, GA 30201, Tel: 404-475-1330, 800-331-1797, FAX: 404-442-9751; FSC No.: FU 718; Empl.: 155; *Sls. Mgr.:* Keith Koehle

PROTOTEK, INC., 25 Standen Dr., Hamilton, OH 45015, Tel: 513-874-5094, FAX: 513-874-2252; FSC No.: 60813; Empl.: 45; *Sls. Mgr.:* Ron Nabors

PTC INDUSTRIES, INC., 5721 Research Drive, Huntington Beach, CA 92649, Tel: 213-598-9547, 714-891-7561, FAX: 714-373-0269; Empl.: 14; *Sls. Mgr.:* Steve Varonka

PTC TRANSFORMERS, P.O. Box 397, Rising Sun Road, Bordentown, NJ 08505, Tel: 609-298-8200, FAX: 609-298-8235; FSC No.: 05853; Empl.: 30; *Sls. Mgr.:* C. W. Harrison

PTS CORPORATION, Box 272, Bloomington, IN 47401, Tel: 812-824-9331; Empl.: 350; *Sls. Mgr.:* Jeff Hamilton; *Dist. Mgr.:* David Melwid

PTX-PENTRONIX INC., 1737 Cicotte, Lincoln Park, MI 48146, Tel: 313-388-3100, TELEX: 23-0398, FAX: 313-388-9171; Empl.: 21; *Sls. Mgr.:* J. Schultz

Z-LINE®

FAX: 714-641-9062

PULIZZI ENGINEERING, INC., 3240 S. Susan St., Santa Ana, CA 92704-6865, Tel: 714-540-4229; FSC No.: 70513; Empl.: 35; *Sls. Mgr.:* Roger A. Lea; *Dist. Mgr.:* Roger A. Lea ..... **D•2224-2228**

Local Sales Offices & Reps
CA Anaheim, Alpha Elctrn. Sls. 714-665-6580
CA Los Angeles, Power Partners 213-215-0800
CA Los Gatos, Norwest Elctrns. 408-395-1190
CA Santa Ana, Pulizzi Engrg., Inc. 714-540-4229
CT Westford, I.C.S. Assocs., Inc. 508-692-3545
IL Bensenville, E.S.I. 708-766-3667
IL Bensenville, R.L. Lang & Assoc. 312-766-3667
MD Columbia, L.G. White & Co., Inc. 301-290-8880
MD Silver Spring, L. G. White & Co., Inc. ... 301-792-0660
MA Westford, ICS Assocs., Inc. 508-692-3545
MO Bridgeton, BC Elctrn. Sls., Inc. 314-739-6683
MD Silver Spring, L.G. White 301-792-0660
OR Beaverton, Temper Tech. Mktg. 503-292-8201
PA Valley Forge, J.E. Cuesta & Co. 215-935-0400
Can Lac-Carre, Que., V.V.M. REG. 514-766-9270

Local Distributors
CA San Jose, Dansco Comp. Sls., Inc. 408-292-9740

PULNIX AMERICA, INC., 770 Lucerne Dr., Sunnyvale, CA 94086, Tel: 408-733-1560, TELEX: 172541 Pulnix America; *Sls. Mgr.:* Richard Hofmeister

PULSE INSTRUMENTS CO., 1234 Francisco, Torrance, CA 90502, Tel: 213-515-5330, FAX: 213-515-0068; Empl.: 30; *Sls. Mgr.:* Ron Perry

PUREDATA, 180 West Beaver Creek Rd., Richmond Hill, Ont., Canada L4B 1B4, Tel: 416-731-6444, FAX: 416-731-7017; Empl.: 150; *Sls. Mgr.:* Alex Kosarow, Cdn. Sls.; *Dist. Mgr.:* Dennis Robinson, US Sls.

PYLE INDUSTRIES, INC., 501 Center St., P.O. Box 620, Huntington, IN 46750, Tel: 219-356-1200, FAX: 219-356-2830; Empl.: 375; *Sls. Mgr.:* Tom Pyle; *Dist. Mgr.:* Mark Pyle, Natl. Sls. Mgr.

PYLE-NATIONAL, INC. LPL CO., 1334 N. Kostner Ave., Chicago, IL 60651, Tel: 312-342-6300 x210, TELEX: 25251, TWX: 910-221-0335, FAX: 312-342-0872; FSC No.: 49367; Empl.: 650; *Sls. Mgr.:* Mike Carroccia, V.P. Sls./Mktg.

PYLON CO., See Augat/Pylon Corp., Inc.

PYLON ELEX DEVELOPMENT CO. LTD., 2300 Victoria, Lachine, PQ, Canada H8S 1Z3, Tel: 514-637-1186, FAX: 514-636-1970; Empl.: 50; *Sls. Mgr.:* J. Guay

PYROCOM CO., 924 N. 143rd St., Seattle, WA 98133, Tel: 206-365-3535, FAX: 206-365-0402; *Sls. Mgr.:* Bill Kurtz

PYROFERRIC INTERNATIONAL, INC., 200 Madison St., Toledo, IL 62468, Tel: 217-849-3300, TWX: 910-663-0616, FAX: 217-849-2544; Empl.: 50; *Sls. Mgr.:* S. John Horner

Local Sales Offices & Reps
AZ Phoenix, Charles T. Fink & Assocs., Ltd. 602-992-9884
CA Alhambra, Deniston/JDA, Inc. 818-289-2844
CA Santa Clara, C. B. King Assocs. 408-988-7551
NY Commack, Marvin Scheck 516-864-9676
OH Shaker Hgts., Don Gype Co. 216-291-0103
TX Dallas, S.W. Elctrn. Ind., Inc. 214-690-9881
VA Roanoke, A.B. Kreger Co. 703-989-4738

PYROFILM RESISTOR CO., See KDI Electronics

PYROHM, INC., 24268 Indoplex Circle, Farmington Hills, MI 48018, Tel: 313-478-5060; *Sls. Mgr.:* Charles R. Berry

Q-CARD, INC., 2 Chellis Ct., Owings Mills, MD 21117-1634, Tel: 410-581-0112; *Sls. Mgr.:* Larry Nickel

QMI/NIEC, 12900 Rolling Oaks Rd., Twin Oaks, CA 93518, Tel: 805-867-2555, FAX: 805-867-2698 ..... **A•2126**

Local Sales Offices & Reps
AL Huntsville, EMA, Inc. 205-830-4030
CA Laguna Hills, 4-Star Elctrn. Comp. Sls. 714-583-9781
CA San Jose, Ruppert Sls. & Engrg., Inc. .. 408-998-8717
FL Boca Raton, Tech Sls. Specialists, Inc. 407-391-3718
GA Roswell, EMA, Inc. 404-992-7240
IL Rolling Meadows, Eagle Tech. Sls. Inc. 708-991-0700
MI Livonia, Leading Edge Sls. Corp. 313-478-6700
MN Prior Lake, Gleason Assoc., Inc. 612-447-7020
NJ No. Fairfield, Metro Logic Corp. 201-575-5585
NJ So. Medford, CEF Assocs. 609-953-3417
NY Syracuse, Murcan Sls. Corp. 315-455-8807
NC Raleigh, EMA, Inc. 919-846-6888
OH Columbus, The Tom Mulligan Co., Inc. 614-457-2242
TX Dallas, Electra Reps., Inc. 214-248-3852
WA Bellevue, N R Schultz Co. 206-746-1890

QSI CORPORATION, 2212 So. W. Temple No. 46, Salt Lake City, UT 84115, Tel: 801-466-8770, FAX: 801-466-8792; Empl.: 10; *Sls. Mgr.:* Gerri Mackey

Local Sales Offices & Reps
CT Orange, Isdale Assocs. 203-387-2704

Q-TECH CORP., 10150 W. Jefferson Blvd., Culver City, CA 90232-3510, Tel: 213-836-7900, TELEX: 69-6140, FAX: 213-836-2157; FSC No.: 51774; Empl.: 140; *Sls. Mgr.:* Sandra Rappaport ..... **A•1444-1447**

Local Sales Offices & Reps
AZ Tempe, Piper Sls. Co. 602-949-0048
CA Hermosa Beach, Quattro Sls. Assoc., Inc. 213-372-4221
CA Moorpark, Quattro Sls. Assoc., Inc. 805-523-2978
CA San Diego, Quattro Sls. Assoc., Inc. ... 619-581-3093
CA San Jose, Blue Elctrn. Sls. 408-345-0260
CA San Juan Capistrano, Quattro Sls. Assoc., Inc. 800-735-4510
CO Parker, Howard Assoc. 303-841-5755
CT Canterbury, The Cygnus Sls. Co., Inc. 203-546-6322
IL Northbrook, Allied Comp. Reps., Inc. .. 708-498-6658
IN Fort Wayne, TX Sales Inc. 219-489-4447
MD Baltimore, R.A. Wafer Assocs. 602-949-0048
MA Tewksbury, The Cygnus Sls. Co., Inc. 508-640-0001
MO St. Louis, Abrams & Assoc. 314-569-0447
NJ Glen Gardner, F & M Tech. Sls. 201-537-7888
NJ Paramus, Eltech Sls. 201-967-1309
NM Albuquerque, Piper Sls. Co. 505-828-1300
TN Winchester, C.J. Sls. 615-967-2156
TX Austin, Texoma Technical Sales, Inc. 512-441-1771
TX Houston, Texoma Technical Sales, Inc. 713-462-1432
VT So. Burlington, The Cygnus Sls. Co., Inc. 802-862-7754

QUAD DESIGN TECHNOLOGY, INC., 1385 Del Norte Road, Camarillo, CA 93010, Tel: 805-988-8250, FAX: 805-988-8259; Empl.: 16; *Sls. Mgr.:* Ron Lee; *Dist. Mgr.:* Jack Weaver

QUALCOMM, INC., 10555 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-587-1121, FAX: 619-452-9096; Empl.: 400; *Sls. Mgr.:* James Madsen; *Dist. Mgr.:* James Madsen

Qualidyne

FAX: 619-429-1011

QUALIDYNE SYSTEMS, INC., Lambda Group of Unitech, plc, 3055 Del Sol Blvd., San Diego, CA 92154, Tel: 619-575-1100; Empl.: 400; *Sls. Mgr.:* Barry A. Chenes ..... **D•2014-2019**

QUALITEC TECHNOLOGIES, INC., 43064 Christy St., Fremont, CA 94538, Tel: 415-498-1046, FAX: 415-498-5938; Empl.: 130; *Sls. Mgr.:* Kevin Daniels ..... **D•1313**

QUALITY AUTOMATION, INC., 1600 E. South Anaheim Blvd., Anaheim, CA 92805, Tel: 714-491-8535, FAX: 714-491-0417; Empl.: 22; *Sls. Mgr.:* Joe George; *Dist. Mgr.:* Joe George

QUALITY COMPONENTS, INC., P.O. Box 113, St. Marys, PA 15857, Tel: 814-834-2817, FAX: 814-834-9141; Empl.: 95; *Sls. Mgr.:* Michael Renaud, Mktg. Mgr.

QUALITY MICROWAVE INTERCONNECTS, INC., 301 Ballardvale St., Wilmington, MA 01887, Tel: 508-988-9090, FAX: 508-988-9393; FSC No.: 64023; Empl.: 30; *Sls. Mgr.:* Paul M. Tusini ..... **A•1824-1826**

Local Sales Offices & Reps
AL Huntsville, Bolton Assoc. 205-880-1164
AZ Tempe, Cain Technlg. 602-966-4322
CA Cupertino, Dura Sls. 408-255-2084
CA Van Nuys, Cain Technlg. 818-904-9392
CO Englewood, Cain Technlg. 303-220-8118
FL Orlando, Bolton Assoc. 407-856-0612
FL Pompano Beach, Bolton Assoc. 305-975-7245
FL St. Petersburg, Bolton Assoc. 813-864-2294
IN Park Ridge, Probe Elctrns. 708-696-2828
MD Laurel, Elec. Mktg. Assoc. 301-953-7800
MA Teskwbury, Sequel Assoc. 508-851-4010
MN New Hope, Baltz Assoc. 612-546-8520
NJ Deptford, Elec. Mktg. Assoc. 609-227-0925
NJ Linden, El-Tech Sls. 201-925-6162
NJ Paramus, El-Tech Sls. 201-967-1309
NY Syracuse, Em-Tech Assocs. 315-437-6410
SC Greenwood, Bolton Assoc. 803-223-4018
TX Garland, Cary McMahill Assoc. 214-681-1414
VA Abingdon, Bolton Assoc. 703-676-0500
WA Seattle, Data Com 206-285-2525
EXP Stamford, Dage Corp. 203-324-3123
Can Montreal, Que., Solid State Engrg. 514-481-3313

Local Distributors

CA Westlake Village, Sertek, Inc. 818-707-2872
MA Tewksbury, Sequel Sls. 508-851-4010

QUALITY POWER SYSTEMS, INC., 2400 S. Texas Ave., Pearland, TX 77581, Tel: 713-997-1700, 800-992-1701, FAX: 713-997-1907; Empl.: 20; *Sls. Mgr.:* Clarence Oliver

QUALITY RESEARCH COMPANY, North 11424 Judkins Lane, Spokane, WA 99207-9632, Tel: 509-924-6895; Empl.: 6; *Sls. Mgr.:* Jon Roath

QUALITY TECHNOLOGIES, 3400 Hillview Ave., Palo Alto, CA 93404, Tel: 415-493-0400, FAX: 415-493-7055; Empl.: 2000; *Sls. Mgr.:* Bob Taber; *Dist. Mgr.:* Candace Johnson

QUALITY THERMISTOR, 2147 Centurion Pl., Boise, ID 83709, Tel: 208-377-3373, FAX: 208-376-4754; FSC No.: 56866; Empl.: 45; *Sls. Mgr.:* John Mahoney ..... **B•1830, 1858-1859**

Local Sales Offices & Reps

EXP Oradell, NJ, Sylvan Ginsbury Ltd. 201-261-3200

QUALOGY INC., 109 Bonaventura Dr., San Jose, CA 95134, Tel: 408-434-5200, FAX: 408-434-5242; Empl.: 25; *Sls. Mgr.:* Mike Sills

QUALISTAR CORP., 9621 Irondale Ave., Chatsworth, CA 91311, Tel: 818-882-5822, TELEX: 510-600-2569, ESYLNK: 6289-9796, FAX: 818-882-4081; Empl.: 50

QUALTEK ELECTRONICS CORP., 7158 Industrial Pk. Blvd., Mentor, OH 44060, Tel: 216-951-3300, TELEX: 985319, FAX: 216-951-7252; Empl.: 75; *Sls. Mgr.:* Laura Yano/Regional Sls. Mgr.; *Dist. Mgr.:* Laura Yano/Regional Sls. Mgr.

QUAM-NICHOLS CO., 234 E. Marquette Rd., Chicago, IL 60637, Tel: 312-488-5800, FAX: 312-488-6944; Empl.: 200; *Sls. Mgr.:* William G. Little; *Dist. Mgr.:* Greg Johns ..... **D•1054-1055**

Local Sales Offices & Reps

AZ Mesa, Yocum Mktg. 602-834-3334
CA Belmont, Brian Trankle & Assocs. 415-595-4004
CA Gardena, Bidwell-Schwartz Assocs. ... 213-770-0300
UT Salt Lake City, Pro Tech Mktg. 801-943-8331
FL Orlando, Cartwright & Bean of FL 407-422-4531
GA Norcross, Cartwright & Bean of GA ... 404-368-0160
IL Mt Prospect, The Dombrow Co. 312-253-3326
IL North Brook, Levy, Grams, & Lassers 708-272-8500
IN Carmel, Green-Wissler Sls.,Inc. 317-843-5785
KS Prairie Village, R. W. Kunz & Assocs., Inc. 913-648-3535
MA Chicopee, Repworks, Inc. 413-533-0845
MN Edina, Mel Foster Techn. Sls. Inv. 612-941-9790
NJ Rahway, R. E. Breuer CO. 201-388-5045
NY Roslyn Hgts., Hudson Mktg. Inc. 516-625-0002
NY Syracruse, The Lewis & Dunnigan Co., Inc. 315-446-5522
OH Stow, J. W. Lehner Co. 216-686-1965
PA Broomall, Lowery Assocs. Co. 215-356-5300
TN Menphis, Cartwright & Bean of TN 901-362-8345
TX Dallas, J. Y. Schoonmaker CO., Inc. ... 214-349-4650
WA Seattle, Vector Manufacturers' Rep. ... 206-368-8400
EXP Yonkers, NY, Roburn Agencies, Inc. ... 914-968-1016
Can Waterloo, Ont., McBride Loudspeaker Source, Ltd. 519-884-3500
MI Southfield, Robert Milsk Co. 313-354-3310

QUAN-TECH, Stansbury Industries Inc., P.O. Box 28, Rte. 206, Flanders, NJ 07836, Tel: 201-927-1766, TWX: 710-987-7500; FSC No.: 63921; *Sls. Mgr.:* Richard A. Stansbury

QUANTRONIX, 49 Wireless Blvd., P.O. Box 9014, Smithtown, NY 11788, Tel: 516-273-6900, TELEX: 685-2167, FAX: 516-273-6958; Empl.: 175; *Sls. Mgr.:* R. J. Bruno; *Dist. Mgr.:* R. J. Bruno

QUANTUM BATTERIES, INC., 2772 Loker Ave. West, Carlsbad, CA 92008, Tel: 619-438-2202, TELEX: 01830, FAX: 619-438-0694; FSC No.: 01830; Empl.: 30; *Sls. Mgr.:* Gregg Kuehn; *Dist. Mgr.:* Terry Nielsen

QUANTUM CHROMODYNAMICS, INC., 2401 208th Street Unit 9, Torrance, CA 90501, Tel: 213-320-5717, FAX: 213-320-5848; Empl.: 3; *Sls. Mgr.:* David L. Hills

QUANTUM DATA®

FAX: 708-888-2802

QUANTUM DATA INC., 2111 Big Timber Road, Elgin, IL 60123, Tel: 708-888-0450, TELEX: 206725; Empl.: 23; *Sls. Mgr.:* Bill Down ..... **D•1315**

QUANTUM ELECTRONICS, INC., 31 Industrial Park Rd., Lewistown, PA 17044, Tel: 717-242-1132, FAX: 717-248-8680; Empl.: 20; *Sls. Mgr.:* Kit C. Kennedy

QUANTUM SCIENTIFIC INC., PO Box 219, Station J, Toronto, Ont M4J4Y1, Tel: 416-239-3363, 800-268-6000, FAX: 416-239-5791; Empl.: 10; *Sls. Mgr.:* Michael G. Sargeant

QUARTZITE PROCESSING, INC., 6 Holyoke St., Malden, MA 02148, Tel: 617-322-3611, FAX: 617-322-9623; Empl.: 11; *Sls. Mgr.:* P. S. Yanofsky

QUATECH INC., 662 Wolf Ledges Pkwy., Akron, OH 44311, Tel: 216-434-3154, TELEX: 5101012726, FAX: 216-434-1409; Empl.: 25; *Sls. Mgr.:* Michael Cenker; *Dist. Mgr.:* Michael Cenker

Q.V.S., INC., 20 North 15th St., East Orange, NJ 07017, Tel: 201-673-3996, FAX: 201-673-3997; FSC No.: 89820; Empl.: 45

QWINT DATA, INC., 333 Corporate Woods Parkway, Vernon Hills, IL 60061, Tel: 708-913-8765, TELEX: 27-0498, FAX: 708-913-8766; Empl.: 140; *Sls. Mgr.:* Tom O'Boyle

RACAL-DANA INSTRS. INC., 4 Goodyear St., Irvine, CA 92718, Tel: 714-859-8999; FSC No.: 21793; Empl.: 230

RACAL-GUARDATA, INC., 480 Spring Pk. Pl, Ste. 900, Herndon, VA 22070, Tel: 703-471-0892, FAX: 703-437-9333; FSC No.: 56496; Empl.: 30; *Sls. Mgr.:* Thomas Mitchell, VP

RACAL-MILGO, 1601 N. Harrison Parkway, Sunrise, FL 33323-2899, Tel: 305-846-1601, 800-327-4440, TWX: 510-955-4145, FAX: 305-846-4942; Empl.: 2800; *Sls. Mgr.:* H. Cheli

RACET COMPUTES, LTD., 3150 E. Birch St., Brea, CA 92621, Tel: 714-579-1725, TELEX: 701160, TWX: RACET UD, FAX: 714-579-3183; Empl.: 25; *Sls. Mgr.:* Michael Dendo, V.P. Sls.; *Dist. Mgr.:* Michael Dosch

RACORE COMPUTER PRODUCTS, INC., 170 Knowles Drive., Los Gatos, CA 95030, Tel: 408-374-8290, FAX: 408-374-6653; *Sls. Mgr.:* Joseph W. Rooney; *Dist. Mgr.:* Joseph W. Rooney

RADIAL CONTROLS, 2555 E. 55th Place, Indianapolis, IN 46220, Tel: 317-255-2796; Empl.: 25; *Sls. Mgr.:* R. L. Newsom

RADIALL, INC., 150 Long Beach Blvd., Stratford, CT 06497, Tel: 203-386-1030, TELEX: 311796, FAX: 203-375-3808; Empl.: 30; *Sls. Mgr.:* Peter Dionisio; *Dist. Mgr.:* Peter Dionisio

RADIANT COMMUNICATIONS CORP., 5001 Hadley Rd. P.O. Box 867, South Plainfield, NJ 07080, Tel: 908-757-7444, TELEX: 908-757-8666; Empl.: 10; *Sls. Mgr.:* Gene Thaw

RADIOMETRICS MIDWEST CORP., 2200 S. Main St., Lombard, IL 60148, Tel: 708-932-7262; FSC No.: Cage Code 1Z075 SIC Code 8748 Ext. 0021; Empl.: 5

RADIO RESEARCH INSTRUMENT CO., INC., 584 North Main Street, Waterbury, CT 06704-3506, Tel: 203-753-5840, TELEX: 962444 RADAR DURY, FAX: 203-754-2567; FSC No.: 57174; *Sls. Mgr.:* E. B. Doyle

RADIO SWITCH CORP., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, Tel: 908-462-6100, TELEX: 908-409-6695; FSC No.: 74217; Empl.: 40; *Sls. Mgr.:* J. L. Bernard

RADIO TELEVISION PRODUCTS CORP., 2702 Washington Ave. N., Douglas, AZ 85607, Tel: 602-364-4438, FAX: 602-364-4430; FSC No.: 5950; Empl.: 120; *Sls. Mgr.:* W. J. McGaw

RADIX WIRE CO., 26260 Lakeland Blvd., Cleveland, OH 44132, Tel: 216-731-9191, FAX: 216-731-7082; Empl.: 90; *Sls. Mgr.:* Peter B. Thurstone, Mktg. Admin.; *Dist. Mgr.:* Peter B. Thurstone, Mktg. Admin.

RADSTONE TECHNOLOGY, 20 Craig Rd., Montvale, NJ 07645, Tel: 201-391-2700, 800-368-2738, FAX: 201-391-2899; *Sls. Mgr.:* Larry Abzug

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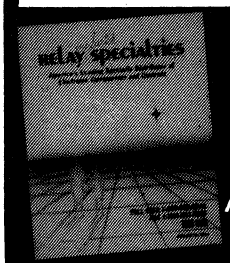
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Local Sales Offices & Reps

AL	Huntsville, Spears & Assocs.	205-461-0881
AZ	Phoenix, Moss Mktg.	602-433-9349
CA	Arcadia, Van Gott & Assoc.	818-445-9728
CA	La Jolla, Coastal Elctrn. Sls.	619-459-4148
CA	Santa Clara, Cummings & Assoc.	408-247-8656
CO	Aurora, Moss Mktg.	303-340-8535
CT	East Hampton, Apex Assocs.	203-269-8401
GA	Norcross, Spears & Assocs.	404-270-5661
MA	Needham, Apex Assocs.	617-444-8070
NY	Commack, Mars Engrg.	516-864-8676
NC	Raleigh, Spears & Assocs.	919-790-7606
UT	Salt Lake City, Moss Mktg.	801-363-5875
FL	Indian Harbor Bch., Post Mktg.	407-777-0994
IA	Davenport, Rush & West Assocs.	319-388-9494
KS	Olathe, Rush & West Assocs.	913-764-2700
MD	Baltimore, Eltron Sls. Ltd.	301-426-6637
MI	Grosse Point Pk., Greiner Assocs.	313-499-0188
OH	Westlake, Baehr Greenleaf & Assocs.	216-892-1770
OR	Hillsboro, Temco Northwest	503-645-2030
PA	Warrendale, Baehr Greenleaf & Assocs.	412-934-3088
TX	Dallas, Electra Reps	214-248-3852
VA	Front Royal, Eltron Sls. Ltd.	703-635-7201
WA	Bothell, Temco Nortwest	206-481-6150
WI	Milwaukee, Bert Wartchow Assocs.	414-964-0942
Can	Montreal, Que, Eli Manis, Inc.	514-484-2923

REN ELECTRONICS CORPORATION, C.C.G., An Insico Co., 755 New Ludlow Rd., S. Hadley, MA 01075, Tel: 413-536-1800, TELEX: 315617, FAX: 413-536-8425; FSC No.: 70143; Empl.: 75; *Sls. Mgr.:* S. W. Pai, Div. Mgr.

REPRODUCTION TECHNOLOGIES INC., P.O. Box 790, Bristol, IN 46507-0518, Tel: 219-848-5233, TELEX: 510 600 2378 R T I, FAX: 219-848-5333; Empl.: 10; *Sls. Mgr.:* Maxine Beasey

REPUBLIC ELECTRONICS CO., 200 Wireless Blvd., Hauppauge, NY 11788, Tel: 516-273-9800, FAX: 516-273-9820; FSC No.: 95750; Empl.: 145; *Sls. Mgr.:* Sy Newman, Mktg. Mgr.

RESEARCH DEVICES, INC., 121 Ethel Rd., Piscataway, NJ 08854, Tel: 908-572-4800, TELEX: 467058, FAX: 908-572-4808; Empl.: 25; *Sls. Mgr.:* Michael Schneider

RESEARCH SPECIALISTS, 1816 Settlers Oval, Cleveland, OH 44145, Tel: 216-871-8909; Empl.: 10; *Sls. Mgr.:* Tim Howard

RESISTANCE TECHNOLOGY INC., 1260 Red Fox Rd., St. Paul, MN 55112, Tel: 612-636-9770, FAX: 612-636-8944; *Sls. Mgr.:* Roger H. Falde

FAX: 708-863-4272

RESISTORS, INC., 5226 W. 26th St., Chicago, IL 60650, Tel: 708-652-7555; Empl.: 35; *Sls. Mgr.:* Theresa McGraw

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Local Sales Offices & Reps

CA	Santa Clara, K M Entprs.	408-986-1458

FAX: 408-982-0210

RESONANT POWER TECHNOLOGY, 3350 Scott Boulevard, Bldg.5302, Santa Clara, CA 95054, Tel: 408-982-0200; FSC No.: 0BZ13; Empl.: 10; *Sls. Mgr.:* Dan H. Burgoon ..... **D•2024-2025**

Local Sales Offices & Reps

FL	Land O Lakes, AJ'S Power Source	813-996-2583
NH	Salem, OEM Marketing & Sales	603-893-0009
TX	Richardson, Jim Gray & Associates	214-699-9976

R.F. ELECTRONICS, INC., 1091 Duryea Ave., Irvine, CA 92714-5517, Tel: 714-263-0661, FAX: 714-263-0662; Empl.: 18; *Sls. Mgr.:* Michael Welter; *Dist. Mgr.:* Michael Welter

RFI CORPORATION, 100 E. Pine Aire Dr., Bay Shore, NY 11706, Tel: 516-231-6400, TWX: 510-227-6233, FAX: 516-231-6465; FSC No.: 13619; Empl.: 140; *Sls. Mgr.:* Dave Radford ..... **A•1633**

Local Sales Offices & Reps

CA	Alhambra, M.W. Riedel Co.	213-283-7694
CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
FL	Clearwater, Tech-Rep Assocs.	813-572-9900
FL	Ft. Lauderdale, Tech Rep Assocs.	305-791-2708
FL	Merritt Island, Tech-Rep Assocs.	407-453-3313
FL	Winter Springs, Tech-Rep Assocs.	407-699-4010
IN	Ft. Wayne, Naunas Sls. Co.	219-432-4792
KS	Lenexa, Midtec Assocs., Inc.	913-541-0505
MD	Rockville, Mechtronics Sls.	301-340-2130
MA	Burlington, Tritek, Inc.	617-272-4550
MO	St. Louis, Midtec Assocs., Inc.	314-275-8666
NM	Albuquerque, M.G. Elctrns.	505-255-1638
NY	Buffalo, Upstate Engrg. Sls.	716-632-0011
NY	Great Neck, Trionic Assocs.	516-466-2300
NY	Rochester, Upstate Engrg.Sls.	716-225-2383
NY	Ronkonkoma, Compucon Distrs., Inc.	516-981-8810
NY	Utica, Upstate Engrg.Sls.	315-797-6721
NC	Winston-Salem, Murcota Corp.	919-722-9445
PA	Glenside, Koebert Assocs.,Inc.	215-887-2310
TX	Garland, McBride Sci. Sls.	214-494-5000
Can	Bedford, N.S., Norgay Entprs. Ltd.	902-835-8530
Can	Neapean, Ontario, Norgay Entprs. Ltd.	613-745-4051
Can	Richmond B.C., Norgay Entprs. Ltd.	604-275-1121
Can	Toronto, Ontario, Norgay Entprs. Ltd.	416-234-8966
Can	Westmount, Quebec, Norgay Entprs. Ltd.	514-932-3233

Local Distributors

IL	Des Plaines, Compucon Distrs., Inc.	312-827-9444
MA	Reading, Compucon Distrs., Inc.	617-944-6875

RF INDUSTRIES, Celltronics, 10040 Mesa Rim Rd., San Diego, CA 92121, Tel: 619-587-0656, FAX: 619-587-0049

RFL INDS., INC., (DBA) Dowty Elctrns. Co., PO Box 250 Prospect St., Brandon, VT 05733, Tel: 802-247-6811, FAX: 802-247-3946; Empl.: 130; *Sls. Mgr.:* Dan Boutin; *Dist. Mgr.:* Dan Boutin

RF MONOLITHICS, INC., 4441 Sigma Rd., Dallas, TX 75244, Tel: 214-233-2903, TELEX: 463-0088, FAX: 214-387-8148; FSC No.: 2U874; Empl.: 120; *Sls. Mgr.:* C. Baker

R.F. POWER LABS., INC., Kalmus Engrg. Labs., Inc., 21820 -87th S.E., Woodinville, WA 98072, Tel: 206-481-8833, FAX: 206-486-1002; FSC No.: 057143; Empl.: 17; *Sls. Mgr.:* Jeannie Olson

RGB SPECTRUM, 2550 Ninth St., Berkeley, CA 94710, Tel: 415-848-0180, FAX: 415-848-0971; Empl.: 30; *Sls. Mgr.:* Lucien E. Long; *Dist. Mgr.:* Lucien E. Long

RHETOREX, INC., 1671 Deli Ave. No. 208, Campbell, CA 95008, Tel: 408-370-0881, FAX: 408-370-1171; Empl.: 15; *Sls. Mgr.:* Michael Ross

RHG ELECTRONICS LABORATORY, INC., 161 E. Industry Ct., Deer Park, NY 11729, Tel: 516-242-1100, FAX: 516-242-1222; Empl.: 205; *Sls. Mgr.:* David E. Krautheimer

RHOMBUS INDUSTRIES, 15801 Chemical Ln., Huntington Bch., CA 92649-1595, Tel: 714-898-0960, TWX: 910-596-1826, FAX: 714-896-0971; FSC No.: 16714; Empl.: 60; *Sls. Mgr.:* Jim Earley; *Dist. Mgr.:* Jim Earley

RICHARD HIRSCHMANN OF AMERICAN, See Hirschmann

RICHARD-LEE CO., 3 Quine St., Cranford, NJ 07016, Tel: 201-276-0710, FAX: 201-276-6179; Empl.: 13

RICHARDS, ARKLAY S., CO., INC., 72 Winchester St., Newton Highlands, MA 02161-1796, Tel: 617-527-4385, FAX: 617-964-3746; *Sls. Mgr.:* L. K. Richards

RICHARDSON ELECTRONICS, LTD., 40W267 Keslinger Rd., LaFox, IL 60147, Tel: 800-323-1770, 708-208-2200, FAX: 708-208-2550; FSC No.: 5L804; Empl.: 625; *Sls. Mgr.:* Chris Cane; *Dist. Mgr.:* Chris Cane

RICHCO PLASTIC CO., P.O. Box 804238, Chicago, IL 60680, Tel: 312-539-4060, FAX: 312-539-6770; FSC No.: 06915; Empl.: 400; *Sls. Mgr.:* Ted E. Pavoris; *Dist. Mgr.:* Ted Pavoris

RIDGE TOOL CO., Sub. Emerson Elec. Co., 400 Clark St., Elyria, OH 44036, Tel: 216-323-5581, TELEX: 0243420, FAX: 216-323-5204; *Dist. Mgr.:* John Drew

RITTAL CORP., 3100 Upper Valley Pike, Springfield, OH 45504-9807, Tel: 800-477-4000, TELEX: 513-390-5599; Empl.: 150

RITZ ELECTRONICS/RELCO, 196 Queen St. N., New Dundee, Ont., Canada N0B 2E0, Tel: 519-696-2616, FAX: 519-696-2670; Empl.: 30; *Sls. Mgr.:* Leonard Snow; *Dist. Mgr.:* Leonard Snow ..... **C•1092; D•2027**

Local Sales Offices & Reps

CA	Torrance, U.S. Power Converting Co.	213-316-9984
KS	Wichita, US Power/Relco Midwest	316-722-6440
Can	New Dundee, Ont., Ritz Elctrns.	519-696-2616

Local Distributors

CA	Torrance, Leonard Snow & Assocs./U.S. Power	213-316-9984
KS	Wichita, US Power/Relco Midwest	316-722-6440
Can	New Dundee, Ont., Ritz Elctrns.	519-696-2616

RJF INTERANTIONAL CORP., 3875 Embassy Pkwy., Fairlawn, OH 44333, Tel: 216-668-7689, FAX: 216-668-7701

R-K ELECTRONICS, 11560 Goldcoast Dr., Cincinnati, OH 45249, Tel: 513-489-4060

RLC ELECTRONICS, INC., 83 Radio Cir., Mt. Kisco, NY 10549, Tel: 914-241-1334, TWX: 710-571-2103, FAX: 914-241-1753; FSC No.: 12598; Empl.: 75; *Sls. Mgr.:* Joseph Norelli; *Dist. Mgr.:* Joseph Norelli

RMF PRODUCTS, INC., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, Tel: 708-879-0020, FAX: 708-879-6749; Empl.: 11; *Sls. Mgr.:* R. Frieders ..... **C•1593**

RMS COMPANY, Connector Division, 980 Osborne Rd., Minneapolis, MN 55432, Tel: 612-786-1520, FAX: 612-786-1771; Empl.: 50; *Sls. Mgr.:* Jack M. Lundeen

RMS TECHN., 11833 Canon Blvd., Ste 100, Newport News, VA 23606, Tel: 804-873-0100, FAX: 804-873-1512; FSC No.: 59606; Empl.: 42

ROANWELL, 180 Varick St., New York, NY 10014, Tel: 212-989-1090, TWX: 710-581-6555, FAX: 212-989-3285; FSC No.: 82872; Empl.: 80; *Sls. Mgr.:* Ray Lefebvre; *Dist. Mgr.:* Ray Lefebvre

RO ASSOCIATES

FAX: 408-744-1521

RO ASSOCIATES, INC., 246 Caspian Dr., Box 61419, Sunnyvale, CA 94088, Tel: 408-744-1450; FSC No.: 24230; Empl.: 47; *Sls. Mgr.:* R. D. Okada ..... **D•2028-2033**

Local Sales Offices & Reps

AL	JSI Inc.	205-883-4163
AL	Huntsville, JSI, Inc.	205-883-4163
AZ	Phoenix, Tech. Sls. Inc.	602-246-1614

CA	Los Angeles, West Coast Reps.	213-690-9960
CA	San Diego, W. Coast Rep	619-581-2406
CA	San Jose, P & M Elctrns.	408-287-0402
CO	Denver, F.G. Mktg.	303-795-9176
CT	Woodbury, Power Factor	203-264-9812
DC	Washington, Gans & Pugh	703-709-0305
FL	Ft. Lauderdale, Panamtech	305-587-3769
FL	Orlando, Panamtech	407-679-5506
IL	Chicago, Mar-con Assocs. Inc.	708-675-6450
KS	Kansas City, Midtec	913-541-0505
MD	Baltimore, Gans & Pugh	301-442-2189
MA	Boston, Power Factor	508-234-6415
MN	Minneapolis, R J Inc.	612-866-3661
MO	St. Louis, Midtec	314-275-8666
NM	Albuquerque, Fry-Gates, Inc.	505-262-1525
NY	Buffalo, NRM Mktg.	716-634-4300
NY	Great Neck, M.O.S. Mktg.	516-487-3966
NY	Rochester, NRM Mktg.	716-352-9166
NY	Syracuse, NRM Mktg.	315-685-8991
OH	Centerville, Omega Sls., Inc.	513-434-5507
PA	Philadelphia, Gans & Pugh	215-699-6655
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
WA	Seattle, West Coast Reps.	206-483-5300
Can	Vancouver, BC, Tracan Elctrn. Western Ltd.	604-984-4141

ROBBINS & MYERS/ELECTRO-CRAFT, 6950 Washington Ave. So., Eden Prairie, MN 55344, Tel: 612-942-3600, FAX: 612-942-3636; *Sls. Mgr.:* Terry McDonald; *Dist. Mgr.:* Brad Nelson

ROBINSON NUGENT, INC., 800 East 8th St., New Albany, IN 47150, Tel: 812-948-0564, TWX: 810-540-4082, FAX: 812-945-0804; Empl.: 567; *Sls. Mgr.:* Terry Johnson; *Dist. Mgr.:* Vic Siccone

Local Sales Offices & Reps

IN	New Albany, Robinson Nugent, Inc.	812-948-0564

ROBISON ELECTRONICS, P.O. Box 8121, San Luis Obispo, CA 93403-8121, Tel: 805-544-8000, FAX: 805-544-8091; FSC No.: 19080; Empl.: 83

ROCKLAND INSULATED WIRE & CABLE, 87 Broadway, Haverstraw, NY 10927, Tel: 914-429-3103, FAX: 914-947-1712; FSC No.: 12111

ROCKLAND SCIENTIFIC CORPORATION, P.O. Box 3135, Princeton, NJ 08543, Tel: 609-896-2255, FAX: 609-895-9726; Empl.: 60; *Sls. Mgr.:* M. Classen

ROCKWELL INTERNATIONAL, 2990 Airway Ave., Costa Mesa, CA 92626, Tel: 714-641-5311, TELEX: 685532 COLLINS CSMA, FAX: 714-641-5320; Empl.: 60; *Sls. Mgr.:* Robert A. Johnson

ROCKWELL INT'L:SEMICONDUCTOR PRODUCTS DIVISION, 4311 Jamboree Rd., Newport Beach, CA 92660, Tel: 714-833-4600, TWX: 910-591-1698; FSC No.: 34576; Empl.: 1995; *Sls. Mgr.:* Ernie Raper, Dir. of Sls.; *Dist. Mgr.:* K. Reutemann

RODALE
Technical Sales Inc.

FAX: 516-277-8375

RODALE TECHNICAL SALES INC., 577 Main Street, Islip, NY 11751, Tel: 516-277-5454, TELEX: 5106007812, ESYLNK: T8003254112; Empl.: 10; *Sls. Mgr.:* Gene Lipman ..... **B•1182, 1388; C•1662-1663, 1816-1817**

Local Sales Offices & Reps

CA	Yorba Linda, Rodale Tech. Sls., Inc.	714-283-3140
KS	Prairie Village, Crosslink Elctrl./Elctrns.	913-432-6100
NY	Islip, Rodale Tech. Sls., Inc.	516-277-5454
OH	Bedford Hgts., P.H.P.	515-472-5984

Local Distributors

AZ	Phoenix, Storm Prods.	602-269-3485
CA	Inglewood, Storm Prods.	213-776-8141
CA	Sacramento, AVAC Sunset	1-800-AVAC-DIV
CA	Santa Ana, BDS Elctrns., Inc.	714-662-1050
CO	Broomfield, Storm Prods.	303-466-1991
MN	St. Paul, AVAC Mid-America	1-800-AVAC-DIV
NJ	Edison, AVAC National	1-800-AVAC-DIV
TN	Nashville, AVAC Pioneer Tenn.	1-800-AVAC-DIV
TX	Dallas, Storm Prods.	214-330-1381
WA	Woodinville, Storm Prods.	206-488-7400

RODANN ELECTRONICS MFG. CO., 133 S. Brea Blvd, Brea, CA 92621, Tel: 714-529-1301, 800-366-7010, FAX: 714-529-9564; *Sls. Mgr.:* Alex Skarbek

RODELCO ELECTRONICS CORP., 111 Haynes Ct, Ronkonkoma, NY 11779, Tel: 516-981-0900, FAX: 516-981-1792; Empl.: 44

ROD-L
ELECTRONICS, INC.

FAX: 415-326-1993

ROD-L ELECTRONICS, INC., 923 Hamilton Ave., Menlo Park, CA 94025, Tel: 415-322-0711, 1-800-548-6305, TWX: 296210; *Sls. Mgr.:* Tom Cooke .... **D•1316-1317**

Local Sales Offices & Reps

CA	Menlo Park, ROD-L (factory)	415-322-0711
CO	Conifer, Energy Equip. Sls.	303-972-3335
IL	Elk Grove, Loren Green Assocs.	312-593-0282
IN	Indianapolis, Loren Green Assocs.	317-293-9827
KS	Lenexa, Midtec Assocs.	913-541-0505
MD	Cockeysville, Sci. Reps.	301-321-1411
MA	Reading, Scheinfein Assocs.	617-944-2304
MI	Detroit, Micro Sls	313-464-4520
MN	Minneapolis, Hei-Lite Sls	612-861-6051
MO	St. Louis, Midtec Assocs.	314-275-8666
NJ	Fairfield, Addem Sls.	201-882-0993
NJ	Pennsauken, Sci. Reps.	609-662-5222
NY	De Witt, DB Assocs.	315-446-0220
OH	Centerville, Micro Sls.	513-433-8171
OH	N. Olmsted, Micro Sls	216-734-3080
OK	Tulsa, Spectra Sls	918-663-7188
OR	Beaverton, Core II Mktg	503-641-0877
TX	El Paso, Venturesearch	915-594-4094
TX	Houston, Spectra Sls.	713-270-8212
TX	Richardson, Spectra Sls.	214-234-3600
VA	Fairfax, Sci. Reps.	703-385-0600
WA	Redmond, Core II Mktg	206-885-4344
WA	Spokane, Core II Mktg	509-922-2971
WV	Pittsburg, Micro Sls	412-471-0105
Can	Ontario, Webster Instrs. Ltd.	416-625-0600

Local Distributors

CA	Menlo Park, Rod-L (Factory)	415-322-0711
Can	Ontario, Webster Instrs. Ltd.	416-625-0600

ROEAN INDUSTRIES, INC., 12970 Branford, Ste. C, Pacoima, CA 91331, Tel: 818-767-7047, FAX: 818-768-4974; Empl.: 8

ROGAN, 3455 Woodhead Dr., Northbrook, IL 60062, Tel: 708-498-2300, FAX: 708-498-2334; FSC No.: 86797; Empl.: 100; *Sls. Mgr.:* D. Pelletier; *Dist. Mgr.:* D. Pelletier

ROGERS CORP. DIV. POWER DISTBN.DIV., 5750 East McKellips Rd., Mesa, AZ 85205, Tel: 602-830-3370, FAX: 602-830-3370

ROGERS CORPORATION, Circuit Components Div., 2400 S. Roosevelt St., Tempe, AZ 85282, Tel: 602-967-0624, FAX: 602-967-9385

ROGERS CORPORATION, Circuit Materials Div., Box 4000, Chandler, AZ 85244, Tel: 602-963-4584, FAX: 602-732-9381

ROGERS CORPORATION, Flexible Interconnections Div., Box 700, Chandler, AZ 85244, Tel: 602-963-4584, TELEX: 140-223, TWX: 910-950-1961, FAX: 602-786-8490; *Sls. Mgr.:* Darrel Brasch

ROGERS CORPORATION, Microwave & Circuit Matls. Div., 100 S. Roosevelt Ave., Chandler, AZ 85226, Tel: 602-961-1382, FAX: 602-961-4533

ROGERS CORPORATION, Molding Materials Div., P.O. Box 550, Manchester, CT 06040, Tel: 203-646-5500, FAX: 203-646-5503

ROGERS CORPORATION, Power Distribution Div., 5750 E. McKellips Rd., Mesa, AZ 85205, Tel: 602-830-3370, FAX: 602-396-6401

ROGERS CORPORATION, Soladyne Div., 7447 Convoy Ct., San Diego, CA 92111, Tel: 619-279-7872, FAX: 619-277-9105; FSC No.: 55655; *Sls. Mgr.:* Dale Reed; *Dist. Mgr.:* Rick Jansen

ROGERS CORP., One Technology Dr., Rogers, CT 06263, Tel: 203-774-9605, TWX: 710-448-0047; Empl.: 2500

ROH, Portland Instrument, 6120 San Fernando Rd., Glendale, CA 91201, Tel: 818-500-0137, FAX: 818-240-1828; Empl.: 10; *Sls. Mgr.:* Dick Herbert

Local Distributors

CA	Los Angeles, Hoffman Video Sys.	213-749-3311
FL	Miami, Midwest Communications	305-592-5355
KY	Hebron, TV One	606-689-4515

ROHDE & SCHWARZ, INC., 4425 Nicole Drive, Lanham, MD 20706, Tel: 301-459-8800, FAX: 301-459-2810; FSC No.: 82199; Empl.: 65

ROHM

FAX: 615-641-2022

ROHM CORPORATION, Rohm Electronics Division, 3034 Owen Drive, Antioch, TN 37013, Tel: 615-641-2020; Empl.: 115; *Sls. Mgr.:* Mike DelGrippo; *Dist. Mgr.:* Steve Bishop .... **A•1742, 1984-1985, 2120-2121; B•1183**

Local Sales Offices & Reps

AL	Huntsville, Strategic Mktg.	205-464-0490
AZ	Tucson, Clemick & Assocs.	602-749-4003
CA	Camarillo, Eltec Entprs.	805-484-8298
CA	Cupertino, GetSales	408-725-8384
CA	Dana Point, Eltec Entprs.	714-493-7003
CA	Diamond Bar, Eltec Entprs.	714-861-4779
CA	San Diego, C.K. Assocs.	619-279-0420
CO	Parker, A5 Company	303-841-3651
FL	Altamonte Springs, Sales Engrg. Concepts	407-682-4800
FL	Deerfield Bch., Sales Engrg. Concepts	305-426-4601
IL	Lake Bluff, Hopewell Assocs.	708-234-3310
IN	Kokomo, Schillinger Assocs., Inc.	317-455-2708
IA	Cedar Rapids, Electromec Sls., Inc.	319-393-1637
KS	Kansas City, B.C. Elctrn. Sls.	913-342-1211
MD	Westminster, Chesapeake Technlgs.	301-876-4318
MA	Harvard, Cycle Sls.	508-456-6868
MI	Grosse Pointe Pk., Greiner Assocs., Inc.	313-499-0188
MN	Burnsville, Electromec Sls., Inc.	612-894-8200
MO	Bridgeton, B.C. Elctrn. Sls., Inc.	314-739-6683
NJ	Springfield, Radix, Inc.	201-467-4970
NY	Buffalo, Quality Comps., Inc.	716-837-5430
NY	Manlius, Quality Comps., Inc.	315-682-8885
NY	Rochester, Quality Comps., Inc.	716-342-7229
NC	Cary, Rohm Corporation	919-460-5959
OR	Tigard, Comps. West, Inc.	503-684-1671
PA	Prospect Park, ELF Sls. Co.	215-534-3340
TN	Jonesboro, Strategic Mktg.	615-753-5518
TN	Nashville, Strategic Mktg.	615-883-7882
TX	Austin, Sage Mktg.	512-335-0300
TX	Bedford, Sage Mktg.	817-267-7781
TX	Denton, Rohm Corporation	817-383-3931
WA	Redmond, Comps. West, Inc.	206-885-5880
WA	Spokane, Comps. West, Inc.	509-922-2412
PR	Puerto Rico, Sales Engrg. Concepts	809-250-0140 x 5321
Can	Hamilton, Ont., Cartwright-Southall Assocs.	416-528-0294
Can	Nepean, Ont., Cartwright-Southall Assocs.	613-723-6733

ROLYN OPTICS CO., 706 Arrowgrand Circle, Covina, CA 91722-2199, Tel: 818-915-5707/5717, TELEX: 67-0380, FAX: 818-915-1379

ROSE ELECTRONICS, INC., Energy Products Group, 1991 Concourse Dr., San Jose, CA 95131, Tel: 408-943-0440, FAX: 408-943-0360; Empl.: 13; *Sls. Mgr.:* Bob Burres; *Dist. Mgr.:* Bob Burres

ROSE ENCLOSURES SYS., INC., 7330 Executive Way, Frederick, MD 21701, Tel: 301-696-9800, FAX: 301-696-9494; FSC No.: 4Y520/C0242; Empl.: 45; *Sls. Mgr.:* Warren Hudacek ..... **C•1093**

Local Sales Offices & Reps

CA	Irvine, Comp. Mktg.	714-951-5950
FL	Tampa, Florida Comp. Sls.	813-960-7044
MA	Needham, Todino Eng. Sls.	617-444-7925
IL	Chicago, Paddock Mktg.	312-452-7852
IA	Cedar Rapids, Tech. Elctrns.	319-366-5443
NY	Rochester, Tech. Comp. Sls.	716-342-2406
NC	Kernersville, Heritage Sls.	919-996-4374
OH	Dayton, J.C. Hofstetter Co.	216-241-4880
PA	Frazer, ICI	215-889-0650
TX	Dallas, D.J. Sls. & Assoc.	214-783-8876
WA	Federal Way, K. R. Jensen Sls.	206-874-2772

Local Distributors

Can	Vancouver, BC, Memco	604-590-1553

ROSEMONT-NASHVILLE, INC., See Chromalox Instrs. & Controls

ROSEMOUNT®

FAX: 201-857-9403

ROSEMOUNT ANALYTICAL INC., 89 Commerce Rd., Cedar Grove, NJ 07009, Tel: 800-367-7242 .... **D•1318**

Local Sales Offices & Reps

AL	Birmingham	205-988-5759
AL	Mobile	205-343-9403
AZ	Phoenix	602-867-9374
CA	Concord	415-674-9799
CA	Laguna Hills, Kendall Mktg.	714-581-9951
CA	LaHabra	213-694-5504
CO	Lakewood	303-935-1524
FL	Maitland	407-740-0170
GA	Marietta	404-426-1300
HI	Honolulu	808-842-4484
IL	Lombard	708-495-8383
IN	Indianapolis	317-247-4613
KS	Shawnee Mission	913-642-8560
LA	Baton Rouge	504-756-7000
LA	Lake Charles	318-436-1828
TX	Stafford	713-274-0500
MD	Hunt Valley	301-527-1030
MA	Westborough	508-898-2444
MI	Brighton	313-227-3622
MN	Bloomington	612-832-5001
MO	Bridgeton	314-739-1540
NJ	Fairfield	201-808-9168
NY	Fairport	716-223-0400
NC	Charlotte	704-523-2223
NC	Raleigh	919-783-6730
OH	Cincinnati	513-381-5343
OH	Independence	216-661-9800
OK	Tulsa	918-663-6025
PA	King of Prussia	215-768-6900
PA	Pittsburgh	412-787-7340
TN	Knoxville	615-588-0014
TN	Memphis	901-365-9906
TX	Dallas	214-869-1461,62
TX	Round Rock	713-274-0500
VA	Midlothian	804-739-0660
WA	Bellevue	206-451-1111
WI	Appleton	414-731-8757

ROSENBERGER-MICRO COAX, (Formerly Micro-Coax Components, Inc.), Box E, Collegeville, PA 19426, Tel: 215-489-3700, FAX: 215-489-1103; Empl.: 50; *Sls. Mgr.:* Lloyd Deery

ROSS ENGINEERING CORP., 540 Westchester Dr., Campbell, CA 95008, Tel: 408-377-4621, FAX: 408-377-5182; FSC No.: 23598; Empl.: 45; *Sls. Mgr.:* Jim Ross; *Dist. Mgr.:* Jim Ross ..... **B•1230, 1567-1569; D•1319**

ROTEK INSTRUMENT CORP., 390 Main St., Waltham, MA 02254, Tel: 617-899-4611, TELEX: 928034; FSC No.: 06678; *Sls. Mgr.:* Eliot Warner

ROTORK CONTROLS, INC., 19 Jetview Drive, Rochester, NY 14624, Tel: 716-328-1550, FAX: 716-328-5848; Empl.: 65; *Sls. Mgr.:* Chris Warnett; *Dist. Mgr.:* Chris Warnett

ROWE INDUSTRIES, INC., 6225 Benore Rd., P.O. Box 6877, Toledo, OH 43612, Tel: 419-729-9761, FAX: 419-729-1794; FSC No.: 82878; Empl.: 89 ..... **C•1513-1515, 1819**

Local Sales Offices & Reps

AL	Huntsville, South Design & Mktg.	205-880-3623
AZ	Phoenix, Blackhart Assocs.	602-893-3488
CA	Morgan Hill, Val. C. Robinson	408-778-6210
FL	Maitland, EIR, Inc.	407-660-9600
IL	Lisle, Connect-Plus	708-355-6363
MD	Kensington, Koebert Assocs.	301-493-8924
MA	Burlington, Don C. Richard	617-273-3888
MN	Stillwater, Kits, Co.	612-439-8088
PA	Glenside, Koebert Assocs.	215-887-2310
TX	Roanoke, CMR	817-379-6540
WA	Bellevue, Advanced Power Comps.	206-747-9127
WV	Inwood, Koebert Assocs.	304-229-8401

Local Distributors

MN	Bloomington, Triad Wire & Cable	612-884-7390

MILTON ROY CO., Environmental, 1238 W. Grove Ave., Orange, CA 92665-4134, Tel: 714-974-5560, FAX: 714-921-2531; Empl.: 60; *Sls. Mgr.:* Harold Peper

ROYONIC INC., 25345 Ave. Stanford, Ste. 201, Valencia, CA 91355, Tel: 805-257-0303, TELEX: 315672, ESYLNK: 62840158, FAX: 805-257-0802; Empl.: 11; *Sls. Mgr.:* Rory Stoner

RTRON CORP., 8151 N. Ridgeway, Skokie, IL 60076, Tel: 708-679-7180, FAX: 708-675-3709; FSC No.: 19130; *Sls. Mgr.:* R. McLean

RTS SYSTEMS, TELEX COMMUNICATIONS, INC., 1100 W. Chestnut St., Burbank, CA 91506, Tel: 818-566-6700, TELEX: 194855, FAX: 818-843-7953; FSC No.: 60572; Empl.: 45; *Sls. Mgr.:* Shelley Brown Harrison; *Dist. Mgr.:* Shelley Brown Harrison

RUBYCON AMERICA, INC., 4293 Lee Ave., Gurnee, IL 60031, Tel: 708-249-3450, FAX: 708-578-1300; Empl.: 8; *Sls. Mgr.:* Jeffrey W. Swanson; *Dist. Mgr.:* Jeffrey W. Swanson

RUNDEL PRODUCTS, Allied Controls Incorporated, 562 Captain Neville Drive, Waterbury, CT 06705, Tel: 203-757-4200, FAX: 203-757-4204; FSC No.: 02288; *Sls. Mgr.:* J. T. Kryjak; *Dist. Mgr.:* D. Varga ..... **B•1768-1769**

Local Sales Offices & Reps

AZ	Phoenix, BLS Comms.	602-841-6613
CA	Irvine, Component Mktg. Assoc.	714-727-0688
CA	Tarzana, Comp. Mktg. Assoc.	818-708-8058
CT	Waterbury, Allied Controls, Inc.	203-757-4200
FL	Lakeland, Munday Sls. Co.	813-858-5606
IL	Skokie, Indl. Reps.	312-967-8430
IN	Indianapolis, M & L Elctrn. Sls., Inc.	317-359-4742
MD	Burtonsville, Chesapeake Technlg.	301-236-0530
MN	Bloomington, Indl. Reps. Inc.	612-854-8027
NJ	Englewood, Gray Assocs., Inc.	201-894-0894
NJ	Kenvil, Gray Assocs., Inc.	201-927-6662
OH	Beachwood, Elctrn. Salesmasters Inc.	216-831-9555
TX	Austin, Comp. Technlg.	512-250-2450
TX	Dallas, Component Technlgy.	214-783-8831
TX	Houston, Comp. Technlg.	713-961-1262
WI	Brookfield, Indl. Reps. Inc.	414-789-9393

RUSH ENTERPRISES INC.:A HEICO COMPANY, 20 Hampshire Drive, Hudson, NH 03051, Tel: 603-886-9460, FAX: 603-886-0372; Empl.: 14; *Sls. Mgr.:* William A. Walsh

RUSSTECH ENGINEERING COMPANY, INC., 23322 (D) Madero Road, Mission Viejo, CA 92691, Tel: 714-472-0880, FAX: 714-472-1081; FSC No.: 01EG24; *Sls. Mgr.:* David Zoscak

RUSTRAK INSTRUMENTS, Mark IV Company, Rte. 2 & Middle Rd., E. Greenwich, RI 02818, Tel: 401-884-6800, 800-332-3202, TWX: 710-387-1500; Empl.: 250; *Sls. Mgr.:* John Olobri; *Dist. Mgr.:* John Olobri ..... **D•1423**

Local Distributors

AZ	Tempe, CMI Metermaster	602-431-0015
CA	Fullerton, Rustrak	714-879-6384
CA	Hayward, Coast Inst.	415-786-9300
CA	San Marcos, Mitchell Inst.	619-744-2690
CO	Commerce City, WACO Elctrns.	303-289-4743
CT	Middletown, EIL Instrs.	203-346-6646
FL	Lakeland, AA Elec.	813-665-6941
GA	Forest Park, Brownell Electro	404-362-9009
IL	Des Plaines, Rustrak	312-803-5390
MD	Sparks, EIL Instrs.	301-771-4800
MA	Burlington, EIL Instrs.	617-272-9450
MI	Grand Rapids, Smith Inst.	616-245-1195
MI	Royal Oak, George Inst.	313-280-1111
MO	St. Louis, Indl. Svc. Labs	314-423-3141
NJ	Newark, Norman Bragar Prods.	201-344-1100
NC	Charlotte, Brownell Electro	704-597-1270
OH	Cincinnati, Schlemmer Assocs.	513-522-8340
OH	Cleveland, M.A. Blankenberg	216-251-7010
PA	Philadelphia, Sunshine Scientific	215-673-5600
RI	E. Greenwich, Rustrak	800-332-3202
TX	Dallas, Inotek Corp.	214-243-8370
TX	Houston, American Analog	713-941-7265
WA	Seattle, Branom Inst.	206-762-6050
WI	Waukesha, Wisconsin Control Corp.	414-796-0290
Can	Mississauga, Ont., Webster Inst.	416-625-0600

RUTHERFORD RESEARCH, Box 249, Rutherford, NJ 07070, Tel: 201-933-2091; Empl.: 4; *Sls. Mgr.:* Dr. A. Blanck; *Dist. Mgr.:* Dr. A. Blanck

R X D INC., Relm Communications, 806 Custer Ave., Norfolk, NE 68701, Tel: 402-379-0012, 800-228-8108, FAX: 402-379-3074 ..... **A•1452-1454**

RYAN INTERNATIONAL CORP., 4800 Evanswood Dr., Columbus, OH 43229-6207, Tel: 614-885-3303, FAX: 614-885-8307; Empl.: 30

RYE INDUSTRIES, INC., 3337 Air Park Rd., Fuquay-Varina, NC 27526, Tel: 919-557-0511, TELEX: 919-557-0510; Empl.: 5

S A B NIFE, INC., Div. of Sonesson, P.O. Box 7366, 251 Industrial Blvd., Greenville, NC 27834, Tel: 919-830-1600, TELEX: 92-9407; Empl.: 150; *Sls. Mgr.:* Alan Feo; *Dist. Mgr.:* Alan Feo

SABRE COMMUNICATIONS CORP., 3400 Hwy 75 N., P.O. Box 536, Sioux City, IA 51102, Tel: 712-258-6690, FAX: 712-258-8250; FSC No.: 60348; *Sls. Mgr.:* Jerry W. Audus; *Dist. Mgr.:* Larry D. Vaydich

SABRITEC, 1733 Kaiser Ave., Irvine, CA 92714, Tel: 714-660-1970, TELEX: 678401, FAX: 714-660-9136; FSC No.: 58795; Empl.: 49

SACO CONTROLS INC., 9700 Trans Canada Hwy., Montreal,Qc., Canada H4S 1V9, Tel: 514-745-0310, TELEX: 055-62171, FAX: 514-745-0315; Empl.: 36; *Sls. Mgr.:* Pat Argento

SAFE POWER, Acme Electric Corporation, 5416 Amelia Earhart Dr., Salt Lake City, UT 84116, Tel: 801-539-0227, 1-800-325-5848, FAX: 801-539-0237; *Sls. Mgr.:* Rod Pullen; *Dist. Mgr.:* Jim Heidenreich

SAFT AMERICA INC., Power Sources Div., 711 Industrial Blvd., Valdosta, GA 31601, Tel: 912-247-2331, TELEX: 547620, TWX: 810-786-5866, FAX: 912-247-6680; Empl.: 200 ..... **D•1426, 1486-1488**

SAFT AMERICA INC., Advanced Battery Systems Div., 107 Beaver Ct., Cockeysville, MD 21030, Tel: 301-771-3200, FAX: 301-771-1144 ..... **D•1426**

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SAFT

FAX: 912-247-6680

SAFT AMERICA, INC., Portable Battery Division, 711 Industrial Blvd., Valdosta, GA 31601, Tel: 912-247-2331, TELEX: 547-620; Empl.: 600; *Sls. Mgr.:* Michael Marcoux ..... **D•1426, 1486-1488**

Local Sales Offices & Reps

CA	Camarillo, SAFT America, Inc.	805-482-4101
CA	Granada Hills, SAFT America, Inc.	818-360-1853
CA	Redwood City, SAFT America Inc.	415-365-4539
FL	Boca Raton, SAFT America, Inc.	407-338-7730
GA	Kennesaw, SAFT America Inc.	404-429-4938
GA	Marietta, SAFT America, Inc.	404-992-6950
IL	Naperville, SAFT America, Inc.	708-355-8990
IL	Oak Forest, SAFT America, Inc.	708-687-6690
TX	Dallas, SAFT America, Inc.	214-239-3935
MN	Inver Grove Hgts., SAFT America Inc.	612-552-0121
OH	Brownsville, SAFT America, Inc.	216-861-1877
PA	McKean, Advacom	814-476-7774

Local Distributors

AZ	Phoenix, Lynntronics	602-433-0288
CA	Carlsbad, Quantum Batteries	619-438-2202
CA	Chatsworth, Mill Comm. Distrs., Inc.	818-998-3111
CA	Costa Mesa, House of Batteries	714-548-3968
CA	Hawthorne, Kent Elctrns.	213-970-0997
CA	Mountain View, Energy Sls.	415-969-0800
CA	N. Hollywood, C.H. & M	818-982-3150
CA	San Rafael, Elctrns. Plus	415-457-0466
CO	Littleton, AVT	303-798-1958
FL	Altamonte Springs, TNR Tech.	407-682-4311
FL	Hialeah, Pro Battery	305-884-4040
GA	Decatur, ELS Prods.	800-334-5066
IL	Downers Grove, Telecomms. Dvcs., Inc.	708-971-3460
IL	Lisle, Jabro Batteries	708-964-9358
IL	Rosemont, Advent Elctrns.	708-297-6200
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
MA	Andover, Generation Elctrns.	508-683-1177
MA	Billerica, A. W. Mayer Co., Inc.	617-229-2255
MA	Middleboro, Glynn Elctrns.	508-947-4262
MA	Sharon, Adcour	617-784-8123
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Livonia, R. S. Elctrns.	313-525-1155
MI	Livonia, Vidcom	313-462-9400
MN	St. Paul, D. C. Battery Prods. Inc,	612-646-7478
NY	Farmingdale, Delta Concepts	516-845-1294
NY	Flushing, W & W Assocs.	718-961-2103
NY	Rochester, Masline Elctrns.	716-546-5373
NC	Charlotte, Electro Sys., Inc.	704-525-2421

PA Bensalem, Avex Elctrns. Corp. 215-638-3300
PA McKean, Advacom 814-476-7774
TN Mt. Juliet, Batteries Unlimited 615-754-8179
TX Austin, Kent Elctrns. 512-834-1900
TX Houston, Kent Elctrns. 713-780-7770
TX Houston, Lone Star Mktg. 713-589-0853
TX Richardson, Kent Elctrns. 214-669-2600
TX Spring, Jabro Batteries, S.W. 713-367-9393
UT Salt Lake City, Standard Supp. Co. 801-486-3371
VA Falls Church, Perrott Engrg. Labs, Inc. 703-532-0700
WA Redmond, Energy Sls. 206-883-2343

SAGE LABORATORIES, INC., 11 Huron Dr., Natick, MA 01760, Tel: 508-653-0844, TWX: 710-346-0390, FAX: 508-653-5671; FSC No.: 07180; Empl.: 43; *Sls. Mgr.:* Tony Cieri

SAINT SWITCH, INC., 103 N. 11th Ave.,Box 604, St. Charles, IL 60174, Tel: 708-377-3779, FAX: 708-377-7438; FSC No.: 60198; Empl.: 30

SAMARIUS PRECISION INSTRUMENTS, INC., 562 Captain Neville Drive, Waterbury, CT 06705, Tel: 203-756-7030, FAX: 203-757-4204; FSC No.: 18065; Empl.: 25; *Sls. Mgr.:* Isabella Dobbins

SAMATIC WINDING MACHINE, Jenlor Ltd., 200 Highbridge St., Fayetteville, NY 13066, Tel: 315-637-9080, FAX: 315-637-9149; Empl.: 15; *Sls. Mgr.:* Jim Philips; *Dist. Mgr.:* Jim Phillips

SAMHWA

FAX: 805-584-9498

SAMHWA U.S.A. INC., 709 E. Cochran St. Bldg. 1A, 1B, Simi Valley, CA 93065, Tel: 805-584-9494, 800-800-0069; Empl.: 8; *Sls. Mgr.:* Joseph Buckle

SAMSUNG ELECTRON DEVICES, See Samtron Displays, Inc.

SAMTEC, INC., 810 Progress Blvd., P.O. Box 1147, New Albany, IN 47150, Tel: 812-944-6733, TWX: 810-540-4095, FAX: 812-948-5047; FSC No.: 55322; Empl.: 200; *Sls. Mgr.:* Mike Hynes

SAMTRON DISPLAYS, INC., SAMSUNG Electron Devices, 14251 E. Firestone Bl. No. 101, La Mirada, CA 90638, Tel: 213-802-8425, TWX: 183423 SEDLA; *Sls. Mgr.:* Myung Bang ..... **B•1114-1116**

Local Sales Offices & Reps

AL Huntsville, SCSI 205-533-6500
AZ Phoenix, Moss Mktg. 602-433-9349
CA Solana Beach, D2 619-481-9310
CT Torrington, Phoenix Sls. Co. 203-496-7709
GA Roswell, SCSI 404-594-7557
IL Arlington Heights, Coombs Assocs. ... 708-439-9810
IN Ft. Wayne, Gen II 219-436-4485
IN Louisville, Gen II 502-491-5250
KS Lenexa, A & M 913-888-0022
KY Indianapolis, Gen II 317-848-3083
MA Peabody, Orion Grp. 508-532-6266
MI Troy, C.B. Jensen 313-643-0506
MN Eden Prairie, Comtek 612-941-7181
NM Albuquerque, Moss Mktg. 505-292-7505
NC Raleigh, Zucker Assocs. 919-782-8433
OH Dayton, Midwest Mktg. 513-433-2511
OH Lyndhurst, Midwest Mktg. 216-381-8575
OR Beaverton, ATMI 503-643-8307
PA W. Conshohocken, Eastern Comp. 215-825-8610
WA Redmond, ATMI 206-882-4565
WI Milwaukee, Coombs Assocs. 414-351-6123
WI Watertown, Deaken Tech 414-261-7600
Can Mississauga, Ont., CMT 416-612-0900
Can Pointe Claire, Que., CMT 514-694-6088

Local Distributors

AZ Scottsdale, Added Value 602-951-9788, FAX:602-951-4182
CA
CA Laguna Hills, Jaco/Distel, Inc. 714-837-8966, FAX:714-837-8974
CA San Diego, Added Value 619-558-8890, FAX:619-558-3018
CA San Jose, JACO/DISTEL INC. 408-432-9290, FAX:408-432-9298
CA Tustin, Added Value 714-259-8258:FAX:714-259-0828
CA Visalia, Added Value 209-734-8861, FAX:209-734-8865
CA Westlake, JACO/DISTEL 805-495-9998, FAX:805-494-3864
CA Westlake Village, Added Value 818-889-2861, FAX:818-889-2472
CO Wheat Ridge, Added Value 303-422-1701, FAX:303-422-2529
CT Meriden, JACO Elctrns, Inc. 203-235-1422, FAX:203-634-4884
CT Wallingford, Green Shaw
FL Tampa, JACO/Q.C. 813-628-4665, FAX:813-626-8185
GA Norcross, JACO/Q.C. 404-449-9508, FAX:404-449-0275
IL Hoffman Estates, IEC 312-843-2040, FAX:312-843-2320
MD Columbia, JACO ELCTRNS, INC. 301-995-6620, FAX:301-995-6032
MA Tewksbury, Jaco Elctrn. Inc. 508-640-0010, FAX:508-640-0755
NY Hauppauge, Jaco Elctrns.,Inc. 516-273-5500, FAX:516-273-5799
NY Rochester, Cam RPC Elctrns. 716-427-9999, FAX:716-427-7559
NC Raleigh, Jaco/Q.C. 919-876-7767, FAX:919-876-6964
OH Dayton, Cam RPC Elctrns. 513-898-1111, FAX:513-433-6792
OK Tusla, Jaco/Q.C. 918-664-8515, FAX:918-664-8812
OR Beaverton, IEC 503-641-1690,FAX:503-646-3737
PA Pittsburgh, Cam RPC Elctrns. 412-963-6202, FAX:412-963-6210
TX Addison, Jaco/Q.C. 214-733-4300, FAX:214-250-0216
TX Austin, Added Value 512-454-8845, FAX:512-459-8043
TX Austin, Jaco/Q.C. 512-835-0220, FAX:512-339-9252
TX Dallas, Added Value 214-404-1144, FAX:214-404-1194
TX Sugar Land, Jaco/Q.C. 713-240-2255, FAX:713-240-6988
UT West Valley City, Added Value 801-977-9750, FAX:801-975-1207
WA Redmond, Jaco/Distel, Inc. 206-881-9700, FAX:206-881-9777

S & EI MANUFACTURING, 18800 Parthenia St., Northridge, CA 91324, Tel: 818-349-4111, FAX: 818-349-4651; FSC No.: 24152; Empl.: 35; *Sls. Mgr.:* Howard Johnson, VP Mktg. Sls.

S & H INDS., 2257 North Penn Rd., Hatfield, PA 19440, Tel: 215-822-7211; Empl.: 50; *Sls. Mgr.:* Bob Keiser

FAX: 805-544-3109

S & S ASSOCIATES, INC., 863 Via Esteban, San Luis Obispo, CA 93401, Tel: 805-544-2500; *Sls. Mgr.:* Bob Priest; *Dist. Mgr.:* Bob Priest ..... **C•1094-1096**

SAN FERNANDO ELEC. MFG., See SFE Technlg.

SANFORD-MILLER CORP., 8 John St., Lynbrook, NY 11563, Tel: 516-593-2025, 800-645-5900; Empl.: 10

SANGAMO COMPONENTS DIV., See Cornell Dubilier Electronics

SANGAMO COMPONENTS DIVISION, Box 128, Pickens, SC 29671, Tel: 803-878-6311, FAX: 803-878-7257; FSC No.: 00853

SANLAR, INC. T/A, Harbison Industrial Products, 7205 Hibbs La., Levittown, PA 19057, Tel: 215-943-9000, FAX: 215-949-1518; Empl.: 40

SAN-O INDUSTRIAL CORP., 85 Orville Dr., Bohemia, NY 11716, Tel: 516-567-5556, TWX: 510-228-7701, FAX: 516-567-5128; Empl.: 50; *Sls. Mgr.:* S.Terry/P. Wernick/C. Bornholdt

SANTA FE TEXTILES, Barcel Wire & Cable, 16951 Murphy Ave., Irvine, CA 92714-5885, Tel: 714-251-1960, FAX: 714-251-9006; FSC No.: 31415; Empl.: 20; *Sls. Mgr.:* Gamble M. Baffert

SANYO

SANYO Energy (U.S.A.) Corporation

FAX: 619-661-6743

SANYO ENERGY CORP., 1201 Sanyo Ave., San Diego, CA 92073, Tel: 619-661-6620, FAX: 619-661-6743; Empl.: 500; *Sls. Mgr.:* Joseph A. Carcone ..... **D•1489**

Local Sales Offices & Reps

AZ Phoenix, Lynntronics 602-433-0288
CA Mountain View, Energy Sls. 415-969-0800
CO Denver, Car-Go Battery 303-296-8763
CO Denver, West Inc. 303-477-8180
NJ Teterboro, Engrd. Assemblies 201-288-4477
NY Farmingdale, Milgray Elctrns. 516-420-9800
NC Winston-Salem, Progressive Techngs. 919-761-1375

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CA Escondido, Alexander Batteries 619-480-4445
CA Santa Clara, Cypress Elctrns. 408-980-8400
FL Altamonte Springs, TNR Tech. 800-346-0601

SANYO SEMICONDUCTOR CORP., 80 Commerce Dr., Allendale, NJ 07401, Tel: 201-825-8080; Empl.: 47; *Sls. Mgr.:* Yoshi Paulovich

Local Distributors

NJ Norwood, Sanyo Semiconductor Distbn. 201-784-0303

SAPHIKON, INC., 51 Powers St., Milford, NH 03055, Tel: 603-673-5831, FAX: 603-673-1256; Empl.: 75; *Sls. Mgr.:* Linda Berthiaume

..SaRonix.....

FAX: 415-856-4732

SARONIX, 151 Laura Lane, Palo Alto, CA 94303, Tel: 415-856-6900, TELEX: 348465; FSC No.: 61441; Empl.: 44; *Sls. Mgr.:* Dean Ransom; *Dist. Mgr.:* Dean Ransom ..... **A•1455-1459**

Local Sales Offices & Reps

AL Huntsville, Interep Assocs. Inc. 205-881-1096
CO Parker, Parker Webster Co. 303-841-4888
CT Torrington, Phoenix Sales 203-496-7709
FL Altamonte Springs, Sls. Engrg. Concepts 305-682-4800
FL Deerfield Beach, Sls. Engrg. Concepts 305-426-4601
GA Norcross, Interep 404-449-8680
IL Rolling Meadows, Phase II 708-806-1330
IN Indianapolis, EMCI 317-921-3450
MD Columbia, Genl. Radio Supp. 301-995-6744
MD Rockville, All American 301-251-1205
MA Norwell, Norris Assocs. Inc. 617-659-7988
MA Wakefield, All American 617-246-2300
MI Jenisen, R. C. Nordstrom & Co. 616-457-5762
MI Southfield, R. C. Nordstrom & Co. 313-559-7373
MN St. Paul, Innovate 612-225-9772
NV Reno, Galena Technlg. Grp. 702-746-0642
NJ Englewood, Harold Gray Assocs. 201-894-0894
NY Buffalo, Lynn Assocs. 716-631-0054
NC Raleigh, J & B Sls. 919-783-9440
OH Dayton, J. C. Hofstetter 513-459-1239
OH Medina, J. C. Hofstetter 216-241-4880
OR Beaverton, Pacific Mktg. Specialists Inc. 503-641-9373
TN Greenville, Interep 615-639-3491
TX Dallas, J.Y. Schoonmaker Co. 214-349-1650
TX Richardson, All American 214-231-5300
UT Murray, Parker Webster Co. 801-266-9939
WA Redmond, Pacific Mktg. Specialists ... 206-882-3144
WI Wauwatosa, Phase II 414-771-9986
EXP CA, Palo Alto, SaRonix 415-856-6900

Local Distributors

CA Anaheim, Deco Elctrns. 714-630-8252
CA Manhattan Bch., Prime Electro Prods. 213-379-3642
CA Manhattan Beach, Prime Electro Prods. 213-379-3642
CA San Diego, Deco Elctrns. 619-693-1595
CA Sherman Oaks, Delay Line Dists., Inc. 818-986-9455
CA Sunnyvale, Target Elctrns. 408-733-0384
CO Englewood, Indelco 303-795-3431
FL Melbourne, Genl. Radio Supp. Co. 407-242-8151
FL Miami, All American 305-621-8282
IL Palantine, Technlg. Sls. Inc. 708-991-6600
MA Wilmington, Northstar Elctrns. 508-657-5155
MN Eden Prairie, All American 612-944-2151
NJ Camden, General Radio Supp. Co. 609-964-8560
NJ Whippany, ADI 201-428-0510
NY Mt. Vernon, All American 914-699-2224
NY Stonybrook, Dove Elctrn. Comps. 516-689-7733
OR Portland, Radar Elec. Co. 503-232-3404
TX Richardson, Ewing Elctrns., Inc. 214-231-6725
WA Seattle, Radar Elec. Co. 206-282-2511
WI Milwaukee, Technlg. Sls. Inc. 414-964-5015

SAS INDUSTRIES INC., Wading River Manor Rd., Manorville, NY 11949, Tel: 516-727-1441, 1-800-544-5238, FAX: 516-727-1387; FSC No.: 4L975; Empl.: 35; *Sls. Mgr.:* Steve Steckis

SAVOY ELECTRONICS, INC., P.O. Box 5727, Ft. Lauderdale, FL 33310, Tel: 305-563-1333, 800-359-5400, FAX: 305-563-1378; FSC No.: 13075; Empl.: 50; *Sls. Mgr.:* Jean Marlowe

SAWTEK INC., P.O. Box 609501, Orlando, FL 32860-9501, Tel: 407-886-8860, FAX: 407-886-7061; FSC No.: 58068; Empl.: 150

SAYLOR ELECTRONICS INT'L, INC., 3680 Research Way, Carson City, NV 89706, Tel: 702-883-4184; Empl.: 7

SBE, 2400 Bisso La., Concord, CA 94520, Tel: 501-680-7722, 800-347-COMM, FAX: 501-680-1427; Empl.: 120; *Sls. Mgr.:* Bill Allen VP Sls.; *Dist. Mgr.:* Bill Allen VP Sls.

S. B. ELECTRONICS, INC., 131 South Main St., Barre, VT 05641, Tel: 802-476-4146, FAX: 802-476-4149; FSC No.: 49588; Empl.: 40; *Sls. Mgr.:* Mark Browning

ZERO SCANBE
UNIT OF ZERO CORPORATION

FAX: 818-444-3953

SCANBE, Unit of Zero Corporation, 3445 Fletcher Ave., El Monte, CA 91731, Tel: 619-452-9333, TWX: 910-587-3437; Empl.: 125; *Dist. Mgr.:* Reggie Streicher ..... **C•1098-1099**

Local Distributors

AL Huntsville, Hall-Mark Elctrns. 205-837-8700
AZ Phoenix, Force Elctrns. 602-437-1060
AZ Phoenix, Hall-Mark Elctrns. 602-437-1200
CA San Diego, Force Elctrns. 619-569-9661
CA Chatsworth, Hall-Mark Elctrns. 818-773-4500
CA El Segundo, Force Elctrns. 213-772-1324
CA Irvine, Hall-Mark Elctrns. 714-727-6000
CA Rocklin, Hall Mark Elctrns. 386-624-9181
CA San Diego, Hall-Mark Elctrns. 619-268-1201
CA San Jose, Hall-Mark Elctrns. 408-432-4000
CA San Jose, Rose Elctrns. 408-263-9700
CA Santa Clara, Force Elctrns. 408-748-1324
CO Englewood, Hall-Mark 303-790-1662
CT Cheshire, Hall-Mark Elctrns. 203-271-2844
CT Danbury, Heilind Elctrns. 203-797-8600
CT Danbury, Pilgram Elctrns. 203-792-7274
CT So. Windsor, Car-Lac Elctrns. 203-282-0631
CT Wallingford, Greene-Shaw Co. 203-265-3333
FL Casselberry, Hall-Mark Elctrns. 407-830-5855
FL Largo, Hall-Mark Elctrns. 813-541-7440
FL Melbourne, Greene-Shaw Co. 407-951-3636
FL Pompano Bch., Hall-Mark Elctrns. 305-971-9280
GA Norcross, Hall-Mark Elctrns. 404-447-8000
IL Rosemont, Advent Elctrns. 708-297-6200
IL Woodale, Hall-Mark Elctrns. 312-860-3800
IN Indianapolis, Advent Elctrns. 317-872-4910
IN Indianapolis, Chelsea Elctrns. 317-253-9065
IN Indianapolis, Hall-Mark Elctrns. 317-872-8875
IA Cedar Rapids, Advent Elctrns. 319-363-0221
KS Lenexa, Hall-Mark Elctrns. 913-888-4747
KS Overland Pk., Olive Elctrns. 913-362-1923
MD Columbia, Hall-Mark Elctrns. 301-988-9800
MD Jessup, Treeko Sls. 301-470-3300
MA Billerica, Hall-Mark Elctrns. 617-935-9777
MD Columbia, Peerless Radio 301-997-1717
MA Newton, Greene-Shaw 800-678-6876
MA Wilmington, Heilind Elctrns. 508-657-4870
MI Farmington Hills, Advent Elctrns. 313-477-1650
MI Livonia, Hall-Mark Elctrns. 313-462-1205
MI Livonia, R.S. Elctrns. 313-525-1155
MN Eden Prairie, Hall-Mark Elctrns. 612-941-2600
MO Earth City, Hall-Mark Elctrns. 314-291-5350
MO Maryland Hts., Olive Elctrns. 314-997-7709
NJ Cranford, Garden State Elctrns. 201-272-6400
NJ Fairfield, Hall-Mark Elctrns. 201-575-4415
NJ Mt. Laurel, Hall-Mark Elctrns. 609-235-1900
NM Albuquerque, International Elctrns. 505-291-9951
NY Bohemia, Car-Lac Elctrns. 516-567-4200
NY Buffalo, Summit Elctrns. 716-887-2800
NY Fairport, Hall-Mark Elctrns. 716-425-3300
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Summit Elctrns. 716-334-8110
NY Ronkonkoma, Hall-Mark Elctrns. 516-737-0600
NC Raleigh, Hall-Mark Elctrns. 919-872-0712
OH Solon, Hall-Mark Elctrns. 216-349-4632
OH Worthington, Hall-Mark Elctrns. 614-888-3313
OK Tulsa, Hall-Mark Elctrns. 918-254-6110
OR Beaverton, Rose Elec. Distr. Co. 503-629-9288
PA Essington, Tri-Com 215-521-3080
TX Austin, Hall-Mark Elctrns. 512-258-8848
TX Dallas, Hall-Mark Elctrns. 214-553-4300
TX El Paso, International Elctrns. 915-598-3406
TX Farmers Branch, Force ELctrns. 214-247-9955
TX Houston, Force Elctrns. 512-476-2104
TX Houston, Hall-Mark Elctrns. 713-781-6100
UT West valley City, Hall-Mark Elctrns. ... 801-972-1008
WA Seattle, Hall-Mark Elctrns. 206-547-04 5
WI New Berlin, Hall-Mark Elctrns. 414-797-7844
WI Milwaukee, Marsh Elctrns. 414-475-6000

SCANNING DEVICES, INC., 108 Elm St., Waltham, MA 02154, Tel: 617-891-8991, FAX: 617-899-2235; Empl.: 16; *Sls. Mgr.:* David Chanoux

SCHAEFER, INC., Schaefer GmBH, 200 Butterfield Dr., Ashland, MA 01721, Tel: 508-879-8658, ESYLNK: 510-100-3630, FAX: 508-879-8669; Empl.: 60; *Sls. Mgr.:* Richard Sakakeeny

Local Sales Offices & Reps

AL Huntsville, Murcota 205-539-8476
AZ Scottsdale, Power Up Elctrn. Sls. 602-955-1105
CA LaHabra, West Coast Reps 213-690-9960
FL Palm Bch. Gdns., Graham Assocs. 407-622-4049
IL Arlington Hgts., Phoenix Elctrn. Sls. ... 708-394-4422
KS Olathe, Tech. Sls. Assocs. 913-829-2800
MD Hunt Valley, Eagle Sls. Corp. 301-666-3930
MA Whitinsville, Power Factor & Assoc. ... 508-234-6415
NY Wantagh, Bytec 516-781-7400
NC Winston-Salem, Murcota 919-722-9445
TX Richardson, Jim Gray and Assoc. 214-699-9976
UT Ogden, Taylor Mktg. 801-546-9570

SCHAFFNER EMC, INC., 825 Lehigh Avenue, Union, NJ 07083, Tel: 908-851-0664, 800-367-5566, FAX: 908-851-0116; *Sls. Mgr.:* Steve Cogger ..... **A•1634-1637**

Local Sales Offices & Reps

AL Huntsville, Beacon Electronics 205-881-5031
AZ Scottsdale, BSE, Inc. 602-483-0373
CA Auburn, Ewing-Foley, Inc. 916-885-6591
CA Fallbrook, Gary Chilcote Assoc. 619-728-7678
CA Irvine, Groh Assocs. 714-837-9871
CA Los Altos, Ewing-Foley, Inc. 415-941-4525
CO Englewood, Delltron Co. 303-741-2122
FL Maitland, Hutto Hawkins Assoc. 407-831-2474
FL Pompano Beach, Hutto Hawkins Assoc., Inc. 305-979-0330
GA Atlanta, Beacon Electronics 404-256-9640
IL Chicago, BNI Elctrns. 312-775-1717
IA Marion, A.E.M. Inc. 319-377-1129
KS Lenexa, A.E.M. Inc. 913-888-0022
MD Randallstown, Beacon North 703-478-2480
NH Hopkinton, Selmark Assocs. 508-376-2914
MI Livonia, Electro Mktg. Grp. 313-421-7590
MI Muskegon, Electro Mktg. Grp. 616-798-1912
MN Mendota Hgts., G-II Sls. 612-454-3086
MO St. Louis, A.E.M. Inc. 314-298-9900
NM Albuquerque, BSE Inc. 505-293-2582
NY Great Neck, F & F Metro 516-482-4080
NY Rochester, H. C. Johnson Agys. 716-586-0777
NC Raleigh, Beacon Elctrns. 919-787-8431
OH N. Royalton, Electro Mktg. Grp. 216-582-0075
OH Vandalia, Electro Mktg. Grp. 513-890-8322
OK Tulsa, D.J. Sls. 918-663-8155
OR Beaverton, Harry Levinson Co. 503-690-1312
PA Pittsburgh, Electro Mktg. Grp. 412-823-5400
SC Greenville, Beacon Electronics 803-297-7830
TN Knoxville, Beacon Electronics 615-524-8325
TX Austin, D.J. Sls. 512-258-3002
TX Dallas, D.J. Sls. 214-783-8876
UT American Folk, Delltron 801-263-9413
UT Sandy, Delltron Co. 801-942-4678
VA Sterling, Beacon North 703-478-2480
WA Seattle, Harry Levinson Co. 206-382-1300
PR Bayamon, Selmark Assoc. 809-787-2096
Can Ontario, Callbrooke Mktg. 519-848-3810

Local Distributors

AL Huntsville, Comp. Distrs. 205-851-7800
AL Huntsville, Cypress 205-533-0783
AZ Tempe, Acacia/Deanco 602-894-2874
AZ Tempe, Cypress 602-966-2256
CA Buena Pk., Cypress/RPS 714-521-5230
CA Fremont, Acacia/Deanco 415-623-7500
CA Gardena, Cal Switch 213-770-2300
CA Irvine, Acacia/Deanco 714-660-0834
CA Manhattan Bch., Prime Electro Prods. 213-379-3642
CA San Diego, Acacia 619-597-0577
CA San Diego, Cypress Elctrns. 619-535-0011
CA San Diego, Southland Comps. 619-673-3800
CA San Jose, Rose Elctrns. 408-263-9700
CA Santa Clara, Cypress Elctrns. 408-980-2500
CA Woodland Hills, Cypress 818-710-7780
CO Denver, IEC 303-292-6121
CO Englewood, Cypress 303-792-5829
CO Lakewood, Acacia/Deanco 303-232-2882
CT Wallingford, Sager Elctrns. 203-265-4600
FL Orlando, Sager Elctrns. 407-240-3114
IL Bensenville, Cypress 312-350-2005

IL Hoffman Estates, IEC 312-843-2040
IL Schaumburg, QPS Elctrns. 708-884-6620
MD Columbia, D.K. Elctrns. 301-995-1950
MD Columbia, Sager Elctrns. 301-995-6580
MA Canton, Impact Sls. 617-821-1500
MA Hingham, Sager Elctrns. 617-749-6700
MA Marlboro, Now Elctrns. 508-460-0187
MI SE Grand Rapids, RM Elctrns. 616-531-9300
MN Eden Prairie, Cypress Elctrns. 612-934-2104
MN New Brighton, Chris Elctrns. 612-631-2647
MO St. Charles, Finnigan Elctrns. 314-946-6201
MO St. Charles, Heartland 314-928-6010
NV Rancho Cordova, Acacia/VWR Elctrns. 916-638-1861
NH Salem, Sager Electrns. 603-898-1348
NJ Moorestown, Marlac 609-234-4200
NY Hauppauge, Sager Elctrns. 516-348-1300
NY Rochester, Masline Elctrns. 716-546-5373
NC Raleigh, Comp. Dists. 919-859-3391
NC Raleigh, Sager Elctrns. 919-850-9550
OR Beaverton, Cypress 503-223-8900
PA Mars, Sager Elctrns. 412-772-2233
PA McKean, Advacom 814-476-7774
PA Philadelphia, Sager Elctrns. 215-464-4336
TX Dallas, Comp. Distrs. 214-644-0373
TX Dallas, Cypress 214-255-0065
TX Richardson, Comp. Tech. Corp. 214-437-2211
UT Salt Lake City, IEC 801-977-9750
WA Blaine, Memco 604-590-1553
WA Bothell, Cypress 206-483-1144
WA Redmond, Acacia/Deanco 206-881-5566
WA Seattle, Kam Elctrns. 206-382-1300
WV McKean, Advacom 814-476-7774
Can Burlington, Ont., Alternate Source Comp. 416-335-6385

SCHAFFNER EMC, INC., 825 Lehigh Avenue, Union, NJ 07083, Tel: 908-851-0644, 800-367-5566, FAX: 908-851-0116; *Sls. Mgr.:* Mark Lazar ..... **D•1321**

Local Sales Offices & Reps
AZ Phoenix, Barnhill Assoc. 602-955-2955
CA Concord, Microwave Meas. 415-846-0377
CA Pleasanton, Microwave Meas. 415-846-0377
CA San Diego, Amasco 619-292-7666
CA Torrance, Amasco 213-781-9494
CO Englewood, Barnhill Assoc. 303-792-9500
FL Clearwater, BMI 813-796-2378
FL Satellite Bch., BMI 407-777-6303
GA Atlanta, BMI 404-449-8464
GA Sylvester, BMI 912-776-4100
IL Willowbrook, PVA Corp. 708-655-3355
IN Fishers, Carter Technlg. 317-842-9277
KS Lenexa, Midtec 913-541-0505
MA Burlington, Intersell 617-273-3844
MI Farmington Hills, Carter Technlg. 313-477-7700
MN Minneapolis, Loren F. Green/Minn. 612-571-6666
MO St. Louis, Midtec 314-275-8666
NM Albuquerque, Barnhill Assocs. 505-299-7658
NY Great Neck, RTI 516-829-3770
NY Syracuse, Labtronics 315-455-7314
NC Raleigh, BMI 919-787-0330
OH Englewood, Carter Technlg. 513-836-0951
OH Pauma, Carter Technlg. 216-348-0400
OR Wilsonville, Syntek 503-682-2750
PA Huntington Valley, Sci-Rep 215-322-6500
PA Pittsburgh, Carter Technlg. 412-826-3800
TX Austin, Barnhill Assocs. 512-343-6448
TX Houston, Barnhill Assocs. 713-266-2666
TX Houston, Barnhill Assocs. 713-776-2382
TX Richardson, Barnhill Assocs. 214-231-2573
UT Orem, Barnhill Assocs. 801-226-1239
VA Fairfax, Sci-Rep, Inc. 703-385-0600
WA Bellevue, Syntek 206-462-7700
WA Bellevue, Syntek 509-466-0451
Can B.C., Jerome & Francis Co. 604-986-1286
Can Ontario, Calbrooke Mktg. 519-848-3810
Can Ontario, Webster Instr. 416-625-0600

SCHAUER MANUFACTURING, 4500 Alpine Ave., Cincinnati, OH 45242, Tel: 513-791-3030, FAX: 513-791-7192; Empl.: 195; *Sls. Mgr.:* A. A. Groenewold; *Dist. Mgr.:* Dan Shaw

SCHELL INC., P.O. Box 12689, 2600 22nd St. N., St. Petersburg, FL 33733, Tel: 813-822-2600, 800-237-2600, FAX: 813-822-8800; Empl.: 50; *Sls. Mgr.:* Tom Enneking; *Dist. Mgr.:* Steve Hahn

SCHENCK PEGASUS CORP., 2890 John R, Troy, MI 48083, Tel: 313-689-9000, TWX: 810-232-1529, FAX: 313-689-8578; Empl.: 130; *Sls. Mgr.:* David Sallberg

SCHLEGEL CORP., P.O. Box 23197, Rochester, NY 14692, Tel: 716-427-7200, TELEX: 6854121, FAX: 716-427-9993; Empl.: 500; *Sls. Mgr.:* Duncan Tyrrel

SCHLEUNIGER USA INC., 150 Dow St. Tower Four, Manchester, MI 03101, Tel: 603-668-8117, FAX: 603-668-8119; Empl.: 11; *Sls. Mgr.:* Charles C. S. Burns

SCHLUMBERGER INDUSTRIES, Tranducers Div., 11321 Richmond, M-102, Houston, TX 77082, Tel: 713-558-2587, TELEX: 791209, FAX: 713-558-8954; *Sls. Mgr.:* Robinson Ord

SCHLUMBERGER INSTRUMENTS, Schlumberger Technlgs., 829 Middlesex Turnpike, Billerica, MA 01821, Tel: 508-671-9700, 1-800-225-5765, FAX: 508-671-9704; Empl.: 70

SCHLUMBERGER INSTRUMENTS, Schlumberger Technologies, 20 North Avenue, Burlington, MA 01803, Tel: 617-229-4825, FAX: 617-229-4885; FSC No.: 1T316; Empl.: 50; *Sls. Mgr.:* Michael Milona

SCHNEIDER CORP. OF AMERICA, 400 Crossways Park Drive, Woodbury, NY 11797, Tel: 516-496-8500, FAX: 516-496-8524; Empl.: 13; *Sls. Mgr.:* Dwight Lindsey; *Dist. Mgr.:* Dwight Lindsey

SCHONSTEDT INSTRUMENT CO., 1775 Wiehle Ave., Reston, VA 22090, Tel: 703-471-1050, FAX: 703-471-1795; Empl.: 45; *Sls. Mgr.:* O. K. Davis

SCHOTT CORP., 1000 Parkers Lk. Rd., Wayzata, MN 55391, Tel: 612-475-1173, FAX: 612-475-1786; FSC No.: 80023; Empl.: 325; *Sls. Mgr.:* A. Schmitt

Local Sales Offices & Reps
MA Needham, Hatch Assocs. 617-963-3306

SCHOTT ELECTRONICS, 42 Silvermine Road, Seymour, CT 06483, Tel: 203-881-0102, TWX: 710-451-8911, FAX: 203-881-0098; Empl.: 150; *Sls. Mgr.:* Ross Wieringa

SCHOTT GLASS TECHNOLOGIES, INC., 400 York Ave., Duryea, PA 18642, Tel: 717-457-7485, TWX: 510-671-4535, FAX: 717-457-6960; FSC No.: 23-169-1403; Empl.: 500; *Sls. Mgr.:* J. Nimmerfroh

SCHRACK NORTH AMERICA CORP., 1995 Pond Rd., Ronkonkoma, NY 11779-7209, Tel: 516-737-0099, FAX: 516-737-2550; Empl.: 10; *Sls. Mgr.:* John Walsh; *Dist. Mgr.:* Christopher Meza ..... **B•1570-1576**

Local Sales Offices & Reps
AL Huntsville, DHR Mktg. 205-533-5165
AZ Phoenix, CPS Assoc. 602-246-1097
CA Arcadia, Van Gott & Assocs. 818-445-9728
CO Boulder, Stratford Grp. 303-530-3194
FL Miami, Omnitron 305-448-0050
FL Tampa, SRT Mktg. 813-884-4805
IN Mishawaka, Power Comp. 219-256-6630
MO Hazelwood, Acorn Elctrns. 314-731-2002
MD Hunt Valley, Eagle 301-666-3930
MA Swansea, Poisson & Assoc. 508-677-3655
MI Ypsilanti, Tech Rep 313-572-1950
MN Roseville, TLC 612-483-2226
NJ Lawrenceville, DVS Co. 609-896-1112
NJ Matawan, Sheppard 201-566-0095
NY Liverpool, Lynn 315-457-6859
NC Raleigh, Spears 919-790-7606
OH Highland Hts., KT/Depco 216-442-6200
PA Gibsonia, Lynn 412-443-3670
TX Dallas, Pro Sls. 214-387-0344
WA Bellevue, Caruso & Co. 206-454-1261
Can Ontario, Honeywell Ltd. 416-293-8111

Local Distributors
AL Birmingham, ACK Ind. 205-322-0588
AZ Tempe, Control Des. Supp. 602-829-7981
CA City of Industry, ITAL 818-968-8515
CA San Rafael, Elctrns. Plus 415-457-0466
CO Denver, CSID 303-292-9594
CT Middlefield, Control Des. Supp. 203-349-0200
FL Ft. Lauderdale, Southeastern Elctrns. 305-563-4131
GA Stone Mountain, Control Des. Supp. 404-979-3500
ID Boise, Bolen's Control House 208-363-5280
IL Carol Stream, Lectro Comps. 708-690-0520
IN Indianapolis, Control Des. Supp. 317-788-4559
IA Marion, Control Des. Supp. 319-373-2923
KS Kansas City, Control Des. Supp. 913-362-4248
ME Gray, Longhill Electro. Tech. 207-657-2183
MD Gaithersburg, Axis Elec. 301-840-9640
MA Norwood, Emtel 617-769-9500
MI Ypsilanti, Tech Rep 313-229-2961
MN Minneapolis, Control Des. Supp. 612-721-1628
MO St. Louis, Control Des. Supp. 314-426-3150
NJ Lodi, Nidisco 201-773-1771
NJ Paramus, Electro Control Supp. 201-836-2112
NJ Pennsauken, IMS Distbn. 609-662-1770
NY Newburgh, Electro 914-561-5330
NY Ronkonkoma, All American 516-981-3935
NC Charlotte, C.P.S. 704-588-4410
NC Pineville, Control Des. Supp. 704-588-4410
OR Portland, Dunn Elctrns. 503-285-0214
OR Portland, O4 Controls, Inc. 503-231-8058
PA Malvern, Control Des. Supp. 215-296-0150
TX Dallas, Control Des. Supp. 214-358-1441
TX Houston, Wofford Elec. 713-847-3583
WA Boseman, C.E.D. 509-535-8891
WA Seattle, Stusser Elec. Co. 206-624-8770
Can Scarborough, Honeywell 514-337-1104

SCHROFF INCORPORATED, 170 Commerce Dr., Warwick, RI 02886, Tel: 401-732-3770, FAX: 401-738-7988; Empl.: 120; *Sls. Mgr.:* William Bottis

SCHUMACHER ELECT. CORP., 7474 N. Rogers Ave., Chicago, IL 60626, Tel: 312-973-1600, FAX: 312-973-7781; Empl.: 700; *Sls. Mgr.:* Norman Patinka

SCHURTER

FAX: 707-778-6401

SCHURTER, INC., 1016 Clegg Ct., Petaluma, CA 94952, Tel: 707-778-6311; FSC No.: 61935; *Sls. Mgr.:* Bruno H. Schurter ... **A•1638-1639; B•1389, 1771; C•1516-1520**

Local Sales Offices & Reps
AL Madison, Benchmark Tech. Sls. Inc. 205-464-0033
AZ Scottsdale, JK & Assos. 602-990-8804
AR Little Rock, Doby Assoc. 501-221-0326
CA La Habra, Cygnus Sls. Engrg. Corp. 213-691-2993
CA San Jose, Arnold Tech. Sls., Inc. 408-954-0400
CO Broomfield, Summit West Mktg., Inc. 303-460-9600
FL Pompano Bch., IMR, Inc. 305-942-2449
IN Carmel, Newton & Assocs. 317-577-5895
GA Norcross, Benchmark Tech. Sls. Inc. 404-446-1711
IL Arlington Hgts., MJ Petersen & Assoc., Ltd. 708-577-8200
MN Shorewood, Frank Anthony Mktg. 612-474-2850
MS Jackson, Doby Assocs. 601-981-1138
MO St. Louis, Acorn Elctrns. Inc. 314-421-1751
NH Nashua, Bell Controls 603-882-6984
NJ Ho-Ho-Kus, D. J. Fisher Co. 201-652-0090
NJ Medford, Champion Elctrn. Sls. Co. 609-983-0932
NY Fairport, TAC Sls, Inc. 716-377-2250
NC Raleigh, Benchmark Tech. Sls. Inc. 919-850-0633
OH Beachwood, Electronic Salesmasters 216-831-9555
OR Hillsboro, Doran Sls. 503-640-4500
TX Dallas, Reese & Assocs. 214-224-1000
UT Salt Lake City, Prorep Mktg. 801-268-3434
WA Redmond, Doran Sls. 206-885-1885

Local Distributors
CA Irvine, Kensington Elctrns., Inc. 714-588-0575
CA Livermore, Quail Elctrns. 415-373-6700
CT Wallingford, Sager Elctrns. 203-265-4600
FL Orlando, Sager 407-240-3114
GA Norcross, NRC-Jarco Dixie, Inc. 404-729-0411
IL Elk Grove Village, Nu-Way Elctrn. Distrbs. Inc. 708-437-7120
MD Columbia, Sager Elctrns. 301-995-6580
MD Rockville, FIC Corp. 800-638-6594
MA Hingham, Sager Elctrns. 617-749-7600
MA Sandwich, JV ELctrns. 508-833-0700
MN Plymouth, Leeds Electro Comps., Inc. 612-557-1277
NH Salem, Sager Elctrns. 603-898-1348
NY Hauppauge, Sager Elctrns. 516-348-1300
NC Raleigh, Sager Elctrns. 919-850-9550
OH Strongsville, Fuse World 216-238-1330
OR Tualatin, Moore Elctrns., Inc. 503-692-5333
PA Harrisburg, Ad-Tech Elctrns., Inc. 717-561-9905
PA Mars, Sager Elctrns. 412-772-2233
PA McKean, Advacom 814-476-7774
PA Philadelphia, Sager Elctrns. 215-464-4336
TX Dallas, Fuses, Inc. 214-341-6407
WI Oconomowoc, GW Elctrns. Ltd. 414-567-9445
Can Markham, Ont., Birde Mktg. 416-477-7722

S ≈ F

SCHUSTER ELECTRONICS, 8 Beattie Court, Huntington, NY 11530, Tel: 516-271-0590; *Sls. Mgr.:* Max Schuster

SCIENCE ACCESSORIES CORP., 200 Watson Blvd., Stratford, CT 06497, Tel: 203-386-9978, FAX: 203-381-9270; Empl.: 40; *Sls. Mgr.:* H. A. Cleveland

SCIENCE & ENGRG. CONSULTANTS, INC., 1820 Discovery St, Ste. 300, Reston, VA 22090, Tel: 703-471-1600, FAX: 703-281-9778; Empl.: 2; *Sls. Mgr.:* Dr. Joseph T. Siewick

SCIENCE/ELECTRONICS, P. O. Box 986, Dayton, OH 45401-0986, Tel: 513-859-5555, FAX: 513-859-7930; Empl.: 25; *Sls. Mgr.:* E. E. Pohl; *Dist. Mgr.:* J. Tanksley

SCIENTECH, INC., 5649 Arapahoe Ave., Boulder, CO 80303, Tel: 303-444-1361, 800-525-0522, TWX: 910-940-0994, FAX: 303-444-9229; Empl.: 35

SCIENTIFIC-ATLANTA, INC., See Optima Enclosures

SCIENTIFIC INSTRUMENTS, 4400 W. Tiffany Dr., West Palm Beach, FL 33407, Tel: 407-881-8500, FAX: 407-881-8556; FSC No.: 591197614; Empl.: 52; *Sls. Mgr.:* Mike Capers; *Dist. Mgr.:* Mike Capers

SCIENTIFIC RESEARCH CORP., See TRAK Microwave Corp.

STI®

FAX: 415-471-9752

SCIENTIFIC TECHNOLOGIES INC., Control Components Div., 31069 Genstar Rd., Hayward, CA 94544-7831, Tel: 415-471-9717, 800-221-7060; FSC No.: 52797; Empl.: 25; *Sls. Mgr.:* Paul N. Dreisezun ..... **B•1578-1579**

SCIENTIFIC TECHNOLOGIES INC., Optical Sensor Div., 31069 Genstar Rd., Hayward, CA 94544, Tel: 415-471-9717, FAX: 415-471-9752; Empl.: 120

SCITEQ ELECTRONICS, INC., 8401 Aero Dr., San Diego, CA 92123, Tel: 619-292-0500, TELEX: 882008, FAX: 619-292-9120; FSC No.: 70561; Empl.: 40; *Sls. Mgr.:* Phil Feinberg

SCOPE INCORPORATED, 1860 Michael Faraday Dr., Reston, VA 22090, Tel: 703-471-5600, FAX: 703-471-1715; Empl.: 150; *Sls. Mgr.:* J. Tietge, Dir. PD

SC TECHNOLOGY, INC., 368 Earhart Way, Livermore, CA 94550, Tel: 415-373-9230, FAX: 415-373-9416; *Sls. Mgr.:* Susan L. Karl

SCREENPRINT DOW, See Dow Switch, Div. of Screenprint Dow

SEABOARD ELECTRONICS, 70 Church St, New Rochelle, NY 10805, Tel: 914-235-8073, TELEX: 646289; Empl.: 40; *Sls. Mgr.:* Bernie Klempner; *Dist. Mgr.:* Subhash Grandhi

SEACOR INC

FAX: 201-664-8544

SEACOR, INC., 123 Woodland Ave, Westwood, NJ 07675, Tel: 201-666-5600; Empl.: 20 ..... **A•1137**

Local Sales Offices & Reps

AL	Huntsville, Summit Mktg.	205-721-1701
AZ	Tempe, FP Sls.	602-894-5303
CA	San Jose, H. W. Assocs.	408-996-9940
CO	Denver, Hi-Level Mktg.	303-660-9685
FL	Melbourne, R-Rep Co.	407-242-9800
GA	Norcross, Summit Mktg. Assoc.	404-498-4530
IL	Inverness, Heartland Tech. Mktg.	708-358-6622
MD	Bel Air, Freedman/Malta Assoc.	301-879-3148
MA	Sudbury, KSA of New England	508-443-5881
MN	St. Paul, The Johnson Co.	612-641-1878
MO	St. Louis, Acorn Elctrns.	314-421-1751
NJ	Parlin, JMR Sls. Inc.	908-525-8000
NM	Albuquerque, FP Sls.	505-345-5553
NY	Rochester, Upstate Engrg. Sls.	716-225-2383
NC	New Hill, Tom Santel Assocs.	919-362-4091
OH	Powell, Val-Skol Sls.	614-889-0174
OH	Willoughby, Val-Skol Sls.	216-942-6021
PA	King of Prussia, Freedman-Malta Assocs.	215-337-9211
TX	Richardson, Eagle Mktg.	214-238-5383
WI	Brookfield, Heartland Tech. Mktg.	414-792-0920

Local Distributors

CA	Garden Grove, Natl. Cap. Supp.	714-892-7744
CA	San Jose, Compass Comps.	408-432-7575
CT	Wallingford, Mid-State Elctrns.	203-265-9900
FL	Ft. Lauderdale, Brothers Elec.	305-561-6700
FL	Ft. Lauderdale, NRC Elctrns.	305-772-4500
IL	Bensenville, Voyager Elec.	312-860-1300
IL	Schaumburg, Q.P.S.	312-884-6620
MA	Burlington, T.L.C.	617-273-0140
MA	Framingham, Now Elctrns.	617-235-9501
MA	N. Chelmsford, Pilgrim Elec.	617-454-9889
MN	Eitzen, Capacitor Assocs.	507-495-3130
MN	Fridley, Voyager Elctrns.	612-571-7766
NJ	E. Brunswick, Brothers Elctrns.	201-238-2200
NJ	Rockaway, Tonar Inds.	201-586-9000
NY	Melville, S.A.I.	516-293-2710
NY	Ronkonkoma, Spectrum Comp.	516-737-6900
TX	Dallas, Off-the-Shelf Comps.	214-238-0808
TX	Ft. Worth, C & W Supp.	817-831-0395
WA	Seattle, Vesco Elctrns.	206-575-3607

SEAFAB, INC., 14648 N.E. 95th St., Redmond, WA 98052, Tel: 206-881-2778, FAX: 206-882-0707; Empl.: 80; *Sls. Mgr.:* Bruce Murray

SEALTRON, INC., 9705 Reading Road, Cincinnati, OH 45215, Tel: 513-733-8400, FAX: 513-733-0131; FSC No.: 3678; Empl.: 140; *Sls. Mgr.:* James Dawson

SEASTROM MANUFACTURING CO., INC., 701 Sonora Ave., Glendale, CA 91201, Tel: 213-245-9121, FAX: 818-246-6803; FSC No.: 86928; Empl.: 80; *Sls. Mgr.:* Dave Buddecke

SECMA, INC., Secme, 17752 Skypark Circle No. 200, Irvine, CA 92714, Tel: 714-261-0610, FAX: 714-261-8390; Empl.: 400

SECTOR MICROWAVE IND. INC., 999 Grand Blvd., Deer Park, NY 11729, Tel: 516-242-2300, TWX: 510-227-6075, FAX: 516-242-8158; Empl.: 45; *Sls. Mgr.:* Thomas Nelson

SECTOR SYSTEMS CO., INC., 416 Ocean Ave., Marblehead, MA 01945, Tel: 617-639-2625; Empl.: 10

SECURITY PLASTICS, INC., 14427 N.W. 60th Ave., Miami Lakes, FL 33014, Tel: 305-823-5440, FAX: 305-557-1431; Empl.: 400; *Sls. Mgr.:* Nelson Rodriguez

SEEQ TECHNOLOGY, 1849 Fortune Dr., San Jose, CA 95131, Tel: 408-432-7400, 1-800-333-7706, TELEX: 296609, TWX: 9103382313, FAX: 408-432-9549; Empl.: 370; *Sls. Mgr.:* Phil Ortiz, V.P Worldwide Sls.; *Dist. Mgr.:* Pat Bringuel

Seiko Instruments

FAX: 213-517-7792

SEIKO INSTRUMENTS U.S.A., INC. ELECTRONIC COMPONENTS, 2990 W. Lomita Blvd., Torrance, CA 90505, Tel: 213-517-7770; *Sls. Mgr.:* D. Brooks ..... **A•1461; B•1117; D•1108, 1490**

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean, Inc.	205-830-1540
AZ	Scottsdale, Fred Board Assocs.	602-994-9388
AZ	Tucson, Fred Board Assocs.	602-299-1508
CA	Irvine, Groh Assoc.	714-837-9871
CA	San Diego, Groh Assocs.	619-673-4321
CA	San Jose, H-Technical Sls.	408-453-2111
CO	Aurora, Electrodyne	303-695-8903
CT	Madison, Focus Elctrn. Sls.	203-245-4314
FL	Plantation, Gallagher & Assocs.	305-473-2101
GA	Norcross, Cartwright & Bean, Inc.	404-368-0160
IL	Elk Grove Village, TriStar Grp., Inc.	708-593-0200
IN	Ft. Wayne, Electro Rep Inc.	219-489-8205
IN	Indianapolis, Electro Rep Inc.	317-842-7202
IA	Cedar Rapids, J.R. Sls. Engrg., Inc.	319-393-2232
KS	Overland Park, Electri-Rep	913-649-2168
MI	Grand Rapids, R.P. Urban & Assoc.	616-245-0511
MD	Burtonsville, Glasscock Assocs.	301-384-5213
MA	Taunton, Focus Elctrns. Sls.	508-824-3840
MI	Detroit, R.P. Urban & Assoc.	313-535-2355
MN	Eden Prairie, Stan Clothier Co.	612-944-3456
MO	St. Louis, Electri-Rep	314-993-4421
NJ	E. Brunswick, Shepard & Assoc.	908-254-5757
NY	E. Syracuse, Nycom, Inc.	315-437-8343
PA	Apollo, J.N. Bailey & Assoc.	412-568-1392
NC	Charlotte, Cartwright & Bean, Inc.	704-536-0303
NC	Raleigh, Cartwright & Bean, Inc.	919-876-4132
OH	Brunswick, J. N. Bailey & Assocs.	216-273-3798
OH	Columbus, J.N. Bailey & Assocs.	614-262-7274
OH	New Lebanon, J. N. Bailey & Assocs.	513-687-1325
OR	Tigard, Electronic Comp. Sls.	503-245-2342
PA	Frazer, Industrial Comps., Inc.	215-889-0650
TN	Knoxville, Cartwright & Bean, Inc.	615-693-7450
Can	Markham, Ont., Birde Mktg.	416-477-7722
TX	Austin, TI Mktg. Inc.	512-837-7272
TX	Dallas, TL Mktg. Inc.	214-484-6800
TX	Houston, TL Mktg. Inc.	713-587-8100
UT	Salt Lake City, Electrodyne	801-264-8050
VA	Ashland, Glasscock Assocs.	804-798-2125
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301
WA	Spokane, Electronic Comp. Sls.	509-456-0100
WI	Menomonee, TriStar Grp., Inc.	800-654-4105
Can	Kanata, Ontario, Birde Mktg.	613-592-5411
Can	St. Laurent, Quebec, Birde Mktg.	514-335-4050
Can	Vancouver, B.C., Birde Mktg.	604-431-0427

Local Distributors

AL	Huntsville, Cypress Elctrns.	205-533-0783
AZ	Phoenix, Aerospace S.W.	602-582-2779
AZ	Phoenix, Sterling Elctrns.	602-437-5565
AZ	Tempe, Cypress Elctrns.	602-966-2256
CA	Buena Pk., Cypress Elctrns.	714-404-0445
CA	Chatsworth, Sterling Elctrns.	818-407-8850
MD	Columbia, Sterling Elctrns.	301-290-3800
CA	San Diego, Cypress Elctrns.	619-535-0011
CA	San Diego, Sterling Elctrns.	619-560-8097
CA	San Jose, Electro Alliance, Inc.	408-280-0221
CA	Santa Clara, Cypress Elctrns.	408-980-2500
FL	Sunrise, All American	305-572-7999
CA	Tustin, OBI	714-258-1411
CA	Tustin, Sterling Elctrns.	714-259-0900
CA	Woodland Hills, Cypress Elctrns.	818-710-7780
CO	Englewood, Cypress Elctrns.	303-792-5829
CO	Englewood, Sterling Elctrns.	303-792-3939
CT	Wallingford, Sterling Elctrns.	203-265-9535
FL	Melbourne, Greene-Shaw Co. Inc.	407-951-3636
GA	Norcross, Applied Power Inc.	404-263-0421
IL	Bensenville, Cypress Elctrns.	708-350-2005
IL	Bensenville, Goold Elctrns. Corp.	708-860-7171
IL	Northbrook, Classic Comps.	708-272-9650
IL	Rosemont, Advent Elctrns., Inc.(printers only)	708-297-6200
IN	Indianapolis, Advent Elctrns., Inc.(printers only)	317-872-4910
IN	Indianapolis, RM Elctrns.	317-843-9403
IA	Cedar Rapids, Advent Elctrns., Inc.(printers only)	319-363-0221
IA	Cedar Rapids, Dee Elctrns., Inc.	319-365-7551
KS	Lenexa, Sterling Elctrns.	913-492-5406
LA	West Wego, Sterling Elctrns.	504-436-1418
MD	Middletown, Current Comps.	301-473-5333
MA	Norwood, Emtel	617-769-9500
MI	Southfield, RM Elctrns.	313-262-1582
MA	Woburn, Sterling Elctrns.	617-938-6200
MI	Farmington Hills, Advent Elctrns., Inc.(printers only)	313-477-1650
MI	Grand Rapids, RM Elctrns.	616-531-9300
MN	Eden Prairie, Cypress Elctrns.	612-934-2104
MN	Minneapolis, Aerospace Computer Supps.	612-884-4725
MN	Minneapolis, Sterling Elctrns.	612-831-2666
NJ	Edison, Sterling Elctrns.	908-417-1000
NM	Albuquerque, Sterling Elctrns.	505-884-1900
NY	Hewlett, Metropolitan Sls.	516-599-7900
NY	Mt. Vernon, QAR Elctrns.	914-699-2224
NC	Raleigh, Century Elctrns.	919-782-2116
NY	Ronkonkoma, All American	516-981-3935
OH	Cincinnati, Schuster Elctrns.	513-489-1400
OK	Tulsa, Sterling Elctrns.	918-663-2410
OR	Portland, Cypress Elctrns.	503-223-8900
OR	Tualatin, Moore Elctrns.	503-692-5333
OR	Beaverton, Micropower (Batteries Only)	503-626-7086
PA	Norristown, Century Elctrns.	215-631-5404
TX	Austin, Sterling Elctrns.	512-836-1341
TX	Dallas, Cypress Elctrns.	214-869-1435
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Sterling Elctrns.	713-623-6600
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bothell, Cypress Elctrns.	206-483-1144
WA	Kent, Moore Elctrns., Inc.	206-251-8090
WI	New Berlin, Classic Comps.	414-786-5300
UT	Salt Lake City, Sterling Elctrns.	801-972-5444
Can	Burnaby, B.C., ITT/RAE Multicomps.	604-291-8866
Can	Concord, Ont., ITT Multicomps.	416-736-1144
Can	Markham, Ont., Semad Elctrns./DGW Elctrns.	416-475-8500
Can	Nepean, Ont., Carsten Elctrns. Ltd.	613-726-9250
Can	Scarborough, Ont., Carsten Elctrns. Ltd.	416-495-7705

Can St. Laurent, Que., Carsten Elctrns. Ltd. 514-334-8321

SEIKO INSTS. USA, INC., Graphic Devices & Systems Div., 1130 Ringwood Ct, San Jose, CA 95131, Tel: 408-922-5800, FAX: 408-922-5840; *Sls. Mgr.:* Steve Dodds; *Dist. Mgr.:* Ralph Kosoff

SEIKO INSTRUMENTS U.S.A., INC., Robotics/Automation Div., 2990 W. Lomita Blvd, Torrance, CA 90505, Tel: 213-517-7850, FAX: 213-517-7793; Empl.: 250; *Sls. Mgr.:* K. Curtis; *Dist. Mgr.:* P. Simpson

SEKAI ELECTRONICS OF AMERICA, INC., 14700 E. Firestone Blvd., Suite 122, La Mirada, CA 90638, Tel: 714-670-1854, FAX: 714-670-1855; FSC No.: 8V398; Empl.: 6; *Sls. Mgr.:* Larry Klementowski

selco

FAX: 714-739-1507

SELCO PRODUCTS CO., SEL Sales, Inc., 7580 Stage Rd., Buena Park, CA 90621, Tel: 714-521-8673; Empl.: 18; *Sls. Mgr.:* Bill Wilkinson; *Dist. Mgr.:* Ray Anton ..... **B•1861; C•1594; D•1370-1371**

Local Sales Offices & Reps

AR	Hot Springs, ASI	501-767-5444
CA	Arcadia, HMC, Inc.	818-447-0958
CA	Mission Viejo, Summit Sls.	800-457-6525
CA	Sunnyvale, Pass Assocs.	408-735-9040
FL	Sarasota, Rep-USA	813-923-2897
IL	Downers Grove, Golten Assocs.	708-512-0093
IN	Indianapolis, S & M Sls. & Mktgs.	317-843-5519
MA	Andover, Crawford Assocs.	617-470-2122
MS	Horn Lake, ASI	601-342-4989
NY	Hauppauge, Sticom	516-366-4221
NY	Naples, LMS Sls. Assoc.	716-374-2626
OR	Beaverton, Luscombe Engrg.	503-636-6664
PA	Hatboro, AQS	215-674-3562
TX	Dallas, Titan- Hill Co.	214-241-1398
WA	Bellevue, Luscombe Engrg.	206-223-1541

Local Distributors

CA	Arcadia, Parco	818-447-0958
FL	Largo, Elctrn. Precepts	813-544-3636
IL	Wheeling, Hawk Elctrns.	312-459-4091
MA	Sandwich, JV Elctrns.	508-833-0700
NY	New York City, Martin Audio/Video	212-541-5900

SELECO, INC., P.O. Box 68809, Indianapolis, IN 46268, Tel: 317-872-4181, FAX: 317-872-0248; Empl.: 30

SELECT CONTROLS INC., 350 I Central Ave., Bohemia, NY 11716, Tel: 516-467-8577, FAX: 516-567-9013; Empl.: 14

SEL-REX DIV., OMI Intl. Corp., 75 River Rd., Nutley, NJ 07110, Tel: 201-667-5200, TELEX: 133-320, TWX: 710-989-1423; Empl.: 250; *Sls. Mgr.:* R. Berg

SEMICOA, 333 McCormick Ave., Costa Mesa, CA 92626, Tel: 714-979-1900, TELEX: 678-315, TWX: 910-595-1961, FAX: 714-557-4541; FSC No.: 34156; Empl.: 85; *Sls. Mgr.:* Don Felder

SEMICONDUCTOR CIRCUITS, INC., Astec America, Inc., 49 Range Rd., Windham, NH 03087, Tel: 603-893-2330, FAX: 603-893-6280; Empl.: 1004; *Sls. Mgr.:* Dale Raveney, VP Mktg. & Sls.

SEMICONDUCTOR PACKAGING MATERIALS CO., 431 Fayette Ave., Mamaroneck, NY 10543, Tel: 914-698-5353, FAX: 914-698-5386; Empl.: 30; *Sls. Mgr.:* Ken Huth

SEMICONDUCTOR TECHNOLOGY, INC., 3131 S.E. Jay St., Stuart, FL 34997, Tel: 407-283-4500, FAX: 407-286-8914; FSC No.: 50891; Empl.: 45

Local Sales Offices & Reps

AZ	Scottsdale, Fred Board Assocs.	602-994-9388
AZ	Tucson, Fred Board Assocs.	602-299-1508
CA	Costa Mesa, Solid State Sls.	714-650-8414
CA	Mountain View, Leddy Assocs.	415-969-6313
CO	Englewood, Component Sls.	303-779-8060
FL	Singer Island, KDI	407-848-7313
IL	Downers Grove, Nextek	708-719-0099
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
KS	Overland Park, Lorenz Sls.	913-469-1312
MD	Towson, Arbotek	301-825-0775
MA	Burlington, Conti-Younger	617-273-1582
MN	Minneapolis, Bill Deming & Assocs.	612-888-5000
MO	St. Louis, Lorenz Sls.	314-997-4558
NE	Lincoln, Lorenz Sls.	402-474-7094
NV	Henderson, Fred Board Assoc.	702-564-5528
NJ	Hasbrouck Heights, Comp Tech Sls.	201-288-7400
NM	Albuquerque, Q.A. Elctrns.	505-888-1121
NY	New Hyde Park, Comp Tech Sls.	516-593-2628
NY	Rochester, Electra Sls.	716-427-7860
NY	Syracuse, Electra Sls.	315-463-1248
OH	Tipp City, Cleary Sls.	513-667-7703
OR	Portland, Index Inc.	503-297-3364
PA	Paoli, Stitzer Assocs.	215-644-5500
TX	Dallas, M-Rep	214-484-5711
TX	Houston, M-Rep	713-988-7613
UT	Midvale, Arrowhead Sls.	801-561-5688
WA	Bellevue, Index Inc.	206-451-9635
Can	Montreal, Que., Solid State Engrg.	514-481-3313

SEMIKRON, INC., 11E Executive Dr., P.O. Box 66, Hudson, NH 03051-0066, Tel: 603-883-8102, 1-800-258-1308, FAX: 603-883-8021; FSC No.: 58687; Empl.: 74; *Sls. Mgr.:* Frank Haase; *Dist. Mgr.:* John Flannery

SEMTECH, 652 Mitchell Rd., Newbury Park, CA 91320, Tel: 805-498-2111, TWX: 910-336-1264; FSC No.: 14099;Multiple; Empl.: 200; *Sls. Mgr.:* Bud Hultz; *Dist. Mgr.:* Bud Hultz

SEMTECH CORPUS CHRISTI, Semtech Corporation, 121 International Dr., Corpus Christi, TX 78410, Tel: 512-289-0403, FAX: 512-289-0472; Empl.: 200

SEMTRONICS CORP., 211 Prospect Pk., P.O. Box 2248, Peachtree City, GA 30269, Tel: 404-487-6681, FAX: 404-487-1128; Empl.: 30; *Sls. Mgr.:* Art Cowart

SENCORE, 3200 Sencore Dr., Sioux Falls, SD 57107, Tel: 1-800-736-2673, 605-339-0100, FAX: 605-339-0317; FSC No.: 33347; Empl.: 230; *Sls. Mgr.:* George Gonds

SENIOR INDS., INC., 610 Pond Dr., Wood Dale, IL 60191, Tel: 312-350-1600, FAX: 312-350-1654

SENSIDYNE, INC., 16333 Bay Vista Drive, Clearwater, FL 34620, Tel: 813-530-3602, 1-800-451-9444; Empl.: 70; *Sls. Mgr.:* Joe Gilberti; *Dist. Mgr.:* Bob Bottini

SENSITEK CORPORATION, See Biddle Instruments

SENSITIVE RESEARCH INSTRUMENTS, 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717, FAX: 914-699-9410; FSC No.: 32590;16034A; Empl.: 35 ..... **D•1322-1324**

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	602-494-0790
CO	Commerce City, Williams Assocs.	303-289-5647
IL	Lincolnwood, Saffro & Assocs.	708-677-9722
LA	Metairie, Data Mktg. Assocs.	504-833-3655
MA	Lexington, Zieco	617-861-8300
MI	Southfield, Comtel Instrs. Co.	313-358-2505
MN	Minneapolis, Hei-Lite Sls.	612-550-0506
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Mount Vernon, Elctrl. Instr. Svc.	914-699-9717
OH	Cleveland, Comtel Instrs. Co.	216-442-8080
OH	Columbus, Comtel Instrs. Co.	614-876-8305
OH	Dayton, Comtel Instrs. Co.	513-426-5310
OK	Tulsa, Data Mktg. Assocs.	918-494-2711
PA	Pittsburgh, Comtel Instrs. Co.	412-922-5720
TX	Austin, Data Mktg. Assocs.	512-338-4701
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-954-5020
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
WI	Lake Mills, Saffro & Assocs.	1-800-327-0312
Can	Baconsfield, Que., Mesurina Ltee /Ltd.	514-630-5990

SENSITRON SEMICONDUCTOR, RSM Electron Power Div., 221 W. Industry Ct, Deer Park, NY 11729, Tel: 516-586-7600, FAX: 516-242-9798; FSC No.: 13409; Empl.: 150; *Sls. Mgr.:* Bryan Rogers; *Dist. Mgr.:* Bryan Rogers

SENSORAY CORP., 44160 Old Warm Springs Blvd., Fremont, CA 94538, Tel: 415-657-7290; Empl.: 6; *Sls. Mgr.:* Richard Soundy

SENSOR CORP., Box 140, Scottdale, PA 15683, Tel: 412-887-4080, FAX: 412-887-0383; Empl.: 6

SENSOR DEVELOPMENTS INC., PO Box 290, Lake Orion, MI 48361, Tel: 313-391-3000, FAX: 313-391-0107; Empl.: 45; *Sls. Mgr.:* James J. Babiarz

SENSOR PRODUCTS, INC., 71 W 23rd St., Ste. 1500, New York, NY 10010, Tel: 212-675-0201, FAX: 212-645-8436; Empl.: 2

Sensor Scientific, inc.

FAX: 201-227-8063

SENSOR SCIENTIFIC, INC., 6 Kingsbridge Rd., Fairfield, NJ 07006, Tel: 201-227-7790, 800-524-1610; FSC No.: 0AES7; Empl.: 125; *Sls. Mgr.:* Donna Caputo ..... **B•1862-1863**

Local Sales Offices & Reps

CA	Irvine, Vale Elctrn. Assoc.	714-551-4004
CA	Mountain View, Shaw Tech Inc.	415-961-4775
CA	Van Nuys, Vale Elctrns.	818-705-0283
CO	Ft. Collins, Rep. Sls.	303-226-1504
FL	Boca Raton, Tech Sls. Spec.	407-391-3718
IL	Des Plaines, ESCO Assocs.	312-298-5310
KS	Overland Pk., Markline Technlgs.	913-681-8880
MA	Lexington, Jodan Technlg.	617-863-8898
NY	Syracuse, ADCON	315-432-4409
NY	Williamsville, CEF Tech. Sls.	716-633-7324
OH	Medina, J.C. Hofstetter	216-241-4880
PA	Harlysville, Thomas Jackson Assoc.	215-256-8877
TX	Dallas, Allied Comps. Inc.	214-238-0408
TX	Houston, Allied Comps. Inc.	713-988-1600

SENSOR SYSTEMS, INC., 8929 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-341-5366, TELEX: 69-1583, FAX: 818-341-9059; *Sls. Mgr.:* E. Schneider

SENSOTEC, INC., 1200 Chesapeake Ave., Columbus, OH 43212, Tel: 614-486-7723, TWX: 810-482-1188, FAX: 614-486-0506; FSC No.: 29927; *Sls. Mgr.:* Jack Feil

SENSYM, INC., 1255 Reamwood Ave., Sunnyvale, CA 94089, Tel: 408-744-1500, FAX: 408-734-0407; FSC No.: 5955; Empl.: 150; *Sls. Mgr.:* Fred Jones; *Dist. Mgr.:* Fred Jones

SENTECH, INC., 518 Ryers Ave., Cheltenham, PA 19012, Tel: 215-663-0422, FAX: 215-663-0461; Empl.: 4

SENTRY MANUFACTURING COMPANY, Crystal Park, Chickasha, OK 73018, Tel: 405-224-6780, FAX: 405-224-8808; FSC No.: 5955; Empl.: 30; *Sls. Mgr.:* Barbara Maberry

SERCO PRODUCTS DIVISION:SERCO MOLD, INC., 612 Commercial Ave., Covina, CA 91723, Tel: 818-331-0517, 800-843-8172(Calif.), FAX: 818-331-8584; Empl.: 45; *Sls. Mgr.:* Neil Reckon ..... **C•1100-1101**

Local Sales Offices & Reps

CA	Covina, Serco Prods.	818-331-0517
CA	Valencia, Lessing & Assocs.	805-295-0225
GA	Norcross, Hollingsworth & Still, Inc.	404-447-1700
IL	Cary, Ellinger Sls. Corp.	708-639-1850
MA	Burlington, Gerber Sls. Corp.	617-229-1150
MO	Florissant, Delltron Co., Inc.	314-839-0033
NY	Latham, L-Tron Corp.	518-785-5032
NY	Pt. Washington, Ashtec, Inc.	516-767-0336
PA	Ft. Washington, Simon Mktg. Consultants	215-628-3394
TX	Richardson, R. F. Kimball Co., Inc.	214-231-3447
Can	Ontario, Avotronics Ltd.	416-475-2024

Local Distributors

AL	Montgomery, Handey's Elctrn. Ctr. Inc.	205-262-4885
AZ	Phoenix, Capital Elctrns.	602-252-5897
AZ	Phoenix, Elctrn. Emporium Inc.	602-437-8633
AZ	Tucson, Electronic City	602-622-1173
CA	Canoga Park, Sandy's Elctrns.	818-346-0510
CA	Costa Mesa, Mar Vac Elctrns.	714-650-2001
CA	Cucamonga, Abletronics	714-944-4952
CA	Culver City, DOW Elctrns.	213-391-6763
CA	El Monte, Marshall Ind.	800-522-0084
CA	Fremont, Fry's Elctrns.	415-770-3797
CA	Goleta, DOW Elctrns.	805-968-7272
CA	Hawiian Gardens, DOW Elctrns.	213-421-3786
CA	Hollywood, Pacific Radio Exchange	213-462-1393
CA	Inglewood, Inglewood Elctrns.	213-674-2366
CA	Oxnard, DOW Elctrns.	805-486-6353
CA	Palo Alto, Fry's Elctrns.	415-496-6100
CA	Pasadena, DOW Elctrns.	818-793-1195
CA	Pomona, DOW Elctrns.	818-966-8461
CA	Sacramento, Mar Vac California Radio	916-922-6531
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Santa Maria, Elctrn. Parts Supermart	805-925-8604
CA	Sunnyvale, Fry's Elctrns.	408-733-1770
CT	Wallingford, Midstate Elctrns.	203-265-9900
FL	Orlando, Atlantic Comps. FL	407-354-0435
FL	Tampa, Sunex Elctrn. Supp. Inc.	813-885-4074

FL West Palm Beach, Dolphin Elctrn. Supp. Inc. 305-659-7166
IL So. Holland, Union Elctrns. Dist. 312-333-4100
MA Burlington, Atlantic Comps. 617-270-0051
MA Lynn, Land Elctrns. Inc. 617-592-2220
MI Detroit, Elctrn. Parts Co. 313-891-7400
MN S. Minneapolis, Tortec Corp. 612-866-3662
NV Las Vegas, Sandy's Elctrns. 702-383-8353
NJ Lodi, Nidisco Inc. 201-773-1771
NY Woodside, Switches Unlimited 718-478-5000
NC Durham, Southeastern Elctrns. 919-638-8204
NC Greensboro, Guilford Elctrn. Supp. Inc. 919-275-1385
NC Raleigh, Southeastern Elctrns. 919-828-2311
NC Winston-Salem, Elctrn. Distrbg. Inc. ... 919-723-1097
TN Clarksville, Randolph, Hale & Matthews Inc. 615-647-2325
TX Austin, Electrotex, Inc. 512-454-0318
TX Dallas, Electrotex, Inc. 214-234-0433
TX Ft. Worth, Allied Elctrns. 800-433-5700
TX Houston, Electrotex, Inc. 713-526-3456
WI Fond du Lac, Fedco Elctrns. Inc. 414-922-6490
WI Milwaukee, Marsh Elctrns. Inc. 414-475-6000
Can Kingston, Ont., Electronic Packaging Sys. Ltd. 613-384-1142
Can Markham, Ont., Arma Elctrns. 416-475-1858
Can Montreal, Future Elctrns. 800-388-8731

SERIAL LAB PRODS., INC., 162 Cook Lane, P.O. Box 766, Marlboro, MA 01752, Tel: 617-481-1684, TELEX: 955318 Attn: SERIAL LAB; Empl.: 12; *Sls. Mgr.:* R. L. Wiedeman; *Dist. Mgr.:* D. Kreck

SERVOBYTE INC., P.O. Box 112, Millbury, MA 01527, Tel: 508-865-0225, FAX: 508-865-0295; Empl.: 5; *Sls. Mgr.:* C. Harris

servo
SERVO CORPORATION OF AMERICA

FAX: 516-938-9644

SERVO CORPORATION OF AMERICA, 111 New South Rd., Hicksville, NY 11802-9907, Tel: 516-938-9700; FSC No.: 92110 & 05627; Empl.: 220; *Sls. Mgr.:* G. Immerso ..... **A•1827; D•1077**

Local Sales Offices & Reps
CA Dana Point, EBA Microwave 714-240-8181
CA Del Mar, Servo Western Reg. Off. 619-792-8672
CA Los Angeles, EBA Microwave 213-822-7510

Local Distributors
VA Fairfax, Servo Eastern Reg. Off. 703-591-4331

SERVOMEX COMPANY, 90 Kerry Pl., Norwood, MA 02062, Tel: 617-769-7710, TELEX: 4430161, FAX: 617-769-2834

SERVO-TEK®

FAX: 201-427-4249

SERVO-TEK PRODUCTS CO., 1086 Goffle Rd., Hawthorne, NJ 07506, Tel: 201-427-3100; Empl.: 60; *Sls. Mgr.:* T. J. Daly ..... **B•1310**

SESCOM, INC., 2100 Ward Dr., Henderson, NV 89015-4249, Tel: 702-565-3400, FAX: 702-565-4828; FSC No.: 7Z174; Empl.: 12; *Sls. Mgr.:* Franklin J. Miller ... **C•1102**

SETRA SYSTEMS, INC., 45 Nagog Park, Acton, MA 01720, Tel: 508-263-1400, 1-800-25-SETRA, TELEX: 4430243, FAX: 508-264-0292; FSC No.: 53367; Empl.: 110; *Sls. Mgr.:* Ed Cope ..... **B•1948-1949**

Local Sales Offices & Reps
AL Huntsville, Burnette Techno Metrics .. 205-830-2832
AK Anchorage, Unit Process 907-522-1010
CA Concord, QCon, Inc. 415-682-2020
CA Downey, Dynasales Co. 213-806-1400
CO Westminster, RMS Sls. 303-429-1111
FL Tampa, Quantum Measurements Corp. 813-933-8078
GA Atlanta, Craft Assocs. 404-256-0420
HI Honolulu, Unit Process 808-834-7195
IL Carpentersville, Precision Meas. Prods. 708-426-4446
IN Ft. Wayne, Domino, Inc. 219-456-5512
IN Indianapolis, Domino, Inc. 317-841-6159
KY Louisville, Domino, Inc. 502-425-2848
MD Columbia, Stein Instrs. 301-596-3748
MA Ashland, NEDT, Inc. 508-881-3265
MI Hazel Park, Tiby Co. 313-547-3550
MN Minneapolis, The Mark Co. 612-933-3026
MO St. Louis, Adelphi, Inc. 314-821-1232
MT Billings, Unit Process 406-252-0455
NJ Little Falls, KLS Assocs. 201-785-4450
NM Albuquerque, TMA, Inc. 505-345-8921
NY Rochester, Ritec Entprs., Inc. 716-271-3170
OH Cleveland, Tiby Co. 216-371-5335
OH Dayton, Tiby Co. 513-277-3822
OK Tulsa, Inotek Corp. 918-627-1500
PA Cheltenham, Stein Instrm. 215-379-1990
TX Richardson, ADI Instrs. 214-680-2222
WA Kirkland, Unit Process 206-827-0433
WI Waukesha, Ray Knitter Assocs. 414-544-1976
Can Ontario, Alpha Controls & Instr. 416-477-2133

SEVEN MOUNTAINS SCI. INC., P.O. Box 650, Boalsburg, PA 16827, Tel: 814-466-6559, FAX: 814-466-6559; Empl.: 4; *Sls. Mgr.:* Josephine Chesworth

SFE TECHNOLOGIES, 1501 1st St., San Fernando, CA 91340, Tel: 818-365-9411, TWX: 910-496-1535, FAX: 818-365-5117; FSC No.: 96733; Empl.: 800; *Sls. Mgr.:* Michael Rosenberg

S. F. PRODUCTS CORPORATION, 1021 Parker Road, Chester, NJ 07930, Tel: 201-271-4009; Empl.: 8; *Sls. Mgr.:* Norman W. Johanson; *Dist. Mgr.:* R. S. Johanson

SGS-THOMSON MICROELECTRONICS, INC., 1310 Electronics, Carrollton, TX 75006, Tel: 214-466-6000, FAX: 214-466-7602; FSC No.: 7X328; Empl.: 1700; *Sls. Mgr.:* Garth Nash; *Dist. Mgr.:* Jack Dauber

Shallco

FAX: 919-934-3298

SHALLCO, INC., Box 1089, Smithfield, NC 27577, Tel: 919-934-3135, 1-800-876-3135; Empl.: 35; *Sls. Mgr.:* M. D. Sutton ..... **B•1772-1777**

Local Sales Offices & Reps
MN St. Paul, Kencotronics, Inc. 612-645-7717

SHALLTRONIX

FAX: 919-965-6620

SHALLTRONIX CORP., Preston St., P.O. Box 235, Selma, NC 27576, Tel: 919-965-6346; FSC No.: 58258; *Sls. Mgr.:* Joe Deans ..... **D•1325**

Local Sales Offices & Reps
TX Arlington, Electronic Prod. Reps. 817-467-0377

SHAMROCK PLASTICS & RUBBER, INC., 5330 E. 25th St., Indianapolis, IN 46218, Tel: 317-543-3540, 800-382-4635, FAX: 317-543-3553; Empl.: 25; *Sls. Mgr.:* Bill Crispen

SHAPE ELECTRONICS, INC., 901 DuPage Ave., Lombard, IL 60148, Tel: 708-620-8394, FAX: 708-620-0784; Empl.: 110; *Sls. Mgr.:* Judy M. Ardolino; *Dist. Mgr.:* Judy M. Ardolino

SHAPIRO SCIENTIFIC INST., 3500 E. Coast Hwy., Corona del Mar, CA 92625, Tel: 714-675-1024, FAX: 714-675-9063; Empl.: 7

SHARP

FAX: 206-834-8903

SHARP ELECTRONICS CORP., Microelectronics Grp., 5700 NW Pacific Rim Blvd., Ste.20, Camas, WA 98706, Tel: 206-834-2500; *Sls. Mgr.:* Terry Manton; *Dist. Mgr.:* Dave Mathews ..... **A•1743-1745; B•1119-1121, 1184, 1339-1341, 1581**

Local Sales Offices & Reps
AL Daphne, Interep Assocs. 205-621-1036
AL Huntsville, Interep Assocs. 205-881-1096
AZ Tempe, Electronic Tech. Sls. 602-921-7122
CA Newport Bch., Plustronics 714-476-8009
CA San Diego, Mesa Comps. 619-278-8021
CA San Jose, Sharp Elctrns. Corp. 408-436-4900, FAX:408-436-0924
CA Sherman Oaks, Plustronics 818-995-8908
CO Denver, Seale & Assocs., Inc. 303-695-1980
FL Orlando, Component Design Mktg. Co. 407-240-3903
GA Norcross, Interep Assocs. 404-449-8680
IL Glendale Hgts., Synergistic Sls. 708-858-8686
IN Leo, Mohrfield Mktg. 219-627-5355
KS Wichita, Baka Corp. 316-682-8411
MD Towson, Advanced Technlg. Sls., Inc. 301-296-9360
MA Burlington, Sharp Elctrns. Corp. 617-270-7979, FAX:617-229-9117
MI Madison Hgts., DEM Sls., Inc. 313-583-1500
MN Minneapolis, Reptek 612-331-1212
NJ Allendale, Eastec Assocs. 201-934-7135
NY N. Syracuse, Micro-Tech Mktg. Inc. ... 315-458-5254
NY Rochester, Micro-Tech Mktg. Inc. 716-426-0808
NC Raleigh, WLA & Assocs. 919-231-9939
OH Dayton, Five Star Elctrns., Inc. 513-299-1718
OH Solon, Five Star Elctrns., Inc. 216-349-1611
OR Beaverton, Blair Hirsh 503-641-1875
PA Erdenheim, Omni Sls. 215-233-4600
TN Greenville, Interep Assocs. 615-639-3491
TX Dallas, Sharp Elctrns. Corp. 214-991-5185
VA Richmond, Advanced Technlgy. Sls. .. 804-320-8756
WA Lynwood, Blair Hirsh 206-774-8151
WI Brookfield, Synergistic Sls. 414-821-1516
Can Dollard des Ormeaux, Indigo Elctrns. Ltd. 514-696-6104
Can Kanata, Ont., Indigo Elctrns. Ltd. 613-831-3106
Can Mississauga, Ont., Indigo Elctrns. Ltd. 416-670-0284
Can Richmond, BC, Enerlec Sls. 604-273-0882

Local Distributors
CA El Monte, Marshall Inds. 818-459-5574
CA Saratoga, Western Micro Technlgy. ... 408-725-1660
CA Tustin, Added Value Elctrns. 714-259-8259
NY Farmingdale, Milgray 516-420-9800
Can Montreal, Que., Space Elctrns. 514-694-7710

SHATTUCK INDUSTRIES, 238 Eleana Dr., Ben Lomond, CA 95005, Tel: 408-336-5145, FAX: 408-336-3376; *Sls. Mgr.:* Bruce Shattuck

SHELDAHL, INC., 1150 Sheldahl Rd., Northfield, MN 55057, Tel: 507-663-8000, TWX: 910-565-2180, FAX: 507-663-8545; Empl.: 1,257; *Sls. Mgr.:* Ed Lundstrom

SHELLY

FAX: 714-669-1081

SHELLY ASSOCIATES, INC., 14811 Myford Rd., Tustin, CA 92680, Tel: 714-669-9850, TELEX: 85-2263; FSC No.: 00303; Empl.: 30 ..... **B•1122-1124, 1185**

Local Sales Offices & Reps
AZ Tempe, Spectrum Assocs., S.W. 602-966-1788
CA Mountain View, Leddy Assocs. 415-969-6313
CA San Diego, O'Donnell Assocs., Inc. 619-578-1645
CA Torrance, O'Donnell Assocs., Inc. 213-539-9664
CO Englewood, Romulus Elec., Inc. 303-770-4888
FL Charlotte, Q Rep, Inc. 813-379-8431
GA Norcross, Intronics 404-973-6605
IL Skokie, Electro Tech Mktg. 312-676-3151
IN Ft. Wayne, Scott Elctrns. 219-484-7865
IN Indianapolis, Scott Elctrns. Inc. 317-841-0010
MA Sudbury, KSA of New England 508-443-5881
MI Ypsilanti, Techrep, Inc. 313-572-1950
MN Hopkins, Steve Forsythe & Assocs. 612-933-8267
MO Grandview, R. R. Burton & Assocs. 816-763-5385
MO Kirkwood, R. R. Burton & Assocs. 314-965-0451
NJ Boonton, TMA 201-263-2946
NJ Cherry Hill, Metz Benham Assocs., Inc. 609-424-0404
NY N. Syracuse, R. F. Roux Co. 315-458-9169
NY Port Washington, TMA 516-883-2432
NC Charlotte, Hollingsworth & Still, Inc. ... 800-241-5712
NC Kernersville, Hollingsworth & Still, Inc. 800-241-5712
OH Cincinnati, Scott Elctrns. 513-791-2513
OH Cleveland, Scott Elctrns. Inc. 216-473-5050
OH Kettering, Scott Elctrns., Inc. 513-294-0539
OH Reynoldsburg, Scott Elctrns. 614-863-1281

OR Beaverton, Luscombe Engrg. Co. 503-636-6664
OR Portland, Temper Tech. Mktg. 503-292-8201
PA Pittsburgh, Scott Elctrns. 412-963-6116
TX Dallas, de Forest Sls. Co. 214-349-3290
WA Bellevue, Luscombe Engrg. Co. 206-223-1541
WI Brookfield, Electro-Tech Mktg. Assocs. 414-785-9554
Can Scarborough, Ont., Banke Elctrns. 416-292-5152

Local Distributors

AR Ft. Smith, Radio, Inc. 501-646-5200
CA Anaheim, Bisco Inds. Inc. 714-635-0380
CA Fremont, VIC/TAL Sls. 415-651-6420
CA San Jose, Bisco Inds. Inc. 408-435-8980
CT Wallingford, Midstate Elctrns. Co. 203-265-9900
IL Franklin Park, Bisco Inds. Inc. 312-451-1230
IA Cedar Rapids, Iowa Radio Supp. Co. .. 319-393-4510
IA Cedar Rapids, Iowa Radio Supp. Co. .. 313-393-4510
MA Woburn, Bisco Inds. 617-938-8590
NJ Cranford, Garden State Indl. Elctrns. .. 201-272-6400
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Oakland, Relay Specialties 201-337-1000
NY Elmsford, White Plains Elctrl. 914-592-9555
NY Huntington, Energy Elctrl. Supp. 516-549-2722
NC Raleigh, Svc. Plus Elctrns. 919-850-9550
OH Strongsville, Roberts Elctrns. Co., Inc. 216-238-1711
OH Twinsburg, Advacom, Inc. 216-425-8477
OK Tulsa, Radio, Inc. 918-587-9123
PA McKean, Advacom 814-476-7774
TX Arlington, Bisco Inds. 817-640-7046
TX Austin, Wofford Elctrns. 512-339-1131
TX Houston, Wofford Elctrns. 713-847-3583
TX Midland, ESI Supp. 915-694-9657
WI Mequon, Lakeview Elctrns. 414-377-8250
Can Calgary, Alberta, Memco 403-258-3399
Can Surrey, B.C., Memco 604-590-1553

SKC

FAX: 818-764-6845

SHINANO KENSHI CORP. (SKC), 7525 Ethel Ave., N. Hollywood, CA 91605, Tel: 818-764-4266; Empl.: 7; *Sls. Mgr.:* Dale Dowis ..... **B•1311**

Local Sales Offices & Reps

AL Madison, Benchmark 205-464-0033
CA Cupertino, PEI Sls. Assoc. 408-253-1960
CA North Hollywood, Shinano Kenshi Corp. 818-764-4266
CO Denver, Tech Rep Sls. Co. 303-758-7031
CT Bloomfield, SIR Assocs. 203-243-9343
FL Melbourne, Phoenix Comps. 407-723-4414
GA Norcross, Benchmark 404-446-1711
MA Westford, SIR Assocs. 508-692-2500
MI Brighton, A.P. Assoc. 313-229-6550
NY Albertson, DOL Engrg. 516-747-3944
NY Pittsford, KLM Garner 716-381-8350
NC Raleigh, Benchmark 919-850-0633
OH Columbus, A.P. Assocs. 614-882-1110
OR Portland, Intertech Sls. 503-775-7885
TX Dallas, Theodore Borek Assoc. 214-985-7702
UT Salt Lake City, Sierra Tech Sls. 801-566-9719

Local Distributors

CA N. Hollywood, Digilog Devices Inc. 818-764-9777

Shindengen America, Inc.

FAX: 805-373-3710

SHINDENGEN AMERICA INC., 2649 Townsgate Road, Ste. 200, Westlake Vl., CA 91361, Tel: 800-634-3654; Empl.: 10; *Sls. Mgr.:* Peter Gajewski; *Dist. Mgr.:* Peter Gajewski ..... **D•2034-2035**

Local Sales Offices & Reps

AZ Phoenix, Hartland Sls. 602-492-0012
CA Murrieta, Mil-Com Sls., Inc. 714-677-2097
CA San Diego, Power Assocs. 619-275-0641
CA Santa Clara, Integrated Tech. Sls. 408-727-3408
CO Arvada, Arrowhead/CSI 303-423-5597
FL Land O' Lakes, A.J.'s Power Source, Inc. 813-996-2583
GA Duluth, AJ's Power Source 404-441-7927
IL Rolling Meadows, Eagle Tech. Sls., Inc. 312-991-0700
AZ Scottsdale, Bill Earl Assocs. 602-994-3813
KS Lenexa, Midtec Assocs. 913-541-0505
MD Baltimore, Chesapeake Indl. Mktg. 301-653-0476
MI Lathrup Vl., R. C. Nordstrom & Co. 313-559-7373
MO St. Louis, Midtec Assocs. 314-275-8666
NH Nashua, Bell Controls, Inc. 603-882-6984
NY Hauppauge, Aurora-Schmitt 516-434-1313
NY Pittsford, Franklin Sls. Corp. 716-248-8251
OR Beaverton, Olsen Tech. Sls. Corp. 503-643-9488
PA Blue Bell, Delatronics Inc. 215-641-9930
MN Mancata, E. I. Sls. 507-345-5786
TX Richardson, Jim Gray & Assocs. 214-699-9976
TX Richmond, Jim Gray & Assocs. 713-342-1710
UT Midvale, Arrowhead/CSI 801-561-5688
WA Bellevue, Olsen Tech. Sls. Corp. 206-883-7792
WI Waukesha, Eagle Tech. Sls. 414-549-3622
Can Mississauga, Ont., Techrep 416-890-2903
Can Nepean, Ont., Techrep 613-225-9186
Can St. Laubert, Que., Techrep 514-337-6046

Local Distributors

AZ Phoenix, Dalis Elctrn. Supply 602-275-2626
AZ Tucson, Dalis Elctrn Supply 602-294-2628
CO Littleton, Dusplays Plus, Inc. 303-730-7333
CT Danbury, Aved Elctrn. Dist., Inc. 203-744-7838
IL Schaumburg, QPS Elctrns. 312-884-6620
MD Gaithersburg, Axis Elctrns. 301-840-9640
MA Andover, Aved Elctrn. Dist., Inc. 508-688-3800
MI St. Clair Shores, Spemco 313-771-2700
NJ Pennsauken, Alta Elctrns. 609-488-1442
NM Albuquerque, Summit Elec. Supp. Co. 505-884-4400
NM Albuquerque, Walker Elctrn. Supply ... 505-883-2992
OH Cleveland, Major Elctrns. 216-442-6200
TX Austin, Wofford Elctrns. 512-339-1131
TX Dallas, Wofford Elctrns. 214-320-0294
TX El Paso, Midland Wintronic Co. 915-779-8391
TX Houston, Wofford Elctrns. 713-847-3583

ShinEtsu

FAX: 415-475-0613

SHIN-ETSU POLYMER AMERICA, INC., 34135 7th St., Union City, CA 94587, Tel: 415-475-9000, TWX: 910-338-2229; *Sls. Mgr.:* Doug Hall ..... **C•1521**

Local Sales Offices & Reps

FL Clearwater, Tech-Rep Assocs. 813-572-9900
IL Crystal Lake, Mid America Reps. 815-455-5310
IN Carmel, Technology Mktg. Corp. 317-844-8462
MA Lexington, Jodan Technlg. 617-863-8898
MO St. Louis, G.M. Brown & Assocs. 314-741-4424
NJ Matawan, SP America, Inc. 201-583-7070
NJ Princeton, Siemens Comps., Inc. 609-987-0083
NM Albuquerque, F-P Sls. 505-345-5553
NY Liverpool, Gen-Tech 315-451-3480
NC Smithfield, ADI, Inc. 919-934-8136
OH Columbus, Siemens Comps., Inc. 614-433-7500
OH Strongfield, Dolfuss-Root & Co., Inc. 216-238-0300
PA Bridgeville, Dolfuss Root & Co. 412-221-4420
PA Broomall, TCA Assoc. 215-353-2022
PA Westchester, TCA Assocs. 215-692-6853
TN Greenville, Interep 615-639-3491
TN Greenville, Lamons Sls. Co. 615-639-8711
TX Arlington, CompTech Sls., Inc. 817-265-6007
TX Austin, CompTech Sls., Inc. 512-331-8922
TX Dallas, THT Sls. 214-783-1501
CA Irvine, Interconn Tech. Mktg. 714-733-1879
UT Salt Lake City, Lange Sls. 801-487-0843
UT Salt Lake City, Lange Sls., Inc. 801-487-0843
WA Bellevue, Micro Sls. 206-451-0568
PR Rio Piedras, Klamco Elec. 809-752-6169

Local Distributors

MI Farmington Hills, J.L. Montgomery Assoc., Inc. 313-489-0099

SHOGYO

FAX: 516-466-0922

SHOGYO INTERNATIONAL CORP., 287 Northern Blvd., Great Neck, NY 11021, Tel: 516-466-0911, TELEX: 4758024, TWX: 12218 ..... **A•2391; B•1186, 1778; C•1523-1525, 1820-1821; D•1058-1059, 1491, 2037**

SHOKAI

FAX: 914-736-3656

SHOKAI FAR EAST LTD., 9 Elena Court, Peekskill, NY 10566, Tel: 914-736-3500, TELEX: 224219; Empl.: 362; *Sls. Mgr.:* Shirlee Serber; *Dist. Mgr.:* Robert Craig ..... **A•2069; B•1187; D•1060**

SHURE BROTHERS INC., 222 Hartrey Ave., Evanston, IL 60202-3696, Tel: 708-866-2200, TELEX: 4330191, FAX: 708-886-2279; *Sls. Mgr.:* L.Z. Morgan, VP Sls.

SHURITE METERS, A Prime Technology Co., P.O. Box 185, Twin Lakes Rd., North Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092, FAX: 203-481-8937; FSC No.: 82239; Empl.: 15; *Sls. Mgr.:* James L. Jamieson ..... **D•1373**

Local Sales Offices & Reps

AK Please Consult Factory, Please Consult Factory 203-481-5721
CA Burbank, Modco Co. 818-848-2215
CA San Diego, Qualtronics 619-873-0118
CA So. San Francisco, Carelli-EMA 415-873-3365
CO Denver, Nelson Co. Inc. 303-295-1017
CT Gilman, Adams McGregor Inc. 203-537-3033
FL Lakeland, Munday Sls. Co. 813-858-5606
IL Cary, Bob Burns Assocs. 708-516-3322
IN Indianapolis, John Sukup Inc. 317-253-5501
IA Des Moines, The Beams Co. 515-255-1148
KS Shawnee Mission, The Beams Co. 913-631-0300
MI E. Detroit, Jack M. Thorpe Co. 313-779-6363
MO St. Louis, The Beams Co. 314-434-8448
NJ Franklin, D. F. Tobias & Co. 201-751-8680
NJ Lawrenceville, DVS Co. 609-896-1112
NY Rochester, D. F. Tobias 201-751-8680
NC Raleigh, B.T. Funderburk Inc. 919-846-2373
OH Cleveland, John Olsen Co. 216-838-0510
PA Glenshaw, DVS Co. 609-896-1112
SC Landrum, B.T. Funderburk Inc. 919-846-2373
TX Dallas, The Crockett Sls. Co. 214-350-3377
Can Thornhill, Ont., R. C. Kahnert Sls. Ltd. 416-764-2596
Can Winnipeg, Manitoba, Smith-Patterson & Assocs. 204-885-1376

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AL Birmingham, ACK Radio Supply 205-322-0588
AZ Phoenix, Capital Elctrns. Supp. 602-252-5897
AR Little Rock, Carlton-Bates 501-562-9100
CA San Francisco, Zack Elctrns. 415-624-1444
CA San Jose, Quements Elctrns. 408-998-5900
CA San Rafael, Electronics Plus 415-457-0466
CO Denver, Fistells Elec. Supp. 303-629-1312
CT New Haven, Hatry Elctrns. 203-787-5921
IN East Chicago, Acro Elctrns. 219-397-8681
IA Des Moines, Radio Trade Supp. 515-288-7237
KY Louisville, Peerless Elctrn.Eqpt. 502-637-7677
LA Baton Rouge, Ralph's Elctrn. Supp. ... 504-344-3761
MO Kansas City, Elctrn. Supp. Co. 816-931-0250
MO Kansas City, Walters Indl. Elect. Inc. 1-800-821-5248
NM Los Cruces, Elctrn. Parts Co. 505-523-4578
OH Akron, Akron Elctrn. Supp. 216-762-8818
OH Lima, Hutch & Sons 419-229-8751
OK Tulsa, Radio Inc. 918-587-9123
PA Reading, Barbey Elctrns. Corp. 215-376-7451
RI Pawtucket, Jabbour Elctrns. 401-728-4600
TX Fort Worth, Allied Elctrns. 1-800-433-5700
TX Houston, City Elctrns. Supp. 713-621-1060
TX Houston, Elctrn. Prts. Outlet 713-784-0140
WI Milwaukee, E.M. Instrs. Inc. 414-272-7799
Can Willowdale, Ontario, Electro Sonic Inc. 416-494-1666

SIEMENS-B C L MAGNETICS, Siemens Automotive Ltd., 5045 North Service Rd., Burlington, Ont., Canada L7L 5H6, Tel: 416-335-2530, FAX: 416-335-8474; Empl.: 160; *Sls. Mgr.:* Dave Dore

SIEMENS COMPONENTS, INC., Optoelectronics Division, 19000 Homestead Rd., Cupertino, CA 95014, Tel: 408-257-7910, TELEX: 352084, TWX: 910-338-0022; FSC No.: 50579; Empl.: 1100; *Sls. Mgr.:* Chuck Berghoff; *Dist. Mgr.:* Regina Walls

SIEMENS COMPONENTS, INC., Special Products Div., 186 Wood Ave., South, Iselin, NJ 08830, Tel: 201-321-3400, TWX: 710-998-0588/0529, FAX: 201-321-3961; Empl.: 800; *Sls. Mgr.:* Curt Hozian; *Dist. Mgr.:* Dick Robert

SIERRACIN/MAGNEDYNE, 2258 Rutherford Rd, Carlsbad, CA 92008, Tel: 619-438-3321, FAX: 619-438-4987; Empl.: 150

SIERRACIN POWER SYSTEMS, See Sierra Power Systems

SIERRA MONITOR CORP., 1991 Tarob Ct, Milpitas, CA 95035, Tel: 408-262-6611, TELEX: 17-1618; FSC No.: MSGSNDR; Empl.: 23; *Sls. Mgr.:* Robert Dunkle; *Dist. Mgr.:* Gordon Arnold

SIERRA POWER SYSTEMS, See Valor Power Sys. Div., Valor Elctrns.

SIERRA SEMICONDUCTOR CORP., 2075 N. Capitol Ave., San Jose, CA 95132, Tel: 408-263-9300, FAX: 408-263-3337

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg., Inc.	205-830-0498
AZ	Scottsdale, Summit Sls.	602-998-4850
CA	Irvine, Strong & Assocs.	714-261-7233
CA	Mountain View, Brooks Tech. Grp.	415-960-3880
CA	San Diego, Pathfinder Elctrns. Reps.	619-578-2555
CO	Wheat Ridge, Wescom Mktg.	303-422-8957
CT	Woodbury, Lindco Assocs., Inc.	203-266-0728
FL	Altamonte Springs, Sls. Engrg. Concepts	407-830-8444
FL	Deerfield Bch., Sls. Engrg. Concepts	305-426-4601
GA	Norcross, Montgomery Mktg., Inc.	404-447-6124
ID	Boise, Wescom Mktg., Inc.	208-226-6654
IL	Rolling Meadows, Eagle Tech. Sls.	708-991-0700
IN	Indianapolis, Elctrn. Sls. & Engineering	317-849-4260
MD	Columbia, Chesapeake Technlg.	301-236-0530
MA	Burlington, New Tech Solutions	617-229-8888
MI	Farmington, Tri-Tech Sls., Inc.	313-442-1200
MN	Minneapolis, P.S.I.	612-944-8545
NJ	E. Hanover, Emtec Sls., Inc.	201-428-0600
NJ	Medford, The McCoy Grp., Inc.	609-953-0770
NM	Albuquerque, Summit Sls.	505-345-5003
NY	Syracuse, PI'Tronics (Upstate)	315-455-7346
NC	Raleigh, Montgomery Mktg.	919-851-0010
OH	Cleveland, Arthur Baier Co.	216-461-6161
OR	Beaverton, L-Squared	503-629-8555
PA	Exton (East), The McCoy Grp.	215-363-0350
PA	Pittsburgh (West), Arthur Baier Co.	412-367-7799
TX	Houston, Logic 1 Sls.	713-444-7594
TX	Richardson, Logic 1 Sls.	214-234-0765
UT	Salt Lake City, Wescom Mktg., Inc.	801-269-0419
WA	Kirkland, L-Squared, Ltd.	206-827-8555
WI	Waukesha, Eagle Tech. Sls.	414-896-0633
Can	Ottawa, Ont., Cantec Reps.	613-725-3704

Local Distributors

CA	Irvine, ITT Multicomponents	714-727-4001
CA	San Jose, ITT Multicomponents	408-453-1404
CO	Westminster, ITT Multicomponents	303-451-8740
CT	Milford, Milgray	203-878-5538
FL	Winter Pk., Milgray	305-647-5747
GA	Norcross, Milgray	404-446-9777
IL	Arlington Hgts., Milgray	312-253-1212
KS	Overland Pk., Milgray	913-236-8800
MD	Columbia, Milgray	301-621-8169
MA	Wilmington, Milgray	508-657-5900
NJ	Marlton, Milgray	609-983-5010
NY	Farmingdale, Milgray	516-391-3000
NY	N. Lindenhurst, Phase 1 Technlg.	516-957-4900
NY	Pittsford (Upstate), Milgray	716-381-9700
OH	Cleveland, Milgray	216-447-1520
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SIGMA ELECTRONICS INC., 10830 Kinghurst Dr., Houston, TX 77099, Tel: 713-933-4700, 800-874-7121, FAX: 713-933-9067; FSC No.: 60767; Empl.: 87; *Sls. Mgr.:* K. Johnson

SIGMA PLASTRONICS, INC., P.O. Box 649, Whitmore Lake, MI 48189, Tel: 313-231-2871, FAX: 313-231-2960; Empl.: 3

SIGMAPOWER, INC., 20790 Leapwood Ave., Carson, CA 90746, Tel: 213-32-Sigma, FAX: 213-769-0172; FSC No.: 55196; Empl.: 145; *Sls. Mgr.:* Carl J. Marquardt

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FAX: 619-283-6526

SIGMA SYSTEMS CORP., 3163 Adams Ave., San Diego, CA 92116, Tel: 619-283-3193; Empl.: 21; *Sls. Mgr.:* T. Stewart ... **D•1201**

Local Sales Offices & Reps

CA	Albany, B/P Assocs.	415-525-7605
CA	San Carlos, Electronic Engrg. Assoc.	415-593-2189
CA	San Carlos, Electronic Engrg. Assocs.	415-593-2189
IL	Elgin, R.K. Elctrns., Inc.	312-695-8552
IL	So. Elgin, RK Elctrns., Inc.	312-695-8552
MN	Edina, Dytec Instrs., Inc.	612-831-7169
NJ	Parsippany, Creative Tech. Sls.	201-335-7881
Intl	Palaiseau, France, Salies S.A.	920-40-10

SIGNAL PROCESSING TECHNOLOGIES, 1510 Quail Lake Loop, Colorado Springs, CO 80906, Tel: 719-540-3900, FAX: 719-540-3970; Empl.: 68; *Sls. Mgr.:* Rick Mintle

SIGNAL RESEARCH INC., River Road, P.O. Box 357, Titusville, NJ 08560, Tel: 609-737-1917 ... **D•1109**

SIGNAL SYSTEMS INTERNATIONAL, P.O. Box 470, Lavalette, NJ 08735, Tel: 201-793-4668, FAX: 201-793-4679; Empl.: 7; *Sls. Mgr.:* W. Kinney ... **B•1779**

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Local Sales Offices & Reps

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SIGNATEC, INC., 357 N. Sheridan-Ste. 119, Corona, CA 91720, Tel: 714-734-3001, FAX: 714-734-4356; Empl.: 4; *Sls. Mgr.:* Belinda Hunt

SIGNATRON, A Subsidiary of Meteor Communications Corp., 110 Hartwell Ave., Lexington, MA 02173, Tel: 617-861-1500, TELEX: 299551 (RCA GLOBCOM), FAX: 617-863-8039; FSC No.: 59371; Empl.: 25; *Sls. Mgr.:* Joseph T. McNamara

SIGNETICS COMPANY, Sub. of North American Philips, 811 E. Arques Ave., P.O. Box 3409, Sunnyvale, CA 94088-3409, Tel: 408-991-2000, FAX: 408-991-2311; FSC No.: 1CH66; Empl.: 7,000; *Sls. Mgr.:* Steve Pletcher; *Dist. Mgr.:* Vinnie Bonanno

SIGNUM, INC., 600 W. Cummings Park, Woburn, MA 01801, Tel: 617-933-4780, TELEX: 948263, FAX: 617-938-1757; *Sls. Mgr.:* Thomas DiGennaro

SIGNUM SYSTEMS CORP., 171 E. Thousand Oaks Blvd. No. 202, Thousand Oaks, CA 91360, Tel: 805-371-4608, TELEX: 36-24-39, FAX: 805-371-4610; Empl.: 12; *Sls. Mgr.:* Don Mull; *Dist. Mgr.:* K. Kristensen ... **D•1326**

Local Sales Offices & Reps

CA	San Jose, C.M.S.	415-487-2118

SIKAMA INTERNATIONAL, INC., 301 B Donaldson Place, Santa Barbara, CA 93117, Tel: 805-683-6379, FAX: 805-683-6740; Empl.: 25; *Sls. Mgr.:* Theresa Roberts; *Dist. Mgr.:* Theresa Roberts

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FAX: 805-484-9935

SILICON DETECTOR CORP., 1240 Avenida Acaso, Camarillo, CA 93012, Tel: 805-484-2884; Empl.: 60; *Sls. Mgr.:* David Tingley, William Bandel ... **B•1342-1344**

Local Sales Offices & Reps

AL	Huntsville, Reynolds & Assocs., Inc.	407-259-7000, FAX:205-534-1015
CA	Santa Clara, Electec	408-496-0706, FAX:408-727-9617
CA	Tarzana, Royal Shillah	818-342-1848, FAX:818-342-2601
CO	Littleton, Simpson Assocs.	303-794-8381, FAX:303-794-2409
CT	Madison, Conti-Younger	203-245-1136
FL	New Port Richey, Reynolds & Assocs., Inc.	407-259-7000,FAX:813-372-7204
GA	Lilburn, Reynolds & Assocs., Inc.	407-259-7000, FAX:404-905-4116
IN	Fishers, Carter, McCormic & Pierce, Inc.	317-842-9277,FAX:317-577-2741
KS	Lenexa, Midtec Assocs., Inc.	913-541-0505, FAX:913-541-1729
MD	Randallstown, Beacon North	703-478-2480
MA	Burlington, Conti-Younger	617-273-1582, FAX:617-270-0310
MI	Farmington Hills, Carter, McCormic & Pierce, Inc.	313-477-7700,FAX:313-477-4149
MN	Eden Prarie, Electronic Innovators, Inc.	612-922-2745,FAX:612-922-3914
MO	St. Louis, Midtec Assocs., Inc.	314-275-8666, FAX:314-275-8859
NJ	Huwitt, Aurora Schmitt Assocs.	201-853-5253
NY	Albany, L-Tron Corp.	518-489-7810, FAX:518-489-7810
NY	Hauppauge, Aurora Schmitt Assocs.	516-434-1313,FAX:516-434-1572
NY	Pittsford, L-Tron Corp.	716-383-0050, FAX:716-383-0701
NC	Raleigh, Reynolds & Assocs., Inc.	407-259-7000
OH	Englewood, Carter, McCormic & Pierce, Inc.	513-836-0951,FAX:513-836-2358
OH	Parma, Carter, McCormic & Pierce, Inc.	216-398-0400,FAX:216-398-0766
OK	Tulsa, Advanced Tech. Sls.	918-664-0482, FAX:918-664-5467
OR	Portland, Venture Elctrns.	503-624-0617, FAX:503-620-4632
PA	Collegeville, Beacon North	703-478-2480
PA	Langhorne, Beacon North	215-752-4429
PA	Pittsburgh, Carter, McCormic & Pierce, Inc.	412-826-3800,FAX:412-826-3803
SC	Greenville, Reynolds & Assocs., Inc.	407-259-7000
TX	Austin, Advanced Tech. Sls.	512-467-9209, FAX:512-467-9405
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SILICON GENERAL, 11861 Western Ave., Garden Grove, CA 92641, Tel: 714-898-8121, TELEX: 692-411, TWX: 910-596-1804, FAX: 714-893-2570; FSC No.: 34333; Empl.: 250; *Sls. Mgr.:* Roger Holliday; *Dist. Mgr.:* Louise Toussaint

SILICONIX, INC., 2201 Laurelwood Rd., Santa Clara, CA 95054, Tel: 408-988-8000, TWX: 910-338-0227; Empl.: 2300; *Sls. Mgr.:* Walter Senges, VP of Sls.; *Dist. Mgr.:* Richard O Tuska, Dist. Sls. Dir.

FAX: 213-630-5338

SILICON POWER CUBE CORP., 6015 Obispo Ave., Long Beach, CA 90805, Tel: 213-634-9390, TELEX: 297340; Empl.: 350 ..... **B•1582-1583**

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AZ	Chandler, Hamilton/Avnet	602-961-1211
CA	Costa Mesa, Hamilton/Avnet	714-641-4100
CA	Gardena, Hamilton/Avnet	213-516-8600
CA	Long Beach, Amps Abundant	213-634-0187
CA	Sacramento, Hamilton/Avnet	916-925-2216
CA	San Diego, Hamilton/Avnet	619-571-1900
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CO	Englewood, Hamilton Avnet	303-799-7800
CT	Danbury, Hamilton/Avnet	203-748-6077
FL	Ft. Lauderdale, Hamilton/Avnet	305-767-6377
FL	St. Petersburg, Hamilton/Avnet	813-576-3930
FL	Winter Pk., Hamilton/Avnet	407-657-3300
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IN	Carmel, Hamilton/Avnet	317-844-9333
IA	Cedar Rapids, Hamilton/Avnet	319-362-4757
KS	Overland Pk, Hamilton/Avnet	913-888-8900
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MA	Peabody, Hamilton/Avnet	508-531-7430
MI	Grand Rapids, Hamilton/Avnet	616-243-8805
MI	Livonia, Hamilton/Avnet	313-347-4270
MN	Minnetonka, Hamilton/Avnet	612-932-0600
MO	Earth City, Hamilton/Avnet	314-537-1600
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NJ	Fairfield, Hamilton/Avnet	201-575-3390
NM	Albuquerque, Hamilton/Avnet	505-345-0001
NY	Hauppauge, Hamilton/Avnet	516-231-9800
NY	Rochester, Hamilton/Avnet	716-292-0810
NY	Syracuse, Hamilton/Avnet	315-437-2641
NC	Raleigh, Hamilton/Avnet	919-878-0810
OH	Dayton, Hamilton/Avnet	513-439-6700
OH	Solon, Hamilton/Avnet	216-242-6610
OH	Westerville, Hamilton/Avnet	614-882-7004
OK	Tulsa, Hamilton/Avnet	918-664-0444
OR	Lake Oswego, Hamilton/Avnet	503-627-0201
PA	Pittsburgh, Hamilton/Avnet	412-281-4150
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TX	Irving, Hamilton/Avnet	214-308-8111
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SILONEX INC., 331 Cornelia St., Plattsburgh, NY 12901, Tel: 518-561-3160, FAX: 514-747-3906; Empl.: 110; *Sls. Mgr.:* Carol Larsen ..... **B•1345**

Local Sales Offices & Reps

CT	Branford, LJM Assocs.	203-488-4244
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MA	Topsfield, RFC Assocs.	508-887-8545
MI	Livonia, Amtech Reps.	313-474-8300
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
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SILTRONICS LTD., P.O. Box 456, Dover, MA 02030, Tel: 617-329-4068, FAX: 508-785-2265; Empl.: 110; *Sls. Mgr.:* G. Urban

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Local Sales Offices & Reps

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GA	Atlanta, Electro Sls. Inc.	404-394-1122
IL	Cary, Bob Burns & Assocs.	708-516-3322
MA	Wakefield, Instr. Dynamics Inc.	617-245-5100
NY	F & F Metro Inc.	516-482-4080
TX	Dallas, Southwest Elctrn. Ind. Inc.	214-690-9881
WI	Wauwatosa, Larsen Assocs. Inc.	414-258-0529
Can	Markham, Ont., Avotronics Ltd.	416-475-2024

SIMCO CO., 2257 North Penn Rd., Hatfield, PA 19440, Tel: 215-822-2171, FAX: 215-822-3795; Empl.: 150; *Sls. Mgr.:* Bob Heacock

SIMMONDS PRECISION ENGINE SYSTEMS, BF Goodrich Aerospace, P.O. Box 310, Norwich, NY 13815, Tel: 607-335-5000, TWX: 510-261-7776; Empl.: 650; *Sls. Mgr.:* G. D. Cummings

SIMPSON ELECTRIC CO., 853 Dundee Ave., Elgin, IL 60120, Tel: 708-697-2260, TELEX: 72-2416, FAX: 708-697-2272; Empl.: 550; *Dist. Mgr.:* George Oskandy, Sls. Admin. Mgr.

SIMTEK CORP., 1465 Kelly Johnson Blvd., Colorado Springs, CO 80920, Tel: 719-531-9444, FAX: 719-531-9481; Empl.: 40; *Sls. Mgr.:* David Bowers; *Dist. Mgr.:* David Bowers

SIMULASER CORP., 15251 E. Don Julian Rd., City of Industry, CA 91746, Tel: 818-369-1355, FAX: 818-336-8694; FSC No.: 8T239; Empl.: 26

SIMULEX CORPORATION, 2832-C Walnut Avenue, Tustin, CA 92680, Tel: 714-730-1500, FAX: 714-730-7176; *Sls. Mgr.:* Dave Guss

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FAX: 708-860-3672

SINGER DATA PRODUCTS, INC., 790 Maple Lane, Bensenville, IL 60106, Tel: 708-860-6500, TELEX: 210-230; Empl.: 40; *Sls. Mgr.:* Ken Krohmer ..... **D•1111**

Local Sales Offices & Reps

NJ	Haddonfield, Singer Data	609-429-6927

SINOTECH, Technology Communications Group, Inc., 23590 Stafford Hill Drive, West Linn, OR 97068, Tel: 503-638-1000, FAX: 503-638-1002; Empl.: 45; *Sls. Mgr.:* John Vezmar

SIPEX CORP., Custom Monolithic Prods. Div., Six Fortune Dr., Billerica, MA 01821, Tel: 508-667-8700, FAX: 508-670-9001; Empl.: 90; *Sls. Mgr.:* Bill Dennehy

SITCO ANTENNAS DIV.OF SIMPLICITY TOOL CORP., 10330 N.E. Marx St., Portland, OR 97220, Tel: 503-253-2000, TELEX: 200 479, FAX: 503-253-2009; Empl.: 18; *Sls. Mgr.:* M. Bureker

Local Distributors

CO	Englewood, Mega Hertz	303-779-1717
MN	Shakopee, Comms. Supp. Grp.	612-445-8424
IL	Elk Grove, Anxiter	800-554-5368
MN	St. Paul, D.F. Coutryman	800-328-6820
NY	Wharton, Anxiter	516-293-7788
OK	Tulsa, Tulsat Corp./DRK Entrps.	918-836-8348
TX	Bedford, Spectrum	817-267-2288
WA	Redmond, Glade Comms.	206-869-4116

S.I. TECH, 901 N. Batavia Ave., Batavia, IL 60510, Tel: 708-232-8640, FAX: 708-232-8677; Empl.: 17; *Sls. Mgr.:* Ramesh Sheth; *Dist. Mgr.:* Kay Brabec ..... **B•1231**

Local Sales Offices & Reps

MA	Holliston, Olson Mktg.	508-429-8066
MN	Hibbing, Minntech Ec.	218-262-5228
NJ	E. Brunswick, EAC Assocs.	908-254-6624
NM	Albuquerque, Fry-Gates Co.	505-262-1525
TN	Memphis, Professional Technlg.	901-458-1228
TX	Ingram, Davis-Hallmark Prods.	512-367-4919
WA	Bellevue, Interconnect Tech.	206-462-9508

Local Distributors

AL	Birmingham, Newark Ec.	205-942-4044
AK	Anchorage, Potelcom Supp.	907-274-8525
AR	Little Rock, Carlton Bates	817-293-5558
CA	Los Angeles, Anixter	213-625-7828
CA	San Francisco, Anixter	415-543-6070
CO	Denver, Newark Ec.	303-373-4540
FL	Miami, Newark Ec.	800-631-4608
IL	Chicago, Newark	312-792-8233
IL	Skokie, Anixter	800-243-8344
LA	Baton Rouge, Anixter	504-922-7755
MA	Boston, Anixter	508-682-8870
MI	Detroit, Anixter	313-478-3900
MO	St. Louis, Newark Ec.	314-821-7466
NY	Hauppauge, Manchester Equip. Co.	516-294-5351
OH	Columbus, Hughes-Peters	614-294-6215
PA	Pittsburgh, South-Mills Ec.	800-245-6215
TN	Chattanooga, Horizon Ec.	615-899-8585
TN	Clarksville, Randolph, Hale, Matthews	615-647-2325
TX	Houston, Anixter	713-460-9473
VA	Chantilly, Newark Ec.	703-471-7447
WA	Bellevue, Newark Ec.	206-641-9800
WI	Milwaukee, Anixter	414-355-0222
Can	London, Newark Ec.	519-685-4280
Can	Toronto, Anixter	416-568-8999

SIVERS IMA AB, 11520 Jefferson Blvd., Culver City, CA 90230, Tel: 213-306-4248, FAX: 213-390-4350; Empl.: 300; *Sls. Mgr.:* Marshall Cleland

SJOBERG, C., & SON, INC., 415 Station St., P.O. Box 3583, Cranston, RI 02910, Tel: 401-461-8220, FAX: 401-467-5446; Empl.: 20

SKB COPORATION, 434 W. Levers Place, Orange, CA 92667, Tel: 714-637-1252, FAX: 714-637-0491; FSC No.: 61302; Empl.: 170; *Sls. Mgr.:* Allan Evavold

SKF CONDITION MONITORING, 4141 Ruffin Rd., San Diego, CA 92123-1841, Tel: 619-496-3400, FAX: 619-496-3546; Empl.: 150; *Sls. Mgr.:* Rich Gabel

SKO-DIE, INC., 8050 Austin Ave., Morton Grove, IL 60053, Tel: 708-965-1130, FAX: 708-966-0322; FSC No.: 7P145; Empl.: 50; *Sls. Mgr.:* Ralph H. Hoffmann

SKY COMPUTER, INC., 27 Industrial Ave., Chelmsford, MA 01824, Tel: 508-250-1920, TELEX: 499-1331, FAX: 508-250-0036

SKYDYNE DIV., AAR MFG., 21 River Rd., Port Jervis, NY 12771, Tel: 914-856-6655, 800-428-CASE, FAX: 914-856-8378; Empl.: 110; *Sls. Mgr.:* M. Timney ..... **C•1106-1107**

SKYNET ELECTRONICS, 1474 Gladding Ct., Milpitas, CA 95035, Tel: 408-945-6355, FAX: 408-945-6357; Empl.: 20

SKYWAY MAGNETICS, 35372 Hwy 79, Warner Springs, CA 92086, Tel: 619-782-3342; FSC No.: 3612; Empl.: 12; *Sls. Mgr.:* John Grudziadz

SLAUGHTER CO., 801 Hailey St., P.O. Box 1805, Ardmore, OK 73402, Tel: 405-223-4773, TELEX: 697-5577, FAX: 405-226-5757; FSC No.: 05611; *Sls. Mgr.:* T. Medrick ..... **D•1327**

SL CORPORATION, 240 Tamal Vista Blvd. No. 110, Corte Madera, CA 94925, Tel: 415-927-1724, FAX: 415-927-2931; Empl.: 26; *Sls. Mgr.:* Christopher Wilson; *Dist. Mgr.:* Christopher Wilson

The Sloan Company
"THE TOUCH OF BRILLIANCE IN PANEL DESIGN"

FAX: 818-768-8326

SLOAN CO., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, Tel: 213-875-1123, TWX: 910-498-2250; FSC No.: 08717; Empl.: 25 ..... **B•1188-1195**

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
CA	Montrose, Signal Entprs. Inc.	818-957-0640
CA	Mtn. View, Francisco & Assocs.	415-962-1717
RI	Warwick, Schumacher & Yarrington	401-884-5671
IL	Wheaton, CS Tech Sls.	708-653-8126
MD	Glen Burnie, Macrotech Assoc.	301-766-1111
MN	Minneapolis, Loren Green Assoc. of Minn.	612-571-6666
MO	Shawnee Mission, Microtronics	913-262-1444
NJ	Cherry Hill, Quality Comps.	609-428-6226
NJ	Englewood Cliffs, E. Glass Assocs.	201-592-0200
NY	Rochester, Tech. Comps.	716-342-2406
OH	Cleveland, Allan Scraga	216-232-4946
TX	Dallas, IBL Engrg. & Sls.	214-363-2921
WA	Bellevue, Olson Tech Sls.	206-883-7792

Local Distributors

AL	Huntsville, Powell Elctrns.	205-529-2731
CA	Anaheim, Deco Elctrns.	714-630-8252

CA	Canoga Park, AMC Radio Hardware	818-998-2584
CA	Costa Mesa, Powell Elctrns.	714-754-1717
CA	San Diego, Deco Elctrns.	619-693-1595
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Torrance, Kent Elctrns.	213-320-2700
CT	W. Hartford, Signal Ctr. Inc.	203-236-6005
FL	Ft. Lauderdale, Peerless Radio Corp.	305-973-4141
FL	Ft. Lauderdale, Powell Elctrns.	305-979-5000
CA	Los Angeles, Trebor Elctrns.	213-641-8304
FL	Pompano Beach, Peerless Radio	305-973-4141
KS	Wichita, Lee Prods.	316-264-2172
MD	Annapolis, Powell Elctrns.	301-880-3355
IL	Arlington, Mar'Lyn Elctrns.	312-364-7880
MA	Westborough, Powell Elctrns.	617-366-6100
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NJ	Englewood, Powell Elctrns.	201-568-5600
OH	Cleveland, Acorn Inds.	216-289-2531
OH	Dayton, D & D Packaging Co., Inc.	513-233-8585
OH	Solon, Repco	216-248-8900
OK	Tulsa, Altair Co.	918-252-5781
PA	Philadelphia, Powell Elctrns.	215-365-1900
TN	Memphis, GFI Sls.	901-683-6252
TX	Austin, The Altair Co.	512-837-4490
NC	Cary, Powell Elctrns.	919-467-1212
TX	Houston, Altair Co.	713-462-3029
TX	Irving, Powell Elctrns.	214-258-6841
TX	Richardson, Altair Co.	214-231-5166

SLOAN TECHNOLOGY CORPORATION, Veeco Instruments Inc., 602 E. Montecito St, Santa Barbara, CA 93103, Tel: 805-963-4431, TWX: 910-334-4901, FAX: 805-965-0522; Empl.: 75; *Sls. Mgr.:* Mel Lipton

SL WABER, INC., 520 Fellowship Rd. Ste. 306, Mt. Laurel, NJ 08054, Tel: 609-866-8888, 800-257-8384, FAX: 609-866-1945; Empl.: 125; *Sls. Mgr.:* Scott Hammill

SMERT COMPTER AIDED DESIGN & PROTOTYPE, DIV. OF SME (MONACO), P.O. Box 13280, Kanata, Ont., Canada K2K 1X4, Tel: 613-839-5588, FAX: 613-839-5582; Empl.: 14; *Sls. Mgr.:* Raymond Fourastier

H H SMITH, NT-T Inc., 632 Arch St., Meadville, PA 16335, Tel: 814-724-6440, FAX: 814-333-1912; Empl.: 300; *Sls. Mgr.:* Larry Zeiser; *Dist. Mgr.:* Larry Zeiser

BRILL ELECTRONICS
(415) 834-5888
610 E. 10th St. Oakland, CA 94606
HHSMITH
(213) 452-8002
1220 Olympic Bl. Santa Monica, CA 90404

BRILL ELECTRONICS
(415) 834-5888
610 E. 10th St. Oakland, CA 94606
A UNIT OF GENERAL SIGNAL
SOLA ELECTRIC
(213) 452-8002
1220 Olympic Bl. Santa Monica, CA 90404

SMK ELECTRONICS CORPORATION, U.S.A., 1901 Nancita Cir., Placentia, CA 92670, Tel: 714-996-0960, TELEX: 18-3081, FAX: 714-779-2790; FSC No.: 637-7400; Empl.: 219; *Sls. Mgr.:* Gary Redman/ T. Klymenko

SMT EAST CORPORATION, 378 Page St., Deerfield Corp. Ctr., Stoughton, MA 02072-1141, Tel: 800-888-SMT1, FAX: 617-344-0480; Empl.: 50

SNAPTITE/ALLIED, 6424 W. Ridge Rd., P.O. Box 8550, Erie, PA 16505, Tel: 814-833-6131, FAX: 814-838-7503; Empl.: 75

SOFREL, INC., 7685 Commerce Way No. 105, Eden Prairie, MN 55344, Tel: 612-937-8835, 1-800-8-SOFREL, FAX: 612-937-9086; Empl.: 8; *Sls. Mgr.:* Scott Henstein; *Dist. Mgr.:* Scott Henstein

SOFTAID, INC., 8930 Route 108, Columbia, MD 21045, Tel: 301-964-8455, FAX: 301-596-1852; Empl.: 9; *Sls. Mgr.:* Tammie Adams

SOFTWARE COMPONENTS GROUP, 1731 Technology Dr., San Jose, CA 95110, Tel: 408-437-0700, FAX: 408-437-0711; Empl.: 35; *Sls. Mgr.:* Dennis O Donel

THE SOFTWARE LINK, INC., 3577 Parkway Lane, Norcross, GA 30092, Tel: 404-448-5465, TELEX: 4996147SWLINK, FAX: 404-263-6474; Empl.: 55

SOHIO ENGINEERED MATERIALS CO., See Standard Engineered Materials Co.

SOKOL CRYSTAL PRODUCTS, INC., 121 Water St., Mineral Point, WI 53565, Tel: 608-987-3363, FAX: 608-987-3882; FSC No.: 56187; Empl.: 150; *Sls. Mgr.:* Steven M. Sokol

SOLA, A Unit of General Sign., 1717 Busse Rd., Elk Grove Village, IL 60007-5666, Tel: 708-439-2800, TELEX: 6871106 SOLAE, FAX: 800-626-6269; *Sls. Mgr.:* James Kimball; *Dist. Mgr.:* Brian Crowe

SOLARCOM TECHNOLOGY, INC., P.O. Box 4715, Hayward, CA 94544, Tel: 415-489-3141; Empl.: 9; *Sls. Mgr.:* Rose Ferguson

SOLAR ELECTRONICS CO., A. T. Parker, Inc., 901 N. Highland, Hollywood, CA 90038, Tel: 213-462-0806, TWX: 910-997-1921, FAX: 213-462-3721; FSC No.: 13222; Empl.: 17; *Sls. Mgr.:* Roy Talley

SOLATRON ENTERPRISES, 421 E. Beach Ave., Inglewood, CA 90302, Tel: 213-678-4981; Empl.: 20

SOLDER ABSORBING TECHNOLOGY (SAT), A Spirig Co., 144 Oakland St., Springfield, MA 01108, Tel: 800-628-8862, FAX: 413-788-0490; Empl.: 8; *Sls. Mgr.:* Joyce White

SOLDER REMOVAL, P.O. Box 1678, Covina, CA 91722, Tel: 818-967-3681, TWX: 910-584-1820; FSC No.: 34605; Empl.: 57

SOLID STATE, INC., 46 Farrand St., Bloomfield, NJ 07003, Tel: 201-429-8700, FAX: 201-429-8683; Empl.: 110; *Sls. Mgr.:* T. King

SOLID STATE DEVICES, 14830 Valley View Ave., La Mirada, CA 90638, Tel: 213-921-9660, FAX: 213-921-2396; FSC No.: 30043; Empl.: 200

SOLID STATE ELECTRONICS CORP., 18646 Parthenia St., Northridge, CA 91324, Tel: 818-993-8257, FAX: 818-993-8259; FSC No.: 11911; Empl.: 15

SOLID STATE RELAYS, 71 Regent, Oak Brook, IL 60521, Tel: 708-932-1660, FAX: 708-887-9522

SOLID STATE SYSTEMS, 1300 Shiloh Rd., N.W., Kennesaw, GA 30144, Tel: 404-423-2200, FAX: 404-423-2228; Empl.: 150; *Sls. Mgr.:* Max Biller; *Dist. Mgr.:* Max Biller

SOLID STATE TESTING, INC., 56 Middlesex Tpke., Burlington, MA 01803, Tel: 617-272-0972, FAX: 617-273-4896; Empl.: 150; *Sls. Mgr.:* James Roberts; *Dist. Mgr.:* James DiGiacomo

SOLITRON DEVICES, INC., Semiconductor Group, 1177 Blue Heron Blvd., Bldg. No.1, Riviera Beach, FL 33404-9978, Tel: 407-848-4311, 800-888-8763, FAX: 407-863-5946; FSC No.: 21845; Empl.: 800; *Sls. Mgr.:* Margaret McNutt; *Dist. Mgr.:* Abe Lincoln

SOLITRON/MICROWAVE, Solitron Devices, Inc., 1177 Blue Heron Blvd., Solitron Pk.,Bldg. No. 2, Riviera Bch., FL 33404-9978, Tel: 407-848-4311, 800-888-8763, FAX: 407-848-4311, Ext.116; FSC No.: 95077; Empl.: 200; *Sls. Mgr.:* Ray Sulzer; *Dist. Mgr.:* Deloris Martinez

SOLTEC CORP., 12977 Arroyo Street, San Fernando, CA 91340-1597, Tel: 818-365-0800, 800-423-2344, TELEX: 365-7089, FAX: 818-365-7839; Empl.: 80; *Sls. Mgr.:* Byron G. McIntire

SONICALL, INC., 3288 E. Willow Street, Signal Hill, CA 90806, Tel: 213-490-2143, FAX: 213-490-2145; *Sls. Mgr.:* Frank Handler ..... **D•1061**

Local Sales Offices & Reps

CA	Mountain View, Francisco & Assocs.	415-962-1717
CA	Arcadia, Van Gott & Assocs.	818-445-9728
CA	Park Ridge, Synmark Sls., Inc.	708-390-9696
FL	Margate, EPM, Inc.	305-977-0331
MD	Severna, Jenco Sls.	301-544-8652
MI	Lathrup Vlg., R.C. Nordstrom	313-559-7373
MN	St. Louis Park, Elctrn. Innovators	612-922-2945
NY	E. Syracuse, Nycom, Inc.	315-437-8343
NY	Great Neck, F&F Metro Inc.	516-482-4080
NC	Raleigh, Micro Sls. Inc.	919-881-0007
OH	Centerville, EMA, Inc.	513-433-3147
OR	Hillsboro, TAC Assocs.	503-648-6110
PA	West Chester, TCA Inc.	215-692-6853
RI	Warwick, Ertronics, Inc.	401-732-3567
TX	Dallas, REM Comps. Corp.	214-234-1069

Local Distributors

MA	Sharon, ADCOUR	800-232-3557

SONICOR INSTRUMENT CORP., 100 Wartburg Ave., Copiague, NY 11726, Tel: 516-842-3344, TELEX: 649494, FAX: 516-842-3389; FSC No.: 31605; *Sls. Mgr.:* Arthur Liers; *Dist. Mgr.:* Arthur Liers

SONNENSCHEIN BATTERIES INC., See East Penn Manufacturing

SONOBOND ULTRASONICS INC., Inductotherm Industries, 887 S. Matlack St., West Chester, PA 19382, Tel: 215-696-4710, 800-323-1269, FAX: 215-692-0674; FSC No.: 15882; Empl.: 35; *Sls. Mgr.:* P. C. Krause

SONY COMPONENT PRODUCTS CO, Semiconductor Division, 108333 Valley View St., Cypress, CA 90630, Tel: 714-229-4197, FAX: 714-229-4271; Empl.: 120; *Sls. Mgr.:* Chuck Schouw, V.P.; *Dist. Mgr.:* Mark Marrietta

SOPHIA SYSTEMS & TECHNOLOGY, 777 California Avenue, Palo Alto, CA 94304, Tel: 415-493-6700, 800-824-9294, FAX: 415-493-4648

Sorensen

FAX: 312-792-2129

SORENSEN COMPANY, 5555 N. Elston Ave., Chicago, IL 60630, Tel: 312-775-0843, 1-800-525-2024; Empl.: 200; *Sls. Mgr.:* Ed Larrabee ..... **D•2038-2046**

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier, Inc.	205-536-1506,FAX:205-551-0558
AZ	Tempe, Trembly Assocs.	602-967-2058, FAX:602-967-2878
CA	Cupertino, Costar	408-446-9339, FAX:408-446-4885
CA	LaCanada Flintridge, Trimarco Synertek	818-952-7106,FAX:818-952-8859
CA	Los Altos, Jay Stone & Assocs.	415-948-4563, FAX:415-948-2714
CA	San Jose, Jay Stone & Assocs.	408-435-1010
CO	Wheat Ridge, Trembly Assocs.	303-421-8900, FAX:303-421-1020
FL	Melbourne, Currie, Peak & Frazier, Inc.	407-724-6795,FAX:407-951-9717
FL	Orlando, Currie, Peak & Frazier, Inc.	407-855-0843, FAX:407-851-1464
FL	Pensacola, Currie, Peak & Frazier, Inc.	904-994-0599
FL	Tampa, Currie, Peak & Frazier, Inc.	813-963-1076, FAX:813-968-2480
GA	Duluth, Currie, Peak & Frazier, Inc.	404-497-9404, FAX:404-497-9412
IL	Arlington Heights, Dytec/Midwest, Inc.	708-255-3200,FAX:708-394-0270

IL Palatine, Vine Sls., Inc. 708-934-5476, FAX:708-934-1290
IN Indianapolis, Dytec/Midwest, Inc. 317-297-5988, FAX:317-297-0355
KS Lenexa, Dytec/South, Inc. 913-888-0215, FAX:913-894-1039
KS Wichita, Dytec/South, Inc. 316-263-7090, FAX:316-262-3189
LA Lafayette, Kemp Instruments, Inc. 318-269-9452, FAX:318-269-1073
MD Baltimore, Sci-Rep, Inc. 410-321-1411
MA Westford, ICS Assocs. 508-692-3545, FAX:508-692-0227
MI Southfield, Comtel Instruments Co. 313-358-2505, FAX:313-352-2324
MN Edina, Dytec Instruments, Inc. 612-831-7169, FAX:612-831-5114
MO Maryland Heights, Dytec/South, Inc. 314-739-0665,FAX:314-739-1405
NV Las Vegas, Trembly Assocs. 702-739-9770, FAX:702-739-0331
NH Salem, Advanced Elctrn. Sls. 603-894-6414, FAX:603-894-7111
NJ Cherry Hill, Sci-Rep, Inc. 609-662-5222
NM Albuquerque, Trembly Assocs. 505-266-8616, FAX:505-255-0635
NY Elmont, Crane & Egert Corp. 516-872-0800, FAX:516-872-9074
NY Rochester, TAE-REP, Inc. 716-586-8710, FAX:716-586-8719
NY Whitney Point, TAE-REP, Inc. 607-692-3705, FAX:607-692-3709
NC Charlotte, Currie, Peak & Frazier, Inc. 704-846-1702
NC Greensboro, Currie, Peak & Frazier, Inc. 919-373-0380,FAX:919-273-6308
OH Cleveland, Comtel Instrument Co. 216-442-8080, FAX:216-442-6009
OH Columbus, Comtel Instruments Co. 614-876-8305, FAX:614-876-1445
OH Dayton, Comtel Instruments Co. 513-426-5310, FAX:513-426-1048
OK Tulsa, Kemp Instruments, Inc. 918-663-4501, FAX:918-665-7362
OR Beaverton, Northwest Test & Measurement, Inc. 503-645-9000,FAX:503-645-5186
PA Huntingdon Valley, Sci-Rep, Inc. 215-322-6500, FAX:215-322-9907
PA Pittsburgh, Comtel Instruments Co. 412-922-5720, FAX:412-922-8454
TN Smyrna, Currie, Peak & Frazier, Inc. 615-459-0743
TX Austin, Kemp Instruments, Inc. 512-263-3322, FAX:512-263-9700
TX Dallas, Kemp Instruments, Inc. 214-931-7100, FAX:214-250-2493
TX Houston, Kemp Instruments, Inc. 713-466-1465, FAX:713-466-7821
UT No. Salt Lake, Trembly Assocs. 801-295-4703, FAX:801-295-8676
VA Fairfax, Sci-Rep, Inc. 703-385-0660, FAX:703-359-7341
VA Newport News, Sci-Rep, Inc. 301-321-0200
VA Richmond, Sci-Rep, Inc. 804-282-0220
WA Redmond, Northwest Test & Measurement, Inc. 206-881-8857,206-867-0742
WI Brookfield, Dytec/Midwest, Inc. 414-792-0320, FAX:414-792-0311
Can Mississauga, Ont., Allan Crawford Assocs., Ltd. 416-890-2010,FAX:416-890-1959
Can No. Vancouver, BC, Allan Crawford Assocs., Ltd. 604-988-2195,FAX:604-980-5892
Can Ottawa, Ont., Allan Crawford Assocs., Ltd. 613-596-9300,FAX:613-596-3081
Can St. Laurent, Quebec, Allan Crawford Assocs., Ltd. 514-747-7878,FAX:514-747-5673

SoLiCo/mec
FAX: 1-800-331-1184

FAX: 203-527-6047

SORENSON LIGHTED CONTROLS, 75 Locust St, Hartford, CT 06114, Tel: 203-527-3092, 1-800-243-0240; Empl.: 100; *Sls. Mgr.:* Ted Ogorzalek ..... **B•1787**

Local Sales Offices & Reps
CA Tustin, Schoenbachler-Dobson Co. ... 714-544-1888
AZ Scottsdale, Advent Comp. Corp. 602-481-0044
CA San Rafael, Wright Assocs. 415-457-9940
CO Boulder, The Stratford Grp. 303-530-3194
FL Deerfield Bch., Jack Krutek & Assoc. .. 305-427-4202
IL Schiller Park, W.R.B. Inc. 708-678-7888
IN Fort Wayne, Menze Sls. 219-747-5616
KS Shawnee Mission, The Mertens Co. ... 913-432-9323
MD Gaithersburg, Naudian Assoc. Southern, Inc. 301-258-5040
MA Hopkinton, Berkshire Elctrns. 508-435-9356
MI Dearborn, Pitcher-Poulin, Inc. 313-582-5450
MN Minneapolis, Tech. Comps. Grp. 612-536-9512
MO Clayton, Mertens Co. 314-993-6600
NJ Burlington, VDE Elctrns. 609-387-9331
NJ Eatontown, Pacent Engrg. 201-389-1409
NY Great Neck, Pacent Eng. Co. 516-482-4678
NC Siler City, Crossroads Elctrns. 919-742-2372
WA Bothell, Evergreen Mktg. Grp. 206-485-8063
WI Mequon, WM Bolles Assoc., Inc. 414-241-3320

Local Distributors
AZ Phoenix, Minarik Elec. Co. 602-233-3000
CA Anaheim, Electro Comps. Dist. 213-628-2844
CA Covina, Selecta Switch 818-967-4123
CA Freemont, KEA Elctrns. 415-651-2600
CA Gardena, California Switch & Signal .. 213-538-9830
CA Glendale, Minarik Elec. Co. 818-507-6445
CA Irvin, J & J Elctrns. 714-455-0104
CA Los Angeles, Electric Switches 213-660-1310
CA San Diego, Minarik Elec. Co. 619-560-6632
CA Santa Clara, Minarik Elec. Co. 408-727-0575
CA Tustin, Western Switches 714-259-8144
CA Van Nuys, Wes-Garde Comps. Grp. ... 818-786-3724
CO Commerce City, Minarik Elec. Co. 303-289-5800
CT Hartford, Wes-Garde Comp. Grp. 203-527-7705
FL Lakeland, Wes-Garde Comp. Grp. 813-644-7564
GA Tucker, CID, Inc. 404-491-3143
IL Carol Stream, Wes-Garde Comp. Grp. 708-653-1460
KS Overland Pk, Wes-Garde Comps. 913-262-2718
MA Canton, Xenell 617-828-2948
MI St. Clair Shores, Specialities Mfg. 313-771-2700
MN Minneapolis, Carl Bergquist 612-835-2322
MO St. Louis, Wes-Garde Comp. Grp. 314-567-7776
NH Nashua, Wes-Garde Comp. Grp. 603-880-1971
NJ Mt. Laurel, Wes-Garde Comp. Grp. 609-778-8190
NY Woodside, Switches Unltd. 718-478-5000
OH Westerville, Wes-Garde Comps. Grp. 614-885-0319
OR Portland, Minarik Elec. 503-253-3402
SC Columbia, Dixie Elctrns. 803-779-5332
TX Dallas, Wes-Garde Comp. Grp. 214-357-1768
TX San Antonio, Minarik Elec. 512-822-7097
WI Grafton, Lake-View Elctrns. 414-377-8250
WI Milwaukee, Progressive Image 414-321-4722
Can Edmonton, Deskin Sls. 403-466-2106
Can Montreal, Deskin Sls. 514-331-2660
Can Ottawa, Deskin Sls. 613-228-1201
Can Richmond, Vancouver, Deskin Sls. 604-324-8343
Can Toronto, Deskin Sls. 416-475-1412
Can Winnipeg, Deskin Sls. 403-466-2106

SOR, INC., 14685 W. 105th St, Lenexa, KS 66215, Tel: 913-888-2630, TELEX: 4992783, FAX: 913-888-0767; Empl.: 200; *Sls. Mgr.:* Steve Spelman

SOSHIN ELECTRIC CO., LTD., No. 18-18, 1-Chome Nakamagome, Ota-Ku, Tokyo, Japan, Tel: (03) 3775-9111, TELEX: 246-6377, FAX: (03) 3775-7092; Empl.: 1150; *Sls. Mgr.:* Z. Uehara, Overseas Dept. ..... **A•1655-1657**

Local Sales Offices & Reps
CA Chatsworth, Arco Elctrns. 818-882-8707

SOUNDCOAT CO., INC., 1 Burt Dr., Deer Park, NY 11729-5701, Tel: 516-242-2200, TELEX: 12-5514, FAX: 516-242-2246; Empl.: 100; *Sls. Mgr.:* Mr. Carl Wolaver

SOURIAU, INC., 28309 N. Avenue Crocker, Valencia, CA 91355, Tel: 805-257-4830, TELEX: 4720328, TWX: 910-336-1553, FAX: 805-257-2383; Empl.: 79; *Sls. Mgr.:* Keith L. Olsen

SOUTH AMERICAN DEVELOPMENT CORP., 29 Noxon Rd., Poughkeepsie, NY 12590, Tel: 914-452-1305, FAX: 914-452-2526; Empl.: 80; *Sls. Mgr.:* C. Healy

SOUTHCO, INC., 210 N. Brinton Lake Rd., Concordville, PA 19331, Tel: 215-459-4000, FAX: 215-459-4012; *Sls. Mgr.:* R. W. Dougherty

SOUTHERN COMPUTER CORP., 141 W. Wieuca Rd., Ste. 300-B, Atlanta, GA 30342, Tel: 404-252-3340, FAX: 404-252-8929; *Sls. Mgr.:* Ray Manley

SOUTHERN ELECTRONICS, F-Dyne, 726 So. Flower St., Burbank, CA 91502, Tel: 818-845-2458, FAX: 818-845-6348; Empl.: 100; *Sls. Mgr.:* Wayne Melvin

SOUTHTRONICS, INC., 1265 Kennestone Circle, Marietta, GA 30066-6029, Tel: 404-429-1000, FAX: 404-424-2000

SOUTHWESTERN NAMEPLATE & MFG. CO., INC., P.O. Box 35, Fourth St., Anna, TX 75003, Tel: 214-231-6663, 214-924-3289, 1-800-331-6600, FAX: 214-924-3090; Empl.: 14

SPACE ELECTRONICS, INC., 81 Fuller Way, Berlin, CT 06037, Tel: 203-829-0001, FAX: 203-829-0005; Empl.: 26; *Sls. Mgr.:* Richard Boynton

SPECIAL ELECTRIC CO., INC., 3628 W. Pierce St., Milwaukee, WI 53215, Tel: 414-383-6370, TELEX: 910-262-3106, FAX: 414-383-6725; Empl.: 40; *Sls. Mgr.:* F. James Heider

SPECIALIZED PRODUCTS COMPANY, 3131 Premier Dr., Irving, TX 75063, Tel: 214-550-1923, TELEX: 732764, FAX: 214-550-1386; Empl.: 39; *Sls. Mgr.:* Paul Jones

SPECIALTY CABLE CORPORATION, P.O. Box 50, Wallingford, CT 06492, Tel: 800-456-SPEC, FAX: 203-269-5293; Empl.: 72

SPECIALTY CONNECTOR CO., 2100 Earlywood Dr., Franklin, IN 46131, Tel: 317-738-2800, TELEX: 217084, FAX: 317-738-2858; *Sls. Mgr.:* Thomas L. Lynn; *Dist. Mgr.:* 234

SPECIALITY ELECTRONICS, INC., 19200 Asheville Hwy., Landrum, SC 29356, Tel: 803-457-3824, FAX: 803-457-2535; Empl.: 30; *Sls. Mgr.:* John Galli ..... **C•1526-1532**

SPECO DIV., Components Specialties, Inc., P.O. Box 624, 1172 Rte. 109, Lindenhurst, NY 11757, Tel: 516-957-8700, 800-645-5516, TELEX: 96-7754, FAX: 516-957-9142; FSC No.: 516-957-9142; Empl.: 29; *Sls. Mgr.:* Eric Forman; *Dist. Mgr.:* Mel Hulkower

SPECTRACOM CORPORATION, 101 Despatch Drive, East Rochester, NY 14445-1484, Tel: 716-381-4827, TELEX: 9103509587, FAX: 716-381-4998; *Sls. Mgr.:* Edward F. O'Connor

SPECTRAGRAPHICS CORP., 9125 Rehco Rd., San Diego, CA 92121, Tel: 619-450-0611, TELEX: 295439; Empl.: 250; *Sls. Mgr.:* Ray Barger, VP Sls.; *Dist. Mgr.:* Elliot Shev

SPECTRAL INNOVATIONS, 4633 Old Ironsides Dr., Ste. 401, Santa Clara, CA 95054-1807, Tel: 408-727-1314, FAX: 408-727-1423

Local Sales Offices & Reps
OH Columbus, ACQsys Solutions 614-486-6401

SPECTRA LUX CORP., 11825 120th Ave. NE, Kirkland, WA 98034, Tel: 206-747-0560, FAX: 206-821-3193; FSC No.: 51896; Empl.: 120; *Sls. Mgr.:* Woody Hertzog

SPECTRAN CORP., 50 Hall Road, Sturbridge, MA 01566, Tel: 508-347-2261, FAX: 508-347-2747; FSC No.: 6V569; Empl.: 80

SPECTRA-PHYSICS LASERS INC., 1330 Terra Bella Ave.,P.O. Box 7013, Mountain View, CA 94039-7013, Tel: 415-961-2550, 800-227-8054, TELEX: 348-488, FAX: 415-969-4084; *Sls. Mgr.:* Bob Turcotte

SPECTRASCAN, INC., 1110A Elkton Drive, Colorado Springs, CO 80907, Tel: 719-599-9254, FAX: 719-599-0815; Empl.: 15; *Sls. Mgr.:* Jim Stathis

SPECTRA SONICS, 3750 Airport Rd., Ogden, UT 84405, Tel: 801-392-7531; Empl.: 35

SPECTRA-STRIP, See Amphenol Products

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FAX: 714-923-6765

SPECTROL ELECTRONICS CORP., 4051 Greystone Dr., Ontario, CA 91761, Tel: 714-923-3313; FSC No.: 02111; Empl.: 200; *Sls. Mgr.:* Joseph L. Lucia; *Dist. Mgr.:* Gene Stauffer, Mgr. OEM Prods. ..... **A•2066-2068**

Local Sales Offices & Reps

AL	Huntsville, DHR Mktg.	205-722-0440
AZ	Phoenix, Deskin Sls.	602-268-2121
AZ	Scottsdale, JK Assocs.	602-990-8804
CA	San Diego, Hadden & Assoc.	619-565-9444
CA	San Jose, Silicon Valley	408-432-1967
CO	Denver, West, Inc.	303-477-8180
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Altamonte Springs, DHR Mktg.	407-331-1199
IL	Naperville, Lancastle Sls.	708-717-9494
IA	Cedar Rapids, Lowell-Kangas	319-362-9290
KS	Shawnee Mission, Lowell-Kangas	913-631-3515
GA	Duluth, DHR Mktg.	404-564-0529
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Farmington Hills, Luebbe Sls.	313-489-8828
MN	Bloomington, Murnco	612-854-4161
MO	St. Louis, Lowell-Kangas	314-821-4050
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NM	Scottsdale, AZ, J.K. Assocs.	602-990-8804
NY	Commack, E.R.A.	516-543-0510
NY	Victor, Net Sls.	716-924-1844
NC	Raleigh, DHR Mktg.	919-829-2510
OH	Cincinnati, Luebbe Sls.	513-530-0600
OH	Cleveland, Luebbe Sls.	216-333-0425
OH	Columbus, Luebbe Sls.	614-431-0474
OH	Dayton, Luebbe Sls.	513-294-0426
OR	Beaverton, Westmark Elctrn., Inc.	503-641-8780
PA	Pittsburgh, Luebbe Sls.	412-364-0490
TX	Richardson, Pro Comp. Sls. Co.	214-669-1500
WA	Bellevue, Westmark Elctrns.	206-454-1944
WI	Lancastle, Lancastle	414-796-2723

Local Distributors

AL	Mobile, Newark Elctrns.	205-471-6500
AZ	Phoenix, Newark Elctrs.	602-864-9905
AZ	Phoenix, Sterling Elctrns.	602-268-2121
AZ	Tempe, Shelley-Ragon	602-894-2058
CA	Buena Park, Cypress Elctrns.	714-521-5230
CA	Fountain Valley, Component Center	714-979-0433
CA	Orange, Newark Elctrs.	714-634-8224
CA	San Diego, Shelley/Ragon	619-453-7133
CA	San Jose, Shelley/Ragon	408-432-0600
CA	Santa Clara, Cypress Elctrns.	408-980-2500
CA	Sunnyvale, Abacus Elctrns.	408-732-2000
CO	Denver, Newark Elctrns.	303-757-3351
CO	Englewood, Shelley/Ragon	303-762-0670
CO	Englewood, Sterling Elctrns.	303-792-3939
CT	Wallingford, Cronin Elctrns.	203-265-3134
GA	Norcross, Newark Elctrns.	404-448-1300
IL	Bensenville, Voyager	312-860-1300
IL	Chicago, Newark Elctrns.	312-784-5100
IN	Ft. Wayne, Newark Elctrns.	219-484-0766
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
KS	Lenexa, Sterling Elctrns.	913-492-5406
MD	Columbia, Newark Elctrns.	301-964-4482
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Waltham, Newark Elctrns.	617-894-8050
MA	Woburn, Sterling Elctrns.	617-938-6200
MI	Farmington Hills, Advent Elctrns.	313-967-0600
MI	Oakpark, Newark Elctrns.	313-967-0957
MN	Bloomington, Sterling Elctrns.	612-831-2666
MN	Fridley, Voyager	612-571-7766
MN	Minneapolis, Newark Elctrns.	612-331-6350
MN	St. Paul, Shelley/Ragon	612-642-2828
MN	St.Paul, Gopher Elctrns.	612-483-3322
MO	Independence, Newark Elctrns.	816-478-0561
MO	Maryland Heights, Chelsea Inds.	314-997-7709
NJ	South Plainfield, Sterling Elctrns.	201-769-7000
NJ	Union, Newark Elctrns	201-851-2290
NM	Albuquerque, Sterling Elctrns.	505-884-1900
NY	Buffalo, Summit Distrs.	716-887-2800
NC	Charlotte, Newark Elctrns.	704-535-5650
OH	Akron, Akron Elctrns. Supp.	216-762-8818
OH	Cincinnati, Newark Elctrns.	513-722-8181
OH	Columbus, Electronics Mktg.	614-299-4161
OK	Tulsa, Altair	918-252-5781
OR	Portland, Radar Elec.	503-232-3401
OR	Tualatin, Moore Elctrns.	503-692-5333
PA	Philadelphia, Shap Elctrns.	215-969-3300
PA	Pittsburg, Newark Elctrns.	412-367-2790
SC	Columbia, Dixie Elctrns.	803-779-5332
TN	Knoxville, Newark Elctrns.	615-588-6493
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Sterling Elctrns.	713-623-6600
TX	Mansfield, Mouser Elctrns.	817-483-0165
TX	Richardson, Altair	214-231-5166
UT	Salt Lake City, Sterling Elctrns.	801-972-5444
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Newark Elctrns.	206-641-9800
WA	Redmond, Shelley/Ragon	206-883-2220
WA	Seattle, Radar Electrns.	206-282-2511
WV	Charleston, Newark Elctrns.	304-744-9022
WI	Milwaukee, Newark Elctrns.	414-453-9100

SPECTRON GLASS & ELECTRONICS, INC., 595 Old Willets Path, P.O. Box 13368, Hauppauge, NY 11788, Tel: 516-582-5600, TELEX: 968296; FSC No.: 57349; Empl.: 70; *Sls. Mgr.:* Bob Marshall

SPECTRONICS CORP., 956 Brush Hollow Rd., Westbury, NY 11590, Tel: 516-333-4840/1-800-274-8888, TWX: 510-222-5877, FAX: 516-333-4859; Empl.: 125; *Sls. Mgr.:* Gary Naftaly

SPECTRUM CONTROL, INC., 2185 W. 8th St., Erie, PA 16505, Tel: 814-455-0966, FAX: 814-455-2550; FSC No.: 33095;5733; Empl.: 450; *Sls. Mgr.:* D. Reynolds; *Dist. Mgr.:* D. Zaday

SPECTRUM CORP., 10048 Easthaven, Houston, TX 77075, Tel: 713-944-6200, 1-800-392-5050(Sls), FAX: 713-944-1290; Empl.: 35; *Sls. Mgr.:* Gary W. Liddell; *Dist. Mgr.:* Jim B. Bishop

SPECTRUM DEVICES, 13706 Larkway Dr., Sugar Land, TX 77478-2420, Tel: 713-242-6417, FAX: 713-242-6415; Empl.: 7; *Sls. Mgr.:* Sajid Rafique

SPECTRUM SIGNAL PROC., 250 H st., P.O. Box 8110-25, Blaine, WA 98230, Tel: 1-800-663-8986 (US), 604-438-7266 (Can.), FAX: 604-438-3046; Empl.: 25; *Sls. Mgr.:* Rod Jensen; *Dist. Mgr.:* Al Rana

Local Distributors

CA	Mountainview, Thorson West	415-964-9300
CA	Riverside, Innovation Prods.	714-682-8570

SPECTRUM TECHNOLOGY, INC., DATUM, Incorporated, 749 Ward Drive, Santa Barbara, CA 93111, Tel: 805-964-7791, TWX: 910-334-1163, FAX: 805-683-3481; FSC No.: 32464; Empl.: 90; *Sls. Mgr.:* Manny Fernandez, Jr. ..... **A•1462-1467**

Local Sales Offices & Reps

AZ	Phoenix, Sedco Sls.	602-461-9069
CA	Los Angeles, The Thorson Co.	213-595-0361
CA	San Diego, Thorson Co.	619-292-8525
CA	San Francisco, Frequency Control	408-252-5250
HI	Santa Barbara, Spectrum Technlg.	805-964-7791
CA	Santa Barbara, Thorson Co.	805-964-8751
CO	Englewood, Advanced Technology Mktg.	303-789-2606
FL	Ocala, Felcomp	904-288-2365
FL	Orlando, Felcomp	407-282-3554
IL	Elgin, R.K. Elctrns.	312-695-8552
MA	Needham Hgts., Todino Engrg. Sls.	617-444-7925
PA	Glenside, Kobert Assocs.	215-887-2310
TX	Dallas, Caton Sls.	214-243-4716
TX	Dallas, Caton Sls.	214-350-1612

Local Distributors

MD	Kensington, Koebert Assocs.	301-493-8924

SPEEDY CIRCUITS, PJC Technologies, Inc., 5332 Commerical Dr., Huntington Bch., CA 92649, Tel: 714-898-4901, FAX: 714-891-0607; Empl.: 36; *Sls. Mgr.:* Jon P. Herkins

Spellman
High Voltage Electronics Corp

FAX: 516-349-8699

SPELLMAN HIGH VOLTAGE ELCTRNS. CORP., 7 Fairchild Ave., Plainview, NY 11803, Tel: 516-349-8686, TWX: 510-221-2155; Empl.: 150; *Sls. Mgr.:* Eric Marko; *Dist. Mgr.:* Eric Marko ..... **D•2047-2055**

Local Sales Offices & Reps

WA	Kirkland, Syntek	206-488-0394
Can	British Columbia, Broman Engrg.	604-254-6311

SPEMCO SWITCHES, 23425 Harper, Box 386, St. Clair Shores, MI 48080, Tel: 800-482-2828, FAX: 313-771-3491; Empl.: 12; *Sls. Mgr.:* Andrew Richardson

SPERRY, A. W. INSTRUMENTS, P.O. Box 9300, Smithtown, NY 11787, Tel: 516-231-7050, 800-645-5398, TELEX: 645104, FAX: 516-434-3128; Empl.: 50; *Sls. Mgr.:* Dennis W. Carroll

SPIRA MANUFACTURING CORP., 12721 Saticoy Street South, North Hollywood, CA 91605, Tel: 818-764-8222, FAX: 818-764-9880; FSC No.: 60050; Empl.: 18; *Sls. Mgr.:* Lisa A Panzich

SPIRICON, INC., 2600 North Main, Logan, UT 84321, Tel: 801-753-3729, TELEX: 296-465 SPIR UR, FAX: 801-735-5231; Empl.: 15; *Sls. Mgr.:* Ed Danahy

SPRAGUE ELECTRIC COMPANY, Sprague Technologies, Inc., 4 Stamford Forum P.O. Box 120007, Stamford, CT 06901-0007, Tel: 203-964-8600, FAX: 203-964-8668; Empl.: 5,500

SPRAGUE ELECTRIC COMPANY, Distribution Division, 41 Hampden Rd. P.O. Box 9102, Mansfield, MA 02048-9102, Tel: 508-339-8900, FAX: 508-339-5063 ..... **A•1138**

SPRAGUE ELECTRIC COMPANY, Solid Tantalum Capacitors, Lower Main St., P.O. Box 231, Sanford, ME 04073-0231, Tel: 207-324-4140, FAX: 207-324-7223

SPRAGUE ELECTRIC COMPANY, Aluminum Capacitors, 9800 Kincey Ave., Suite 100, Huntersville, NC 28078, Tel: 704-875-8070, FAX: 704-875-8541

SPRAGUE ELECTRIC COMPANY, Wet & Foil Tantalum Capacitors, MIL Filters, 1600 Curran Hwy., North Adams, MA 01247-3987, Tel: 413-664-4431, FAX: 413-663-5079

SPRAGUE ELECTRIC COMPANY, Film Capacitors, 1221 W. Hwy 17/92, Longwood, FL 32750, Tel: 407-695-6562, FAX: 407-695-6889

SPRAGUE ELECTRIC COMPANY, Thick Film Networks and Hybrids Div., 267 Lowell Rd., Hudson, NH 03051, Tel: 603-881-7200, 603-883-9774 (Mktg), FAX: 603-880-1910

SPRAGUE FIL-MAG, 4787 Cardin Street, San Diego, CA 92111-1416, Tel: 619-569-6577, FAX: 619-569-6073; Empl.: 500; *Sls. Mgr.:* Linda Sorrentino

SPRAGUE GOODMAN

FAX: 516-746-1396

SPRAGUE-GOODMAN ELCTRNS., INC., 134 Fulton Ave., Garden City Pk., NY 11040, Tel: 516-746-1385, TELEX: 14-4533; FSC No.: 52769; Empl.: 80; *Sls. Mgr.:* Martin D. Markson ..... **A•1140-1141**

Local Sales Offices & Reps

AL	Huntsville, Electramark Inc.	205-830-4400
AZ	Mesa, System Sls. of Arizona	602-464-9989
CA	Cupertino, Dura Elctrn. Sls.	408-255-2084
CA	Garden Grove, ELSCO Elctrns.	714-891-4621
CO	Denver, West Inc.	303-477-8180
CT	Milford, KSA Connecticut	203-524-5849
FL	Orlando, TMA	407-857-3760
GA	Norcross, Electramark Inc.	404-446-7915
ID	Meridian, WEST Inc.	208-888-6227
IL	Chicago, B.N.I. Elctrns.	312-775-1717
IN	Ft. Wayne, Denton Mktg., Inc.	219-486-0665
IA	Marion, M.S.B. Assocs.	319-377-6261
KS	Shawnee Mission, M.S.B. Assocs.	913-432-2131
MD	Monkton, Imagitron Sls.	301-374-5600
MA	Sudbury, KSA of New England	508-443-5881
MI	Brighton, A.P. Assocs.	313-229-6550
MN	Eden Prairie, Electro Mark Inc.	612-944-5850
MO	St. Charles, M.S.B. Assocs.	314-946-5577
NJ	Monkton, Imagitron Sls. Co., Inc.	800-638-3592
NM	Albuquerque, SSA of New Mexico	505-889-2901
NY	Melville, R F Elctrns. Sls. Co. Inc.	516-420-8890
NY	Utica, Upstate Engrg. Sls.	315-797-6721
NC	Raleigh, Micro Sls. Inc.	919-881-0007
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
OR	Portland, Harry Levinson Co.	503-690-1312
PA	Maple Glen, Imagitron/Pennsylvania	800-638-3592
TX	Seagoville, Delta Comps.	214-287-6333
UT	Centerville, West/Utah	801-292-8787
WA	Seattle, Harry Levinson Co.	206-382-1300
PR	Rio Piedras, Elctrn. Sls. Assocs.	809-762-6459
Can	Toronto, Ont., Norgay Entprs.	416-259-9663

Local Distributors

AZ	Phoenix, Arizona Comps.	602-269-5655
AZ	Tempe, TTI, Inc.	602-431-1191
CA	Garden Grove, Natl. Elctrns.	714-892-7749
CA	Milpitas, Projections Unltd.	408-942-1717
CA	Milpitas, TTI, Inc.	408-946-5577
CA	Mission Hills, TTI, Inc.	818-892-4669
CA	Mission Hills, TTI, Inc.	818-891-8850
CA	San Diego, Neumann Elctrns.	619-695-3005
CA	San Diego, Projections Unltd.	619-453-7900

CA	San Diego, TTI, Inc.	619-748-2025
CA	Santa Ana, TTI, Inc.	714-641-9393
CA	Tustin, Projections Unltd.	714-544-2700
CO	Denver, TTI, Inc.	303-429-6806
CT	Wallingford, TTI, Inc.	203-284-7474
FL	Ft. Lauderdale, Bros. Elctrns. of FL	305-561-6700
FL	Melbourne, New Yorker Elctrns.	407-727-0955
FL	Orlando, TTI, Inc.	407-859-1000
GA	Norcross, TTI, Inc.	404-662-0911
MD	Columbia, TTI, Inc.	301-995-1331
MD	Savage, Pyttronic Inds.	301-953-9650
MA	Wilmington, TTI, Inc.	508-658-4700
MN	Eden Prairie, TTI, Inc.	612-944-5080
NJ	Fairfield, Tri Start Elctrns.	201-227-3500
NJ	Mt. Laurel, TTI, Inc.	609-234-6400
NY	Mamaroneck, New Yorker Elctrns.	914-698-7600
NY	Ronkonkoma, Tri-Start Elctrns.	516-737-2200
NY	Ronkonkoma, TTI, Inc.	516-737-2000
NC	Charlotte, TTI, Inc.	704-522-0277
OH	Columbus, TTI, Inc.	614-848-5770
PA	Harrisburg, Adtech	717-561-9905
PA	Montgomeryville, Pyttronic Inds.	215-855-0925
TX	Ft. Worth, TTI, Inc.	817-595-3100
TX	Garland, J & S Elctrns. Inc.	214-487-8808
WA	Redmond, TTI, Inc.	206-882-0291
WA	Seattle, Kam Elctrns.	206-382-1300
Can	Toronto, Ont., Norgay Entprs. Ltd.	416-234-8966

S-PRODUCTS INC., 35 Kings Highway East, Fairfield, CT 06430, Tel: 203-331-9546, FAX: 203-335-2723; Empl.: 4

SPS SOFTWARE PRODUCTS & SERVICES, INC., 14 E. 38th Street, 14th Fl, New York, NY 10016, Tel: 212-686-3790, TELEX: 852616, FAX: 212-481-7464; *Sls. Mgr.:* Peter Voletsky

SQUARE D CO., Executive Plaza, Palatine, IL 60067, Tel: 708-397-2600, FAX: 708-397-8814; Empl.: 19,000; *Sls. Mgr.:* J. Giore, VP Sls.; *Dist. Mgr.:* E.P. Mazzetta

SQUARE D. COMPANY, Control Products, Hwy 64 East, Knightdale, NC 27545, Tel: 919-266-3671, FAX: 919-266-8393; Empl.: 900

SQUARE D CO. POWER PROTECTION SYSTEMS, 9192 Topaz Way, San Diego, CA 92123-1165, Tel: 619-279-0831, TWX: 910-335-1556, FAX: 619-569-8427; FSC No.: 06049; Empl.: 200; *Sls. Mgr.:* Dan Mathews, Dir. of Sls.; *Dist. Mgr.:* Dan Mathews, Dir. of Sls.

Please refer to Topaz' sales representatives for distributor information.

SQUARE D. DATA ENTRY PRODUCTS FORMERLY K.B. DENVER, See MGR Industries

SR ENGINEERING, BW/IP International, Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643, Tel: 714-554-4200, TELEX: 364412INTR-871, FAX: 714-265-0856; FSC No.: 21441; *Sls. Mgr.:* Mel Hitchcock

SSAC INCORPORATED, P.O. Box 1000, Baldwinsville, NY 13027, Tel: 315-638-1300, FAX: 315-638-0333; FSC No.: 16-0985719; Empl.: 250; *Sls. Mgr.:* D. Carroll

S SQUARED ELECTRONICS, formerly ComTech Systems, Inc., 10 Halyard Rd., Valley Stream, NY 11581-2813, Tel: 516-791-1175; Empl.: 10

STACKBIN CORP., Albion Road, P.O. Box 397, Lincoln, RI 02865, Tel: 401-333-1600, 800-333-1603, FAX: 401-333-1952; Empl.: 50; *Sls. Mgr.:* Valerie Baxter; *Dist. Mgr.:* Timothy J. O'Leary

STACKPOLE CARBON COMPANY, 201 Stackpole St., St. Marys, PA 15857, Tel: 814-781-1234, FAX: 814-781-8570; *Sls. Mgr.:* R.A. Williams

STACKPOLE COMPONENTS CO., See Ark-les Special Products Grp., Div. of Stackpole Switches

STACKPOLE, MAGNET DIV., 700 Elk Ave., Kane, PA 16735, Tel: 814-837-0272, FAX: 814-837-0277; *Sls. Mgr.:* G.A. Olson, Mgr. Sls. & Mktg.

STACO, INC., See Staco Transpower

STACO ENERGY PRODUCTS CO.

FAX: 513-253-1723

STACO ENERGY PRODUCTS CO., 301 Gaddis Blvd., Dayton, OH 45403, Tel: 513-253-1191, TELEX: 288-032; FSC No.: 83008; Empl.: 146; *Sls. Mgr.:* Robert Simpson ..... **A•2412-2413**

Local Sales Offices & Reps

CA	Laguna Hills, South Rep	714-951-1084
CO	Wheat Ridge, Cluff	303-425-6604
FL	Maitland, H & H	305-831-2474
GA	Atlanta, Millar	404-634-3350
IL	Chicago, Saffro	312-677-9720
IN	Indianapolis, EMCI	317-921-3452
MA	Lexington, Hathaway	617-861-1010
MI	Detroit, Shalco	313-547-4771
MN	St. Paul, Kencotronics	612-645-7717
MO	St. Louis, Dowell	314-849-4234
NM	Albuquerque, Carlberg	505-836-1448
NY	Northport, LSC	516-266-5020
NC	Raleigh, Millar	919-828-8840
OH	Cleveland, Rockford	216-725-3705
OR	Hillsboro, Turn-A-Round	503-640-4661
PA	Philadelphia, ECSC	215-825-8610
TX	Dallas, B & R	214-985-0028
Can	Scarborough, Decade	416-439-9921

Local Distributors

AL	Birmingham, JLS	205-322-2486
CO	Arvada, Denver Beta Wintronics	303-431-7161
CO	San Francisco, Stevens Engrg.	415-588-9200
CT	Wallingford, Sager Elctrns.	203-265-4600
FL	Miami, Elctrn. Equip.	305-871-3500
GA	Atlanta, Cleveland Elec.	404-696-4550
HI	Honolulu, Victor Kim	808-841-6266
IL	Chicago, Newark Elctrns.	312-784-5100
IN	Indianapolis, Bell Elctrns.	317-875-8200
KY	Louisville, Peerless	502-637-7674
LA	Lafayette, Ralph's	318-234-4507
MA	Somerville, Electro Sls.	617-666-0500
MI	Madison Hgts., Galco	313-542-9090
MN	Minneapolis, Elctrn. Center	612-378-2442
MS	Jackson, Ellington Elctrns.	601-355-0561
MO	St. Louis, Chelsea Elctrns.	314-997-7709
NJ	Kenilworth, Federated Purchaser	201-272-0505
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Dayton, Stotts Friedman Elctrns.	513-298-5555
PA	Drexel Hill, Kass Elctrns.	215-449-2300
SC	Charleston, Wholesale Elctrns.	803-722-2634
TN	Knoxville, Indl. Elctrns.	615-573-7135
TX	Ft. Worth, Allied Elctrns.	817-336-5401
VA	Charlottesville, VA Elctrns.	804-296-4184
WA	Seattle, Radar Elec.	206-282-2511
WI	Milwaukee, Marsh Elctrns.	414-475-6000
Can	Scarborough, Decade Elctrns.	416-439-9921

STACOSWITCH, 1139 Baker St., Costa Mesa, CA 92626, Tel: 714-549-3041, TWX: 910-595-1507, FAX: 714-549-0930; FSC No.: 12522;Multiple; Empl.: 115; *Sls. Mgr.:* D. Sugg

STACO TRANSPOWER, Components Corp. of America, 610 W. 6th St., Mt. Carmel, IL 62863, Tel: 618-262-5555, FAX: 618-263-3150; FSC No.: 83008; Empl.: 75; *Sls. Mgr.:* Bill Chidester

STAFFALL INC., 1468 Elmwood Ave., Cranston, RI 02910, Tel: 401-461-5554, TWX: 710-381-6964; Empl.: 25

STAG MICROSYSTEMS INC., 1600 Wyatt Drive, Santa Clara, CA 95054, Tel: 408-988-1118, 1-800-227-8836, FAX: 408-988-1232; Empl.: 150; *Sls. Mgr.:* Phil Holden; *Dist. Mgr.:* Phil Holden

STAINLESS, INC., 210 S. 3rd St., N. Wales, PA 19454, Tel: 215-699-4871, TWX: 510-661-8097, FAX: 215-699-9597; Empl.: 80; *Sls. Mgr.:* Owen F. Ulmer

STANCOR

FAX: 219-722-5189

STANCOR, White-Rodgers, 131 Godfrey St., Logansport, IN 46947, Tel: 219-722-2244; FSC No.: 80089; Empl.: 400; *Sls. Mgr.:* Steve Fisher; *Dist. Mgr.:* Stephanie Starbuck, Prod. Mgr. ..... **A•2414-2419; B•1584-1587**

Local Sales Offices & Reps

AL	Athens, E.M.F.	205-233-2947
AZ	Contact Factory	219-722-2244
CA	Campbell, Shur Sls.	408-374-5577
CA	Irvine, Groh Assocs.	714-837-9871
CO	Denver, West, Inc.	303-477-8180
CT	Waterbury, Cannon Assocs.	203-597-0240
FL	Tampa, Uni-Rep	813-831-6083
GA	Atlanta, E.M.F.	404-944-9216
IL	Chicago, Joel Wasserman Assocs.	708-256-3566
IN	Ft. Wayne, K & D Sls.	219-436-2221
KS	Shawnee, Lowell Kangas	913-631-3515
MD	Sykesville, D.J.C.	301-795-7020
MA	Chelmsford, Cannon Assocs., Inc.	508-649-3809
MN	Bloomington, Murnco	612-854-4161
MO	St. Louis, Lowell Kangas	314-821-4050
NM	Contact Factory	219-722-2244
NY	Rochester, A.J. Electromarketing	716-426-3598
NC	Raleigh, E.M.F.	919-867-6221
OH	Beachwood, Elctrn. SalesMasters	216-831-9555
OR	Portland, Temper Tech.	503-292-8201
PA	Philadelphia, D.J.C.	215-334-4533
RI	Warwick, Cannon Assocs.	401-732-1570
TX	Richardson, Pro-Comp Sls.	214-669-1500
VT	Isle La Motte, Cannon Assocs.	802-928-3041

STANDARD CONDENSER CORP., 8151 N. Ridgeway, Skokie, IL 60076, Tel: 708-675-3133, FAX: 708-675-3709; FSC No.: 97419; *Sls. Mgr.:* B. P. McLean

STANDARD CRYSTAL CORPORATION, 9940 E. Baldwin Pl., El Monte, CA 91731, Tel: 818-443-2121, TELEX: 4998755, FAX: 818-443-9049; FSC No.: 30149; *Sls. Mgr.:* Tom Valasek/Gus Jimenez; *Dist. Mgr.:* Betty Longwell ..... **A•1469**

Local Sales Offices & Reps

AZ	Phoenix, CPS Assocs., Inc.	602-246-1097
AZ	Scottsdale, Az Tech-CPS Inc.	602-991-6300
CA	Milpitas, Ward Elctrn. Packaging Sls.	408-945-0420
GA	Norcross, Spar Tech Assocs.	404-446-7300
IL	Berkeley, ESA Tech. Mktg.	312-544-0120
IL	Northbrook, Allied Comp. Reps., Inc.	312-498-6658
MI	Grand Rapids, R.P. Urban & Assocs.	616-245-0511
MA	Sherborn, Barlow Engrg. Assoc., Inc.	508-655-6751
TX	Dallas, Allied Comps., Inc.	214-238-0408
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Bellevue, Caruso and Company	206-455-8811

STANDARD ENVIRONMENTAL SYSTEMS, INC., 383 Minnisink Rd., Totowa, NJ 07512, Tel: 201-256-2200, FAX: 201-256-2820; Empl.: 42

STANDARD GRIGSBY, INC., FLINT INDUSTRIES, See OakGrigsby, Inc.

STANDARD GRIGSBY INC., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany, Tel: 0911-65521, TELEX: 622351, FAX: 0911/6552-239

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STANDARD MAGNETIC CORP., 3000 E. Coronado St, Anaheim, CA 92806, Tel: 714-630-9751, FAX: 714-630-1601; Empl.: 15; *Sls. Mgr.:* Satish Jain

STANDARD MICROSYSTEMS, 35 Marcus Blvd, Hauppauge, NY 11788, Tel: 516-273-3100, FAX: 516-273-3123; FSC No.: 53848; Empl.: 500

STANDARD REFERENCE LABS, INC., See Koep Precision Standards, Inc.

STANDARD WIRE & CABLE CO., 1959 E. Cashdan St, Rancho Dominguez, CA 90220, Tel: 213-609-1811, 800-326-0006, TELEX: 65-3423, ESYLNK: 62931655, FAX: 213-609-1862; Empl.: 50; *Sls. Mgr.:* Dan Varvais; *Dist. Mgr.:* Jerry Gaither

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STANDEX ELECTRONICS, Standex International, 4538 Camberwell Rd, Cincinnati, OH 45209, Tel: 513-871-3777; FSC No.: 56402; Empl.: 450; *Sls. Mgr.:* Charles C. Johnson, VP Sls. .... **A•1262-1267; B•1782-1783**

Local Sales Offices & Reps

AL	Huntsville, R. W. Mitscher Co.	205-464-0792
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Cupertino, Codella Mktg. Grp., Inc.	408-257-2561
CA	Granada Hills, C & W Comp. Sls.	818-368-4032
CO	Longmont, Butler Tech. Sls.	303-651-7703
FL	Boca Raton, R. W. Mitscher Co.	305-368-3841
FL	Tequesta, R.W. Mitscher Co.	407-575-4485
GA	Lawrenceville, R. W. Mitscher Co.	404-923-3239
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
IN	Granger, Gregory Sls. Co.	219-272-9626
MD	Edina, Jay Borman Sls. Co.	612-922-5525
MD	Laurel, R. W. Mitscher Co., Inc.	301-498-6090
MA	Sudbury, KSA of New England	617-443-5881
MI	Detroit, R.P. Urban & Assoc.	313-535-2355
MI	Grand Rapids, R.P. Urban & Assoc.	616-245-0511
MO	Kansas City, EPI Inc.	816-523-8911
MO	St. Louis, EPI Inc.	314-962-1411
NJ	Woodbridge, Jade Mktg.	201-750-2998
NY	Clarence, R. W. Mitscher Co., Inc.	716-759-2350
NY	Red Hook, R. W. Mitscher Co., Inc.	914-758-8375
NY	Rochester, R. W. Mitscher Co., Inc.	716-227-0839
NC	Raleigh, R. W. Mitscher Co., Inc.	919-848-0941
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Portland, Components Technlg.	503-292-1518
PA	Wynnewood, Metz-Benham Assocs., Inc.	215-896-7300
TN	Johnson City, R. W. Mitscher Co., Inc.	615-929-7258
TX	Houston, B & R Elctrn. Sls. Corp.	713-682-5448
TX	Plano, B & R Elctrn. Sls. Corp.	214-985-0028
VA	Richmond, R. W. Mitscher Co., Inc.	804-320-7350
WI	Waukesha, Brainard-Wilson Mktg.	414-797-7940

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STANDISH INDUSTRIES, Hamlin LCD Div., W7514 Hwy V, Lake Mills, WI 53551, Tel: 414-648-1000, FAX: 414-648-1001; Empl.: 250; *Sls. Mgr.:* Richard D. Barbieri ..... **B•1125**

Local Sales Offices & Reps

AZ	Chandler, Lindberg Co.	602-786-9115
CA	Anaheim, Gabriel & Assocs.	714-666-0660
CA	Mountain View, Straube Assocs.	415-969-6060
CO	Boulder, R-G Entprs.	303-447-9211
CT	Branford, Coakley, Boyd & Abbett, Inc.	800-225-8402,203-481-2218
FL	Palm Harbor, Bob Dean, Inc.	813-789-1233
GA	Atlanta, Wallace Elctrn. Sls.	404-634-3159
IL	Skokie, Indl. Rep.	708-967-8430
IN	Carmel, TMC	317-844-8462
IN	Ft. Wayne, TMC	219-432-5553
KY	Louisville, TMC	502-893-1377
MD	Gaithersburg, Naudain Assocs. Southern, Inc.	301-258-5040
MA	Framingham, Coakley, Boyd & Abbett, Inc.	508-820-0800
MI	Farmington Hills, J.L. Montgomery Assocs.	313-489-0099
MN	Minneapolis, R-J, Inc.	612-866-3661
MO	Blue Springs, Palatine Sls.	816-229-4007
MO	Florissant, Palatine Sls.	314-839-0800
NJ	Hackensack, Coakley, Boyd, Abbett, Metro	201-440-4114
NJ	Marlton, Naudain Assoc.	609-983-5300
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NC	Kernersville, Wallace Elctrn. Sls.	919-996-2742
OH	Centerville, Bear Mktg.	513-436-2061
OH	Richfield, Bear Mktg.	216-659-3131
TX	Austin, Allied Comps.	512-331-4494
TX	Dallas, Allied Comps.	214-238-0408
TX	Hurst, Allied Comps.	817-589-0456
WI	Brookfield, Indl. Rep.	414-789-9393
Can	Mississauga, Ont., Indigo Elctrs. Ltd.	416-670-0284

Local Distributors

AZ	Phoenix, Force Elctrns.	602-437-1060
AZ	Tempe, Cypress Elctrns.	602-966-2256
CA	Buena Park, Cypress Elctrns.	213-744-0355
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	San Diego, Cypress Elctrns.	619-535-0011
CA	Santa Clara, Cypress Elctrns.	408-945-8400
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CO	Englewood, Indelco	303-694-9444
CT	Danbury, Heilind Elctrns.	203-797-8600
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Hammond Elctrn.	407-849-6060
IL	Palatine, Ohm Elctrns.	708-359-5500
IN	Ft. Wayne, Bell Inds.	219-423-3422
IN	Indianapolis, Bell Inds.	317-875-8200
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Wilmington, Heilind Elctrns.	508-657-4870
MI	Grand Rapids, Calder Elctrns.	616-698-7400
MN	Fridley, Voyager Elctrns.	612-571-7766
NJ	W. Berlin, General Comps., Inc.	609-768-6767
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Buffalo, Summit Distr.	716-887-2800
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Rome, Rome Elctrns.	315-337-5400
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Dayton, Bell Inds.	513-435-8660
OH	Solon, Repco	216-248-8900
OH	Stow, Advacom	216-688-5311
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Radar Elec.	503-233-3404
PA	McKean, Advacom	814-476-7774
TX	Dallas, Harrison Equip. Co.	214-239-2750
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Stafford, Harrison Equip.	713-879-2727
TX	Stafford, Southwest Elctrns.	713-240-4000
WA	Seattle, Radar Elec. Co.	206-282-2511
WA	Spokane, Radar Elec. Co.	509-747-3053
WI	Mequon, Taylor Elec.	414-241-4321
Can	Burnaby, B.C., Semad Elctrns.	604-420-9889
Can	Calgary, Alberta, ITT Multicomponents	403-273-2780
Can	Concord, Ont., ITT Multicomponents	416-736-1144
Can	Edmonton, Alberta, ITT Multicomponents	403-436-9555
Can	Markham, Ont., Semad Elctrns.	416-475-8500
Can	Ottawa, Ont., Semad Elctrns.	613-727-8325
Can	Surrey, B.C., Memco Elctrn. Mkts.	604-590-1553
Can	Ville St. Laurent, Quebec, ITT Multicomponents	514-335-7697
Can	Winnipeg, Manitoba, ITT MultiComponents	204-697-2300
WA	Bellevue, Testco, Inc.	206-454-7422

STANFORD RESCH. SYS., INC., 1290 D. Reamwood Ave., Sunnyvale, CA 94089, Tel: 408-744-9040, TELEX: 706891 SRS UD, FAX: 408-744-9049; *Sls. Mgr.:* Daniel R. Melick

STANFORD TELECOMMUNICATIONS, INC., 2421 Mission College Blvd., Santa Clara, CA 95056, Tel: 408-748-1010, TWX: 910-339-9531, FAX: 408-980-1066; FSC No.: 61362; Empl.: 900; *Sls. Mgr.:* Chuck Frank

STANGENES INDUSTRIES, INC., 1052 East Meadow Circle, Palo Alto, CA 94303, Tel: 415-493-0814, FAX: 415-855-9926; FSC No.: 62709; Empl.: 61; *Sls. Mgr.:* Magne Stangenes

STANLEY ELECTRONICS DIV., 250 E. Sandford Blvd., Mt. Vernon, NY 10550, Tel: 914-699-2000; FSC No.: 61544; Empl.: 12

STANLEY

FAX: 714-222-0777

I I STANLEY CO. INC., Stanley Electric Co. LTD., 2661 Gates Avenue, Suite 2000, Irvine, CA 92714, Tel: 1-800-LED-LCD1; Empl.: 390; *Sls. Mgr.:* Bill Roth; *Dist. Mgr.:* Al Kile ..... **B•1134, 1196-1201**

Local Sales Offices & Reps

AZ	Scottsdale, B.S.E.	602-483-0373
CA	Laguna Hills, Bart Budge Assoc.	714-582-8720
CO	Boulder, Stratford Grp.	303-530-3194
FL	Lighthouse Pt., Jack Krutek Assoc.	305-783-2501
IL	Berkeley, ESA Tech. Mktg.	708-544-0120
IN	Indianapolis, EMCI	317-921-3450
KS	Overland Park, Mink Assoc.	913-341-8309
MA	N. Reading, Alpha-Omega Sls.	508-664-1118
MN	Minneapolis, Holmgren Assoc.	612-574-9983
MO	Bridgeton, Mink Assoc.	314-291-5454
NY	Port Washington, ASHTEC	516-767-0336
OH	Dayton, K W Elctrns.	513-899-2150
PA	Horsham, Jacobsen Assoc.	215-674-2937
TX	Dallas, TESCO	214-553-1200
WA	Kirkland, Northwest Comp. Sls.	206-828-2104
WY	Jackson, TETONICS	307-733-1077
Can	Markham, Ontario, Deskin Sls.	416-475-1412

Local Distributors

AL	Huntsville, Future Elctrns.	205-830-2322
AZ	Phoenix, Arizona Comps.	602-269-5655
CA	Santa Clara, Cypress Elctrns.	408-980-2500
CO	Littleton, Indelcc, Inc.	303-796-3461
CT	Hartford, Wesgarde Comps. Grp.	203-527-7705
FL	Lakeland, Wesgarde Comps. Grp.	813-644-7564
IL	Woodale, NEP Elctrns.	708-595-8500
IA	Cedar Rapids, DEE Elctrns. Inc.	319-365-7551
MD	Columbia, Future Elctrns.	301-290-0600
MA	Westborough, Future Elctrns.	508-366-2400
MI	Livonia, Future Elctrns.	313-261-5290
MN	New Brighton, CHRIS Elctrns.	612-631-2647
MO	St. Louis, Wesgarde Comps. Grp.	314-567-7776
NH	Nashua, Wesgarde Comps. Grp.	603-880-1971
NJ	Mt. Laurel, Wesgarde Comps. Grp.	609-778-8190
NY	Rochester, Future Elctrns.	716-272-1120
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Meafield Heights, Future Elctrns.	216-449-6996
PA	N. Versailles, CMD Elctrns.	412-678-6020
TX	Houston, Kent Elctrns.	713-780-7770
WA	Redmond, Priebe Elctrns.	206-881-2363
WI	New Berlin, NEP Elctrns.	414-785-9100

STANLEY-VIDMAR, Stanley Works, 11 Grammes Rd., Allentown, PA 18103, Tel: 215-797-6600, TELEX: 847-345; Empl.: 500ò; *Sls. Mgr.:* Ernie Gitlin, Vic Joliat; *Dist. Mgr.:* Frank Casey

STANPAT PRODS., 100 Goldstein Drive, Woonsocket, RI 02895, Tel: 401-766-8400, FAX: 401-767-0244; Empl.: 35; *Sls. Mgr.:* Mark Barbone

STANTON MAGNETICS, INC., Terminal Dr., Plainview, NY 11803-1511, Tel: 516-349-0235, TWX: 510-221-1845, FAX: 516-349-0230; Empl.: 300; *Dist. Mgr.:* Jack O'Donnell, Natl. Sls. Mgr.

STANTRON, Unit of Zero Corporation, 6900-6918 Beck Ave., P. O. Box 9156, N. Hollywood, CA 91605, Tel: 818-841-1825, FAX: 818-841-8892; FSC No.: 06514; Empl.: 125; *Sls. Mgr.:* G. A. Tessier

STAR CASE MANUFACTURING CO., INC., 648 Superior Avenue, Munster, IN 46321, Tel: 219-922-4440, 800-822-STAR (outside IN), 800-782-CASE (inside IN), FAX: 219-922-4442; Empl.: 75; *Sls. Mgr.:* Veronica Stadden ..... **C•1097**

FAX: 908-572-5095

STAR MICRONICS, INC., OEM Division, 70-D Ethel Rd. W., Piscataway, NJ 08854, Tel: 908-572-9512; Empl.: 120; *Sls. Mgr.:* Georgia Lombardi; *Dist. Mgr.:* Chris Duffy ..... **D•1062-1065, 1112-1115**

Local Sales Offices & Reps

CA	Irvine, Star Micronics	714-768-7203
IL	Itasca, Star Micronics	312-773-3717

Local Distributors

CA	Los Angeles, Elec. Switches, Inc.	213-660-1310
CA	San Diego, Tauber Elctrns.	619-274-7242
CA	Stanton, MS Cash Drawer	818-792-2111
CA	Sunnyvale, Penstock / Waltronics	408-730-0300
CO	Englewood, NEP Elctrns.	303-799-9898
FL	Davie, Arco Dist., Inc.	305-473-2550
GA	Norcross, Applied Power	404-263-0421
IL	Wood Dale, NEP Elctrns.	708-595-8500
IL	Wheeling, Hawk Elctrns.	708-459-4030
MD	Middletown, Current Comps.	301-473-5333
MA	Sharon, Adcour	617-784-8123
MI	Brighton, Applied Power	313-227-3604
MI	Grand Rapids, S. F. Elec. Supp., Inc.	616-459-0216
NJ	Sparta, Instrument & Equip.	201-729-4293
NY	Hewlett, Metropolitan Sls.	516-599-7900
OH	Cincinnati, U.R.I. Elctrns.	513-761-4030
TX	Channelview, R. T. Henry Elctrns.	713-452-4451
TX	Dallas, Foxfire	214-353-9543
CA	Tustin, OBI Dists.	714-250-9003
WI	New Berlin, NEP Elctrns.	414-785-9100
EXP	Markham, Ont., Birde Mktg.	416-477-7722

STAR PORCELAIN, 71 Muirhead Ave., Trenton, NJ 08638, Tel: 609-392-3154; Empl.: 70; *Sls. Mgr.:* Art Weigold

STAR-TRON CORPORATION, 58 Curtis St., Providence, RI 02909, Tel: 401-274-5090, FAX: 401-274-3936; Empl.: 50; *Sls. Mgr.:* Debra Chandronet-Christy

FAX: 714-997-1256

STATEK CORP., 512 N. Main St., Orange, CA 92668, Tel: 714-639-7810, TELEX: 67-8394; FSC No.: 51791; Empl.: 200; *Sls. Mgr.:* Bob Goodwin; *Dist. Mgr.:* S. Schaefer ..... **A•1470-1471**

Local Sales Offices & Reps

AL	Huntsville, L & D	205-837-1469
AZ	Phoenix, Eltron	602-266-2164
CA	Fallbrook, Chilcote Assoc.	619-728-7678
CA	Mission Viejo, Jay Mktg.	714-768-7519
CO	Englewood, Comp. Sls.	303-779-8060
FL	Palm Habor, Sigma Tech	813-789-5522
GA	Atlanta, L & D	404-395-7079
IL	Rolling Meadows, Eagle Tech. Sls.	312-991-0700
IN	Fort Wayne, M/S Sls. & Assocs.	219-436-3023
IN	Greenwood, M/S Sls. & Assocs.	317-881-0110
IA	Des Moines, SPS Assocs.	515-225-0607
KS	Olathe, SPS Assocs.	913-764-4460
MA	Woburn, Radian Assocs.	617-933-7386
MI	Brighton, AP Assoc.	313-229-6550
MN	Bloomington, Murnco Inc.	612-854-4161
MO	Earth City, SPS Assocs.	314-291-0520
NJ	Bellmawr, TAI Corp.	609-778-5353
NY	New Rochelle, Robert Diamond Inc.	914-632-2828
NC	Charlotte, Prime Comps.	704-522-1150
NC	Raleigh, Prime Comps.	919-850-9866
OH	Centerville, Omega Sls. Inc.	513-434-5507
OH	Cleveland, Omega Sls. Inc.	216-360-9400
OR	Oregon City, Halbar Assoc.	503-656-3714
TX	Austin, Norcom	512-451-2757
TX	Dallas, Norcom	214-386-4888
TX	Houston, Norcom	713-778-0392
UT	Midvale, Comp. Sls.	801-561-5688
WA	Redmond, Halbar Assocs.	206-882-0990

Local Distributors

CA	Orange, Western Micro	714-637-0200
CA	San Diego, Western Micro	619-453-8430
CA	Sunnyvale, Target Elctrns.	408-733-0384
CA	Yorba Linda, Target Elctrns.	714-692-1630
CO	Littleton, Indelco	303-795-3431
FL	Ft. Lauderdale, Reptron Elctrns.	305-735-1112
FL	Tampa, Reptron Elctrns.	813-855-4656
GA	Norcross, Reptron Elctrns.	404-446-1300
IL	Palatine, OHM Elctrns.	708-359-5500
IL	Schaumberg, Reptron Elctrns.	708-882-1700
IN	Indianapolis, Mar Elctrns., Inc.	317-633-6699
MA	Woburn, First Frequency	617-935-3885
MI	Livonia, Reptron Elctrns.	313-525-2700
MN	Minnetonka, Reptron Elctrns.	612-938-0000
MO	Maryland Hgts., RS Elctrns.	314-997-7709
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Mt. Vernon, All American	914-699-2224
OH	Solon, Reptron Elctrns.	216-349-1415
OH	Worthington, Reptron Elctrns.	614-436-6675
TX	Richardson, Ewing Elctrns., Inc.	214-231-6725
WA	Redmond, Kent Elect	206-883-7200

STATE OF THE ART, INC., 2470 Fox Hill Rd., State College, PA 16803-1797, Tel: 814-355-8004, TELEX: 866633, FAX: 814-355-2714; Empl.: 100; *Sls. Mgr.:* Joseph J. Curcio ..... **A•1986-1991**

Local Sales Offices & Reps

AZ	Phoenix, Eltron, Inc.	602-266-2164
CA	La Miranda, Select Elctrns.	714-739-8891
CA	Saratoga, EMS	408-446-3833
CT	New Haven, Masten-Wright, Inc.	203-288-1638
FL	Melbourne, Graham Assoc., Inc.	407-773-6631
FL	Palm Bch. Gdns., Graham Assoc., Inc.	407-662-4049
IL	Glenview, Crimson Engrg. Sls., Inc.	312-470-0024
IN	Indianapolis, Hi-Tech Sls.	317-887-2564
MA	Newton, NormellAssocs.,Inc.	617-969-5478
MN	Edina, Peterson Sls. & Assocs.	612-944-0030
NY	Huntington, Compar NY, Inc.	516-423-5660
NY	Lewistown, Watmet, Inc.	716-285-3595
PA	Colmar, E.L. Assocs.	215-822-2510
TX	Dallas, Merino Sls. Co.	214-233-6002
WA	Bellevue, Mars	206-747-3292
Can	Niagara Falls, Waters Metal Prods., Ltd.	416-356-4925

Local Distributors

CA	Los Alamitos, Semi Dice, Inc.	213-594-4631
FL	Tampa, Impala Elctrns.	813-885-4747
NJ	Fairfield, CHPS, Inc.	201-882-0997
NJ	Fairfield. Micross Comps.	201-227-8007
NY	Melville, Semi Dice	516-753-0050
NY	Port Chester, Zeus Comps.	914-937-7400

FAX: 516-666-8039

STAVER CO., INC., P.O. Box 220M 41 Saxon Ave., Bay Shore, NY 11706, Tel: 516-666-8000, TELEX: 6711657 STAVER; Empl.: 80; *Sls. Mgr.:* Arnold Lazarus ..... **B•1127-1131**

Local Sales Offices & Reps

CA	Ventura, R D Sls. Corp.	805-650-0111
IL	Wheaton, RMP McBride Corp.	708-462-2500
IN	Sugar Grove, The Manx Co.	708-466-4200
MI	Jackson, Jordan-Elliott Sls.	517-788-8353
MN	St. Paul, Proud Inds.	612-646-9428
NH	Hancock, Eisenbeis Sls.	603-525-4417
NY	East Northport, Levison Sls. Co.	516-266-5020
NC	New Hill, Tom G. Santel	919-362-4091
OK	Tulsa, Jerry Robison & Assocs.	918-665-3562
OR	Beaverton, Quest Mkgt.	503-641-7377
PA	Montgomeryville, Eastern Scientific Mktg.	215-368-4570
SC	Mauldin, Carl Hart Assocs.	803-288-2323
TX	Dallas, Innovative Tech. Sls.	214-669-3485
TX	Houston, Innovative Tech. Sls.	713-468-3882
WA	Bellevue, Quest Mkgt.	206-747-9424
WI	Colgate, RMP McBride Sls. Corp.	414-628-4016

STEMCO INSTRUMENTS, Colt Industries, P.O. Box 8047, Longview, TX 75607, Tel: 214-643-3236, TWX: 710-730-5236, FAX: 214-643-3339; FSC No.: 07446; Empl.: 100; *Sls. Mgr.:* Bob Halpin

STENNING INSTRMENTS, INC., 671 Enchanted Way, Pacific Palisades, CA 90272, Tel: 213-459-2930, FAX: 213-459-4983; *Sls. Mgr.:* Charles Stenning

STEP ENGINEERING, P.O. Box 3166, Sunnyvale, CA 94088, Tel: 408-733-7837, TWX: 910-339-9506, FAX: 408-773-1073; Empl.: 50; *Sls. Mgr.:* Robert C. Davi

STEPHENS ANALYTICAL, INC., 2750 Brabant-Marineau, Montreal, Que., CA H4S 1L1, Tel: 514-332-1230, FAX: 514-331-2084; Empl.: 8; *Sls. Mgr.:* Mr. Alan Lee

STERLING INSTRUMENTS, 2101 Jericho Turnpike, New Hyde Pk., NY 11040, Tel: 516-328-3300, TWX: 510-223-0642, FAX: 516-326-8827; Empl.: 150

STETCO, INC., 3344 Schierhorn Ct., Franklin Pk., IL 60131, Tel: 708-671-4208, FAX: 708-671-5270; FSC No.: 52763; Empl.: 41; *Sls. Mgr.:* Saul A. Gusaras

STETRON INTERNATIONAL, INC., 90 Broadway, Buffalo, NY 14203, Tel: 716-854-3443, FAX: 716-854-3448; Empl.: 70

STEVENS-ARNOLD DIV., Computer Prods./Stevens-Arnold, 7 Elkins St., So. Boston, MA 02127, Tel: 617-268-1170, TELEX: 95-1456 STEARCO, TWX: 710-339-0855, FAX: 617-268-0300; FSC No.: 80640; Empl.: 260; *Sls. Mgr.:* John T. Parent

Refer to Computer Products, Inc., Fremont, CA for sls. offices and reps. and for distrs. listings. Refer to Computer Products, Inc., Pompano Beach, FL for sls. offices and reps. and for distrs. listings.

STEVENS PRODUCTS, INC., 128 N. Park St., E. Orange, NJ 07019, Tel: 201-672-2140, FAX: 201-672-2837; Empl.: 50; *Sls. Mgr.:* Robert Cantilina

STEWARD, D. M., MFG. CO., E 36th st, P.O. Box 510, Chattanooga, TN 37401, Tel: 615-867-4100, FAX: 615-867-4102; Empl.: 250; *Sls. Mgr.:* Don Lepard

STEWART CONNECTOR SYS., INC., Insilco, R.D. No. 2 Box 2020, Glen Rock, PA 17327, Tel: 717-235-7512, TELEX: 4977105, FAX: 717-235-7954; Empl.: 187; *Sls. Mgr.:* Ed Cavanaugh; *Dist. Mgr.:* Ed Cavanaugh ..... **C•1533**

Local Sales Offices & Reps

AL	Huntsville, Hughes Assoc., Inc.	205-533-9108
CA	Dana-Point, PCA	714-493-9822
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Boulder, Component Prod. Sls. Co., Inc.	303-530-2800
CT	Madison, Focus	203-245-4314
FL	Tamarac, Hughes Assoc., Inc.	305-720-1674
GA	Norcross, Hughes Assoc., Inc.	404-662-1561
IL	St. Charles, XYZ Mktg.	708-584-3001
IN	Columbus, Connect 21, Inc.	812-378-4361
KS	Parker, S.W. Assocs., Inc.	913-898-6552
KY	Louisville, Connect 21, Inc.	502-426-8955
MA	Tauton, Focus	508-824-3840
MI	Southfield, Carl H. Schmidt	313-353-6000
MN	Brooklin Center, Combined Sls.	612-566-2724
MS	Corinth, Hughes Assoc.	601-287-2915
NJ	Paramus, Atlantic Tech. Comps., Inc.	201-261-0542
NY	Syracuse, Leonard D. Allen, Inc.	315-437-8387
NC	Charlotte, Quantum	704-523-8822
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
OH	Medina, J.C. Hofstetter	216-725-6422
OK	Tulsa, Blair Engrg., Inc.	918-622-3100
OR	Beaverton, Elctrns. Northwest,Inc.	503-629-9241
PA	Glen Rock, SCS	717-235-7512
TX	Dallas, Blaire Engrg., Inc.	214-241-5655
UT	Salt Lake City, Component Prod. Sls., Inc.	801-531-7672
WA	Redmond, Elctrns. Northwest, Inc.	206-883-1959
Can	Bellevue, Ont., Quest	206-747-9424
Can	Campden, Ont., Magden	416-563-5408

Local Distributors

CA	Irvine, Kensington Elctrns.	714-588-0575

STIMPSON COMPANY, INC., 900 Sylvan Ave., Bayport, NY 11705-1097, Tel: 516-472-2000, TELEX: ITT 4972370, FAX: 516-472-2425; Empl.: 900; *Sls. Mgr.:* Edward J. Dewalters

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ST MICROWAVE CORP., Sub. of Signal Technlg. Corp., 955 Benecia Ave., Sunnyvale, CA 94086, Tel: 408-730-6300, FAX: 408-245-3396,408-733-0254; FSC No.: 27338; Empl.: 237; *Sls. Mgr.:* Phillip B. Cox-VP

STOCK DRIVE PRODUCTS, Div. of Designatronics, Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, Tel: 516-328-0200, 328-3300, TWX: 510-223-0642, FAX: 516-326-8827; Empl.: 228; *Sls. Mgr.:* Murray Ores ..... **B•1312**

Local Sales Offices & Reps

AL	Huntsville, Par Marketing, Inc.	205-859-5702
CA	Chatsworth, Western Comp. Sls.	818-882-6226
CA	San Carlos, SDP West	415-594-0700
CA	San Carlos, Western Comp. Sls. N.	415-594-1222
CO	Denver, Manufacturer's Mktg.	303-985-2008
CO	Wheatridge, Manufacturers Mktg.	303-425-9569
CT	Wethersfield, Underwood Sls.	203-563-3046
FL	Clearwater, Tech-Rep Assoc., Inc.	813-576-9900
IL	Downers Grove, Rockford Controls Co.	312-960-2046
IN	Indianapolis, Rockford Controls Ohio	317-251-2866
MD	Upperco, Imagitron Sls. Co.	301-374-5600
MA	Lowell, Underwood Sls.	617-256-8191
MA	Topsfield, Liberty Electro	508-887-6655
MI	Southfield, R.C. Nordstrom & Co.	313-559-7373
MN	St. Paul, Northstar Motion & Control	612-770-5311
NJ	Paramus, Design Elctrns.	201-845-6224
NY	Clark Mills, KLM-Garner, Inc.	315-853-6126
NY	New Hyde Park, SDP	516-328-3300
NY	Pittsford, KLM-Garner	716-381-8350
OH	Euclid, Rockford Controls Ohio, Inc.	216-731-5250
OH	Medina, Rockford Controls Ohio	216-725-3705
TX	Houston, Zonk & Assoc.	713-579-7777
TX	Richardson, Zonk & Associates	214-238-7651
WA	Seattle, Northmar Inc.	206-524-5170
WI	Madison, Rockford Controls	608-233-8750

Local Distributors

CA	San Carlos, SDP West	415-594-1222

STOCK MODEL PARTS, Designatronics Inc., 2101 Jericho Turnpike, New Hyde Pk., NY 11040, Tel: 516-328-3300, FAX: 516-326-8827

STOCKO CONNECTORS, Stocko Corporation, 495 Industrial Road, Carlstadt, NJ 07072, Tel: 201-933-4452, FAX: 201-933-4522; Empl.: 34

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STOELTING CO., 620 Wheat Lane, Wood Dale, IL 60191, Tel: 708-860-9700, TELEX: 314176, FAX: 708-860-9775; Empl.: 50; *Sls. Mgr.:* Charles W. Scouten

STOLZBERG RESEARCH, INC., 3 Seabrook Court, Stony Brook, NY 11790, Tel: 516-751-4277, FAX: 516-689-6671; Empl.: 4; *Sls. Mgr.:* Bruce Davis; *Dist. Mgr.:* Bruce Davis

STORM PRODUCTS CO., 116 Shore Drive, Hinsdale, IL 60521, Tel: 708-323-9121, TWX: 910-651-0850, FAX: 708-323-9398; FSC No.: 57500; Empl.: 68; *Sls. Mgr.:* Brian J. Holland

STRATOS PRODUCT DEVELOPMENT GROUP, 2025 First Ave. 830 Market Pl. Tower, Seattle, WA 98121, Tel: 206-448-1388, FAX: 206-448-7830; Empl.: 14

STRAWBERRY TREE, INC., 160 S. Wolfe Rd., Sunnyvale, CA 94086, Tel: 408-736-8800, TELEX: 650 3172834 MCI, FAX: 408-736-1041; Empl.: 25

STREET ELECTRONICS CORP., 6420 Via Real, Carpinteria, CA 93013, Tel: 805-684-4593, FAX: 805-684-6628; *Dist. Mgr.:* Mark Pfeffer

ST RESEARCH CORPORATION, 8419 Terminal Road, Newington, VA 22122, Tel: 703-550-7000, FAX: 703-550-7470; FSC No.: 50406; Empl.: 160

STRONGBOX, P.O. Box 2726, Culver City, CA 90231-2726, Tel: 213-305-8288; FSC No.: 2T043; Empl.: 5; *Sls. Mgr.:* Larry Martinek ..... **C•1108-1109**

S-D

FAX: 609-589-2619

STRUTHERS-DUNN, INC. AND HI-G CO., INC., Lambs Rd., Pitman, NJ 08071-0901, Tel: 609-589-7500, ESYLNK: 622-87939; FSC No.: 78290; Empl.: 467 ..... **B•1588-1603**

Local Sales Offices & Reps

AZ	Scottsdale, BSE, Inc.	602-483-0373
CA	RD & D	
CA	Los Angeles, RD & D	213-666-1611
CA	Palo Alto, Innovative Sls.	415-961-0456
CO	Englewood, Omega	303-762-1921
CT	Bloomfield, Friedman	203-242-7781
FL	Orlando, Comp. Design Mktg.	407-352-5480
IL	Downers Grove, Bob Burns & Assoc.	312-960-2046
IN	Ft. Wayne, TX Sls.	219-423-3422
IA	Cedar Rapids, Pattison	319-365-3150
KS	Olathe, Advanced Tech. Sls.	913-782-8702
LA	Lafayette, Fralia	318-269-9452
MD	Columbia, Imagitron	301-381-0225
MI	Southfield, TX Sls.	313-353-8210
MN	Minneapolis, Jay Borman	612-888-2122
MO	St. Louis, Advanced Tech. Sls.	314-878-2921
NJ	West Caldwell, Grimm, Siegel Assocs.	201-575-9300
NM	Albuquerque, B.S.E.	505-293-2582
NY	Buffalo, Tri-Tech	716-877-3677
OH	Cincinnati, Elctrn Comps.	513-729-1969
PA	Broomall, Imagitron Sls.	215-356-5300
PA	Pittsburgh, Elctrn. Comps.	412-242-9500
TX	Euless, W. Pat Fralia Co.	817-354-1144
WA	Bellevue, Eltech, Inc.	206-643-4330

Local Distributors

CA	Santa Ana, Norstan Elctrns., Inc.	714-540-4165
MO	Maryland Hgts., L Comp. Inc.	314-291-6200
NJ	Oakland, Relay Specialties, Inc.	201-337-1000
NY	Plainview, A.C.I. Elctrns.	516-293-6630
PA	Philadelphia, PEI/Genesis	215-673-0400
TX	Dallas, Associated Aircraft	214-331-4381

ST-SEMICONDUCTORS OF INDIANA, INC., 415 N. College Ave., P.O. Box 609, Bloomington, IN 47402-0609, Tel: 812-332-1435, FAX: 812-331-8706; Empl.: 100; *Sls. Mgr.:* Jim Davis; *Dist. Mgr.:* Jim Davis

SUBMARINE SIGNAL DIVISION, Raytheon Company, 1847 W. Main Road, Portsmouth, RI 02871, Tel: 401-847-8000, TELEX: 71-6817111, FAX: 401-847-2364; Empl.: 2,300

SUCKLE CORP., 733 Davis St., Dept. EM, Scranton, PA 18505, Tel: 717-346-3871, FAX: 717-346-1612; Empl.: 220; *Sls. Mgr.:* James J. Castellino

SULLINS ELECTRONICS CORP., P.O. Box 189, 801 E. Mission Rd., San Marcos, CA 92069, Tel: 619-744-0125, TWX: 910-322-1472, ESYLNK: 62912413, FAX: 619-744-6081; Empl.: 75 ..... **C•1534-1535**

Local Sales Offices & Reps

AZ	Phoenix, TM Entprs.	602-759-5057
AL	Athens, Effective Mktg. Force	205-233-2947
CT	Bethel, Cycle Sls.	203-621-2131
CA	Newport Beach, Qual Conn	714-851-6465
CA	Santa Clara, Nova-Tronix, Inc.	408-727-9530
CO	Wheatridge, Cluff & Assocs.	303-425-6604
FL	Palm Harbor, Bob DEan, Inc.	813-789-1233
GA	Lithia Springs, Effective Mktg. Force	404-948-6023
IL	Mt. Prospect, Dombrow Co.	708-253-3326
IN	Indianapolis, M & L Elctrn. Sls.	317-359-4742
IA	Marion, M-S-B Assocs.	319-377-6261
KS	Shawnee Mission, M-S-B Assoc.	913-432-2131
MD	Randallstown, Chesapeake Inds. Mktg.	301-653-0476
MA	Harvard, Cycle Sls.	617-456-6868
MI	Southfield, Comp. Assocs.	313-355-4110
MN	Minneapolis, RK Sls. Assocs., Inc.	612-571-1001
MO	St. Louis, M-S-B Assocs., Inc.	314-772-2166
NJ	Medford, Comp. Consultants	609-654-5300
NY	E. Rockaway, HLJ Comp-Tech	516-599-2999
NC	Fayettville, Effective Mktg. Force	919-867-6221
OH	Centerville, Omega Sls., Inc.	513-434-5507
OH	Dublin, Sls. Plus	216-942-7811
PA	Ft. Washington, SMC Inc.	215-628-3394
TX	Allen, Bozman & Assocs.	214-727-3719
TX	Richardson, Comp. Partners	214-644-1288
TX	Richardson, Off The Shelf Comp.	214-238-0808
TX	Round Rock, Bozman & Assocs.	512-255-2444
WA	Chattaroy, Elctrn. Mktg. Grp.	509-922-2718
WA	Redmond, Elctrn. Mktg. Grp.	206-882-0962
WA	Vancouver, Elctrn. Mktg. Grp.	206-254-4572
WI	Oconomowoc, Artmor Ltd.	414-367-8789
Can	Carlsbad, QualConn	714-851-6465
Can	La Canada, KCP Entprs.	818-790-1365

Local Distributors

AL	Birmingham, American Elctrn. Supp.	205-942-4656
AL	Huntsville, Cypress Elctrns.	205-533-0783
AZ	Phoenix, Arizona Comps.	602-269-5655
AZ	Tempe, Cypress Elctrns.	602-966-2256
CA	Buena Park, Cypress Elctrns.	213-404-0445
CA	Burbank, Atwater Elctrns.	818-841-9050
CA	City of Industry, Ital Elect Sls. Inc.	818-968-8515
CA	Pasadena, Empire Elctrns.	213-681-2711
CA	San Diego, Cypress/RPS Elect.	619-535-0011
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	San Jose, Sierra W. Elctrns.	408-435-7477
CA	Santa Ana, Sigma Elctrns.	714-558-8600
CA	Santa Clara, Cypress Elctrns.	408-980-2500
CA	Simi Valley, Lee Johnson Sls.	818-346-5412
CA	Woodland Hills, Cypress Elctrns.	818-710-7780
CO	Arvada, Denver Beta Wintronic	303-431-7161
CO	Engelwood, Cypress Elctrns.	303-792-5829
CO	Englewood, NEP Elect. of Co.	303-799-9898
CO	Littleton, Indelco Inc.	303-795-8298
CT	Bridgeport, Millenium Elctrn. Sls.	203-372-2037
FL	Davie, Arco Distrs., Inc.	305-473-2550
FL	Miami, Electronic Equip. Co.	305-871-3500
FL	Winter Park, Deanco	417-671-5100
GA	Duluth, Interface Elctrns.	404-623-1066
GA	Marietta, Deanco	404-429-0126
IL	Addison, Belford Elctrns.	312-691-1100
IL	Carol Stream, Lectro Comps.	708-690-0520
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Wheeling, Hawk Elctrns.	312-459-4030
IL	Wood Dale, NEP Elctrns.	708-595-8500
IN	Evansville, Excalibur Elctrns.	812-464-0079
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Advent Elctrns.	312-872-4910
IN	Indianapolis, Mar Elctrns., Inc.	317-633-6699
IA	Cedar Rapids, DEE Electrns.	319-365-7551
IA	Cedar Springs, Barton Digital	319-474-2247
MD	Beltsville, Petricko Sls.	301-937-4960
MD	Gaithersburg, Axis Elctrns., Inc.	301-840-9640
MD	Gaithersburg, Deanco	301-948-5444
MD	Timonium, M X 4 Elctrns., Inc.	301-252-1192
MA	Canton, EPC Elctrns. Inc.	617-821-2111
MA	Canton, Richey/Impact Elect.	617-821-1500
MA	Wilmington, EPC Elctrns.	508-657-6523
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Grand Rapids, Caider Elctrns.	616-698-7400
MI	St. Claire Shore, Spemco	313-771-2700
MN	Bloomington, Bergquist Co.	612-835-2322
MN	Eden Prarie, Cypress Elctrns.	612-934-2104
MN	St. Paul, Shelley Ragon Inc.	612-642-2828
MN	Thief River Fls., Digi-Key Corp.	218-681-6674
MO	Independence, Shelley-Ragon, Inc.	816-254-3410
NH	Atkinson, Astrum Elctrns.	603-898-3399
NH	Hampstead, Astrum Elctrns.	603-329-9640
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WI Milwaukee, Indl. Elctrns. 414-276-1212
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WI Oconomowoc, G.W. Elctrns., Ltd. 414-367-6003
Can Burnaby, Intek 604-294-8100
Can Pointe Claire, Que., A. R. Gray & Assocs. 514-694-6378
Can Victoria, Pacific Coast Elect. 604-385-5111

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FAX: 314-265-3350

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Can Markham, Ont., Avotronics Ltd. 416-475-2024

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FAX: 213-638-9956

TAMURA CORPORATION OF AMERICA, 1150 Dominguez St., Carson, CA 90746-3518, Tel: 213-638-1790; Empl.: 5000 ..... **A•1269-1272, 1641-1643, 2427, 2429-2436; D•1494-1495, 2058-2068**

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FL Winter Springs, Micro-Elctrn. Comps. .. 407-366-1379
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KS Olathe, Rush & West Assocs., Inc. 913-764-2700
MA Westborough, Anchor Engrg. Corp. ... 508-898-2724
KY Lexington, Elctrn. Rep. 606-273-8425
MD Columbia, Robert Elctrn. Sls. 301-995-1900
MD Livonia, Lowell-Wendt Mktg. Co. 313-464-2722
MI Wyoming, Lowell-Wendt Mktg. Co. 616-791-7370
MN Edina, Grayden & Flemmer, Inc. 612-941-1120
SC Greenville, Electronic Mktg. Assoc. 803-233-4637
MO St. Louis, Rush & West Assocs., Inc. .. 314-965-3322
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NC Raleigh, Elctrn. Mktg. Assoc. 919-847-8800
NC Raleigh, Robert Elctrn. Sls. 919-878-4465
NC Sapphire, Robert Elctrn. Sls. 704-877-3280
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OH Westlake, Dolfuss-Root & Co. 216-899-9370
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Can Pointe Claire, Que., A.R. Gray & Assoc. 514-694-6378

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FL Palm Bay, Comp. Distrs., Inc. 407-724-9910
GA Gastonia, JMT Automation & Controls 704-867-4401
GA Norcross, American Elctrn. Supp. 404-449-5339
GA Norcross, Applied Power Inc. 404-263-0421
GA Norcross, Comp. Distrs., Inc. 404-441-3320
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IN Carmel, Altex Elctrns. 317-848-1323
MD Columbia, Sager Elec. Supp. 301-995-6580
MD Columbia, Vantage Comps. 301-720-5100
MA Andover, Vantage Comps. 508-887-3900
MA Hingham, Sager Elec. Supp. 617-749-6700
MA Sharon, Adcour, Inc. 617-784-8123
MI Brighton, Applied Power Inc. 313-227-3604
MI Livonia, LWC Distrs. 313-464-7700
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MN Minneapolis, Tortec Corp. 612-866-3662
NH Salem, Sager Elec. Supp. 603-898-1348
NJ Lodi, TRC Elec. Inc. 201-779-8282
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NY Hauppauge, Sager Elec. Supp. 516-348-1300
NY Syracuse, ADR Technlgs. Inc. 315-437-7087
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OH Centerville, Indl. Prods. Distbg., Inc. ... 513-435-2086
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OH Twinsburg, Schuster Elctrns., Inc. 216-425-8134
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OR West Linn, Power Factor & Assocs. ... 503-657-6969
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PA Philadelphia, Sager Elec. Supp. 215-464-4336
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TX El Paso, Power & Data Technlg. 505-589-0052
TX Houston, The Altair Co. 713-462-3029
TX Richardson, The Altair Co. 214-231-5166
TX Round Rock, LCD Elctrns. 512-388-1339
TX Stafford, Southwest Elctrns. 713-240-4000
WA Edmonds, Prime Source 206-743-6641
WA Redmond, Priebe Elctrns. 206-881-2363
WI Mequon, Taylor Elec. Co. 414-241-4321
WI Milwaukee, Progressive Image, Inc. ... 414-321-4722
WI Sullivan, Bergquist Co. 414-593-2020

T&W SYSTEMS, INC., See Versacad Corp.

TANE ALARM PRODUCTS, 247-40 Jericho Tpke., Floral Park, NY 11001, Tel: 516-328-3351, FAX: 516-326-9125; Empl.: 10; *Sls. Mgr.:* Tab Hauser; *Dist. Mgr.:* Sam Lurie

TANSITOR ELECTRONICS, West Rd., P.O. Box 230, Bennington, VT 05201, Tel: 802-442-5473, TELEX: 954007, FAX: 802-447-1297; FSC No.: 030266626; Empl.: 183; *Sls. Mgr.:* David Latchum; *Dist. Mgr.:* 225 ..... **A•1143**

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AL Huntsville, Elctrn. Mktg. Assocs. Inc. 205-880-8050, FAX:205-880-8054
AZ Tempe, Piper Sls. 602-949-0048, FAX:602-894-1032
CA Chatsworth, Wes-K Assocs. 818-770-0933, FAX:818-709-9832
CA San Diego, Wes-K Assocs. 619-695-2040, FAX:619-695-8602
CO Grand Junction, Krebill Comp. Sls. 303-243-8220, FAX:303-243-7939
CT Farmington, Ray Perron & Co., Inc. 203-673-4825, FAX:203-675-7345
FL Boca Raton, So. Atlantic Comp. Sls. ... 407-391-1034
FL Orlando, So. Atlantic Comp. Sls. 407-857-3650, FAX:407-857-3298
FL St. Petersburg, So. Atlantic Comp. Sls. 813-324-0953
GA Atlanta, Elctrns. Mktg. Assocs. Inc. 404-448-1215, FAX:404-446-9363
IL Itasca, Circuit Sls. 708-773-0200, FAX:708-773-2721
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KS Olathe, Rush & West Assocs. Inc. 913-764-2700, FAX:913-764-0096
ME Yarmouth, Memar, Inc. 207-846-3791, FAX:207-846-6488
MD Annapolis, Elctrn. Engrg. 301-269-6573, FAX:301-269-6476
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MI Livonia, Amtech Reps. 313-474-8300, FAX:313-474-8301
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NJ Haddonfield, Sunday O'Brien 609-429-4013, FAX:609-429-9249
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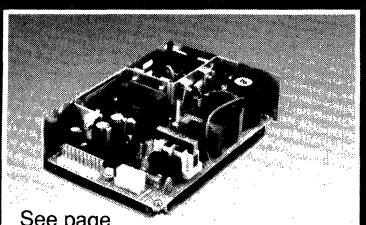
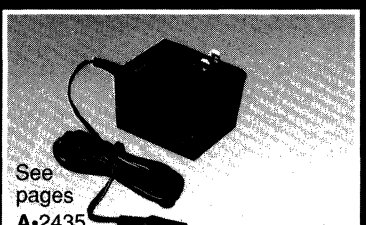
NY Cazenovia, S/T Woolard Co. 315-655-8145
NY Great Neck, M.O.S. Assocs. 516-487-3966, FAX:516-487-3989

TAMURA

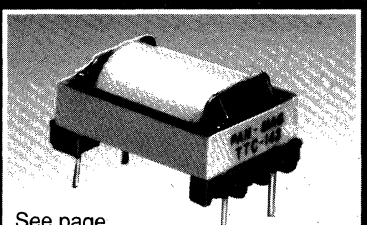
DELIVERS FROM STOCK



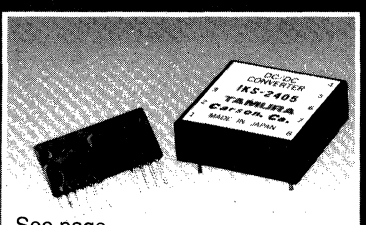
See page D•2062 **SINGLE AND MULTI–OUTPUT SWITCHERS**



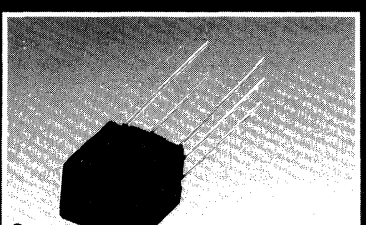
See pages A•2435, D•1495, D•2066 **WALL PLUG–IN, AC & DC POWER**



See page A•2428 **FCC PART 68 TELCOM LINE COUPLING**

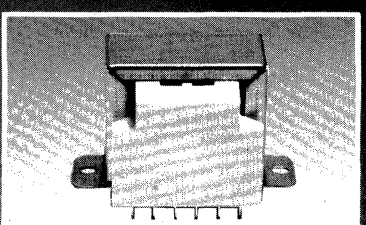


See page D•2059 **DC/DC CONVERTERS SIP & DIP PKG**

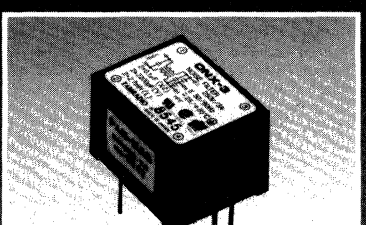


See page A•2430 **MINIATURE AUDIO & PART 68 COUPLING**

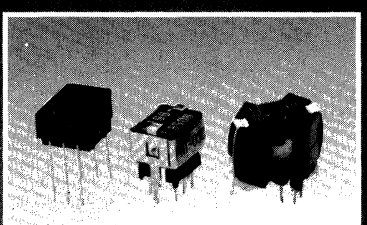
CONTACT FACTORY **COMPUTER NETWORKING BALUNS**



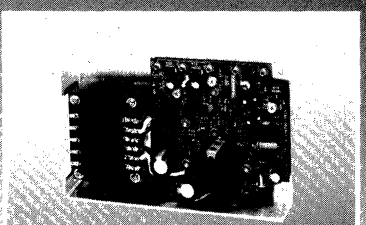
A•2432 **INT'L PCB POWER– UL 1411, IEC, VDE, & CSA**



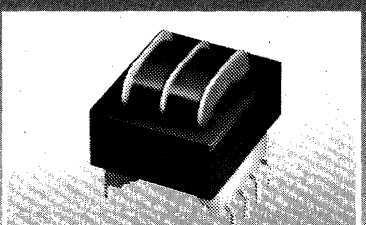
A•1643 **EMI LINE FILTERS**



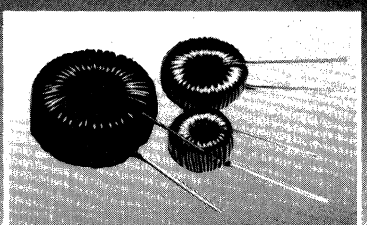
A•2431 **WIDE BAND PULSE– T1 & DIGITAL**



D•2064 **LINEAR POWER SUPPLIES**



A•2433 **UL/CSA PCB POWER**



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UT Valley City, Aved 801-975-9500, FAX:801-977-0245
WA Redmond, Jaco Elctrns., Inc. 206-881-9700, FAX:206-881-9777

TAPECON, INC., 10 Latta Rd., Rochester, NY 14612, Tel: 716-621-8400; Empl.: 120; *Sls. Mgr.:* Joseph C. Pallone

TAPESWITCH CORP. OF AMERICA, 100 Schmitt Blvd., Farmingdale, NY 11735, Tel: 516-694-6312, FAX: 516-694-6304; Empl.: 100; *Sls. Mgr.:* Ed Duhon

TAPPAN WIRE & CABLE, 256 Oak Tree Rd., Tappan, NY 10983, Tel: 914-359-9300, FAX: 914-359-9369; FSC No.: 2G330; Empl.: 27; *Sls. Mgr.:* Mike Ressa

TAUBER

FAX: 619-274-2220

TAUBER ELCTRNS. INC., 4901 Morena Blvd., Bldg. 314, San Diego, CA 92117, Tel: 619-274-7242; Empl.: 38; *Sls. Mgr.:* Bob Tauber; *Dist. Mgr.:* Ed Hoscoe ..... **D•1496**

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AL Huntsville, Macro-Marketing 205-883-9630
AL Huntsville, Macro-Mktg. 205-883-9630
AZ Scottsville, Mactronix 602-998-1848
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CA Santa Ana, Berman Sls. 1-800-829-4747
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FL Land-O-Lakes, AJ'S Power Source ... 813-996-2583
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IL Wheeling, Ed Joyner & Co. 312-520-1200
IA Des Moines, Beams Co. 515-255-1148
KS Shawnee Mission, Beams Co. 913-631-0300

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TAYLOR ELECTRONICS, INC., 401 West Orion, Tempe, AZ 85283, Tel: 602-838-4523, FAX: 602-838-7456; Empl.: 25; *Sls. Mgr.:* Sharon F. Hansen

TAYLOR INDUSTRIAL SOFTWARE, , Edmonton, Alberta, Canada T5K 2M5, Tel: 403-482-7547, FAX: 403-488-8032; Empl.: 65; *Sls. Mgr.:* Glenn Saunders

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FAX: 203-929-6408

T-BAR DATA SWITCH CORP., 1 Enterprise Dr., Shelton, CT 06484, Tel: 203-926-1801, TWX: 710-463-3210; Empl.: 140; *Sls. Mgr.:* Gerard F. Ryan .... **B•1788**

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KS Lenexa, MIDTEC Assocs. 913-541-0505
MD Gaithersburg, Carwithen Assocs. 301-921-9545
MO St. Louis, MIDTEC Assocs. 314-275-8666
TX Richardson, McCoy Assocs. Co. 214-864-1838

Local Distributors

IL Chicago, Newark Elctrns. 312-784-5100
CT Wallingford, Sager Elctrl. Supp. Co. 203-265-4600

TCA, 7733 Telegraph Rd., Montebello, CA 90640, Tel: 213-726-0303, FAX: 213-727-7621; Empl.: 200; *Sls. Mgr.:* Jay Giles

T.D.I. BATTERIES, 2852 Hitchcock Ave., Downers Grove, IL 60515, Tel: 708-971-3460, FAX: 708-971-3903; Empl.: 160; *Sls. Mgr.:* Kurt Padera; *Dist. Mgr.:* Theresa Kanaga

TDJ CO., INC., 1154 Morena Blvd., San Diego, CA 92110, Tel: 619-276-5920, FAX: 619-276-5960; FSC No.: 60382; Empl.: 7; *Sls. Mgr.:* R. Scherr ..... **C•1110-1111**

TDK

FAX: 708-803-6296

TDK CORPORATION OF AMERICA, Electronic Components & Material, 1600 Feehanville Drive, Mount Prospect, IL 60056, Tel: 708-803-6100; Empl.: 7,800; *Sls. Mgr.:* Tadashi Enami; *Dist. Mgr.:* Tadashi Enami (TDK Corp. of America) .... **A•1144-1147, 1273, 1294-1299, 1597, 1644-1645; D•1066, 2069**

Local Sales Offices & Reps

AL Huntsville, TDK Corp. of America 205-464-0222
CA San Jose, TDK Corp. of America 408-437-9585
CA Torrance, TDK Corp. of America 213-539-6631
IL Mt. Prospect, TDK Corp. of America ... 708-803-6100
IN Indianapolis, TDK Corp. of America ... 317-872-0370
MA Southborough, TDK Corp. of America 508-624-4262
MI Livonia, TDK Corp. of America 313-462-1210
NJ New Jersey, MH & W Intl. Corp. 201-891-8800
NJ West Orange, TDK Corp. of America .. 201-736-0023
NY Port Washington, TDK Corp. of America 516-625-0151
NC Greensboro, TDK Corp. of America ... 919-292-0012
TX Irving, TDK Corp. of America 214-506-9800
Can Ontario, MH & W Intl. Corp. 416-676-9401

TDS, Tang Ind., 1965 Pratt Blvd., Elk Grove Village, IL 60007, Tel: 1-800-323-6648, 312-806-7240, FAX: 312-806-7222

TEAL ELECTRONICS CORPORATION, 9190 Camino Santa Fe, San Diego, CA 92121, Tel: 619-693-6000, 800-888-8325, FAX: 619-693-8325; Empl.: 50; *Sls. Mgr.:* Stephanie Kaupp

TEAM SYSTEMS, Div. of Toyo Spectrum, 2934 Corvin Dr., Santa Clara, CA 95051, Tel: 408-720-8877, TELEX: 297584 TEAM UR, FAX: 408-720-9643; Empl.: 6; *Sls. Mgr.:* Bill Nicklin

TEAPO ELECTRONIC CORP. OF AMERICA, 5550 Peachtree Inds. Blvd., Norcross, GA 30071, Tel: 404-449-6220, FAX: 404-447-1109,404-448-8584; Empl.: 1000; *Sls. Mgr.:* Michael Lin

TECA, THERMOELECTRIC COOLING AMERICA CORP., 448 N. Halsted St., Chicago, IL 60622, Tel: 312-666-1600, FAX: 312-666-3964; Empl.: 50 ..... **C•1664-1665**

Local Distributors

EXP Hamburg, Germany, BWD Automotive, GMBH 040-24-67-54
Can Sudbury, Ont., Avad Indl. Sls. 705-897-2584

TECCOR ELECTRONICS INC
A SIEBE COMPANY

FAX: 214-550-1309

TECCOR ELECTRONICS, INC., 1801 Hurd Dr., Irving, TX 75038, Tel: 214-580-1515, TELEX: 79-1600; Empl.: 1250; *Sls. Mgr.:* Gerry Wiley ..... **A•2122-2125**

Local Sales Offices & Reps

AL Daphne, Interep Assocs. 205-478-1036
AL Huntsville, Interep Assocs. 205-881-1096
AZ Mesa, System Sls. of Az.(SSA) 602-464-9989
CA San Diego, O'Donnell Assocs. 619-578-1645
CA San Jose, O'Donnell North 408-456-2950
CA Torrance, O'Donnell Assocs. 213-539-9664
CO Littleton, Harthun Assocs. 303-795-5545
CT Bridgeport, Advanced Comp. Sls. (ACS) 203-332-1124
FL Boca Raton, Perrott Assocs. 407-362-0191
FL Casselberry, Perrott Assocs. 407-830-0094
FL Clearwater, Perrott Assocs. 813-530-5779
FL Melbourne, Perrott Assocs. Inc. 407-676-0305
GA Norcross, Interep Assocs. 404-449-8680
IL Itasca, Micro Sls.(MSI) 708-285-1000
IN Huntington, Elctrn. Rep, Inc. 219-356-3513
IN Indianapolis, Elctrn. Rep, Inc. 317-894-1414
IA West Des Moines, SPS Assocs. Ltd. .. 515-225-0607
KS Olathe, SPS Assocs. Ltd. 913-764-4460
KS Wichita, SPS Assocs. Ltd. 316-733-4415
KY Lexington, Elctrn. REP, Inc. 606-273-8425
MA Still Water, JEF Comps. 508-456-3369
MA Walpole, JEF Components 508-668-6695
MI Farmington Hills, Rathsburg Assocs. .. 313-489-1500
MN Minneapolis, Electric Comp. Sls. 612-933-2594
MO Earth City, SPS Assocs. Ltd. 314-291-0520
NJ Mt. Laurel, S-J South Assocs. 609-866-1234
NM Albuquerque, Sys. Sls. of NM (SSA) .. 505-889-2901
NY Canandaigua, Bensman/Upstate Assocs. 716-396-2498
NY Lewiston, Bensman/Upstate Assocs. 716-754-9155
NY Rockville Centre, S-J Assocs. Inc. 516-536-4242
NC Raleigh, Godwin Assocs. 919-878-8000
OH Cleveland, Del Steffen & Assocs. 216-461-8333
OH Dayton, Del Steffen & Assocs. 513-293-3145
OH Lexington, Del Steffen & Assocs. 419-884-2313
PA Carnegie, Del Steffen & Assocs. 412-276-7366
TN Greenville, Interep Assocs. Inc. 615-639-3491
TX Irving, Mike Farrar 214-580-1515
NE Panama, SPS Assocs. Ltd. 402-477-7227
VA Falls Church, S-J Chesapeake 703-533-2233
NC Charlotte, Godwin Assocs. 704-549-8500
WA Lynnwood, Quadra Sls. 206-743-2633
WI Wauwatosa, Larsen Assocs. 414-258-0529
Can Concord, Ont., Astec Comps. 416-669-4022
Can Pierrefonds, Que., Astec Comps. 514-683-5473

Local Distributors

AL	Huntsville, Hammond Elctrns.	205-830-4764
AZ	Phoenix, Arizona Comp. Co.	602-269-5655
CA	Hayward, Electro Comp. Distrs.	415-783-5800
CA	Santee, Mouser Elctrns.	619-449-2220
CA	Tustin, Added Value Elect.	714-259-8258
CT	East Haven, JV Elctrns.	203-469-2321
CT	Killingsworth, ACI Elctrns.	203-663-3311
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Hammond Elctrns.	407-849-6060
GA	Norcross, Hammond Elctrns.	404-449-1996
CO	Wheat Ridge, Added Value Rcky. Mtns.	303-422-1701
IL	Rosemont, Advent Elctrns.	312-298-4210
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
LA	Baton Rouge, Indl. Elctrns. Supp.	504-357-4249
LA	Shreveport, Indl. Elctrns. Supp.	318-222-9459
MD	Savage, Pyttronic Inds.	301-953-9650
MA	Woburn, ACI Elctrns.	617-935-7230
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MN	Minneapolis, Stark Elctrns.	612-332-1325
MN	St. Paul, Gopher Elctrns.	612-483-3322
MN	Thief River Falls, Digi-Key	800-344-4539
NE	Lincoln, Scott Elctrns.	402-466-8221
NJ	Bloomfield, Solid State Inc.	201-429-8700
NJ	Randolph, Mouser Elctrns	201-328-3322
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Buffalo, Summit Elctrns.	716-887-2800
NY	Penn Yan, Advacom	315-536-7221
NY	Plainview, ACI Elctrns.	516-293-6630
NC	Greensboro, Hammond Elctrns.	919-275-6391
OR	Portland, Radar Elec.	503-232-3404
PA	Export, Advacom Inc.	412-325-7551
PA	McKean, Advacom Inc.	814-476-7774
PA	Montgomeryville, Pyttronic Inds.	215-643-2850
SC	Greenville, Hammond Elctrns.	803-233-4121
TX	Dallas, Omni Pro Intl. Inc.	214-233-9368
TX	Mansfield, Mouser Elctrns.	817-483-4422
UT	West Valley City, Added Value (AVED)	801-975-9500
WA	Richland, Radar Elec.	509-943-8336
WA	Seattle, Radar Elec.	206-282-2511
WA	Spokane, Radar Elec.	509-747-3053
WI	Milwaukee, Marsh Elctrns.	414-475-6000
Can	Burnaby, BC, RAE Indl. Elctrns. Ltd.	604-291-8866
Can	Calgary, Alberta, Cardinal Ind Elctrns.	403-259-6817
Can	Edmonton, Alberta, Cardinal IND Elctrns.	403-483-6266
Can	London, Ont., Peterson Co., CM	519-434-3204
Can	Montreal, Que, Electronic Wholesalers	514-769-8861
Can	Saskatoon, Sask., Cardinal Ind. Elctrns.	306-934-3443
Can	Willowdale, Ont., Electro Sonic Inc.	416-494-1666

TECHDYNE, INC., Lance Wire & Cable Div., 380 Treadwell St., Hamden, CT 06514, Tel: 203-288-5571, TWX: 510-601-0470, FAX: 203-248-0256; Empl.: 50; *Sls. Mgr.:* Bill Kahler

TECH-ETCH, INC., 45 Aldrin Rd., Plymouth, MA 02360, Tel: 508-747-0300, TELEX: 989997, FAX: 508-746-9639; Empl.: 280; *Sls. Mgr.:* P. A. Thomas

TECH LABORATORIES INC., 500 10th St., Palisades Pk., NJ 07650, Tel: 201-944-2221, FAX: 201-944-1653; FSC No.: 83332; Empl.: 25; *Sls. Mgr.:* Nino M. Vlacich ..... **B•1789**

Local Sales Offices & Reps

CA	Canoga Park, C & W Compents Sls.	818-700-2684
CA	Mtn. View, Bridge Mktg.	415-965-8045
IL	Glenview, Crimson Engrg. Co.	312-470-0024
KS	Lenexa, Midtec Assocs.	913-541-0505
MA	Norwood, Components Mktg. Svc.	617-762-4339
MI	Jackson, N. Scroggs Co.	517-750-1170
MO	St. Louis, Midtec Assocs.	314-275-8666
NJ	Whippany, Ken L. Love Assocs.	201-540-0204
NY	Fairport, Net Sls.	716-223-1030
NY	Hempstead, Ken L. Love Assocs.	516-681-3155
OH	Cincinnati, Patco	513-931-3311
SC	Myrtle Beach, Candor Co. Inc.	803-448-8361
TX	Dallas, Southwest Elctrns.	214-690-9881
TX	Houston, Southwest Elctrns.	713-729-1670

TECHLAND BLUELYNX, P.O. Box 877, Cumberland, MD 21502, Tel: 800-832-4526, TELEX: 961-134, FAX: 301-777-3307; *Sls. Mgr.:* Janine Filion

FAX: 213-827-2572

TECHMAR CORP., 5420 McConnell Ave., Los Angeles, CA 90066, Tel: 213-827-8897, 1-800-TECHMAR; FSC No.: 32597; Empl.: 12; *Sls. Mgr.:* Jeff Wilson ... **C•1113-1115**

TECHMATION, INC., 2730 South Hardy, Ste. 5, Tempe, AZ 85282, Tel: 602-968-9946, FAX: 602-968-1849

TECHNAR, INC., See TRW Technar, Inc.

TECHNIC, INC., Box 9650, Providence, RI 02940-9650, Tel: 401-781-6100, TELEX: 927514, FAX: 401-781-2890; Empl.: 125; *Sls. Mgr.:* Andrew T. Ferris

TECHNICAL DEVICES, 560 Alaska Ave., Torrance, CA 90503, Tel: 213-618-8437, FAX: 213-618-1543; FSC No.: 04772; Empl.: 45; *Sls. Mgr.:* D. Murrin; *Dist. Mgr.:* D. Murrin

TECHNICAL MARKING SYS., See Autoroll Machine Corp.

TECHNICAL PANELS, INC., 9162 La Rosa Dr., Temple City, CA 91780, Tel: 800-343-1170, 818-285-3105, FAX: 818-287-0420; Empl.: 14

Local Sales Offices & Reps

CA	San Jose, McFarland Assocs. Corp.	408-993-0200
CA	Carlsbad, Zerimar Sls.	619-436-3379
IL	Mundelein, Northpoint Technlgs.	708-566-7999
NJ	Pt. Pleasant, Jade Mktg.	201-899-7265
MN	Wayzata, Cardinal Sls.	612-475-0042
RI	Warwick, Schumacher & Yarrington	401-884-5671
OH	Chagrin, Crest Comp. Sls.	216-543-9808

TECHNICAL RESEARCH & MFG., INC., See TRM, Inc.

TECHNICAL SERVICES LABORATORY INC., 95 Ready Ave., Ft. Walton Beach, FL 32548, Tel: 904-243-3722, FAX: 904-244-6653; FSC No.: 51283; Empl.: 24; *Sls. Mgr.:* Andrew J. Corbin

TECHNIPOWER, A PENRIL CO., P.O. Box 222, Commerce Pk., Danbury, CT 06813, Tel: 203-748-7001, TELEX: 710-456-9280, FAX: 203-797-9285; FSC No.: 13850; Empl.: 135; *Sls. Mgr.:* L. Carbone; *Dist. Mgr.:* Larry Carbone

TECHNIQUES, INC., 235 Jackson St., Englewood, NJ 07631, Tel: 201-569-5900, FAX: 201-569-5615; Empl.: 60

TECHNI-TOOL, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462, Tel: 215-825-4990, TELEX: 834-763, FAX: 215-828-5623; FSC No.: 30239; Empl.: 80; *Sls. Mgr.:* W. Bezar

TECHNITROL, 1952 E. Allegheny Ave., Philadelphia, PA 19134, Tel: 215-426-9105, FAX: 215-426-2836; FSC No.: 90095; Empl.: 900; *Sls. Mgr.:* G. Shilling ..... **A•1598-1605; B•1028-1029**

Local Sales Offices & Reps

CA	Livermore, United Techn. Mktg.	415-449-7644
AZ	Phoenix, Detomasi & Grupp	602-947-3724
CA	Mission Hills, Detomasi & Grupp	818-365-8285
CA	San Diego, Detomasi & Grupp	619-277-0178
CA	Torrance, Detomasi & Grupp, Inc.	213-618-8898
AL	Huntsville, Advanced Comps. Mktg.	205-881-5493
GA	Norcross, Advanced Comps.Mktg.	404-448-7025
IL	Wauconda, Cudahy Sls.	708-526-2484
MD	Baltimore, Callas Elctrns.	301-744-7711
NY	Fairport, TAC Sls.	716-377-2250
NY	Jericho, J. Square Mktg.	516-935-3200
OH	Akron, Augnat Assocs.	216-239-2499
FL	Seminole, Q-Rep	813-397-8431
PA	Easton, The Kendon Co.	215-253-3100
TX	Dallas, M-Rep	214-484-5711
TX	Houston, M-Rep	713-988-7613
Can	Quebec, Elcom GbM, Inc.	514-668-3361

TECHNO DIVISION, DALE ELECTRONICS, INC., 7803 Lemona Avenue, Van Nuys, CA 91405-1139, Tel: 818-781-1642, FAX: 818-781-8647; FSC No.: 69274; Empl.: 140; *Sls. Mgr.:* Danny Jagirdar; *Dist. Mgr.:* Jon Trabert ..... **A•2037**

Refer to Dale Electronics, Inc., Columbus, NE for sale offices and distributor information.

TECHNO-ISEL USA DIVISION, Designatronics, 2101 Jericho Tunpike, New Hyde Park, NY 11040, Tel: 516-328-3970, TWX: 510-223-0642, FAX: 516-326-8827; Empl.: 85; *Sls. Mgr.:* Sam Singer

TECHNOLOGY DESIGN INC., 10838 Main St., Bellevue, WA 98006, Tel: 206-455-9822, FAX: 206-455-3449; Empl.: 16; *Sls. Mgr.:* Robert Hamilton

TECHNOLOGY DYNAMICS inc.

FAX: 201-385-0702

TECHNOLOGY DYNAMICS INC., 100 School St., Bergenfield, NJ 07621, Tel: 201-385-0500; Empl.: 70; *Sls. Mgr.:* Mark S.Jacobus

TECHNOLOGY 80, INC., 658 Mendelssohn Ave. N, Minneapolis, MN 55427, Tel: 612-542-9545, FAX: 612-542-9785; Empl.: 25; *Sls. Mgr.:* James Burkett

TECHRAND CORP. OF AMERICA, 6520 Schamber Dr., Muskegon, MI 49444, Tel: 616-798-2930, FAX: 616-798-2934; Empl.: 40; *Sls. Mgr.:* James Arter

TECHRON

FAX: 1-219-294-8329

TECHRON DIV., Crown Intl., Inc., 1718 W. Mishawaka Rd., Elkhart, IN 46517, Tel: 219-294-8300, TWX: 810-294-2160; FSC No.: 06306; Empl.: 490 ..... **D•1017-1019**

Local Sales Offices & Reps

IL	Arlington Hgts., Berndt Assocs., Inc.	312-632-0900
CA	Milpitas, IFM Inc.	408-945-5920
CO	Commerce City, Williams Assocs.	303-289-5647
CT	Woodbridge, Electronic Marketing Assoc.	203-397-1461
FL	Melbourne, Reynolds & Assocs., Inc.	305-259-7000
IL	Chicago, Berndt Assocs.	312-283-0713
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
NY	Syracuse, Labtronics Inc.	315-455-7314
OH	Brecksville, Audio Mktg. Assoc.	216-526-2426
PA	Montgomeryville, Eastern Sci-Mktg.	215-368-4570

TECH SPRAY, INC., Box 949, Amarillo, TX 79105, Tel: 806-372-8523, TELEX: 738450, FAX: 806-372-8750; Empl.: 58; *Sls. Mgr.:* Richard C. Johnson; *Dist. Mgr.:* Rich Johnson

TECHTROL CYCLONETICS, INC., 815 Market St., New Cumberland, PA 17070, Tel: 717-774-2746, FAX: 717-774-6799; FSC No.: 58792; Empl.: 15; *Sls. Mgr.:* James M. Griffith

TECKNIT (EASTERN FACILITY), 129 Dermody St., Cranford, NJ 07016, Tel: 908-272-5500, TELEX: 6853079 TCKNT, FAX: 908-272-2741; FSC No.: 07700; Empl.: 300; *Sls. Mgr.:* Thomas McCreery

TECLAB, Kalamazoo Technical Furniture, P.O. Box 1165, Kalamazoo, MI 49005, Tel: 616-372-6000, 800-832-5227, FAX: 616-372-6116; Empl.: 42; *Sls. Mgr.:* B. Smith ..... **C•1117-1119**

TECNETICS, See Computer Products, Inc.

TECNETICS INC., Computer Products, 6287 Arapahoe Ave., Boulder, CO 80303, Tel: 303-442-3837, FAX: 303-444-9437; Empl.: 135; *Sls. Mgr.:* Cliff Payne

Refer to Tecnetics Inc. 6287 Arapaho Ave. Boulder, CO 80303

TECO CORP., Bay Rd., P. O. Box A, Winnisquam, NH 03289, Tel: 603-524-1998, FAX: 603-524-1899; Empl.: 30; *Sls. Mgr.:* Sandra Murphy

TECOM INDUSTRIES, INC., 9324 Topanga Canyon Blvd., Chatsworth, CA 91311, Tel: 818-341-4010, TELEX: 69 8476, FAX: 818-718-1402; FSC No.: 59850001; Empl.: 134

TECTROL INC
SWITCHING POWER PRODUCTS

FAX: 416-638-0553

TECTROL, INC., 39 Kodiak Cres., Downsview, Ontario, Canada M3J 3E5, Tel: 416-630-8108; Empl.: 450; *Sls. Mgr.:* Paul Carroll ..... **D•2071-2074**

Local Sales Offices & Reps

CA	San Diego, Mesa Comps.	619-278-8021
CA	Cupertino, PEI Sls. Assoc.	408-253-1960
IL	Chicago, Century Elctrns. Corp.	312-777-9700
CT	Bloomfield, Zaslow Sls.	203-242-7781
MA	Natick, Zaslow Sls.	508-393-8150
MN	S.St. Paul, Northport Engrg., Inc.	612-457-8000
NJ	Ho-Ho-Kus, Alto Assocs.	201-447-1770
NY	Buffalo, Lynn Assocs.	716-631-0054
OH	Dayton	513-890-6811
OR	Tigard, Rep-West	503-639-0325
PA	Pittsburgh, Lynn Assocs.	412-443-3670
TX	Richardson, Interactive Comp. Sls.	214-669-2277
WA	Seattle, Rep-West	206-283-8351
WI	Wauwatosa, Larsen Assocs., Inc.	414-258-0529
Can	Downsview, Ont., Tectrol Inc.	416-630-8108

Local Distributors

CA	San Jose, Delta Lu Research	408-453-0490

TEGAL SCIENTIFIC, INC., Box 5905, Concord, CA 94524, Tel: 415-827-1054, TELEX: 380053, FAX: 415-827-1189; *Sls. Mgr.:* L. Rigali

TEGAM, INC., 7230 North Ridge Rd., Madison, OH 44057, Tel: 800-666-1010, TELEX: 205188, FAX: 216-428-7505; Empl.: 30; *Sls. Mgr.:* Gerry Hubbard

TEKA an Interpoint Industries company
INTERCONNECTION SYSTEMS, INC.

FAX: 401-461-2310

TEKA INTERCONNECTION SYSTEMS, 45 Salem Dr., Providence, RI 02907, Tel: 401-785-4110; Empl.: 89; *Sls. Mgr.:* Barry Manchester; *Dist. Mgr.:* Barry Manchester ..... **C•1544-1549**

Local Sales Offices & Reps

OH	Dayton, Shamrock Elctrns.	513-258-1227
AL	Huntsville, Total Circuits	205-881-4000
MO	Blue Springs, Atronics	816-224-2131
AZ	Tempe, Spectrum Assocs. S.W. Inc.	602-966-1788
CA	Downey, Management Mktg. & Sls.	213-560-5584
CA	San Diego, Qualtronics	619-695-0118
CA	Sunnyvale, W. W. Posey Co.	408-746-0771
CO	Boulder, R.G. Entprs., Inc.	303-447-9211
IL	Arlington Hgts., Russell Elctrns.	708-394-5560
MA	Danvers, C.H. Burnham Assoc.	508-774-0111
MN	Wayzata, Cardinal Sls.	612-475-0041
NY	Hauppauge, Sticom Sls. & Mktg.	516-366-4221
NC	Matthews, R.G. Sls.	704-847-0049
OR	Aloha, Norwest Interconnect Sys.	503-649-7714
PA	Mt. Laurel, Wyck Mkt. Inc.	215-677-7790
TX	Houston, Mil-Rep Assocs.	713-444-2557
EXP	Huntington Beach, Intercation Inc.	714-636-3722
Can	St. Laurent, Que., HHR	514-739-7054

Local Distributors

CA	Hayward, KEA Elctrns.	415-887-2900
CA	Irvine, Mann Southwest	714-380-4170
CA	San Jose, Compass Comp.	408-432-7575
CA	San Jose, Spectra Elec.	1-800-252-1590
CA	Santa Ana, Norstan Elctrns.	800-854-8344
CA	Santa Clara, Cypress Elctrns.	408-980-2500
CA	Santa Clara, Kent Elec.	408-727-9810
MA	Andover, Aved Elctrns.	617-688-3800
MA	Canton, E.P.C., Inc.	617-821-2111
MI	Roseville, Madsion Elctrns.	313-778-7640
MN	St. Paul, Shelley-Ragon, Inc.	612-642-2844
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Ronkonkoma, Conco Elctrns.	516-467-8200
NC	Raleigh, Resco Raleigh	919-781-5700
OH	Centerville, I.P.D., Inc.	513-435-2086
RI	Warwick, AL Greg Comp. Inc.	401-738-6170
TX	Allen, Prime Distbn.	214-231-0170
TX	Dallas, Cypress Elctrns.	214-869-1435
WA	Seattle, Shelley Ragon, Inc.	206-241-1980
Can	Burlington, Ont., Alternate Source Comp.	416-335-6385

TEK-COM /PRENTICE CORP., 2343 Bering Dr., San Jose, CA 95131, Tel: 408-435-9515, TELEX: 277216, FAX: 408-435-9514; FSC No.: 72242; Empl.: 23; *Sls. Mgr.:* Garry Stoddard

TEKNATIONAL INDS., INC., 430 S. Clinton Ave., Rochester, NY 14620-1103, Tel: 716-232-1291, FAX: 716-232-1295; FSC No.: 24227; Empl.: 15; *Sls. Mgr.:* J. D. Hochheimer

TEKTONE SOUND & SIGNAL, 1331 S. Killian Dr., Lake Park, FL 33403, Tel: 407-844-2383, FAX: 407-845-1587; FSC No.: 59-1500771; Empl.: 70; *Sls. Mgr.:* Carlos Mira; *Dist. Mgr.:* Carlos Mira

TEKTRONIX, INC., P.O. Box 500, Beaverton, OR 97077, Tel: 800-835-9433, TWX: 910-467-8708; FSC No.: 80009; Empl.: 12,500

TEKTRONIX, INC., Display Products, P.O. Box 500 M/S 46-943, Beaverton, OR 97077, Tel: 503-627-5000, FAX: 503-627-1070

TEKTRONIX-SIGNAL ANALYSIS UNIT, 1350 Dell Ave., No. 104, Campbell, CA 95008, Tel: 408-374-6464, FAX: 408-374-6467; *Sls. Mgr.:* Jim Searles

TEKWORKS, INC., 72 Redner Rd., Morristown, NJ 07960, Tel: 201-540-1096, FAX: 201-540-9412; Empl.: 2; *Sls. Mgr.:* David A.H. Robinson

TELCO INTERCONTINENTAL, 9812 Whithorn Dr., Houston, TX 77095, Tel: 713-855-2218, FAX: 713-859-8825; Empl.: 12; *Sls. Mgr.:* Ruth Haber

TELCOM INTERNATIONAL, INC., See Hadron, Inc.

TELEBYTE TECHNOLOGY, INC., 270 East Pulaski Road, Greenlawn, NY 11740, Tel: 516-423-3232, 800-835-3298, FAX: 516-385-8184; Empl.: 48; *Sls. Mgr.:* J. Kramer; *Dist. Mgr.:* R. Nazario

TELECOMMUNICATIONS TECHNIQUES CORP., 20410 Observation Drive, Germantown, MD 20876, Tel: 301-353-1550, FAX: 301-353-0734

TELECTRO SYSTEMS CORP., 96-18 43rd Ave., Corona, NY 11368, Tel: 718-651-8900, TWX: 510-601-8607 TELECTRO, FAX: 718-651-4103; FSC No.: 30040; Empl.: 50; *Sls. Mgr.:* Harry Sussman

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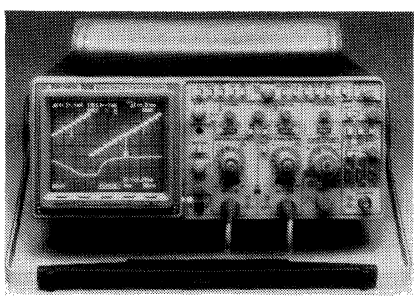

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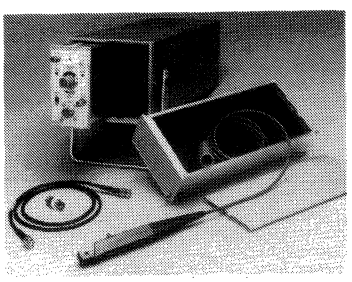

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IN	Indianapolis, Leslie M. Devoe Co.	317-842-3245
FL	Longwood, Teledyne Relays	407-682-9044
FL	Winter Pk., HHP Assocs., Inc.	407-740-0320
GA	Norcross, Advanced Comps. Mktg.	404-448-7025
IL	Bloomingdale, Teledyne Relays	708-529-1060
IA	Cedar Rapids, Stan Clothier Co.	319-365-1717
KS	Olathe, Stan Clothier Co.	913-829-0073
MD	Towson, Arbotek Assocs.	301-825-0775
MA	Marlborough, VISTAssociates	508-481-9277
MN	Eden Prairie, Stan Clothier Co.	612-944-3456
MO	St. Louis, Rothkoph & Assocs.	314-961-4485
NJ	Cranford, Teledyne Relays	201-272-0020
NM	Albuquerque, Reptronix	505-292-1718
NY	Mount Vernon, Friedman-Smith Elctrns.	914-664-4866
NY	Syracuse, Hotze & Murcan Assoc.	315-455-8807
Can	Truro, Nova Scotia, Deskin Sls.	902-893-9228
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
OH	Medina, J.C. Hofstetter Co.	216-241-4880
NJ	Cherry Hill, Vantage Sls.	609-424-6777
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
TX	Austin, Kruvand Assocs.	512-346-8579
TX	Dallas, Kruvand Asso.	214-437-3355
WA	Houston, Kruvand Assocs.	713-956-6741
UT	Salt Lake City, Thorson Rocky Mtn.	801-973-7969
WA	Seattle, TEKREP	206-286-2047
Can	Calgary, Alb., Deskin Sls.	403-270-4440
Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Nepean, Deskin Sls.	613-228-1201
Can	St. Laurent, Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	403-466-2106
Can	Vancouver, Deskin Sls.	604-324-8343

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AZ	Tempe, Time-Arizona	602-967-2000
CA	Camarillo, Milgray/Los Angeles	805-484-4055
CA	Chatsworth, Time Elctrns.	818-998-7200
FL	Clearwater, Pioneer/Clearwater	813-536-0445
FL	Deerfield Bch., Pioneer/Deerfield Bch.	305-428-8877
CA	Irvine, Milgray/Orange County	714-753-1282
CA	San Diego, Time Elctrns.	619-586-0129
CA	San Jose, Pioneer/San Jose	408-495-9100
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Tustin, Time Elctrns.	714-669-0100
CO	Englewood, Time Elctrns.	303-799-8851
CT	Norwalk, Pioneer/Connecticut	203-853-1515
CT	Milford, Milgray/Conn.	203-878-5538
FL	Altamonte Springs, Pioneer/Altamonte Spgs.	407-834-9090
WI	Brookfield, Pioneer Wisconsin	414-784-3480
FL	Ft. Lauderdale, Time Elctrns.	305-484-7778
FL	Orlando, Time Elctrns.	407-841-6565
FL	Winter Pk., Milgray/Fla.	407-647-5747
NY	Woodbury, Pioneer Woodbury	516-921-8700
GA	Atlanta, Electro-Air-Georgia	404-351-3545
GA	Atlanta, Milgray/Atlanta	404-446-9777
NY	Binghamton, Pioneer Binghamton	607-772-9300
GA	Norcross, Pioneer/Norcross	404-448-1711
GA	Norcross, Time Elctrns.	404-368-0969
IL	Addison, Pioneer/Chicago	708-495-9680
IL	Palatine, Milgray/Chicago	708-202-1900
IL	Schaumburg, Time Elctrns.	708-303-3000
IN	Indianapolis, Pioneer/Indianapolis	317-573-0880
KS	Overland Pk., Milgray/Kansas City	913-236-8800
MD	Columbia, Milgray/Wash.	301-621-8169
MD	Columbia, Time Elctrns.	301-964-3090
MA	Lexington, Pioneer/Mass.	617-861-9200
MA	Peabody, Time Elctrns.	508-532-9900
MA	Wilmington, Milgray/New England	508-657-5900
MI	Grand Rapids, Pioneer Western Mich.	616-698-1800
MI	Livonia, Pioneer/Mich.	313-525-1800
MN	Eden Prairie, Pioneer Twin Cities	612-944-3355
MN	Edina, Time Elctrns.	612-835-1250
MO	Manchester, Time Elctrns.	314-391-6444
MO	St. Louis, Pioneer St. Louis	314-432-4350
NJ	Fairfield, Pioneer NJ	201-575-3510
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NJ	Marlton, Time Elctrns.	609-596-6700
NJ	Parsippany, Milgray/New Jersey	201-335-1766
NY	Buffalo, Summit Dist.	716-887-2800
NY	E. Syracuse, Time Elctrns.	315-432-0355
NY	Farmingdale, Milgray Elctrns.	516-391-3000
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Pittsford, Milgray/Rochester	716-381-9700
NY	Rochester, Summit Dist.	716-334-8110
NY	Fairport, Pioneer Rochester	716-381-7070
OH	Cleveland, Milgray/Cleveland	216-447-1520
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Columbus, Time Elctrns.	614-794-3301
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Portland, Time Elctrns.	503-684-3780
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Pioneer	512-835-4000
TX	Austin, Time Elctrns.	512-346-7346
TX	Austin, Wyle	512-834-9957
TX	Dallas, Milgray/Dallas	214-248-1603
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Houston, Pioneer/Houston	713-495-4700
TX	Richardson, Time Elctrns.	214-644-4644
TX	Stafford, Milgray/Houston	713-240-5360
UT	Salt Lake City, Milgray/Utah	801-272-4999
UT	W. Valley City, Time Elctrns.	801-973-8494
Can	Pointe Claire, Que., Milgray/Montreal	514-426-5900
WA	Redmond, Time Elctrns.	206-882-1600
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Can	Edmonton, Alb., Deskin Sls.	403-466-2106
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Can	Mississauga, Ont., Time Elctrns. of Can., Inc.	416-572-5300
Can	Nepean, Deskin Sls.	613-228-1201
Can	St. Laurent, Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	204-224-1321
Can	Truro, Nova Scotia, Deskin Sls.	902-893-9228
Can	Vancouver, BC, Deskin Sls.	604-324-8343
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FAX: 213-779-9161

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Local Sales Offices & Reps

AL	Huntsville, Advanced Comps. Mktg.	205-881-5493
AZ	Scottsdale, Arcom Sls.	602-947-5745
CA	San Jose, Teledyne Solid State	408-978-8899
CO	Englewood, Thorson Rocky Mtn.	303-799-3435
CT	Stratford, VISTAssociates	203-375-5456
FL	Longwood, Teledyne Relays/Teledyne Solid State	407-682-9044
FL	Winter Pk., HHP Assocs., Inc.	407-740-0320
GA	Norcross, Advanced Comps. Mktg.	404-448-7025
IL	Bloomingdale, Teledyne Solid State	708-529-1060
IN	Indianapolis, Leslie M. Devoe Co.	317-842-3245
IA	Cedar Rapids, Stan Clothier Co.	319-365-1717
KS	Olathe, Stan Clothier Co.	913-829-0073
MD	Towson, Arbotek Assocs.	301-825-0775
MA	Marlborough, VISTAssociates	508-481-9277
MN	Eden Prairie, Stan Clothier Co.	612-944-3456
MO	St. Louis, RothKopf & Assocs.	314-961-4485
NJ	Cranford, Teledyne Solid State	201-272-0020
NM	Albuquerque, Reptronix	505-292-1718
NY	Mount Vernon, Friedman-Smith Elctrns.	914-664-4866
NY	Syracuse, Hotze & Murcan Associates	315-455-8807
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
NJ	Cherry Hill, Vantage Sls.	609-424-6777
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
TX	Austin, Kruvand Assocs.	512-346-8579
TX	Dallas, Kruvand Assocs.	214-437-3355
TX	Houston, Kruvand Assocs.	713-956-6741
UT	Salt Lake City, Thorson Rocky Mtn.	801-942-1683
WA	Seattle, Tekrep Elec.	206-286-2047
Can	Calgary, Alb., Deskin Sls.	403-290-4440
Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Nepean, Deskin Sls.	613-228-1201
Can	St. Laurent, Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	204-224-1321
Can	Truro, Nova Scotia, Deskin Sls.	902-893-9228
Can	Vancouver, Deskin Sls.	604-324-8343

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AL	Huntsville, Time Elctrns.	205-721-1133
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Camarillo, Milgray/Los Angeles	805-484-4055
CA	Chatsworth, Time Elctrns.	818-998-7200
CA	Irvine, Milgray/Orange Ctny	714-753-1282
CA	San Diego, Time Elctrns.	619-586-0129
CA	San Jose, Pioneer/San Jose	408-954-9100
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CA	Tustin, Time Elctrns.	714-669-0100
CO	Englewood, Time Elctrns.	303-799-8851
CT	Milford, Milgray/Conn.	203-878-5538
CT	Norwalk, Pioneer/CT	203-853-1515
FL	Altamonte Spgs., Pioneer/Altamonte Spgs.	407-834-9090
FL	Clearwater, Pioneer/Clearwater	813-536-0445
FL	Deerfield Bch., Pioneer/Deerfield Bch.	305-428-8877
FL	Ft. Lauderdale, Time Elctrns.	305-484-7778
FL	Orlando, Time Elctrns.	407-841-6565
FL	Winter Pk., Milgray/Fla.	407-647-5747
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GA	Norcross, Milgray/Atlanta	404-446-9777
GA	Norcross, Time Elctrns.	404-448-4448
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IL	Schaumburg, Time Elctrns.	708-303-3000
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NJ	Marlton, Milgray/Delaware Valley	609-983-5010
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NY	Haupauge, Time Elctrns.	516-273-0100
NY	Pittsford, Milgray/Upstate New York	716-381-9700
NY	Rochester, Summit Dist.	716-334-8110
NC	Charlotte, Pioneer/Charlotte	704-527-8188
NC	Durham, Pioneer/Durham	919-544-5400
NC	Raleigh, Milgray/Raleigh	919-790-8094
NC	Raleigh, Time Elctrns.	919-847-9650
NY	Woodbury, Pioneer/Woodbury	516-921-8700
OH	Cleveland, Milgray/Cleveland	216-447-1520
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Columbus, Time Elctrns.	614-794-3301
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Portland, Time Elctrns.	503-684-3780
PA	Horsham, Pioneer/Delaware Valley Horsham	215-674-4000
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Pioneer/Austin	512-835-4000
TX	Austin, Time Elctrns.	512-346-7346
TX	Dallas, Milgray/Dallas	214-248-1603
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Houston, Pioneer/Houston	713-495-4700
TX	Richardson, Time Elctrns.	214-644-4644
TX	Stafford, Milgray/Houston	713-240-5360
UT	Salt Lake City, Milgray/Utah	801-272-4999
WA	Redmond, Time Elctrns.	206-882-1600
WI	Brookfield, Pioneer/Wisconsin	414-784-3480
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Can	Edmonton, Alb., Deskin Sls.	403-466-2106
Can	Markham, Ont., Deskin Sls.	416-475-1412
Can	Mississauga, Ont., Time Elctrns. of Canada, Inc.	416-572-5300
Can	Nepean, Deskin Sls.	613-228-1201
Can	Pointe Claire, Que., Milgray/Montreal	514-426-5900
Can	St.Laurent,Que., Deskin Sls.	514-331-2860
Can	Transcona, Man., Deskin Sls.	204-224-1321
Can	Truro,Nova Scotia, Deskin Sls.	902-893-9228
Can	Vancouver,B.C., Deskin Sls.	604-324-8343
Can	Willowdale,Ont., Milgray Elctrns.	416-756-4481

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TELEGENIX, INC., Div. of Inductotherm Industries, P.O. Box 5550, Cherry Hill, NJ 08034, Tel: 609-424-5220, FAX: 609-424-0889; Empl.: 85

TELEMET, Geotel, Inc., 25 Davids Dr., Hauppauge, NY 11788, Tel: 516-436-7260, TWX: 510-227-9850, FAX: 516-436-7257; Empl.: 35; *Sls. Mgr.:* Paul H. Paulson III

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TELEPACIFIC ELECTRONICS CO., INC., Pacific Vista Sys., 1261 Liberty Way, Vista, CA 92083, Tel: 619-598-6729, FAX: 619-598-9316; Empl.: 40; *Sls. Mgr.:* Rick Mulanix

TELEPHONICS CORPORATION/PRD INSTRUMENTS, 770 Park Avenue, Huntington, NY 11743, Tel: 516-549-6415/6428, TELEX: 510-222-4494, FAX: 516-549-6114; FSC No.: 78711, 9N770; Empl.: 22; *Sls. Mgr.:* Ronald Freedman

TELEPLEX, INC., Alford Division, 32 Sixth Rd., Woburn, MA 01801, Tel: 617-935-8610, FAX: 617-933-4512; FSC No.: 07177; Empl.: 20; *Sls. Mgr.:* Lois Clark, V.P.

TELEQUARZ-GMBH, See Raltron Electronics Corp.

TELESIS CONTROLS CORP., Box 5000, Chillocothe, OH 45601, Tel: 614-642-3200, FAX: 614-642-2037; Empl.: 61; *Sls. Mgr.:* Robert Perelman

TELE-TECH CORPORATION, P.O. Box 790, Bozeman, MT 59715, Tel: 406-586-0291, FAX: 406-587-0653; FSC No.: 62759; Empl.: 75; *Sls. Mgr.:* Robert E. Diggs

TELETERMINAL CORP., Greenland, NH 03840, Tel: 603-431-1200; Empl.: 13

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TELLUREX CORP., 1248 Hastings, Traverse City, MI 49684, Tel: 616-947-0110, FAX: 616-947-5821; Empl.: 16; *Sls. Mgr.:* Gregg Smith

TELONIC/BERKELEY, Berkeley Inds. Inc., P.O. Box 277, Laguna Beach, CA 92652, Tel: 714-494-9401, FAX: 714-497-7331; FSC No.: 04423; Empl.: 50; *Sls. Mgr.:* Christopher Chrissie

TELPAR, INC., 4137 Billy Mitchell Rd., Box 796, Addison, TX 75001, Tel: 214-233-6631, TELEX: 73-2561, FAX: 214-233-8947; Empl.: 28; *Sls. Mgr.:* Bob Reynolds **D•1117**

TELTEC, INC., 7890 12th Ave. S., Minneapolis, MN 55425, Tel: 612-854-9632, FAX: 612-854-8601; FSC No.: 57856; Empl.: 5; *Sls. Mgr.:* Victor Vachhani; *Dist. Mgr.:* Victor Vachhani

TELTRON, INC., 2 Riga Lane, Birdsboro, PA 19508, Tel: 215-582-2711, TELEX: 4990805, FAX: 215-582-0851; FSC No.: 28287; Empl.: 35; *Sls. Mgr.:* Clyde Mock

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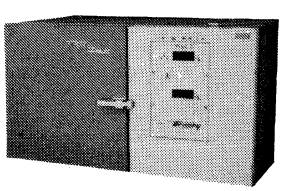

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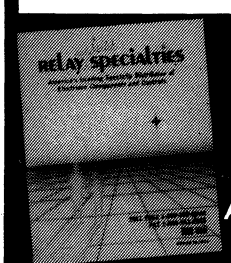

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OH	Novelty, Spectro-Com	216-338-5226
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TX	Richardson, Barry Sls., Inc.	214-234-0255
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FL	Satellite Beach, Glen White Assocs.	407-773-3514
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GA	Norcross, Glen White Assocs.	404-441-1447
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MD	Towson, Glen White Assocs.	301-321-7235
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MN	Minneapolis, R. K. Sales Assocs.	612-571-1001
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MO	St. Louis, Harris-Hanson Co.	314-432-3611
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NJ	Princeton, Murtronic Assocs.	609-394-3737
NY	Syracuse, Labtronics	315-455-7314
NC	Raleigh, Glen White Assocs.	919-848-1931
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OH	No. Royalton, Electro Mktg.	215-582-0075
OR	Portland, Venture Mktg.	503-624-0617
PA	Pittsburgh, Electro Mktg.	412-823-5400
TN	Gray, Glen White Assocs.	615-477-8850
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TX	Irving, AID Elctrs. Inc.	214-790-4761
UT	Salt Lake City, Thorson Rocky Mtn. Inc.	801-942-1683
VA	Lynchburg, Glen White Assocs.	804-385-6110
WA	Bellevue, Venture Elctrns. Inc.	206-454-4594
WI	Brookfield, Control Sls. Inc.	404-797-9500

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FL	Miami Bch., B. Frank Inc.	305-861-8227
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IL	Skokie, Sargent Welch Inc.	312-677-0600
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MD	Bethesda, Albee Sls.	301-897-8088
MA	Revere, Sozio's	617-547-6900
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NJ	Newark, Pinto Trading	201-344-7748
NY	New York, ABC Trading Co.	212-228-5080
NY	New York, Rosetta Elec.	212-233-9088
NY	New York, Taft Elctrns.	212-575-5194
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TX	Houston, Western Sls.	713-869-6671
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NC	Raleigh, L & D, Inc.	919-292-3201
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PA	Langhorne, R.P. Luce & Co.	215-757-3518

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IL	Palatine, Vine Sls., Inc.	708-934-5476
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NY	Buffalo, Lynn Assocs.	716-631-0054
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WA	Lynnwood, Blair Hirsh Co.	206-774-8151
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Can	Mississauga, RFM Electro Sls. Inc.	416-677-0027

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TX	Houston, Wofford	713-847-3583
TX	Richardson, Off the Shelf	214-238-0808

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FL	Maitland, EIR	407-660-9600
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IL	Arlington Hgts., MB Sls.	312-392-9499
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MI	Livonia, Giesting & Assoc.	313-478-8106
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NM	Alburquerque, Cantec Sls.	505-889-9165
NY	Fayetteville, Henry G. Richter	315-637-6713
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OH	Cincinnati, Giesting & Assoc.	513-385-1105
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CA	Redondo Bch., S & S Techlg, Inc.	213-379-9335
CA	San Diego, S & S Technlg. Inc.	619-484-2996
CO	Parker, Howard Assocs.	303-841-5755
FL	Melbourne, Jerry Williams, Inc.	407-259-7700
FL	Tampa, M. Lader Co.	813-264-1444
WA	Bellevue, Arva Hudson	206-455-0773
GA	Lawrenceville, M. Lader Co.	404-985-8057
IL	Mt. Prospect, Cain-Forlaw	708-253-3578
IN	Ft. Wayne, TX Sls. Indiana	219-489-4447
IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
MD	Columbia, M. Lader Co.	301-381-1550
MD	Conowingo, M. Lader Co.	301-378-3449
MA	Andover, Bee Assoc.	508-475-2124
MO	Florissant, Blair Engrg.	314-831-4069
NM	Albuquerque, Thorson Desert States, Inc.	505-293-8555
NY	Liverpool, R&D Assocs.	315-457-0100
NY	New Rochelle, Ascor Elctrns.	914-235-8838
NC	Greensboro, M. Lader Co.	919-674-8970
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TX	Austin, Thorson Co.	512-345-1985
TX	Dallas, Thorson Co.	214-233-5744
TX	Houston, Thorson Co.	713-558-8205
Can	Ottawa, Giga Tron Assocs. Ltd.	613-225-4090

Local Distributors

AZ	Scottsdale, Spirit Elctrns.	602-998-1533
CA	Mtn. View, Comstock Distrs., Inc.	415-969-3010
NY	Ronkonkoma, Compucon Distr., Inc.	516-981-8810
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TX	Dallas, Thorson Co.	214-233-5744

TRAK MICROWAVE LTD., TRAK Microwave Corp., 3/4 Lindsay Court, Dundee Technlg. Pk., Dundee, Scotland DD2 1TY, Tel: 44-382-561509, FAX: 44-382-562643; Empl.: 30

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FAX: 813-886-2794

TRAK SYSTEMS, Div. TRAK Microwave Corp., 4722 Eisenhower Blvd., Dept. E-1, Tampa, FL 33634-6391, Tel: 813-884-1411, TELEX: 52-827, TWX: 810-876-9140; FSC No.: 11165; *Sls. Mgr.:* Thomas L. Roberts **D•1078, 1194-1195**

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AZ	Phoenix, J. Smith Assocs.	602-267-0981
CA	Huntington Beach, Scientific Dvcs. West	714-840-3501
CA	San Diego, Scientific Dvcs. West	619-268-9635
CA	San Jose, Scientific Dvcs. West	408-554-0455
CO	Parker, Howard Assocs.	303-841-5755
FL	Sarasota, Bass Assocs.	813-378-1405
GA	Atlanta, Magaro & Assocs.	404-451-8862
IN	Ft. Wayne, TX Sls. Indiana	219-489-4447
MD	Andover, Saret Assocs.	508-475-9332
MD	Annapolis, Blackwood Assocs.	301-268-3669
NM	Albuquerque, J. Smith Assocs.	505-345-6501
NC	Greensboro, Magaro & Assocs.	919-282-4424
OR	Portland, Scientific Dvcs. West	503-248-6340
PA	Philadelphia, Rabal Assocs.	215-922-6914
TX	Arlington, J. T. Houston Assocs.	817-265-2931
WA	Bellevue, Scientific Dvcs. West	206-637-0945
Can	Ottawa, Giga Tron Assocs., Ltd.	613-225-4090

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TRANSAMERICA DELAVAL, See IMO Delaval, Inc., Gems Sensors Div.

Trans American Transformer, Inc.

FAX: 516-928-0852

TRANS AMERICAN TRANSFORMER, 26 Hulse Rd., E. Setauket, NY 11733, Tel: 516-928-0762; FSC No.: 61619; Empl.: 30 **A•2452**

TRANSCO PRODUCTS, INC., Subsidiary of Datron Systems Inc., Vard Newport, Camarillo, CA 93012, Tel: 805-987-8007, TELEX: 857579, FAX: 805-484-0830; FSC No.: 82152; Empl.: 300; *Sls. Mgr.:* A. Kwon, V.P. of Mktg.

TRANSDUCERS & SYSTEMS, A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092, FAX: 203-481-8937; Empl.: 60; *Sls. Mgr.:* J. L. Jamieson **B•1947**

All states not listed consult factory, N. Branford, CT

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OH	Dayton, RIXAN Assocs.	513-278-4216
PA	Bensalem, Rixan Assoc.	513-278-4216
SC	Greer, Trask Instrumentation	803-292-8900
TX	Humble, Talon Tech. Sls.	713-852-3962

TRANSDUKTOR, INC., See Ulveco, Inc.

TRANSENE, Rte. 1, Rowley, MA 01969, Tel: 508-948-2501, FAX: 508-948-2206; Empl.: 21; *Sls. Mgr.:* H. Femino

TRANSFORMER DESIGN , MTE Corporation, W147 N9525 Held Drive, Menomonee Falls, WI 53051, Tel: 414-253-8200, FAX: 414-253-8222; Empl.: 120; *Sls. Mgr.:* John A. Houdek

TRANSFORMER TECHNOLOGIES, INC., 52 Putnam St., Mt. Vernon, NY 10550, Tel: 914-668-1600, FAX: 914-668-4794; Empl.: 15; *Sls. Mgr.:* Thomas Quaglieri ..... **A•2453**

Local Sales Offices & Reps

IL Highland Pk, Mid-Tek Mktg. 708-831-1130
NJ Brunswick, Synergy Sls. 201-828-5090
VA Ashland, Glasscock Assocs. 804-798-2125

TRANSICOIL, INC., Eagle-Picher, P.O. Box 9011, Valley Forge, PA 19485, Tel: 215-539-4400, FAX: 215-539-3400; FSC No.: 82686; Empl.: 290

TRANSICOIL INC., Penn Airborne Products, 950 Industrial Hwy., Southampton, PA 18966, Tel: 215-355-3400, TELEX: 834-759, FAX: 215-322-2194; FSC No.: 25805; Empl.: 41; *Sls. Mgr.:* Claude Mercier

TRANSICOIL INC., Robinson-Halpern Products, 2560 General Armistead Blvd., Trooper, PA 19403, Tel: 215-539-4400, FAX: 215-539-3400; Empl.: 300; *Sls. Mgr.:* Francis Mashintonio

TRANSISTOR DEVICES, INC., 274 S. Salem St., Randolph, NJ 07869, Tel: 201-361-6622, FAX: 201-361-7665; FSC No.: 09004; Empl.: 650; *Sls. Mgr.:* Don Fedderly ..... **D•1331, 2108-2109**

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AL Huntsville, Reynolds & Assocs., Inc. ... 205-539-1485
AZ Scottsdale, Dave Menegay & Assocs. 602-994-9519
AR El Dorado, Kemp Instrs. 501-862-5869
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CA Campbell, SMA 408-370-6900
CA Canoga Pk., FLW, Inc. 818-719-0037
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CA Costa Mesa, FLW Inc. 714-751-7512
CO Denver, Elcom, Inc. 303-337-2300
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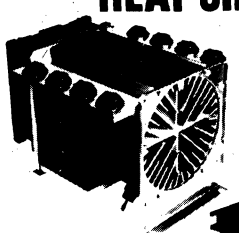

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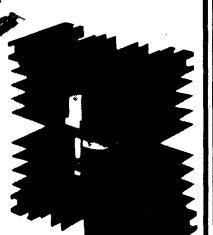

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NY Hicksville, Comp-Tech Sls. 516-593-2628
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NY Rochester, Advanced Comps. Corp. ... 716-544-7017
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PA Pittsburgh, Ashby Assocs. 412-343-5105
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VA Alexandria, Dyna-Rep Co. 703-354-1222
WA Bellevue, Topp Engrg. Sls. Corp. 206-747-5400
Can Weston Ont., Duncan Instrs. Canada Ltd. 416-742-4448

TRANSKINETIC SYS., 110 Shawmut Rd., Canton, MA 02021, Tel: 617-828-3000; Empl.: 17; *Sls. Mgr.:* D. Pettijohn

TRANSMAGNETICS, 210 Adams Blvd., Farmingdale, NY 11735, Tel: 516-293-3100, TWX: 510-224-6420, FAX: 516-293-3793; FSC No.: 17755; Empl.: 44; *Sls. Mgr.:* Fred Haber ..... **D•1196-1199**

TRANS METRICS, INC., 5325 Naiman Pkwy Ste.E , Solon, OH 44139, Tel: 216-248-2229, FAX: 216-248-7780; FSC No.: 6685; Empl.: 20; *Sls. Mgr.:* James N. Dietrich

TRANSONIC SYSTEMS INC., 34 Dutch Mill Road, Ithaca, NY 14850, Tel: 607-257-5300, TELEX: 413523, ESYLNK: 62050974; Empl.: 40

TRANSTECHNOLOGY ELECTRONICS, Transtechnology Corporation, 8800 Allen Rd., Peoria, IL 61615-1584, Tel: 309-693-3300, TWX: 510-390-3691, FAX: 309-693-3308; FSC No.: 30463; Empl.: 280; *Sls. Mgr.:* Arthur J. Mallamo, Jr.; *Dist. Mgr.:* Arthur J. Mallamo, Jr.

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FL Altamonte Springs, Krebs Myton Assoc. 407-788-9333
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KS Olathe, Rothkopf & Assocs. 913-829-8898
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MA St. Louis, Rothkopf & Assocs., Inc. 508-851-4010
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OH TippCity, Cleary Sls. Co. 513-667-7703
PA Newtown Square, Hagy Assocs. 215-459-0504
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TX Colleyville, DeArmond Entprs. 817-267-2048
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VA Charlottesville, Pdg Sls. 804-979-7085
WA Bellevue, Lehr Assocs. 206-453-9993

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CA Van Nuys, Air Electro 818-988-4400
WA Auburn, West Air Intl. 206-631-1000

TRANSTECTOR SYSTEMS, INC., P.O. Box 300, Hayden Lake, ID 83835, Tel: 800-829-2901, TELEX: 150-077TRANSTECPFLS, FAX: 208-772-9016; FSC No.: 30992; Empl.: 150; *Sls. Mgr.:* Mary Munger; *Dist. Mgr.:* Mike Sweeney

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NY Bay Shore, Russell Assocs. 516-666-6500
NY Morrisville, Naylor Elec. Co. 315-684-9620
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WA Bellevue, Russell Assocs. 206-455-3694

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TREE TECHNOLOGIES CORPORATION, Baird Research Pk., 1576 Sweet Home Rd., Buffalo, NY 14228, Tel: 716-688-4640, FAX: 716-636-3630; Empl.: 8; *Sls. Mgr.:* Victor Demjanenko, PH.D.

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TREMETRICS INC., Baker Hughes Incorporated, 6500 Tracor La., Bldg. 27, Austin, TX 78725-2100, Tel: 512-929-2051, TWX: 910-874-1366, FAX: 512-929-2747; FSC No.: 63409; Empl.: 160; *Sls. Mgr.:* William R. Murphy; *Dist. Mgr.:* Will Hoover

TREND CIRCUITS, 44358 Old Warm Springs Blvd., Fremont, CA 94538-6148, Tel: 415-651-1150, FAX: 415-651-5763; Empl.: 142; *Sls. Mgr.:* Colleen Frisz

TREND DLC, Card Technology, 70 Eisenhower Dr., Paramus, NJ 07652, Tel: 201-845-7373, FAX: 201-845-3337; Empl.: 60; *Sls. Mgr.:* Joseph R. La Manna

TRENT, INC., 201 Leverington Ave., Philadelphia, PA 19127, Tel: 215-482-5000, FAX: 215-482-9389; Empl.: 55

TRIAC ELECTRONIC SYSTEMS, INC., 87-27 Myrtle Ave., Glendale, NY 11385, Tel: 718-441-4759, TWX: 221500 ASAS ATT TRIAC; Empl.: 35; *Sls. Mgr.:* Victor Botnick

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TRICONEX CORP., 15091 Bake Parkway, Irvine, CA 92718, Tel: 714-768-3709, 800-325-2128 (outside Ca), FAX: 714-768-6601; Empl.: 60; *Sls. Mgr.:* Peter B. Robinson; *Dist. Mgr.:* Paul Hamilton

TRICON INDUSTRIES, INC., Brazing Alloys & Chemical Products Div., 5000 Chase St., Downers Grove, IL 60515-4012, Tel: 708-963-0220, FAX: 708-963-0269; Empl.: 19; *Sls. Mgr.:* T. R. Boedeker

TRICON INDUSTRIES, INC., Electromechanical Division, 2325 Wisconsin Avenue, Downers Grove, IL 60515-4076, Tel: 708-964-2330, FAX: 708-964-5179; Empl.: 289; *Sls. Mgr.:* Robert Stevens

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TRIDYNE PROCESS SYSTEMS, DBI Industries, 80 Allen Rd., So. Burlington, VT 05403, Tel: 802-863-6873, FAX: 802-860-1591; Empl.: 35; *Sls. Mgr.:* Bonnie Rousseau

TRIGON/ADCOTECH, Dynatech, 100 S. Milpitas Blvd., Milpitas, CA 95035, Tel: 408-946-4300, FAX: 408-263-9217; Empl.: 50; *Sls. Mgr.:* Gary Dotzler

TRILITHIC, INC., 9202 E. 33rd St., Indianapolis, IN 46236, Tel: 800-344-2412, FAX: 317-895-3613; FSC No.: 23042; Empl.: 120; *Sls. Mgr.:* D. Distler

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MS	Jackson, EPI, Inc.	601-856-6251
MO	St. Louis, EPI, Inc.	314-962-1411
MA	Southboro, Sullivan Tech. Sls.	508-485-2215
NJ	Ridgewood, Ballou, Inc.	201-444-6990
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NY	Syracuse, R.M. Scanlon & Assoc., Inc.	315-463-7682
OH	Mentor, Sales Plus, Inc.	216-942-7811
OK	Tulsa, Cunningham Comps.	918-665-3562
OR	Beaverton, Pacific Mktg. Spec.	503-641-9373
PA	Ambler, W.R. Hartmaier Assoc. Inc.	215-643-6691
PA	Ambler, W.R. Hartmaier Assocs., Inc.	215-643-6691
TX	Austin, Cunningham Comps.	512-255-1510
TX	Dallas, Cunningham Comps.	214-699-3485
TX	Houston, Cunningham Comps.	713-461-4197
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WI	Milwaukee, Coombs Assocs., Inc.	414-351-6123

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TRIM-TRONICS, INC., 2763 Route 20 East, Cazenovia, NY 13035, Tel: 315-655-9528, FAX: 315-655-2149; Empl.: 20; *Sls. Mgr.:* James E. Dowd

TRINETICS INC., 55807 Currant Rd., Mishawaka, IN 46545-4899, Tel: 219-259-8535, FAX: 219-259-8552; FSC No.: 3677; Empl.: 100; *Sls. Mgr.:* P. L. Kamerer

TRIO LABORATORIES, INC., 80 Dupont St., Plainview, NY 11803, Tel: 516-349-0400, FAX: 516-349-0442; FSC No.: 00638; Empl.: 60; *Sls. Mgr.:* Richard Frerking, Dir. of Sls. & Mktg.

TRIONICS, INC., P.O. Box 225, St. Charles, IL 60174, Tel: 312-232-9117, FAX: 312-232-0820; Empl.: 50

TRIO-TECH INTERNATIONAL, 355 Parkside Dr., San Fernando, CA 91340, Tel: 818-365-9200, TELEX: 194811(TTI INTL SFDO), FAX: 818-365-8210; Empl.: 266; *Sls. Mgr.:* Jon Easterson

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TRIRIDGE CORP., P.O. Box 12420, Pittsburgh, PA 15231, Tel: 412-899-2288, 800-537-3529, FAX: 412-899-2284; FSC No.: 31951; Empl.: 48; *Sls. Mgr.:* Michael Minich **B•1613**

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FL	Maitland, EIR Inc.	407-660-9600
GA	Norcross, Hughes Assocs.	404-662-1587
IL	Downers Grove, Golten Assocs.	708-512-0093
MA	Chelmsford, Interstate Sls. Assocs.	508-256-2287
MN	Stillwater, Kits Co.	612-439-8088
MS	Corinth, Hughes Assocs.	601-287-2915
NY	Manhasset, Win-Cor Elctrn.Sls.	516-627-9474
NC	Cary, Hughes Assocs.	919-467-7029
TN	Knoxville, Hughes Assocs.	615-558-0283

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OH	Warren, Rem Elctrn. Supp. Co.	216-373-1300
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FL	Pace, Currie, Peak & Frazier	904-994-0599
FL	Tampa, Currie,Peak, & Frazier	813-963-1076
FL	W.Melbourne, Currie, Peak & Frazier	407-724-6795
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IN	Carmel, Berndt Assocs.	317-844-0114
KS	Overland Pk, Baka	913-432-5252
KS	Wichita, Baka	316-682-8411
MD	Landover, Sel-Tronics	301-341-2700
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MI	Sterling Hgts., Geotronix	313-254-0520
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NJ	Elmwood Park, L & M Assoc. Eng. Rep.	201-797-0441
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Buffalo, T.A.E. Reps.	716-688-5008
NY	Clifton Park, T.A.E. Reps.	518-371-3117
NY	New York, L & M Assocs. Eng. Rep.	212-243-6155
NY	Rochester, T A E Reps.	716-586-8710
NY	Whitney Point, T.A.E. Reps.	607-692-3705
NC	Charlotte, Currie, Peak & Frazier	704-846-1702
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
OH	Richfield, Geotronix	216-659-6100
OH	Trotwood, Geotronix	513-854-5939
PA	Allison Park, Geotronix	412-487-1770
PA	Festerville, L & M Assocs.	215-953-9808
TN	Smyrna, Currie, Peak & Frazier	615-459-0743
TX	Grand Prairie, ION Assocs.	214-647-8225
UT	Salt Lake City, Aztec Entprs.	801-467-4675
WA	Bothell, Evergreen Mktg.	206-485-8063
WI	Milwaukee, Berndt Assocs.	414-545-8400
Can	Markham, Ont., Components, Ltd.	416-479-7200
Can	St. Laurent, Que., Componetics, Ltd.	514-331-9930

TRONTECH, INC., 38 Industrial Way E., Eatontown, NJ 07724, Tel: 908-542-1133; Empl.: 70; *Sls. Mgr.:* Albert E. Arbuckle

TRUEVISION, 7340 Shadeland Station, Indpls., IN 46256, Tel: 317-841-0332, FAX: 317-576-7700; Empl.: 64; *Sls. Mgr.:* Greg Vandendries

TRULINE CORPORATION, 909 W. Visalia Rd., Farmersville, CA 93223, Tel: 209-747-1261, FAX: 209-747-0280; Empl.: 85; *Sls. Mgr.:* R. W. Aubery

TRUMETER COMPANY, INC., 38 West 32nd St., New York, NY 10001, Tel: 212-564-0666, 800-537-2261, FAX: 212-268-0432; Empl.: 9; *Sls. Mgr.:* Rene Jacobus

TRW LSI PRODUCTS INC., PO Box 2472, La Jolla, CA 92038, Tel: 619-457-1000, FAX: 619-455-6314; FSC No.: 59621; Empl.: 290; *Sls. Mgr.:* Al Jonas, Dir. Sls.

TRW MICROWAVE, See FEI Microwave

TRW RESISTIVE PRODUCTS DIV., See International Resistive Co.

TRW TECHNAR, INC., TRW, Inc., 5462 Irwindale Ave., Irwindale, CA 91706, Tel: 818-334-0250, FAX: 818-969-4781; Empl.: 750; *Sls. Mgr.:* George R. Downs

TS PRODUCTS, INC., 12455 Branford St., Bldg. 22, Arleta, CA 91331-3429, Tel: 818-896-6676, FAX: 818-896-2816; Empl.: 6; *Sls. Mgr.:* James T. Thomasson; *Dist. Mgr.:* James T. Thomasson ..... **D•2245**

Local Sales Offices & Reps

CA	Corona Del Mar, Motion Control, Inc.	714-675-0211
CA	Los Angeles, TS Products, Inc.	818-896-6676
CA	Montebello, TUCUL Engrg.	818-791-1364

TSSI, 8205 S.W. Creekside Place, Beaverton, OR 97005, Tel: 503-643-9281, FAX: 503-646-4954; Empl.: 50; *Sls. Mgr.:* Dean Turnbaugh, V.P., N.A. Sls.; *Dist. Mgr.:* David Flaningam, V.P., Intl. Sls.

TTE

FAX: 213-445-2791

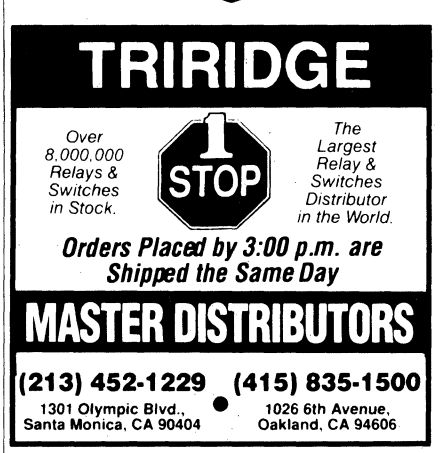
TTE, INCORPORATED, 2251 Barry Ave., W. Los Angeles, CA 90064, Tel: 213-478-8224; FSC No.: 07766; Empl.: 30; *Sls. Mgr.:* S. J. Sodaro ..... **A•1708-1717**

T T I TESTRON INC., 41 Century Drive, Woonsocket, RI 02895, Tel: 401-766-9100, FAX: 401-766-9017; Empl.: 250; *Sls. Mgr.:* Carl Reed

TUCKER ELECTRONICS, Box 551419, Dallas, TX 75355-1419, Tel: 214-348-8800, 800-527-4642, TELEX: 79-1726, TWX: 62812862, FAX: 214-348-0367; Empl.: 43; *Sls. Mgr.:* Don Stabeno

TUMBLER CORP. CABLE DIV., 175 Kootenai Drive, Fremont, CA 94539, Tel: 415-657-3002, FAX: 415-770-1933; Empl.: 86; *Sls. Mgr.:* Vincent P. Lin

TUNGSTONE BATTERIES, INC., 18 Billings St., Sharon, MA 02067, Tel: 617-784-2000, FAX: 617-784-5563; Empl.: 23; *Sls. Mgr.:* William O'Connell



TURCK INC., 3000 Campus Drive, Minneapolis, MN 55441-2656, Tel: 612-553-9224, 1-800-328-0580, 1-800-544-PROX, FAX: 612-553-0708; Empl.: 75; *Sls. Mgr.:* Jerald L. Moser, Dir.of Sls.; *Dist. Mgr.:* Daniel P. Cina, Eastern Reg'l Sls. Mgr., Brad Nielson, Western Reg'l Sls. Mgr.

TUSONIX, INC., 7741 N. Business Park Drive, P. O. Box 37144, Tucson, AZ 85740-7144, Tel: 602-744-0400, TELEX: 102-299640, TWX: 310-299640, FAX: 602-744-6155; FSC No.: 59660; Empl.: 800; *Sls. Mgr.:* Robert H. Jones; *Dist. Mgr.:* John H. Ohlrich

TUSTIN ELECTRONICS CO., 1580 N. Kellogg Drive, Anaheim, CA 92807, Tel: 714-777-5800, FAX: 714-777-5814; FSC No.: 7025-0010; *Sls. Mgr.:* Saul Tunkelrott

TWO TECHNOLOGIES,INC., 419 Sargon Way, Horsham, PA 19044, Tel: 215-441-5305, FAX: 215-441-0423; Empl.: 10; *Sls. Mgr.:* Joan Rickards

TWP, INC., 2133 4th St., Berkeley, CA 94710, Tel: 415-548-4434, TELEX: 171-267, FAX: 415-548-3073; Empl.: 10; *Sls. Mgr.:* C. Donahue

TYCO INSTR. DIV., See Data Instrs.

TYCOR INTERNATIONAL INC., 6107-6 Street S.E., Calgary, Alberta, Canada T2H 1L9, Tel: 403-259-3200, FAX: 403-253-0663; *Sls. Mgr.:* Scott Lee, Canadian

TYTON CORP., Box 23055, 7930 N. Faulkner Rd., Milwaukee, WI 53223, Tel: 414-355-1130, 800-535-5552, TWX: 910-262-3094, FAX: 414-355-7341; *Sls. Mgr.:* Jim Campion, VP Sls.; *Dist. Mgr.:* Terry Tuttle

UCE, INC., 35 Rockland Rd., Norwalk, CT 06854, Tel: 203-838-7509, FAX: 203-838-2566; Empl.: 20; *Sls. Mgr.:* Greg Borstelmann

U. E. SYSTEMS, INC., 12 West Main St., Elmsford, NY 10523, Tel: 914-592-1220, 800-223-1325, TELEX: 229676, FAX: 914-347-2181; Empl.: 20

ULTRAN LABORATORIES, 139R North Gill St., State College, PA 16801, Tel: 814-238-9083, TELEX: 82-0978, FAX: 814-234-3367; FSC No.: 6625, 6635; Empl.: 20

ULTRA VOLT, CS9002, Ronkonkoma, NY 11779, Tel: 800-876-POWER, FAX: 516-363-2423; Empl.: 11; *Sls. Mgr.:* Jim Morrison ..... **D•2115**

ULTRONIX, INC., A Company of Vishay, P.O. Box 1090, Grand Junction, CO 81502, Tel: 303-242-0810, FAX: 303-242-5917; FSC No.: 05347; Empl.: 250; *Sls. Mgr.:* Rai Warzecha; *Dist. Mgr.:* Linda Million, Sls. Coord. ..... **A•1992-1995**

Local Sales Offices & Reps

AL	Huntsville, JWL Assocs.	205-883-1712
AZ	Phoenix, Howe & Howe Sls., Inc.	602-264-7971
AZ	Tempe, Dale Elctrns.	602-966-0291
CA	Redwood City, James S. Heaton Co.	415-367-9000
CA	San Diego, V.E.C. San Diego	619-690-5112
CA	Tustin, V.E.C. Los Angeles	714-544-7024
CO	Loveland, V.E.C. Rockey Mtns.	303-667-7500
FL	Altamonte Springs, Semtronic Assocs.	407-831-8233
GA	Roswell, JWL Assocs.	404-993-0100
IL	Skokie, I.R.I. of IL	312-967-8430
IN	Ft. Wayne, Scott Elctrns.	219-489-5690
IN	Indianapolis, Scott Elctrns.	317-841-0010
KS	Olathe, Tech Sls.	913-829-2800
MD	Glen Burnie, Tri-Mark, Inc.	301-761-6000
MD	Lutherville, J.A. Dougherty Sls., Inc.	301-321-7890
MA	Wakefield, Howard C. Jappe Co.	617-245-9359
MA	Westwood, Comp Rep Assocs.	617-329-3454
MI	Plymouth, Jay Mktg.	313-459-1200
MN	Bloomington, I.R.I. of MN	612-854-8027
MO	St. Louis, Tech Sls.	314-521-2044
NJ	Flanders, K & R. Eng.	201-584-5235
NM	Albuquerque, Nelco Electronix	505-293-1399
NY	E. Rochester, L-Mar Assocs.	716-381-9100
NC	Charlotte, JWL Assocs.	704-541-5750
OH	Centerville, EMA, Inc.	513-433-2800
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5000
OH	Dayton, Scott Elctrns.	513-294-0539
OH	Reynoldsburg, Scott Elctrns.	614-863-1281
OR	Beaverton, L D Elctrns.	503-684-8221
PA	Horsham, T M I	215-441-4300
TX	Dallas, Edward F. Aymond Co.	214-826-7620
TX	Houston, Edward F. Aymond	713-943-3149
WA	Bellevue, UniComp, Inc.	206-869-5124
WA	Snohomish, L D Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Brooksfield, I.R.I. of Wisconsin	414-789-9393
Can	British Columbia, Kaytronics, Inc.	604-294-2000
Can	Concord, Ont., Kaytronics	416-669-2262
Can	Kanata, Ont., Kaytronics	613-564-0080
Can	Ville St. Laurent, Ont., Kaytronics	514-745-5800

ULVAC NORTH AMERICA CORPORATION, P.O. Box 799, 105 York Street, Kennebunk, ME 04043, Tel: 207-985-2973, TELEX: 46-9045, FAX: 207-985-4459; Empl.: 50; *Sls. Mgr.:* Susan Zilaro; *Dist. Mgr.:* Harold Baum

Ulveco

FAX: 713-977-5031

ULVECO, INC., 10401 West Office Dr., Houston, TX 77042, Tel: 1-800-527-7042; Empl.: 50; *Sls. Mgr.:* Ron Schneider ..... **A•2454-2457**

Local Sales Offices & Reps

AL	Huntsville, BCI, Inc.	205-539-4411
CA	Arcadia, Van Gott & Assocs.	818-445-9728
CA	Escondido, Van Gott & Assocs.	619-489-0893
CA	Santa Clara, Gagner-Toomey Assocs., Inc.	408-244-2200
CO	Franktown, MRC	303-660-8750
CT	Avon, Tom Maguire Assocs.	203-673-3019
FL	Maitland, E I R, Inc.	407-660-9600
MA	Norwood, Tom Maguire Assocs.	617-551-0500
MN	Minneapolis, Electro-Serv Co.	612-338-3475
NH	Windham, Tom Maguire Assocs.	603-432-0363
NY	Plainview, Robert Smith Assocs.	516-681-3155
PA	Exton, Linear Sls.	215-524-8080
WA	Seattle, Northmar, Inc.	206-524-5170
WI	Thiensville, TFL Assocs. Inc	414-242-6800
Can	Toronto, Cana Reps.	416-250-6683

UNADILLA ANTENNA MFG. CO., Ballardvale Station, P.O. Box 4215, Andover, MA 01810, Tel: 508-475-7831, FAX: 508-474-8949; Empl.: 6; *Sls. Mgr.:* P. Jannini

FAX: 619-744-7320

UNDERWATER KINETICS, 1020 Linda Vista Dr., San Marcos, CA 92069, Tel: 619-744-7560; Empl.: 85; *Sls. Mgr.:* Greg Sippel ..... **C•1127-1129**

UNDERWOOD INDUSTRIES OF N.Y., INC., d/b/a Viking Products, 456 Broad St., P.O. Box 269, Waverly, NY 14892, Tel: 607-565-4551, FAX: 607-565-9650; Empl.: 7; *Sls. Mgr.:* Robert Pichette

UNGAR, Div. Eldon Inds., Inc., 5620 Knott Ave., Buena Park, CA 90621, Tel: 714-994-2510, TELEX: 4720750 Eldon, FAX: 714-523-7790; FSC No.: 78976; Empl.: 140; *Sls. Mgr.:* Richard Shivers; *Dist. Mgr.:* Dianna Maes

Local Sales Offices & Reps

AZ	Tempe, Rich Sls. Co.	602-968-7787
CA	Gardena, Ungar Sls. Assocs.	213-532-6837
CA	Mountain View, Production Innovation	415-968-0380
CA	San Clemente, Diversitech Reps.	714-366-1496
CO	Boulder, Intersys	303-443-5897
FL	Coral Springs, PSR Technlgs. Inc.	305-753-5732
GA	Lithia Springs, Effective Mktg. Force	404-948-6023
IL	Itsaca, LTD Technlgs.	708-773-2900
IN	Fishers, Rathsburg Assoc.	317-577-4500
MA	N. Reading, Yankee Tech	508-664-0865
MI	Farmington Hills, Rathsburg Assoc.	313-489-1500
MN	Minneapolis, Milt Westlund Assocs.	612-866-5002
MO	St. Louis, Thomas L. Dowell & Assocs.	314-849-4234
NY	Orchard Park, Davis-Callahan Co.	716-662-5988
OH	Franklin, Wiethe & Young Assoc.	513-422-5959
OR	Tualitin, Weaver & Assocs. Inc.	503-691-0665
PA	Spring City, Classen & Doolittle Assocs.	215-948-5958
TX	Dallas, Rich Sls.	214-257-0761
TX	Round Rock, Rich Sls.	512-244-0205
EXP	Inglewood, Eldon Industries, Inc.	213-642-7716

UNHOLTZ-DICKIE CORP., 6 Brookside Dr., Wallingford, CT 06492, Tel: 203-265-3929, FAX: 203-265-2690; Empl.: 45

UNIBOX, Div. of Amerex, P.O. Box 2815, Riverside, CA 92516, Tel: 714-686-1400; *Sls. Mgr.:* Kim Dabe

UNICO, 3725 Nicholson Rd., Franksville, WI 53126-0505, Tel: 414-886-5678, TWX: 910-271-2385, FAX: 414-886-8396; Empl.: 250; *Sls. Mgr.:* Joseph Glover

UNICORP

FAX: 201-674-3803

UNICORP, 291 Cleveland St., Orange, NJ 07050, Tel: 201-674-1700, 800-526-1389; FSC No.: 04729; Empl.: 82; *Sls. Mgr.:* B. Levine ..... **C•1598-1599**

Local Sales Offices & Reps

CA	Irvine, The Hapco Group	714-474-8474
CO	Wheatridge, Skip Jutze Assoc.	303-231-0900
CT	Lyme, Gerard M. Blaney Assoc.	203-434-9497
IL	Addison, Houlihan Sls. Co.	708-543-7200
NJ	Ramsey, R.W. Rundle Assocs.	201-327-4151
PA	Doylestown, George Recentio Assocs.	215-348-7577

UNIMAX SWITCH CORP., See C & K/Unimax, Inc.

UNIMEASURE, INC., 7055 N.W. Grandview Dr., Corvallis, OR 97330, Tel: 503-757-3158, FAX: 503-757-0858

UNION CARBIDE CHEMICALS & PLASTICS COMPANY INC., Industrial Chemicals Div., Crystal, 9320 Chesapeake Dr., Ste. 216, San Diego, CA 92123, Tel: 619-279-4500, FAX: 619-565-8926; Empl.: 125; *Sls. Mgr.:* L. R Rothrock

UNIPLEX CORP., 221 E. Little Canada Rd., St. Paul, MN 55117, Tel: 612-490-1936, FAX: 612-490-0495; Empl.: 8; *Sls. Mgr.:* M. Bryan

UNIPOWER CORPORATION

FAX: 305-971-1837

UNIPOWER CORPORATION, 2981 Gateway Dr., Pompano Bch., FL 33069-4803, Tel: 305-974-2442; FSC No.: 62125; Empl.: 65; *Sls. Mgr.:* Warren Peters, Mgr. Tech. Sls. ..... **D•2116-2130**

Local Sales Offices & Reps

AL	Huntsville, Marco Mktg.	205-883-9630
AZ	Phoenix, Shefler-Kahn	602-257-0884
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-453-9018
CA	Santa Clara, Gagner-Toomey	408-244-2200
CO	Denver, AKI Enterprises	303-388-4488
FL	Margate, EPM Corp.	305-977-0331
FL	Orlando, EPM Corp.	407-425-6149
IL	Itasca, Beta Technlg. Sls.	708-250-9586
IA	Cedar Rapids, Stan Clothier	319-393-1576
KS	Olathe, Stan Clothier	913-829-0073
MD	Gaithersburg, Deltatronics	301-253-0615
MA	Arlington, Interstate Sls.	617-646-3914

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MO St. Charles, Stan Clothier 314-928-8078
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NY Syracuse, Elcom Sls. Inc. 315-685-8967
NC Charlotte, RG Sls. 704-531-0096
OH Columbus, McFadden Sls. 614-761-3177
PA Blue Bell, Deltatronics 215-641-9930
TX Houston, Jim D. Gray Assocs. 713-342-1710
TX Richardson, Jim D. Gray Assocs. 214-699-9976
VA Pohaton, Deltatronics 804-492-9027
Can Mississauga, Andy Bauman Assocs. .. 416-828-2600
Can W. Vancouver, Leister Blake Entprs. ... 604-926-6127

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UNIT DESIGN, 1811 N. Case St., Orange, CA 92665, Tel: 714-282-8100, TWX: 910-250-0136, FAX: 714-526-0119; Empl.: 15; *Sls. Mgr.:* Bill Potter

UNITED CHEMI-CON

FAX: 708-640-6341

UNITED CHEMI-CON INC., 9801 W. Higgins Rd., Rosemont, IL 60018, Tel: 708-696-2000; Empl.: 65; *Sls. Mgr.:* R. Donham ..... **A•1148-1149**

Local Sales Offices & Reps

PA Spring House, Hartmaier, Assoc. 215-643-6691
AL Huntsville, R. O. Whitesell 205-883-5110
CA Irvine, English/Damco Sls. 714-753-1950
CT Plainville, Northeast Reps 203-866-6030
GA Norcross, R. O. Whitesell 404-449-9190
IL Chicago, M. Gottlieb Assocs. 312-775-1151
IN Indianapolis, R. O. Whitesell 317-876-9000
KS Overland Pk., Spectrum Sls. 913-648-6811
KY Versailles, R. O. Whitesell 606-873-1182
MA Hingham, Northeast Reps. 617-749-8700
MI Grand Rapids, R. O. Whitesell 616-942-5420
MI Southfield, R. O. Whitesell 313-559-5454
MI St. Joseph, R. O. Whitesell 616-983-7337
MN Plymouth, Twist Co. 612-550-0922
NH Mt. Vernon, Northeast Reps 603-880-8199
NJ Englewood Cliffs, Caravan Sls., Corp. 201-567-7600
NY Hauppauge, Aurora Mktg. 516-434-1313
NY Pittsford, Franklin Sls. Corp. 716-248-8251
NC Greensboro, Caravan Sls. 919-271-2668
NC Raleigh, Tingen Tech Sls., Inc. 919-870-7123
OH Cincinnati, R. O. Whitesell 513-521-2290
OH Cleveland, R. O. Whitesell 216-447-9020
OH Columbus, R. O. Whitesell 614-888-9396
OH Dayton, R. O. Whitesell 513-298-9546
OR Beaverton, Earl & Brown 503-639-2100
PA Ambler, W.R. Hartmaier 215-643-6691
PA Pittsburgh, R. O. Whitesell 412-963-6161
TN Knoxville, R. O. Whitesell 615-694-9476
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TX Houston, Mil-Rep 713-444-2557
TX Richardson, Mil-Rep 214-644-6731
WA Redmond, Earl & Brown 206-885-5064
Can Richmond Hill, Renmark Elctrns. 416-881-8844

Local Distributors

AL Huntsville, Hammond Elctrns 205-830-4764
AL Huntsville, Resistacap 205-883-4270
AZ Phoenix, Arizona Comps. 602-269-5655
AZ Tempe, Bell Inds. 602-269-5655
AZ Tempe, Future Elctrn. 602-968-7140
AZ Tempe, Time Elctrns. 602-967-2000
CA Agoura Hills, Bell Inds. 818-706-2608
CA Agoura Hills, Time Elctrns. 818-707-2890
CA Anaheim, Time Elctrns. 714-937-0911
CA Camarillo, Milgray Elctrns. 800-635-7812, 805-484-4055
CA Chatsworth, Future Elctrns. 818-700-0914
CA Chatsworth, Passive Comps. 818-700-8838
CA Fountain Valley, Components Ctr. 714-979-0433
CA Irvine, Kelex Elctrns. 714-863-1230
CA Irvine, Milgray Elctrns. 714-753-1282
CA Irvine, S.A.I. 213-376-0861
CA Riverside, Elctrn. Supp. 714-683-7300
CA San Diego, Elctrn. Supp. 619-693-8222
CA Santa Clara, Components Ctr. 408-988-6931
CA Sunnyvale, Capsco Sls., Inc. 408-734-3020
CA Tustin, Capstone Elctrns. 713-730-0349
CA Tustin, Projections Unltd. 714-544-2700
CO Denver, Capstone Elctrns. 303-375-1300
CO Englewood, Nep Elctrns. 303-799-9898
CO Englewood, Time Elctrns. 303-799-8851
CO Westminster, Future Elctrns. 303-650-0123
CO Wheatridge, Bell Inds. 303-424-1985
CT Bethel, Future Elctrns. 203-743-9594
CT Cheshire, Time Elctrns. 203-271-3200
CT East Haven, JV Elctrns. 203-469-2321
CT Milford, Milgray 800-922-6911
CT Wallingford, Midstate Elctrns. 203-265-9900
FL Altamonte Springs, Bell Inds. 407-339-0078
FL Altamonte Springs, Future Elctrns. 407-767-8414
FL Altamonte SPrings, S.A.I. 407-831-6201
FL Clearwater, Future Elctrns. 813-578-2770
FL Ft. Lauderdale, Hammond Elctrns. 305-973-7103
FL Ft. Lauderdale, Reptron Elctrns. 305-735-1112
FL Ft. Lauderdale, Time Elctrns. 305-974-4800
FL Longwood, RM Elctrns. 407-862-9191
FL Tampa, Reptron Elctrns. 813-855-4656
FL Winter Pk., Milgray Elctrns. 800-241-5523
GA Atlanta, Time Elctrns. 404-984-0923
GA Norcross, Bell Inds. 404-662-0923
GA Norcross, Future Elctrns. 404-441-7676
GA Norcross, Hammond Elctrns. 404-449-1996
GA Norcross, Milgray Elctrns. 800-241-5523
GA Norcross, Reptron Elctrns. 404-446-1300
IL Arlington Hgts., Milgray Elctrns. 800-322-6271
IL Elk Grove Vlg., Bell Inds. 708-640-1910
IL Itasca, Capstone Elctrns. 708-250-0300
IL Northbrook, Classic Comps. 708-272-9650
IL Rolling Meadows, RM Elctrns. 708-358-0300
IL Schaumburg, Future Elctrns. 708-882-1255
IL Schaumburg, Reptron Elctrns. 708-882-1700
IL Schaumburg, Time Elctrns. 708-303-3000
IL Wood Dale, Nep Elctrns. 708-595-8500
IN Ft. Wayne, Bell Inds. 219-423-3422
IN Indianapolis, Classic Comps. 317-872-4777
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MA Hopkinton, Interface Elctrns. 508-435-6858
MA Peabody, Time Elctrns. 508-532-9756
MA Sandwich, JV Elctrns. 508-833-0700
MA Sutton, EAC 508-865-0722
MA Westborough, Future Elctrns. 508-366-2400
MA Wilmington, Capstone Elctrns. 508-657-5874
MA Wilmington, Milgray Elctrns. 800-334-6941
MA Wilmington, North Star Elctrns. 508-657-5155
MA Wilmington, S.A.I. 617-938-5460
MI Ann Arbor, Bell Inds. 313-971-9093
MI Grand Rapids, RM Elctrns. 616-531-9300
MI Livonia, Reptron Elctrns. 313-525-2700
MN Chanhassen, G&F Distbn. 612-934-8225
MN Eden Prairie, Future Elctrns. 612-944-2200
MN Eitzen, Capacitor Assocs. 507-495-3306
MN Minnetonka, Reptron Elctrns. 612-938-0000
MN New Brighton, Parts One 612-633-8079
MO St. Louis, Time Elctrns. 314-391-6444
NH Nashua, Brevan Elctrns. 603-889-7230
NJ Marlton, Milgray Elctrns. 800-257-7111
NJ Mt. Laurel, Capstone Elctrns. 609-727-7800
NJ Mt. Laurel, Future Elctrns. 609-778-7600
NJ Parsippany, Milgray Elctrns. 800-622-0291
NJ Rockaway, Tonar Inds. 201-586-9000
NJ Teterboro, EAC 201-288-4477
NM Albuquerque, Bell Inds. 505-292-2700
NY Brooklyn, Chip Technlg. 718-251-8300
NY Canandiaga, Advacom, Inc. 716-396-9050
NY E. Syracuse, ADR Technlgs. 315-437-7087
NY Farmingdale, Milgray Elctrns. 800-645-4729
NY Hauppauge, Time Elctrns. 516-273-0100
NY Liverpool, Future Elctrns. 315-451-2371
NY Melville, S.A.I. 516-293-2710
NY Penn Yan, Advacom 315-536-2221
NY Rochester, Masline Elctrns. 716-546-5373
NC Charlotte, Time Elctrns. 704-522-7600
NC Charolette, Elctrn. Mktg. Corp. 704-394-6195
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Capstone Elctrns. 919-954-0600
NC Raleigh, Century Elctrn. Comps. 919-782-2116
NC Raleigh, EAC 919-970-9700
NC Raleigh, Milgray Elctrns. 800-562-3118
NC Raleigh, Sager Elctrns. 919-850-9550
OH Cleveland, Milgray Elctrns. 800-321-0006
OH Columbus, Elctrn. Mktg. Corp. 614-299-4161
OH Dayton, Bell Inds. (Indl.) 513-435-8660
OH Dayton, Elctrn. Mktg. Corp. 513-439-4711
OH Dublin, Time Elctrns. 614-761-1100
OH Highlands Hills, Elctrn. Mktg. Corp. 216-442-3441
OH Solon, Reptron Elctrns. 216-349-1415
OR Beaverton, Future Elctrns. 503-645-9454
OR Lake Oswego, Bell Inds. 503-635-6500
PA Exton, VSH 215-363-2250
PA King of Prussia, Time Elctrns. 215-337-0900
PA Malvern, Interface Elctrns. 215-889-2060
PA McKean, Advacom 814-476-7774
PA McKean, Advacom, Inc. 814-476-7774
PA Norristown, Century Elctrn. Comps. ... 215-631-5400
PA Philadelphia, Future Elctrns. 609-778-7600
PA York, E.C.I. 717-846-5334
SC Greensville, Hammond Elctrns. 803-233-4121
TX Austin, Kent Elctrns. 512-834-1900
TX Carrollton, Capstone Elctrns. 214-380-9049
TX Dallas, Milgray Elctrns. 800-637-7227
TX Houston, Time Elctrns. 713-530-0800
TX Irving, HArper, S.I.D. 214-621-0500
TX Richardson, Bell Inds. 214-690-0466
TX Richardson, S.A.I. 214-231-6330
UT Midvale, Bell Inds. 801-255-9611
UT Salt Lake City, Future Elctrns. 801-972-8489
UT Salt Lake City, Milgray Elctrns. 800-537-9739
UT Salt Lake City, Standard Supp. Co. 801-486-3371
UT W. Valley, Time Elctrns. 801-973-8181
VT Rutland, S.A.I. 802-775-7126
WA Bothell, Projections Unltd. 206 485-2147
WA Redmond, Capsco Sls., Inc. 206-869-7400
WA Redmond, Future Elctrns. 206-881-8199
WA Redmond, Time Elctrns. 206-882-1600
WI New Berlin, Classic Comps. 414-786-5300
WI New Berlin, Nep Elctrns. 414-785-9100
WI Waukesha, Bell Inds. 414-547-8879
Can Calgary, Zentronics 403-295-8838
Can Mississauga, Time Elctrns. 416-672-5300
Can Mississauga, Zentronics 416-564-9600
Can Nepean, Carsten Elctrns. 613-726-9250
Can Ottawa, Future Elctrns. 613-820-8313
Can Richmond, Electrosonics, Inc. 604-273-2911
Can Richmond, Zentronics 604-273-5575
Can Scarborough, Carsten Elctrns. 416-495-7705
Can Willowdale, Milgray Elctrns. 800-268-3315, 416-756-4481

UNITED ELECTRIC CONTROLS, P. O. Box 9143, Watertown, MA 02272-9143, Tel: 617-926-1000, TELEX: 92 2445, FAX: 617-926-2568; Empl.: 420; *Sls. Mgr.:* Dave Williams; *Dist. Mgr.:* George Miller

UNITED FOAM PLASTICS, 172-Q E. Main St., Georgetown, MA 01833, Tel: 508-352-2200, TWX: 710-347-0315, FAX: 508-352-7169; FSC No.: 55900; Empl.: 200; *Sls. Mgr.:* R.L. Bailly

Local Sales Offices & Reps

AL Decatur, United Foam Plastics Corp. .. 205-351-0800
CT Pawcatuck, United Foam Plastics 203-599-1242
FL Kissimee, United Foam Plastics Corp. 407-933-4880
GA Fairburn, United Foam Plastics 404-964-5888
NJ Somerset, United Foam Plastics 201-560-9550
PA Bridgeport, United Foam Plastics 215-272-5430

UNITED PRICING REPORTS, 645 Stewart Ave., Garden City, NY 11530, Tel: 516-227-1300, FAX: 516-227-1901

UNITED SOLDER WRAP INC., See Vector Elctrn. Co., Solderwrap of CA, Inc.

UNITED STATES CRYSTAL CORP., 3605 McCart St., Fort Worth, TX 76110, Tel: 817-921-3014, TWX: 910-893-4084, FAX: 817-923-0424; FSC No.: 52847; Empl.: 75; *Sls. Mgr.:* Jan Henderson

UNITED STATES ELECTRONICS, 60 Brown Ave., Springfield, NJ 07081, Tel: 201-912-0111, FAX: 201-912-0015; Empl.: 20

UNITED SUPERTEK, INC., 118 Charcot Ave., San Jose, CA 95131-1101, Tel: 408-922-0730, FAX: 408-922-0534; Empl.: 55; *Sls. Mgr.:* Roger Meade

UNITED TECHNOLOGIES CONTROL SYSTEMS, 131 Godfrey St., Logansport, IN 47401, Tel: 219-747-6142, TWX: 810-295-0699; Empl.: 3,700; *Sls. Mgr.:* Terry Smith

UNITED TECHNOLOGIES MICROELECTRONICS CENTER, United Technologies Corp., 1575 Garden of The Gods Rd., Colorado Springs, CO 80907, Tel: 719-594-8000, 1-800-MIL-UTMC, FAX: 719-594-8032; Empl.: 485; *Sls. Mgr.:* Dwight Deem

UNITED WIRE & CABLE CORP., 425 Shrewsbury St., Worcester, MA 01604, Tel: 508-757-3872, FAX: 508-753-2173; FSC No.: 51348; Empl.: 10; *Sls. Mgr.:* T. P. Andrews

UNIT INDUSTRIES, 1140 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-4161, FAX: 714-871-4164; FSC No.: 0AMM9; Empl.: 40; *Sls. Mgr.:* D. Molby

UNITRACK INDUSTRIES, INC., 1372 Enterprise Dr., Goshen Corp. Pk., P.O. Box 1927, West Chester, PA 19380, Tel: 215-692-0800; *Sls. Mgr.:* Anna Orcutt

UNITREK CORPORATION, 3000 Lewis & Clark Hwy., Ste.2, Vancouver, WA 98661, Tel: 206-699-7277, FAX: 206-694-6930; Empl.: 40; *Sls. Mgr.:* John Sailer

UNITRODE CORP., 580 Pleasant St, Watertown, MA 02172, Tel: 617-926-0404, FAX: 617-924-1235; Empl.: 2,000; *Sls. Mgr.:* Leslie Wallace; *Dist. Mgr.:* Ron Myers

UNITRON INC., 10925 Miller Rd., Dept. EE, Dallas, TX 75238, Tel: 214-340-8600, TELEX: 882511, FAX: 214-341-2099; FSC No.: 6130; Empl.: 75; *Sls. Mgr.:* James Baker

UNIVERSAL AD-YU/D-F INC., 2517 E. Norwich St, Milwaukee, WI 53207, Tel: 414-482-4100; FSC No.: 90101; Empl.: 10; *Sls. Mgr.:* Ronald Tessmer

UNIVERSAL DATA SYSTEMS, INC., Motorola Information Systems Group, 5000 Bradford Dr., Huntsville, AL 35805-1993, Tel: 205-430-8000, TELEX: 752602 UDS HTV, FAX: 205-830-5657; Empl.: 950; *Sls. Mgr.:* Tony Zalenski

UNIVERSAL INSTRS. CORP., MECHANIZED ELCTRN. ASSEMBLY (MEA) DIV., See Mechanized Elctrn. Assembly Div., Universa

UNIVERSAL MFG., CO. INC., 1168 Grove St, Irvington, NJ 07111, Tel: 201-374-9800, TELEX: 710-995-4647, FAX: 201-374-2265; Empl.: 60; *Sls. Mgr.:* Martin Mayer; *Dist. Mgr.:* Martin Mayer

FAX: 914-241-3129

UNIVERSAL VOLTRONICS CORP, Thermedics Inc./ThermoElctron Corp., 27 Radio Circle Dr., Mt. Kisco, NY 10549, Tel: 914-241-1300, TWX: 710-571-2142; FSC No.: 14225; Empl.: 85 ..... **D•2131-2133**

Local Sales Offices & Reps

FL	Satellite Beach, BWS Microwave Marktg.	407-773-6170
MA	Whitinsville, Power Factor & Assocs.	617-234-6415
NV	Las Vegas, Trembly Assoc., Inc.	702-739-9770
NM	Albuquerque, Trembly Assoc., Inc.	505-266-8616
PA	Audubon, Holmes Assocs.	215-666-0636
PA	Audubon, Holmes Assocs., Inc.	215-666-0636
TX	El Paso, Trembly Assocs., Inc.	915-533-9380
UT	No. Salt Lake City, Trembly Assocs., Inc.	801-295-4703
Can	Nepean, Ont., Datacomp Elctrns.	613-723-8825
Can	Toronto, Ont., Datacomp Elctrns.	416-533-4076

Local Distributors

AZ	Phoenix, Trembly Assoc. Inc.	602-967-2058
CO	Wheat Ridge, Trembly Assoc. Inc.	303-421-8900
NV	Las Vegas, Trembly Assoc. Inc.	702-739-9770
NM	Albuquerque, Trembly Assoc. Inc.	505-266-8616
TX	El Paso, Trembly Assoc. Inc.	915-533-9380
UT	North Salt Lake, Trembly Assoc. Inc.	801-295-4703
EXP	London, England, Stansberry Assoc. Int'l, Inc.	01-467-0535
Can	Toronto, Ont., Datacomp Elctrns.	416-533-4076

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UPSYSTEMS, INC., Subsidiary of Chloride Power Elec., One Technology Place, Caledonia, NY 14423, Tel: 716-538-4421, FAX: 716-538-6345; FSC No.: 3698; *Sls. Mgr.:* Steve Olson

URBAN ELECTRONICS, P. O. Box 456, Dover, MA 02030, Tel: 617-329-4068, FAX: 508-785-2265; Empl.: 50; *Sls. Mgr.:* G. Urban

USAR SYSTEMS, INC., 568 Broadway Ste. 405, New York, NY 10012, Tel: 212-226-2042, FAX: 212-226-3215; Empl.: 3; *Sls. Mgr.:* Yannis Milios

DIGITAL

FAX: 206-576-0515

U. S. DIGITAL CORP., 8409 N.W. 15th Court, Vancouver, WA 98665, Tel: 206-576-0514, 800-736-0194 (Sales); *Sls. Mgr.:* David Madore ..... **B•1952-1955**

Local Sales Offices & Reps

VA	Roanoke, Engrg. & Mktg. Corp. of VA	703-562-0726

Local Distributors

VA	Roanoke, Engrg. & Mktg. Corp. of VA	703-562-0726

USD PRODUCTS , Div. of Bussmann, 7300 W. Wilson Ave., Chicago, IL 60656, Tel: 708-867-4600, FAX: 708-867-2211; Empl.: 200; *Sls. Mgr.:* Mr. Chris Osmun

USECO DIV., Litton Inds, 13536 Saticoy St, Van Nuys, CA 91409, Tel: 818-786-6381, FAX: 818-902-4516; FSC No.: 88245; Empl.: 100; *Sls. Mgr.:* Peggy Slattery

U.S. ELCO,INC., 2930 Scott Blvd., Santa Clara, CA 95054, Tel: 1-800-888-ELCO, FAX: 408-980-9754; *Sls. Mgr.:* Douglas Hemingway

U.S. INSTRUMENT RENTALS, INC., AT&T Capital Corp., 1830 West Airfield Drive, D/FW Airport, TX 75261, Tel: 800-874-7123; Empl.: 500; *Sls. Mgr.:* Greg Lapham

U. S. LASER CORP., 825 Windham Court North, Wyckoff, NJ 07481, Tel: 201-848-9200, FAX: 201-848-9006; Empl.: 25; *Sls. Mgr.:* James F. Golden

U.S. POWER/RELCO MIDWEST, U.S. Power Converting Co., 8830 West 61st North, Wichita, KS 67205, Tel: 316-722-6440; Empl.: 12; *Dist. Mgr.:* Jonathan P. Snow ..... **C•1092; D•2027**

U.S. POWER CONVERTING COMPANY/RELCO, Leonard V. Snow & Assocs., 21517 Ocean, Torrance, CA 90503, Tel: 213-316-9984, FAX: 213-316-9050; Empl.: 8; *Sls. Mgr.:* Van Snow; *Dist. Mgr.:* Tom Clark ..... **C•1092; D•2027**

Local Sales Offices & Reps

KS	Wichita, U.S. Power Converting/Relco	316-722-6440
Can	New Dundee, Ont., Ritz Elctrns.	519-696-2616
Can	Torrance, U.S. Power Conv. Co.	213-316-9984

Local Distributors

CA	Torrance, U.S. Power Converting/L. Snow & Assocs.	213-316-9984
KS	Witchita, U.S. Power Converting/Relco	316-722-6440
Can	New Dundee, Ont., Ritz Elctrns.	519-696-2616

U.S. SENSOR CORP., 1832 W. Collins Ave., Orange, CA 92667, Tel: 714-639-1000, FAX: 714-639-1220; Empl.: 25 ..... **B•1871**

Local Sales Offices & Reps

AZ	Phoenix, Compass Mktg. & Sls. Inc.	602-996-0635
AZ	Tucson, Compass Mktg. & Sls. Inc.	602-577-5146
CA	Los Angeles, Landa & Assocs.	213-879-0770
CA	San Jose, Arnold Tech. Sls.	408-954-0400
CA	Santa Ana, Landa & Assocs.	714-543-7805
CO	Englewood, Compass Mktg. & Sls., Inc.	303-721-9663
FL	Orlando, Richmar Elctrns. Corp.	407-352-3755
IL	Downers Grove, Richmar Elctrns. Corp.	708-968-0118
IN	Indianapolis, Richmar Elctrns. Corp.	317-577-9950
IA	Iowa City, Richmar Elctrns. Corp.	319-354-8894
MA	Canton, John Ferrari Co.	617-821-4599
MI	Farmington, J.P.Bergin Assocs.	313-471-7940
NM	Albuquerque, Compass Mktg. & Sls., Inc.	505-344-9990
TX	Plano, Richmar Elctrns. Corp.	214-424-8388
WI	Butler, Richmar Elctrns. Corp.	414-781-1730

U.S. TERMINALS INC., 7502 Camargo Rd., Cincinnati, OH 45243, Tel: 513-561-8145, FAX: 513-561-8755; FSC No.: 12615; Empl.: 45; *Sls. Mgr.:* George L.Stepp ..... **C•1563**

Local Sales Offices & Reps

AZ	Phoenix, Gramer & Co.	602-942-1415
FL	Melbourne, Jerry Williams, Inc.	407-259-7700
IL	Chicago, LTD Technologies	708-773-2900
IL	Itasca, LTD Technologies	708-773-2900
IA	Cedar Rapids, J.R. Sls. Engrg., Inc.	319-393-2232
IA	Cedar Rapids, J.R. Sls.Engrg.,Inc.	319-393-2232

FAX: 818-287-7350

U.S. TOYO FAN CORP., 4915 Walnut Grove Ave., San Gabriel, CA 91776, Tel: 818-287-5297; Empl.: 20; *Sls. Mgr.:* Peter Jeanseau; *Dist. Mgr.:* Peter Jeanseau ..... **C•1668-1669**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Oceanside, Noo Rep Tech Sls.	619-941-0558
CA	San Gabriel, U.S. Toyo Fan Corp.	818-287-5297
CA	Santa Clara, U.S. Toyo Fan Corp.	408-988-1260
FL	Winter Springs, Sunland Assocs.	407-365-9533
IL	Downers Grove, Golten Assoc.	708-512-0093
IA	Cedar Rapids, Stan Clothier Co.	319-393-1576
KS	Olathe, Stan Clothier Co.	913-829-0013
MD	Cockeyesville, Dalbrook Corp.	301-666-2212
MI	Farmington Hills, W. R. Hummon	313-474-0661
MN	St. Paul, Innovate Sls.	612-225-9772
MO	St. Charles, Stan Clothier Co.	314-928-8078
NJ	Fort Lee, Nepture Elec.	201-461-2789
NY	E. Syracuse, Fountain, Young & Co.	315-437-7733
NY	Plainview, Neptune Elec.	516-349-1600
NC	Matthews, Arthur, Harris & Assoc.	704-845-1085
OH	Richfield, Geotronix	216-659-6100
OH	Trotwood, Geotronix	513-252-6700
OR	Beaverton, Unicomp, Inc.	503-643-1645
PA	Allison Pk., Geotronix Inc.	412-487-1770
PA	Colmar, Dalbrook Corp.	215-997-2770
TX	Richardson, Zonk Assocs.	214-238-7651
TX	Stafford, Zonk & Assocs.	713-561-7777
WA	Snohomish, Unicomp, Inc.	206-568-0511
PR	Santruce, SISCO	809-726-3137
Can	Islington, Ont., Pipe-Thompson Ltd.	416-236-2355

Local Distributors

AZ	Phoenix, Aero-Space Southwest	602-269-5655
CA	Anaheim, Almo/Pacesetter	714-777-4711
CA	Fremont, Terminal Sls. Corp.	415-656-7722
CA	Tustin, Added Value Elctrns. Distr.	714-259-8258
MN	Fridley, Voyager Elect.	612-571-7766
UT	Salt Lake City, Added Value Elect.	801-975-9500
IL	Elk Grove, Martec Assocs.	708-956-8090
MD	Beltsville, Petricko Sls.	301-937-4960
MA	Haverhill, Cord Elctrns.	617-374-0100
MI	Farmington Hills, Versatron	313-474-0667
MN	Fridley, Voyager Elec.	612-571-7766
NV	Las Vegas, Kiesub Corp.	702-733-3888
NJ	Corbin City, Index	609-628-4040
NM	Albuquerque, Betatron	505-821-1122
NY	Elmsford, Multimeterics	914-347-3666
NY	Endwell, Pryme-Line Distr.	607-748-5200
OH	Richfield, Alpha Distr. Corp.	216-659-7100
OR	Beaverton, Hansen Elctrns.	503-642-4455
PA	Harrisburg, Cumberland Elctrns.	717-233-5883
TX	Richardson, Zec Sls.	214-669-0895
Can	Mississauga, Ont., Rush Elex. Ltd.	416-677-7280

UTE MICROWAVE, 3500 Sunset Ave., Asbury Park, NJ 07712, Tel: 908-922-1009, TELEX: 13-2461, FAX: 908-922-0848; FSC No.: 23261; Empl.: 35

UTI INSTRUMENTS CO., 2030 Fortune Drive, San Jose, CA 95131, Tel: 408-428-9400, FAX: 408-428-0823; Empl.: 80; *Sls. Mgr.:* Clyde Madsen

UVP, INC., 5100 Walnut Grove Ave., P.O. Box 1500, San Gabriel, CA 91778, Tel: 818-285-3123, TELEX: 371 6381, FAX: 818-285-2940; Empl.: 100

VACO PRODUCTS, 7200 McCormick Blvd., Chicago, IL 44139-3395, Tel: 708-677-9500, TELEX: 72-4431; Empl.: 250; *Sls. Mgr.:* Bill Redmond

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FAX: 619-457-0127

VALHALLA SCIENTIFIC, 9955 Mesa Rim Rd., San Diego, CA 92121, Tel: 619-457-5576; Empl.: 75; *Sls. Mgr.:* Kerry Clark ..... **D•1332-1333**

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier	205-536-1506
CA	Costa Mesa, Cutlass Elctrns.	714-549-9358
CA	San Diego, Amasco	619-292-7666
CA	San Jose, ARC Tech. Resources	408-263-6486
CA	Sunnyvale, ARC Technical Resources	408-773-8871
CA	Torrance, Cutlass Elctrns.	213-324-7360
FL	Orlando, Currie, Peak & Frazier	407-855-0843
FL	Pace, Currie, Peak & Frazier	904-994-0599
FL	Tampa, Currie, Peak & Frazier	813-963-1076
FL	W. Melbourne, Currie, Peak & Frazier	407-724-6795
GA	Dulth, Currie, Peak & Frazier	404-497-9404
IL	Arlington Hgts., Comtel Midwest Co.	708-392-4040
IN	Indianapolis, Comtel Midwest Co.	317-253-1681
KS	Shawnee Mission, Comtel Midwest Co.	913-268-0762
LA	Lockport, AIREP Elctrns.	504-693-3666
MD	Lanham, Sel-Tronics	301-731-8080
MA	Hopkinton, Eastern Sys.	508-435-2151
MI	Farmington Hills, Carter, McCormic & Peirce (CMP)	313-477-7700
MN	Wayzata, Comtel Midwest Co.	612-476-1551
MO	Florissant, Delltron Co., Inc.	314-839-0033
MO	Kansas City, Delltron Co., Inc.	816-436-6445
NY	Rochester, Eastern Systems	716-292-1460
NC	Charlotte, Currie, Peak & Frazier	704-846-1702
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
OH	Englewood, Carter, McCormic & Peirce (CMP)	513-836-0951
OH	Parma, Carter, McCormic & Peirce (CMP)	216-398-0400
OK	Tulsa, AIREP Elctrns.	918-592-7711
OR	Portland, Westcon, Inc.	503-283-0132
PA	Philadelphia, Robert Meyers Assocs.	215-224-1663
PA	Pittsburg, Carter, McCormic & Peirce (CMP)	412-826-3800
TX	Austin, AIREP Elctrns.	512-327-0778
TX	Dallas, AIREP Elctrns.	214-349-4360
TX	Tomball, AIREP Elctrns.	713-255-2828
VA	Hampton, Sel-Tronics	804-827-6308
WI	New Berlin, Comtel Midwest Co.	414-544-6042

Local Distributors

MD	Sparks, EIL Instruments	301-771-4800
NY	Rochester, Transcat	716-458-4801
NC	Charlotte, EIS	704-392-7366

VALIDYNE ENGINEERING CORPORATION, 8626 Wilbur Ave., Northridge, CA 91324, Tel: 818-886-2057, TELEX: 65-1303, FAX: 818-886-6512; Empl.: 200

VALLEY ELECTROMAGNETICS, ECM Motor Co., 1099 Proctor Dr., Elkhorn, WI 53121, Tel: 414-723-6400, FAX: 414-723-6461; Empl.: 100; *Sls. Mgr.:* R. Forschler

VALOR

FAX: 619-458-0875

VALOR ELECTRONICS, 6275 Nancy Ridge Dr., San Diego, CA 92121-2245, Tel: 619-458-1471, TELEX: 653406 VALORSD; FSC No.: 15003; Empl.: 2000; *Sls. Mgr.:* Brad Rogers; *Dist. Mgr.:* Bill Karlicek ..... **A•1606-1607; D•2134**

Local Sales Offices, & Reps

AL	Madison, Benchmark Tech.	205-464-0033, FAX:205-464-9909
AZ	Scottsdale, American Mktg., Inc.	602-948-2778, FAX:602-860-4455
CA	Garden Grove, Elsco Elctrns.	714-891-4621, FAX:714-891-1251
CA	Santa Clara, Fahrner-Miller Assocs.	408-727-9800, FAX:408-496-6952
CO	Englewood, Comp. Sls.	303-779-8060, FAX:303-779-8357
FL	Orlando, So. Atlantic Comp.	407-857-3650, FAX:407-857-3298
FL	Seminole, So. Atlantic Comp.	813-595-6397, FAX:407-857-3298
GA	Norcross, Benchmark	404-446-1711, FAX:404-448-2854
IL	Arlington Hgts., KMA	708-398-5300, FAX:708-398-5708
MD	Annapolis, Electronic Eng.	301-249-0616, FAX:301-249-0617
MA	Topsfield, Whitehead Assocs. Inc.	617-887-8050, FAX:617-887-5434
MI	Canton, Techrep Inc.	313-981-1950, FAX:313-981-2006
MN	Minneapolis, DeBeck-Hays Assocs. Inc.	612-835-3610,FAX:612-835-0515
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NJ	Marlton, BGR Assocs.	609-983-1020, FAX:609-983-1879
NY	Port Washington, Ashtec Inc.	516-767-0336, FAX:516-767-0981
OH	Dayton, KW Elctrn. Sls.	513-890-2150, FAX:513-890-5408
OH	Shaker Hgts., KW Elctrn. Sls.	216-491-9177, FAX:216-491-9102
TX	Austin, Kruvand	512-219-9441,FAX:512-219-1932
TX	Dallas, Kruvand	214-437-3355,FAX:214-680-8854
UT	Midvale, Comp. Sls.	801-561-5099, FAX:801-561-6016
VA	Midlothian, Elctrns. Engr.	804-794-8939, FAX:804-794-6090
WA	Seattle, Northmar Inc.	206-524-5170, FAX:206-524-0402
WI	Milwaukee, KMA	414-259-1771,FAX:414-259-0246
PR	Rio Piedras, D.K. Mktg.	809-765-5380, FAX:809-758-5380

Local Distributors

AL	Huntsville, Hall-Mark Elctrns. Corp.	205-837-8700
AZ	Phoenix, Hall-Mark Elctrns. Corp.	602-437-1200
CA	Chatsworth, Hall-Mark Elctrns. Corp.	818-773-4560
CA	Duluth, Hall-Mark Elctrns. Corp.	404-623-4400
CA	Irvine, Hall-Mark Elctrns. Corp.	714-727-6000
CA	Rocklin, Hall-Mark	916-624-9781
CA	San Diego, Hall-Mark Elctrns. Corp.	619-268-1201
CA	San Jose, Hall-Mark Elctrns. Corp.	408-432-4000
CO	Englewood, Hall-Mark Elctrns. Corp.	303-790-1662
CT	Cheshire, Hall-Mark Elctrns. Corp.	203-271-2844
FL	Casselberry, Hall-Mark Elctrns. Corp.	407-830-5855
FL	Largo, Hall-Mark Elctrns. Corp.	813-541-7440
FL	Pompano Bch., Hall-Mark Elctrns. Corp.	305-971-9280
IL	Wood Dale, Hall-Mark Elctrns. Corp.	708-860-3800
IN	Indianapolis, Hall-Mark Elctrns. Corp.	317-872-8875
KS	Lenexa, Hall-Mark Elctrns. Corp.	913-888-4747
MD	Columbia, Hall-Mark Elctrns. Corp.	301-988-9800
MA	Billerica, Hall-Mark Elctrns. Corp.	508-667-0902
MA	Needham, Cronin Elect.	617-449-5000
MI	Livonia, Hall-Mark Elctrns. Corp.	313-462-1205
MN	Eden Prairie, Hall-Mark Elctrns. Corp.	612-941-2600
MN	Roseville, Parts 1	612-633-8079
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NY	Fairport, Hall-Mark Elctrns. Corp.	716-425-3300
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VA-TRAN SYSTEMS INC., 677 Anita St. Ste. A , Chula Vista, CA 91911, Tel: 619-423-4555, FAX: 619-423-4604; Empl.: 10; *Sls. Mgr.:* J.E. Sloan

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NY Syracuse, T-Squared Elctrn. Sls. 315-463-8592
NY Victor, T-Squared 716-924-9101
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SC Greenville, DHR Mktg. Inc. 803-235-3594
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VETRA SYSTEMS CORP., 27 Newtown Rd., Plainview, NY 11803, Tel: 516-454-6469, FAX: 516-454-1648; Empl.: 10; *Sls. Mgr.:* Jim Del Rossi

VG CONTROLS, INC., 34 Jenkins Road, Hewitt, NJ 07421, Tel: 201-853-4600, TELEX: 201-853-7913; Empl.: 3

VGI, INC., Vikay Industrial Pte. Ltd., 1800 Vernon St., Roseville, CA 95661, Tel: 916-783-7878, FAX: 916-783-7845; Empl.: 14; *Sls. Mgr.:* Gary Johnson

VIABLE SYSTEMS INC., Box 369, Sherborn, MA 01770, Tel: 508-653-7665, TELEX: 922 495 VIABLEUS, FAX: 508-653-6645; Empl.: 30

VIATRAN CORPORATION, 300 Industrial Drive, Grand Isl. 14072, Tel: 716-773-1700, TELEX: 710-260-1353, ESYLNK: 716-773-2488; Empl.: 110

VIA WEST INTERFACE, INC., 534 N. Stone Ave., Tucson, AZ 85705, Tel: 602-623-5716, 1-800-266-5716, FAX: 1-602-623-5718; Empl.: 4; *Sls. Mgr.:* Robert S. Bos

VIBRAC, 16 Columbia Dr., Amherst, NH 03031, Tel: 603-882-6777, TELEX: 312698 VIBRAC, FAX: 603-886-3857; Empl.: 50; *Sls. Mgr.:* R. Searle

Vibra-Metrics INC.

FAX: 203-288-4937

VIBRA-METRICS, INC., 1014 Sherman Ave., Hamden, CT 06514, Tel: 203-288-6158, 1-800-8-SENS-IT; Empl.: 25; *Sls. Mgr.:* William McClain ..... **B•1957**

Local Sales Offices & Reps

AK	Anchorage, Amerom Assoc.	907-338-0894
CA	Laguna Hills, Elotek Sys.	714-830-4856
CO	Longmont, Weaver & Assocs.	303-772-1999
CA	Pleasanton, Secco Sls. Inc.	415-484-1030
IL	Palos Hills, James L. Griffin Co., Inc.	708-974-1770
GA	Tunnel Hill, Pump & Vibration Consltns.	404-935-5851
MI	Troy, Satullo Assoc., Inc.	313-585-4811
IL	Carpentersville, Precision Meas. Prods.	708-426-4446
LA	Baton Rouge, Data Signal Sys., Inc.	504-927-4953
MD	Columbia, Stein Instrumn. Corp.	301-596-3748
RI	Narragansett, Pat Assoc.	401-783-9565
MO	St. Louis, Precision Meas. Prods.	314-394-4403
NM	Albuquerque, Mesa Tech. Corp.	505-883-8833
NY	Baldwinsville, Oshex Assoc.	315-635-6027
OH	Cleveland, Abitec	216-531-9122
OK	Data Signal Sys., Inc.	918-866-2450
PA	Philadelphia, Metrasystems	215-247-7347
TN	Chattanooga, Pump & Vibation Consltns.	404-935-5851
TX	Friendswood, Data Signal	713-482-9653
UT	West Amercan Fork, Highland Tech. Mktg.	801-756-2634
WI	Mequon, James L. Griffin Co. Inc.	414-241-4451
EXP	Hamden, CT, Vibra-Metrics, Inc.	203-288-6158
Can	Mississauga, Ont., SRP Control Sys. Ltd.	416-238-2880

VIBRO-METER CORP., P.O. Box 5058, Billerica, MA 01822-5058, Tel: 508-663-7322, TELEX: 948145, TWX: 710-320-1872, FAX: 508-667-1944; Empl.: 50; *Sls. Mgr.:* Joe Micali

VICOM SYSTEMS, INC., 46360 Fremont Blvd., Fremont, CA 94538, Tel: 415-498-3200, FAX: 415-498-3325; Empl.: 77; *Sls. Mgr.:* Ernie Pope

VICOR CORP., 23 Frontage Rd., Andover, MA 01810, Tel: 508-470-2900, TELEX: 910-380-5144, ESYLNK: 508-475-6715; Empl.: 400; *Sls. Mgr.:* D. Nesbitt; *Dist. Mgr.:* L. Cavanaugh

V.I. CORPORATION, 47 Pleasant St., Northampton, MA 01060, Tel: 413-586-4144, FAX: 413-586-3805; Empl.: 75; *Sls. Mgr.:* Paul Maguire, VP Nat. Sls.

VICTOREEN

FAX: 216-248-9301

VICTOREEN, INC., 6000 Cochran Rd., Solon, OH 44139-3395, Tel: 216-248-9300, 216-248-9043, TWX: 810-421-8287; Empl.: 350; *Sls. Mgr.:* Glenn Whiteley ..... **A•1996-1999**

VICTOR ELEC. WIRE & CABLE, 618 Main St., W. Warwick, RI 02893, Tel: 401-821-1700, SALES 401-821-7800, TELEX: 952122, TWX: 710-382-1534, FAX: 401-828-0441; Empl.: 500; *Sls. Mgr.:* E. M. Colasanto

VICTOR WIRE & CABLE CORP., 3601 Holdrege Ave., Los Angeles, CA 90016, Tel: 213-870-9933, FAX: 213-559-4167; Empl.: 30

VICTORY ENGINEERING CORP., Victory Rd., Springfield, NJ 07081, Tel: 201-379-5900, TELEX: 710-983-4430, FAX: 201-379-5982; Empl.: 150; *Sls. Mgr.:* P. Foley

VIDCO, INC., 8039 S.W. Cirrus Dr., Beaverton, OR 97005, Tel: 503-641-1804, FAX: 503-641-1806; Empl.: 10; *Sls. Mgr.:* Bradley Cohen

VIDEO AUTOMATION SYSTEMS, Upper Shad Rd., Pound Ridge, NY 10576, Tel: 914-764-4613, FAX: 914-764-4613; Empl.: 5

VIDEO DISPLAY CORP., 1868 Tucker Industrial Dr., Tucker, GA 30084, Tel: 404-938-2080,800241-5005, FAX: 404-493-3903; Empl.: 300; *Sls. Mgr.:* Robert (Bob) Liss; *Dist. Mgr.:* Randy Russell

VIDEO MONITORS, INC., Dotronix, Inc., 3833 N. White Ave., Eau Claire, WI 54703, Tel: 715-834-7785, TELEX: 510-100-1880, FAX: 715-834-5672; Empl.: 190; *Sls. Mgr.:* L. Stewart

VIEWLOGIC SYSTEMS, INC., 293 Boston Post Rd. West, Marlboro, MA 01752, Tel: 508-480-0881, FAX: 508-480-0882; Empl.: 200; *Sls. Mgr.:* Harvey Ford

VIKING CASES, 10480 Oak St. N.E., St. Petersburg, FL 33716, Tel: 813-577-1216, FAX: 813-577-2082; *Sls. Mgr.:* Bill Strickland

VIKING ELECTRONICS, 1531 Ind. St. PO Box 448, Hudson, WI 54016, Tel: 715-386-8861; Empl.: 26; *Sls. Mgr.:* Roy Crist

VIKING ELECTRONICS, INC., 21001 Nordhoff St., P.O. Box 2379, Chatsworth, CA 91311, Tel: 818-341-4330, FAX: 818-882-5713; FSC No.: 05574; Empl.: 150; *Sls. Mgr.:* William Vockerath; *Dist. Mgr.:* Karen Claybaugh

VIKING INDUSTRIAL PRODUCTS, 729 Farm Rd., Marlboro, MA 01752, Tel: 508-481-4600; Empl.: 25; *Sls. Mgr.:* Aubrey Elms

VIRGINIA PANEL CORPORATION, 1400 New Hope Rd., Waynesboro, VA 22980, Tel: 703-949-8376, FAX: 703-942-2856; FSC No.: 18117; Empl.: 130; *Sls. Mgr.:* Norman D. Wood

FAX: 703-375-0135

VIRGINIA PLASTICS CO., P.O. Box 4577, Roanoke, VA 24015-0577, Tel: 703-375-0100; FSC No.: 59608; Empl.: 130; *Sls. Mgr.:* Barry D. Lee ..... **C•1564-1567, 1822-1824**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Arcadia, H M C Inc.	818-447-0958
CA	San Diego, HMC, Inc.	619-484-8921
CA	Santa Clara, Penmark Sls. Co.	408-980-1303
CO	Denver, Lindberg Co.	303-758-9033
CT	Middletown, Gerber Sls.	203-347-3000
IL	Wheaton, CS Tech. Sls., Inc.	708-653-8126
IN	Kokomo, John McKenzie	317-452-7390
MD	Gaithersburg, Carwithen Assocs.	301-921-9545
MA	Burlington, Gerber Sls.	617-229-1150
MI	Livonia, Engrg. & Mktg. Svcs. Co.	313-522-9465
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594

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NY Skaneateles, NRM Mktg. Grp. 315-685-8991
NC Raleigh, Spears & Assocs. 919-790-7606
OK Bixby, MGR Elctrns. 918-369-5186
OH Cincinnati, Makin & Assocs. 513-871-2424
OH Cleveland, Makin & Assocs. 216-248-7370
OH Dublin, Makin & Assocs. 614-793-9545
OR Lake Oswego, SPS Elctrns. 503-697-7768
PA Harrisburg, All-Tech. Mktg. 717-540-1204
PA West Chester, All-Tech Mktg., Inc. 215-344-0134
KS Overlook Pk., Markline Technlgs. 913-681-8880
TX Dallas, MGR Elctrns., Inc. 214-238-5246
UT Salt Lake City, Lindberg Co. 801-484-8689
WA Snohomish, SPS Elctrns. 206-794-0154
Can Downsview, Ont., Tienkay, Inc. 416-736-1221

Local Distributors

CA Canoga Park, Acort Inds. 818-700-2991
NH Manchester, Yankee Elctrn. Supp. Co. 800-365-9720
Can Downsview, Ont., P.S. Comps. 416-665-9546

VIRTIS CO., Rte. 208, Gardiner, NY 12525, Tel: 914-255-5000, 800-431-8232, TELEX: 926474, FAX: 914-255-5338; Empl.: 92; *Sls. Mgr.:* J. D. Schmidt

VISHAY-MANN SYSTEM, See Vishay Resistive Systems Group

VISHAY RESISTIVE SYSTEMS, 63 Lincoln Hwy., Malvern, PA 19355, Tel: 215-644-1300, TWX: 510-668-5812; Empl.: 500
..... **A•1844-1845, 1914-1915, 1965-1967, 1992-1995, 2001-2009, 2015, 2076; D•1335**

Local Sales Offices & Reps

AL Huntsville, JWL Assocs. 205-883-1712
AZ Phoenix, Howe & Howe 602-264-7971
CA Loveland, VEC 303-667-7500
CA Redwood City, James S. Heaton Co. .. 415-367-9000
CA San Diego, VEC 619-690-5112
CA Tustin, VEC 714-544-7024
CT Yalesville, Comp Rep Assocs. 407-269-1145
FL Altamonte Springs, Semtronic Assocs. 305-831-8233
FL Clearwater, Semtronic Assocs. 813-461-4675
FL Ft. Lauderdale, Semtronic Assocs. 305-731-2484
GA Atlanta, JWL Assocs. 404-993-0100
IN Ft. Wayne, Scott Elctrns. 219-489-5690
IL Skokie, IRI-Illinois 312-967-8430
IN Indianapolis, Scott Elctrns. 317-841-0010
KS Olathe, Technical Sls. Assocs. 913-829-2800
MD Lutherville, J. A. Dougherty Sls. Co. ... 301-321-7890
MA Westwood, Comp Rep Assocs. 617-329-3454
MI Plymouth, Jay Mktg. Assocs. 313-459-1200
MN Bloomington, IRI of Minnesota 612-854-8027
MO St. Louis, Technical Sls. Assocs. 314-521-2044
NJ Flanders, K & R Engrg. Sls. Co. 201-584-5235
NM Albuquerque, Nelco Electronix 505-293-1399
NY Rochester, L-Mar Assocs. 716-381-9100
NC Charlotte, JWL Assocs. 704-541-5750
NC Raleigh, JWL Assocs. 919-787-4826
OH Aurora, EMA, Inc. 216-562-6104
OH Centerville, EMA, Inc. 513-433-2800
OR Beaverton, N. R. Schultz Co. 503-643-1644
PA Horsham, TMI 215-441-4300
PA Malvern, Vishay Resistive Sys. Grp. ... 215-644-1300
TX Dallas, Edward F. Aymond Co. 214-826-7620
TX Houston, Edward F. Aymond Co. 713-943-3149
WI Milwaukee, IRI-Wisconsin 414-789-9393
WA Bellevue, N. R. Schultz Co. 206-746-1890
PR Caguas, Comp Rep Assocs. 809-746-6550
Can Burnaby, B.C., Kaytronics, Inc. 604-294-2000
Can Concord, Ont., Kaytronics, Inc. 416-669-2262
Can Kanata, Ont., Kaytronics, Inc. 613-564-0080
Can Ville St. Laurent, Que., Kaytronics, Inc. 514-745-5800

Local Distributors

AZ Tempe, Shelley-Ragon, Inc. 602-894-2058
AZ Tempe, TTI, Inc. 602-431-1191
CA Chatsworth, Passive Comps. Inc. 818-700-8838
CA Chatsworth, Shelley-Ragon, Inc. 818-998-3333
CA Milipitas, TTI, Inc. 408-946-5577
CA Mission Hill, TTI, Inc. 818-891-8885
CA San Diego, Shelley-Ragon, Inc. 619-453-7133
CA San Diego, TTI, Inc. 619-748-2025
CA San Jose, Passive Comps. 408-441-1441
CA San Jose, Shelley-Ragon, Inc. 408-432-0600
CA Santa Ana, TTI, Inc. 714-641-9393
CO Denver, TTI, Inc. 303-429-6806
FL Orlando, TTI, Inc. 407-859-1000
FL Pinellas Pk, MMG Elec./L&S 813-545-1700
FL Tampa, Shelley-Ragon, Inc. 813-623-6560
CT Wallingford, TTI, Inc. 203-284-7474
GA Norcross, TTI, Inc. 404-662-0911
MA Chelmsford, Shelley-Ragon, Inc. 508-250-9666
IL Glendale Hgts., Shelley-Ragon, Inc. ... 708-529-9977
IA Cedar Rapids, Shelley-Ragon, Inc. 319-373-0525
MD Baltimore, RESCO/Baltimore 301-931-8200
MD Beltsville, RESCO/Washington 301-937-9100
MA Wilmington, TTI, Inc. 508-658-4700
MN Minnetonka, TTI, Inc. 612-933-8555
MN St. Paul, Shelley-Ragon, Inc. 612-642-2828
MO Hazlewood, Shelley-Ragon, Inc. 314-895-1515
MO Independence, Shelley-Ragon, Inc. 816-254-3410
NJ Mt. Laurel, TTI Inc. 609-234-6400
NY Farmingdale, Command Elctrns. Corp. 516-293-1212
NY Medford, Shelley-Ragon, Inc. 516-447-2000
NY Ronkonkoma, Mast Distrs., Inc. 516-471-4422
NY Ronkonkoma, TTI, Inc. 516-737-2000
NY Valley Stream, L & S Elctrns. 516-561-2474
SC Charleston, L & S 803-720-4242
OH Dayton, Micro Mil Div. 513-434-8231
OH Worthington, TTI, Inc. 614-848-5770
PA Malvern, Vishay Resistive Sys. Grp. ... 215-644-1300
TX Fort Worth, TTI, Inc. 817-595-3100
TX Ft. Worth, TTI, Inc. 817-831-8300
TX Houston, Texas Comp. Corp. 713-468-3882
WA Redmond, Shelley-Ragon 206-883-2220
WA Redmond, TTI, Inc. 206-882-0291
Can Burnaby, B.C., Kaytronics 604-294-2000
Can Concord, Ont., Kaytronics 416-669-2262
Can Kanata, Ont., Kaytronics 613-564-0080
Can Que., Kaytronics, Inc. 514-745-5800

VISIONARY ELECTRONICS, 141 Parker Avenue, San Francisco, CA 94118, Tel: 415-751-8811

VISION ENGINEERING, INC., 570 Danbury Rd., New Milford, CT 06776, Tel: 203-355-3776, TELEX: 643769, FAX: 203-355-0712; Empl.: 15; *Sls. Mgr.:* Bill Johnson

VISIONICS CORPORATION, 3032 Bunker Hill Ln.-Ste. 201, Santa Clara, CA 95054, Tel: 408-492-1440, FAX: 408-492-1380; *Sls. Mgr.:* Mary Leasure

VISTA SYSTEMS, INC., 2 Centennial Drive, Peabody, MA 01960, Tel: 508-532-1971, FAX: 508-532-2068; Empl.: 4; *Sls. Mgr.:* Jim Atwood

VISUAL COMMUNICATIONS CO., INC., 7920 Arjons Dr., Ste. G, San Diego, CA 92126, Tel: 619-549-6900, FAX: 619-549-3520; Empl.: 9; *Sls. Mgr.:* P. Loudon ..... **B•1208-1209**

Local Sales Offices & Reps

EXP CT, Litchfield, Intrade 203-567-5901

Local Distributors

AL Huntsville, Component Dist. Inc. 205-881-7800
AZ Phoenix, Keystone Electro 602-995-3005
CA Costa Mesa, Orange County Comp. ... 714-979-3597
CA Los Angeles, Electric Switch Inc. 213-660-1310
CA San Diego, Orange County Comps. ... 619-549-2511
CA San Jose, Spectra Elctrns. 408-452-1590
CA Sunnyvale, PSC Elctrns. 408-737-1333
CO Englewood, Component Dist. Inc. 303-770-6214
FL Clearwater, Component Distrs. 813-796-0466
FL Ft. Lauderdale, Component Distrs. 305-973-6650
FL Melbourne, Component Dist. Inc. 407-724-9910
GA Norcross, Component Dist. Inc. 404-441-3320
IL Palatine, OHM Elctrns. 708-359-5500
MA Lynn, Land Elctrns. 617-592-2220
MI Grand Rapids, S F Elctrn. Supp. 616-459-0216
MN New Brighton, Chris Elctrns. 612-631-2647
NJ Bellmawr, Mid Atlantic 609-931-5303
OH Aurora, Industrial Prods. 216-562-8113
OH Centerville, Industrial Prod. Dist. 513-435-2086
TX Dallas, Component Dist. Inc. 214-644-0373
WA Kent, Shannon Indl. 206-575-8600

VISUAL INFORMATION INSTITUTE, Box 33, Xenia, OH 45385-0033, Tel: 513-376-4361, TELEX: 501031 VIS INFO INST, FAX: 513-376-2802; FSC No.: 27432; Empl.: 45

VISUAL INFORMATION TECHNOLOGIES, INC.(UITEC), 3460 Lotus Dr., Plano, TX 75075, Tel: 214-596-5600, 800-325-6467, FAX: 214-867-4489; Empl.: 90; *Sls. Mgr.:* Ken Hilton, VP Sls., Mktg.; *Dist. Mgr.:* Ken Hilton, VP Sls., Mktg.

VITEC

FAX: 209-651-1538

VITEC ELECTRONICS CORP., 8530 W. Roosevelt Ave., Visalia, CA 93291, Tel: 209-651-1535; *Sls. Mgr.:* Ed Green ..... **A•2459-2463**

Local Sales Offices & Reps

AZ Phoenix, O'Donnell Assoc.,S.W. 602-944-9542
AR Little Rock, Doby-Morse Assocs. 501-221-0326
CA Northern, Comtech Mktg. 408-249-3330
CA San Diego, VanGott & Assocs., Inc. ... 714-698-7774
CA Southern, Van Gott & Assocs. Inc. 818-445-9728
CO Englewood, Harthun Assocs., Inc. 303-795-5545
DC McLean, Jin Sung Hsia 703-734-1739
FL Longwood, SAM Reps. Inc. 407-869-9565
CT Plainville, Northeast Reps., Inc. 203-866-6030
IL WoodDALE, BNI Elctrns., Inc. 708-595-9210
IN Kokomo, Schillinger Assocs., Inc. 317-455-2708
MA Hingham, Northeast Reps., Inc. 617-749-8700
MI Bloomington, RK Elctrn. Sls. & Assocs. 612-888-2757
MS Jackson, EPI Inc. 601-362-5045
MO Kansas City, EPI Inc.-West 816-523-8911
MO St. Louis, EPI Inc. 314-962-1411
NH Mt. Vernon, Northeast Reps., Inc. 603-880-8199
NY Penfield, Upstate Comps 716-381-6070
NY Huntington, Andrews & Andrews 516-692-8686
OH Beachwood, Elctrn. Sls. Master Inc. ... 216-831-9555
OR Beaverton, Evergreen Mktg. Inc. 502-643-8020
PA Willow Grove, Edwin Leiby & Assocs. 215-659-8938
TX Plano, Meg-Tech Mktg., Inc. 214-423-6342
TX Austin, Mega-Tech Mktg. Inc. 512-440-0258
TX Houston, Mega-Tech Mktg. Inc. 713-894-2335
WA Bothell, Evergreen Mktg. Grp., Inc. 206-485-8063
WI Brookfield, BNI Elctrns. 414-781-4775
Can Nepean, Electromate Indl. Sls.,Ltd. 613-829-6561

Local Distributors

CA Costa Mesa, E.E.P. Corp. 714-549-2275
CA Fremont, Kea Elctrns. 415-651-2600
CA Irvine, Schweber Elctrns. 714-863-0261
IA Cedar Rapids, Advent Elctrns. 319-363-0221
FL Melbourne, New Yorker Elctrns. 407-727-0955
GA Augusta, Dixie Elctrns. 404-722-2055
IL Northbrook, Classic Comps. Supp., Inc. 708-272-9650
IL Palatine, OHM Elctrns. 708-359-5500
IL Rosemont, Advent Elctrns. 708-297-6200
IL Schaumberg, Marsh Elctrns. 708-240-9290
IN Indianapolis, AdventElctrns. 317-872-4910
IN Indianapolis, Bell Inds. 317-875-8200
IA Cedar Rapids, Dee Elctrns., Inc. 319-365-7551
MD Columbia, Aztech Elctrns. 301-995-6800
MA N. Adams, ICO-Rally Corp. 413-664-4951
MI Farmington Hills, Advent Elctrns. 313-477-1650
MA Hingham, Sager Electl. Supply, Inc. 617-749-6700
MA N. Adams, Elctrn. Supp. Ctr. 413-664-1086
NJ Kenilworth, Federated Purchaser, Inc. 201-272-0505
NY Binghamton, Pioneer-Standard Elctrns., Inc. 607-722-9300
NY Buffalo, Summit Dists., Inc. 716-887-2800
NY Elmsford, Ancar Elctrns. 914-592-7100
IN Indianapolis, Bell Inds.-JIT 317-299-5487
NY Mamaroneck, New Yorker Elctrns. 914-698-7600
NY Penn Yan, Advacom 315-536-2221
NY Rome, Rome Elctrns. 315-337-5400
NC Charlotte, Dixie Elctrns. 704-377-5413
NC Winston-Salem, Dixie Elctrns. 919-724-5961
OH Cleveland, Pioneer-Standard Elctrns., Inc. 216-587-3600
TX Dallas, Wallace Elctrns. 214-340-0400
OK Tulsa, Radio, Inc. 918-587-9123
PA Bristol, Aim Elctrns. 215-785-3500
PA McKean, Advacom, Inc. 814-476-7774
SC Columbia, Dixie Elctrns. 803-779-5332
WI Milwaukee, Marsh Elctrns. 414-475-6000
WI New Berlin, Classic Comps. Supp. Inc. 414-786-5300
PA Export, Advacom, Inc. 412-325-7551

VITEQ CORP., 1000 Aerospace Rd., Lanham, MD 20706, Tel: 301-731-0400, FAX: 301-731-5995; Empl.: 120; *Sls. Mgr.:* Edward Bone

VIZ METEOROLOGICAL INSTRUMENTS, 335 E. Price St., Philadelphia, PA 19144-5782, Tel: 215-844-2626, TWX: 710-670-2626; FSC No.: 41226; Empl.: 325; *Sls. Mgr.:* Tom Curran; *Dist. Mgr.:* Tom Curran

V8

FAX: 213-738-5340

VL ELECTRONICS, INC., 3250 Wilshire Blvd., Ste. 1301, Los Angeles, CA 90010-1603, Tel: 213-738-8700; FSC No.: 95-3896380; Empl.: 10; *Sls. Mgr.:* C. Kreslake; *Dist. Mgr.:* C. Kreslake ..... **B•1132**

Local Sales Offices & Reps

CO	Denver, MRC	303-660-8750
DC	D.C./Baltimore, Eastern Elctrns.	919-876-7591
IN	Indianapolis, J-C Hofstetter	317-897-7914
IA	Marion, A.E.M. Assocs.	319-377-1129
KS	Olathe, A.E.M. Assocs.	913-888-0022
MA	Canton, New England Elctrn. Sls.	617-828-4835
MO	St. Louis, A.E.M. Assocs.	314-298-9900
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, Hoftstetter	216-241-4880
PA	Philadelphia, HB Sys.	215-489-3256
PA	Pittsburgh, J. C. Hoffsetter	412-356-2305
NY	E. Chester, WDS Sls.	914-779-8738
MN	St. Paul, Proud Inds.	612-646-9428
WI	Colgate, Rep One	414-628-4016
WI	Madison, Rep 1 & Assocs.	608-246-8889
Can	Toronto, Ont., Norgay Entprs., Ltd.	416-234-8966
Can	Vancouver, Norgay Ltd.	604-275-1121

Local Distributors

CA	Los Angeles, VL Elctrns Inc.	213-661-8883
NC	Raleigh, Eastern Elctrns.	919-876-7591

VLSI TECHNOLOGY, INC., 1109 McKay Dr., San Jose, CA 95131, Tel: 408-434-7673, FAX: 408-434-7931; Empl.: 2000; *Dist. Mgr.:* Frank Reynolds

VME MICROSYSTEMS INTL. CORP., 12090 South Memorial Pkwy., Huntsville, AL 35803-3308, Tel: 205-880-0444, FAX: 205-882-0859; FSC No.: OBPH5; Empl.: 90; *Sls. Mgr.:* Al Casteleyn

VMETRO, INC., VMETRO as, 2500 Wilcrest Ave., Ste. 550, Houston, TX 77042, Tel: 713-266-6430, FAX: 713-266-6919; Empl.: 15; *Sls. Mgr.:* Gunnar Ostgaard; *Dist. Mgr.:* Jim Williams

VOICE CONNEXION, 17835 Skypark Circle, Ste. C, Irvine, CA 92714, Tel: 714-261-2366, FAX: 714-261-8563; *Sls. Mgr.:* Shirlee Runge

VOICE IDENTIFICATION, Box 714, Somerville, NJ 08876, Tel: 908-526-3408, FAX: 908-526-5714; Empl.: 7

VOICE PROCESSING CORP., 1 Main St, Cambridge, MA 02142, Tel: 617-494-0100, FAX: 617-494-4970; Empl.: 19

VOLGEN AMERICA, INC., Volgen Electric Co., Ltd., Tokyo, 39650 Liberty St, Suite 325, Fremont, CA 94538, Tel: 415-498-5950, FAX: 415-498-5940; Empl.: 7; *Sls. Mgr.:* Ron Wild; *Dist. Mgr.:* Brian Hagino

VOLPI-MFG-USA, 26 Aurelius Ave., Auburn, NY 13021-1289, Tel: 315-255-1737, FAX: 315-255-1202; Empl.: 25; *Dist. Mgr.:* Stephanie Dunner

VAI

FAX: 209-651-0740

VOLTAGE MULTIPLIERS, INC., 8711 W. Roosevelt Ave., Visalia, CA 93291, Tel: 209-651-1402, TELEX: 530484; FSC No.: 60211; Empl.: 85; *Sls. Mgr.:* Karen Spano ..... **A•2127**

VOLTAMPERE CORP., 146 Horton Ave., Lynbrook, NY 11563, Tel: 516-887-9443, FAX: 516-887-9869; FSC No.: 64196; Empl.: 30; *Sls. Mgr.:* Robert Pampin

VOLTARC TECHNOLOGIES, INC., 186 Linwood Ave., P.O. Box 688, Fairfield, CT 06430, Tel: 203-255-2633, TELEX: 96-4337, FAX: 203-259-1194; Empl.: 180; *Sls. Mgr.:* Albert H. Katz

Voltech

FAX: 508-879-8669

VOLTECH, INC., 200 Butterfield Dr., Ashland, MA 01721, Tel: 508-881-7329; Empl.: 10; *Sls. Mgr.:* Louise Hall ..... **D•1336**

Local Sales Offices & Reps

AL	Huntsville, Teqspec	205-830-1797
CA	Laguna Hills, Electro Venture-South	714-581-9244
CA	Santa Clara, Electro Venture-North	408-727-1553
FL	Cape Canaveral, Teqspec	407-783-3444
GA	Snellville, Teqspec	404-972-7955
IL	Arlington Hgts., Berndt Assoc., Inc.	708-632-0900
IN	Carmel, Berndt Assoc., Inc.	317-844-0114
MA	Burlington, Intersell	617-273-3844
MI	Plymouth, E Q S Sys.	313-455-7920
NJ	Cherry Hill, SCI Rep, Inc.	609-662-2068
NY	East Burne, Northeast Tech. Sls.	518-872-2062
NY	Wantagh, Bytec	516-781-7400
NC	Winston Salem, Teqspec	919-765-5553
OH	Chesterland, E Q S Sys.	216-729-2222
OH	Dayton, E Q S Sys.	513-236-7676
MN	Minneapolis, Berndt Assoc., Inc.	612-546-2021
OR	Portland, Power Factor & Assoc.	503-233-6969
PA	Huntington Valley, Sci Rep, Inc.	215-322-6500
PA	Wexford, E Q S Sys.	412-935-0678
UT	Ogden, Taylor Mktg.	801-546-9570
VA	Fairfax, SCI Rep, Inc.	703-385-0600
WI	Milwaukee, Berndt Assoc., Inc.	414-545-8400

VOLTEX

FAX: 516-842-2991

VOLTEX, 3460 Great Neck Rd., Amityville, NY 11701, Tel: 516-842-2772; Empl.: 55; *Sls. Mgr.:* S. Vogel ... **D•2135**

Local Sales Offices & Reps

CA	San Clemente, 3-J Prods.	714-361-7727
CA	Santa Clara, W-J Elctrns. Sls.	408-982-9222
CT	Washington, Tri-Com Assocs.	203-868-7027
FL	Boca Raton, Tech Sls. Specialties	407-391-3718
GA	Atlanta, Electro Sls.	404-394-1122
MD	Churchtown, Dawn Assocs.	301-261-5001
MA	Burlington, Tri-Com Assocs.	617-272-8163
NJ	Fairfield, Astrorep, Inc.	201-808-0025
NY	Babylon, Astrorep, Inc.	516-422-2504
PA	Norristown, Rivco January Inc.(RJI)	215-631-1414

VOLTRONICS CORPORATION, West St., P.O. Box 476, E. Hanover, NJ 07936, Tel: 201-887-1517, FAX: 201-887-3349; FSC No.: 18736;Multiple; Empl.: 70; *Sls. Mgr.:* Nicholas J. Perrella

VORNE INDUSTRIES, INC., 5831 Northwest Highway, Chicago, IL 60631, Tel: 312-775-9440, FAX: 312-775-3854; *Sls. Mgr.:* Bob Benedict

VTC, INCORPORATED, Control Data Corp., 2401 E. 86th St, Bloomington, MN 55425, Tel: 612-851-5200, 800-882-2667, TELEX: 857113, FAX: 612-851-5199; Empl.: 400; *Sls. Mgr.:* Dan Griffith, VP Sls.; *Dist. Mgr.:* Sue Mansk

V-TRON ELECTRONICS CORP., 10 Venus Way, P.O. Box 3297, S. Attleboro, MA 02703, Tel: 508-761-9100, FAX: 508-761-4727; Empl.: 150; *Sls. Mgr.:* Richard E. French

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MA	Needham, Com-Sale	617-444-8071
NJ	Englewood, Sprung Nussbaum, Inc.	201-569-5666
TX	Ft. Worth, Diversified Comps.	817-244-7704
VA	Manassas, F.B.D. Sls. Corp.	703-369-7212

VU-DATA CORPORATION, 9180 Brown Deer Rd, San Diego, CA 92121, Tel: 619-452-7670, FAX: 619-452-2543; FSC No.: 34160; Empl.: 20; *Sls. Mgr.:* M. Knapp

VYNCKIER, INC., 4 Skyline Dr., Hawthorne, NY 10532, Tel: 714-896-0772, FAX: 714-891-0749; Empl.: 50

WABASH MAGNETICS, Kearney-National Inc., 1375 Swan Street, Huntington, IN 46750, Tel: 219-356-8300, TWX: 510-100-2867, FAX: 219-356-3846; Empl.: 1000; *Sls. Mgr.:* Stanley P. Bickhart

WABASH MAGNETICS, First & Webster Streets, P.O. Box 708, Wabash, IN 46992, Tel: 219-563-2191, TWX: 810-290-2722, FAX: 219-563-1652; Empl.: 250; *Sls. Mgr.:* Bob Lunn

WAFERSCALE INTEGRATION, INC., 47280 Kato Rd., Fremont, CA 94538, Tel: 415-656-5400, 800-451-5970 (USA), TELEX: 289255, FAX: 415-657-5916; Empl.: 125; *Sls. Mgr.:* Bob Hoard; *Dist. Mgr.:* Mike Speckman

WAGO CORP., 9085 N. Deerbrook Trail, Brown Deer, WI 53223, Tel: 414-354-5511, FAX: 414-354-1268; FSC No.: 65996; *Sls. Mgr.:* Thomas J. Artmann

WALDMANN LIGHTING CO., 9 W. Century Dr., Wheeling, IL 60090, Tel: 708-520-1060, FAX: 708-520-1730; *Sls. Mgr.:* Gary Cardoza

WALKER POWER, INC., 18 Mill St., Warner, NH 03278, Tel: 603-456-3111, FAX: 603-456-2498; Empl.: 115; *Sls. Mgr.:* Paul D. Iverson

WALKER SCIENTIFIC, Rockdale St., Worcester, MA 01606, Tel: 508-852-3674, 508-853-3232, 800-962-4638, FAX: 508-856-9931; Empl.: 83; *Sls. Mgr.:* B. Langley ..... **D•1337**

Local Sales Offices & Reps

AL	Birmingham, Levand Sci. Co.	800-222-2595
CA	San Marcos, Mitchell Instrs.	619-744-2690
CA	Santa Barbara, Abbeon Cal, Inc.	805-966-0810
CT	Westport, A.J. Abrams Co.	203-226-3010
IL	Chicago, McMaster Carr Supp. Co.	312-834-9600
MA	Gardner, MR Resources	508-632-7000
MD	Baltimore, Davis Instrs.	301-243-4301
NY	Rochester, Transcat	716-458-4801
TX	Garland, Tucker Elctrns.	214-348-8800

Local Distributors

AL	Birmingham, Levand Sci. Co.	800-222-2595
CA	San Marcos, Mitchell Instrs.	619-744-2690
CA	Santa Barbara, Abbeon Cal, Inc.	805-966-0810
CT	Westport, A.J. Abrams	203-226-3010
IL	Chicago, McMaster Carr Supp. Co.	312-834-9600
MA	Gardner, MR Resources	508-632-7000
MD	Baltimore, Davis Instrs.	301-243-4301
TX	Garland, Tucker Elctrns.	214-348-8800
NY	Rochester, Transcat	716-458-4801

WALL, A. T., CO., 55 Service Ave., Warwick, RI 02886, Tel: 401-739-0740, TWX: 710-382-1535, FAX: 401-732-5784; Empl.: 75; *Sls. Mgr.:* Jim Matzen; *Dist. Mgr.:* R. Huntsman

WALL INDUSTRIES, 5 Watson Brook Rd., Exeter, NH 03833, Tel: 603-778-2300, 800-321-WALL, FAX: 603-778-9797; Empl.: 50; *Sls. Mgr.:* Bill Elswick

WALL LENK CORPORATION, Box 3349, Kinston, NC 28502-3349, Tel: 919-527-4186, FAX: 919-527-4189; FSC No.: 79165; Empl.: 60; *Sls. Mgr.:* Richard B. Davis

WAMCO, INC., 11555-A Coley River Cir., Fountain Valley, CA 92708, Tel: 714-545-5560, TELEX: 678-459, FAX: 714-545-6093; FSC No.: 58774; Empl.: 20; *Sls. Mgr.:* Gordon R. Calvert; *Dist. Mgr.:* Sheila A. Sherman .... **B•1180-1181**

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AZ	Scottsdale, Advent Comp. Corp.	602-481-0044
FL	Melbourne, Jerry Williams Inc.	407-259-7700
IL	Elmhurst, Utronix Sls., Inc.	312-834-1100
IN	Kokomo, (SAI)Schillinger Assoc. Inc.	317-455-2708
KS	Parker, S. W. Wollard Co.	913-898-6552
NY	Bayshore, Richard McGrath Inc.	516-968-8448
NY	Jericho, Metro Tech. Sls., Inc.	516-935-3330
TN	Nashville, INSUL-REPS Inc.	615-383-0524
WA	Seattle, Repwest	206-283-8351

WARREN COMMUNICATIONS, See Fiskars Electronics Corporation

WARREN G-V, GENERAL SIGNAL CORP., 1 APOLLO DRIVE, WHIPPANY, NJ 07981, Tel: 201-386-1200, FAX: 201-386-9311; FSC No.: 93929; Empl.: 140; *Sls. Mgr.:* William J. Vandertulip; *Dist. Mgr.:* William J. Vandertulip ..... **B•1870**

Local Sales Offices & Reps

AZ	Phoenix, Dorton Entprs. Inc.	602-944-2957
CA	Brea, Masco Inc.	714-529-0866
CA	Foster City, Polach and Bensinger Inc.	415-578-8200
CO	Golden, James Hurlburt Co.	303-279-7796
IL	S. Elgin, R.K. Elctrns.	708-695-8552
KS	Lenexa, Midtech Inc.	913-541-0505
MA	Norwood, Comp. Mktg. Svcs.	617-762-4339
MN	Eden Praire, PWC Inc.	612-934-1409
NY	Hauppauge, Sticom	516-366-4221
NY	Rochester, Lamb Comps. Inc.	716-328-6350
PA	Hatboro, AQS Inc.	215-674-3562
TX	Carrollton, Seaton Corp.	214-980-9860

WARREN-KNIGHT INSTRUMENT CO., Warren Industries, Inc., 2045 Bennett Rd., Philadelphia, PA 19116, Tel: 215-464-9300; Empl.: 50; *Sls. Mgr.:* Richard M. Marron

WASATCH HIGH VOLTAGE, P.O. Box 15457, Salt Lake City, UT 84115, Tel: 801-265-9561; Empl.: 75; *Sls. Mgr.:* Gary I. Tobian

WATERS MANUFACTURING, INC. | Talley Industries

FAX: 508-358-5649

WATERS MANUFACTURING, INC., Talley Industries, Longfellow Ctr., Wayland, MA 01778, Tel: 508-358-2777; FSC No.: ;Multiple; Empl.: 125; *Sls. Mgr.:* James Dyne ..... **A•2078-2079**

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AZ Paradise Valley, Techrep-Don Epand 602-443-8288
CA Alameda, Liaison, Inc. 415-769-1991
CA Lomita, Techrep 213-539-9070
CT Bloomfield, Sir Assocs. 203-243-9343
FL Melbourne, R-Rep Co. 407-242-9800
IL Chicago, Bierhaus Sls. 312-751-8088
KS Overland Park, Acorn Elctrns. 913-649-6402
MA Westford, Sir Assocs. 508-692-2500
MO St. Louis, Acorn Electronics 314-421-1751
NJ Union, SSAI 201-687-6363
NY Le Roy, SSAI 716-768-7213
OH Dayton, INH Comp. Sls. 513-434-8808
TX Dallas, Allied Comps. 214-238-0408
WI Milwaukee, Bierhaus Sls. 414-963-0318

WATKINS-JOHNSON CO., 3333 Hillview Ave., Palo Alto, CA 94304, Tel: 415-493-4141, TELEX: 34-8415, TWX: 910-373-1253; FSC No.: 14482; Empl.: 3000

WAVETEK, (Western Area Sales Office), 9045 Balboa Avenue, San Diego, CA 92123, Tel: 619-565-9234

WAVETEK, (Central Area Sales Office), 5808 Churchman Bypass, Indianapolis, IN 46203, Tel: 317-782-4619

WAVETEK, Southeast Area Sales Office, 2085 U.S. 19 North, Ste. 102, Clearwater, FL 34623, Tel: 813-797-1792

WAVETEK DATRON, See Datron Instruments (or call area sales offices)

WAVETEK MICROWAVE, INC., (Formerly Pacific Measurement, Inc.), 488 Tasman Dr., Sunnyvale, CA 94089, Tel: 408-734-5780, FAX: 408-747-1265

For sales offices and representatives, see Wavetek San Diego, Inc.

WAVETEK RF PRODUCTS, INC., (Formerly Wavetek Indiana, Inc.), 5808 Churchman By-Pass, Indianapolis, IN 46203-6109, Tel: 317-788-9351, FAX: 317-788-5999; FSC No.: 34280; Empl.: 303; *Sls. Mgr.:* Sara Mussmann; *Dist. Mgr.:* Ben Constantini

For Sls. Ofcs. & Reps. 9145 Balboa Ave, San Diego, CA 92123

WAVETEK SAN DIEGO, INC., Wavetek Corp., 9045 Balboa Avenue, San Diego, CA 92123, Tel: 619-279-2200, FAX: 619-565-9558; *Sls. Mgr.:* Bob Hynes

WEBER, Inmark Corporation-Importer, 4 Byington Place, Norwalk, CT 06850, Tel: 203-866-8474, FAX: 1-203-866-0918

WEBER U.S., INC., Weber AG, 291 Great Valley Parkway, Malvern, PA 19355, Tel: 215-651-0770, FAX: 215-651-0775; Empl.: 7; *Sls. Mgr.:* Theo Notaras

WECO®

FAX: 518-298-5938

WECO ELECTRICAL CONNECTORS, INC., Trimex Bldg., Rte. 11, Mooers, NY 12958, Tel: 518-298-4810; FSC No.: 5935, 5963, 5940; Empl.: 52; *Sls. Mgr.:* John T. Meikle; *Dist. Mgr.:* John T. Meikle ..... **C•1568-1577**

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CA San Diego, SPA Inc. 619-530-0209
CA San Jose, Silicon Valley Sls. 408-432-1967
CO Littleton, Chinook Tech Sls. 303-933-9007
FL Apopka, Cartwright & Bean Inc. 407-889-9100
GA Norcross, Cartwright & Bean Inc. 404-368-0160
IL Palatine, Key Entprs. Inc. 708-991-2144
IN Indianapolis, MEI (Mktg. Engrs.) 317-872-5665
IA Davenport, Rush & West Assocs. Inc. 319-388-9494
KS Overland Park, Rush & West Assocs.,Inc. 913-764-2700
KY Louisville, M E I 502-267-7093
MD Rising Sun, LHR Assocs. Inc. 301-658-4058
MA Scituate, Olsen Tech Sls. Inc. 617-545-5101
MN Edina, Engrg. Prods. Assocs. 612-835-9022
MS Jackson, Cartwright & Bean Inc. 601-981-1170
MO St. Louis, Rush & West Assocs.,Inc. ... 314-965-3322
NH Nashua, Olsen Tech. Sls. Inc. 603-888-3619
NJ Woodbridge, Riser Sls.Inc. 201-634-0954
NY Buffalo, NRM Mktg. Inc. 916-634-4300
NY Skaneateles, NRM Mktg. Inc. 315-685-8991
NY Spencerport, NRM Mktg. Inc. 716-352-9166
NC Charlotte, Cartwright & Bean Inc. 704-536-0303
NY Mooers, WECO Elctrl. Connectors Inc. 518-298-4810
OH Cleveland, Marlow Assocs. 216-831-8232
OH Dayton, Marlow Assocs., Inc. 513-274-9666
OR Lake Oswego, SPS Elctrns. 503-697-7768
PA Harrisburg, Beil & Whitaker 717-564-6900
PA Pittsburg, Marlow Assocs., Inc. 412-343-5050
SC Raleigh, Cartwright & Bean Inc. 919-876-4130
TN Memphis, Cartwright & Bean Inc. 901-362-8345
TX Irvine, Aid Elctrns., Inc. 214-790-4761
UT Riverton, Chinook Tech Sls. 801-254-7166
WA Snohomish, SPS Elctrns. 206-323-4140
WI Milwaukee, Key Entprs. Inc. 414-762-2323

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CA Fountain Valley, Comp. Ctr. 714-979-0433
CA Fremont, Terminal Sls. Corp. 415-656-7722, 800-972-5932
CA Fullerton, I.S.I. Mktg. Co. 714-773-0411
CA Orange, Wes-Garde Comps. Grp. 714-953-1254, 800-624-1516
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FL Davie, ARCO Dists. Inc. 305-473-2550, 305-940-3295
CO Denver, Control Dseign Supply Inc. ... 303-296-1922
FL Largo, Electronic Precepts of FL Inc. .. 813-544-3636
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IN Indianapolis, Control Design Supp. Inc. 317-788-4559
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NH Manchester, Glynn Elctrns. 603-622-8131
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NJ Kenilworth, Federated Purchaser Inc. 201-272-0505
NY Bohemia, Key Comps. Inc. 516-567-7500
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NY Syracuse, ADR Tech. 315-437-7087
NC Charlotte, Control Design 704-588-4410, 800-334-3726
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OH Cleveland, Roberts Elec. Co. Inc. 216-238-1711
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OH Columbus, Thompson Elctrn. Supp. ... 614-228-6191
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PA McKean, Advacom 814-476-7774
PA Wilkes Barre, Wallco Inc. 717-823-6181
PA York, Elctrn. Comp. for Inds. 717-846-5334
PA Allentown, Lighting Fixture & Supply Co. Inc. 215-435-9691
TX Austin, Wofford Elctrns., Inc. 512-339-1181
TX Dallas, Control Design .. 214-358-1441,512-448-1919
TX Ft. Worth, Allied Elctrns. Inc. 817-595-3500
TX Houston, Control Design Supply INc. 713-880-9418
TX Richardson, RSC Elctrns., Inc. 214-644-3444
UT Nephi, Control Design Supply Inc. 801-623-2908
TX Richardson, Off The Shelf 214-238-0808, 800-648-5387
WA Seattle, H.D. Campbell 206-433-1900
TX Austin, Control Design Supp. Inc. 512-448-1919
WI New Berlin, Control Design 414-784-1016, 800-242-4395

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WECO ELECTRICAL CONNECTORS, INC., 16805 Hymus Blvd., Kirkland, Quebec, Canada H9H 3L4, Tel: 514-694-9136; FSC No.: 5935, 5963, 5940; Empl.: 52; *Sls. Mgr.:* Ramy Badawy; *Dist. Mgr.:* Ramy Badawy ..... **C•1568-1577**

Local Sales Offices & Reps

Can Calgary, Alb., Deskin Sls. 403-270-4440
Can Edmondton, Sas., Deskin Sls. 403-466-2106
Can Kirkland, Que., WECO Elctrl. Connectors Inc. 514-694-9136
Can Rexdale, Ont., WECO Elctrl. Connectors Inc. 416-674-1084
Can Transcona,Man., Deskin Sls. 800-661-1935
Can Vancouver, B.C., Deskin Sls. 604-324-8343

Local Distributors

Can Calgary,Alb., Deskin Sls. 403-270-4440
Can Concord, Ont., Zierick Canada Corp. .. 416-669-1429
Can Dartmouth, N.S., Arcom Elctrns. 902-464-1600
Can Dorval, Que., Bentin Elctrl. 514-631-2061
Can Drummondville, Que., Marnel Intl., Inc. 819-478-3128
Can Edmonton, Deskin Sls. 403-466-2106
Can Islington, Ont., D.T. Shaw Co. Ltd. 416-231-2706
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Can Montreal, Que., D.T. Shaw Co. Ltd. 514-332-1163
Can Montreal, Que., Versatech Elctrns. Inc. 514-481-0196
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Can Vancouver,B.C., Deskin Sls. 604-324-8343
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WECO ELECTRICAL CONNECTORS, INC., 151 Carlingview Dr., Unit 5, Rexdale, Ontario, Canada M9W 5S4, Tel: 416-674-1084, TELEX: 06-989100 POS TOR, FAX: 416-675-0057 ..... **C•1568-1577**

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Can Edmonton, Alta., Deskin Sls. 403-466-2106
Can Islington, Ont., D. T. Shaw Ltd. 416-231-3494
Can Kanata, Ont., Prelco Ltd. 613-592-3636
Can Longueuil, Que., Lumen Inc. 514-679-3460
Can Mississauga, Ont., Prelco Ltd. 416-678-0401, 1-800-387-38
Can Mississauga, Ont., Sayal Elctrns. 416-238-8440
Can Montreal , Que, Versatech Elctrns. Inc. 541-481-0196
Can Montreal, Que., D. T. Shaw Ltd. 514-332-1163
Can Montreal, Que., Prelco Ltd. 514-389-8051
Can Nepean, Ont., Carsten Electrns. Ltd. ... 613-726-9250
Can Oakville, Ont., Cantwell & Co. 416-842-8470
Can Ottawa, Ont., Cantwell Cullen & Co. Inc. 613-744-4516
Can Quebec, Que, Pro Technique J. M. Emond 418-529-5774
Can Quebec, Que., Crobel Llee Electronique 418-687-1171
Can Scarborough, Ont., Carsten Elctrns. Ltd. 416-495-9999,1-800-268-34
Can Scarborough, Ont., Sayal Elctrns. 416-494-8999
Can Sherbrooke, Que., Lumen Inc. 819-566-0966
Can St Laurent, Que., Carsten Elctrns. Ltd. 514-334-8321
Can St Laurent, Que., Zierick 514-331-7460
Can Surrey, B. C., Carsten Elctrns. Ltd. 604-590-6877
Can Transcona, Man., Deskin Sls. 1-800-661-1935
Can Vancouver, B.C., Deskin Sls. 604-324-8343
Can Ville Laval, Que., Montcalm Elctrns. ... 514-663-3102
Can Winnipeg, Man., Wes Elctrns. Ltd. 204-632-1260

WEED FIBER OPTICS INC., Weed Instrument Co., 1702-D Ponderosa, College Station, TX 77845, Tel: 409-693-5397, FAX: 409-693-1205; Empl.: 15; *Sls. Mgr.:* Chuck Landis; *Dist. Mgr.:* Chuck Landis

WEED INSTRUMENT CO., INC., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78680-0300, Tel: 512-255-7043, FAX: 512-388-4362; Empl.: 123; *Sls. Mgr.:* Jim Robertson

WEICO

FAX: 516-254-2099

WEICO WIRE & CABLE, INC., 161 Rodeo Dr., Edgewood, NY 11717, Tel: 516-254-2970; FSC No.: 7R617; *Sls. Mgr.:* Theodore Weill ..... **C•1826-1863**

Weidmüller

FAX: 804-794-0252

WEIDMULLER INC., 821 Southlake Blvd., Richmond, VA 23236, Tel: 804-794-2877, TELEX: 828376; Empl.: 98; *Sls. Mgr.:* Peter Anest ..... **C•1578-1581**

Local Sales Offices & Reps

AK Anchorage, Arctic Tech. 907-563-7110
CA Danville, Bob Henke 415-837-0302
CA Los Gatos, Alan Foss-Reg. Mgr. 408-356-8063
CA Montrose, Luscombe Engrg. Co. 818-249-9000
CO Littleton, Con-Tek Mktg. 303-973-8490
CT Simsbury, Larry Kingsley-Reg. Mgr. ... 203-658-1522
FL Tampa, Flordia Comp. Sls., Inc. 813-873-3622
GA Marietta, Bill Ibsen 404-924-2829
IL Machesney Park, David Brownley 815-654-2815
LA Harvey, Power Sys. Spec. 504-340-7340
IN Indianapolis, Elctrnc. Rep. 317-894-1414
MN Hopkins, S. J. Collins 612-933-7661
MO St. Louis, Thomas Dowell & Assocs. .. 314-849-4234
NY Fairport, Belltronics 716-377-6790
OH Mentor, Dan Rowe 216-257-2211
OK Tulsa, Lynn Elliott Co., Inc. 918-663-4616
OR Portland, Elect. Eng. Sls. 503-639-3978
NY Pt. Washington, Ashtec, Inc. 516-767-0336
PA Willow Grove, Jacobson-Rodger 215-657-4300
RI Warwick, Greg Jacobson 401-738-6454
SC Greer, Jim Hall 803-322-6016
TN Memphis, Byron Carson Co. 901-276-0614
TX Missouri City, Jack Guinn 713-437-2011

WEIR ELECTRONICS, INC., Weir Elctrns., Ltd., 418 3rd St., Annapolis, MD 21403, Tel: 301-268-0122, FAX: 301-268-7909; Empl.: 2; *Sls. Mgr.:* Barbara Bunting

WEIR ELCTRNS. LTD., Durban Rd., Bognor Regis, West Sussex, ENG PO 22 9RW, Tel: 0243-865991, TELEX: 86543, FAX: 0243-868613; Empl.: 500; *Sls. Mgr.:* Peter Cole (Exp.)

WEITEK CORP., 1060 E. Arques, Sunnyvale, CA 94086, Tel: 408-738-8400; Empl.: 220

WEITZ ELECTRONICS/MARVWA USA, Tel: 718-523-3688, FAX: 718-657-6938; Empl.: 49; *Sls. Mgr.:* Greg Weitz

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AZ Scottsdale, Kaye C.R. 602-948-8433
CA Santa Clara, Amelox, Inc. 408-970-9366
CO Thornton, Kaye C.R. 303-426-7951
FL Longwood, EAB Inc. 407-339-4986
GA Atlanta, EAB Inc. 404-975-3660
MN Edina, Orrin Eames Tech. Sls. 612-944-3494
RI Warwick, Ertronics 401-732-3567
TX Dallas, Passive Component Assocs. .. 214-824-6162

Local Distributors

IL Lemont, Trend Tronics 708-972-1166
NJ Roselle, Lectron Inds. 201-245-5858
NY Bohemia, Edge Elctrns. 516-567-6300

WELCH ALLYN, INC., Data Collection Div., 4619 Jordan Rd., Skaneateles Falls, NY 13153-0187, Tel: 315-685-8945, FAX: 315-685-3172; *Sls. Mgr.:* Richard Kraetz; *Dist. Mgr.:* Andy Adams

WELLEX CORPORATION, 44141 S. Grimmer Blvd., Fremont, CA 94538, Tel: 415-490-3263, TELEX: 3717647, FAX: 415-490-5531; Empl.: 356; *Sls. Mgr.:* John E. Soares

WELLS ELECTRONICS, INC., 1701 S. Main St., South Bend, IN 46613, Tel: 219-287-5941, TELEX: 4937960, FAX: 219-287-0356; FSC No.: 219-287-0356; Empl.: 200; *Sls. Mgr.:* Mike Myers

WELLS-GARDNER ELCTRNS. CORP., 2701 N. Kildare Ave., Chicago, IL 60639, Tel: 312-252-8220, FAX: 312-252-8072; Empl.: 282; *Sls. Mgr.:* Lawrence J. Brady ..... **B•1133**

Local Sales Offices & Reps

IL Inverness, James Inds. 1-708-358-8000
MA Action, Boston Elctrns. 508-264-4456
NJ Mountainside, Henry G. Richter, Inc. .. 201-233-4615
NY Fayetteville, Henry G. Richter, Inc. 315-637-6713
OH Cincinnati, JMK Elctrns. 513-271-3860
PA Phoenixville, Henry G. Richter, Inc. 215-495-6176

WENZEL ASSOCIATES, INC., 14050 Summit Dr., Austin, TX 78728, Tel: 512-244-7741, FAX: 512-244-9338; FSC No.: 62821; Empl.: 32; *Sls. Mgr.:* Liz Ronchetti

WERLATONE, INC., P. O. Box 47, Rte. 22, Brewster, NY 10509, Tel: 914-279-6187, FAX: 914-279-7404; FSC No.: 28812; Empl.: 11; *Sls. Mgr.:* G. Werlau

WESCHLER INSTRUMENTS

FAX: 216-238-0660

WESCHLER INSTRUMENTS, 16900 Foltz Parkway, Cleveland, OH 44136, Tel: 216-238-2550; Empl.: 125; *Sls. Mgr.:* Jim Tatalick ..... **D•1395-1405**

Local Sales Offices & Reps

AZ Kachina Controls 602-886-4984
CA Northern CA, Seco Controls 415-798-8300
CA Southern CA, RDX Corp. 714-599-0985
CO Anderson Controls 303-692-0290
FL Datarep Inc. 407-843-5224
GA Cascade Controls 404-998-1027
IL Ray Knitter Assoc. 708-690-6363
IN IN North, Jacks Margis 219-374-5905
IN IN South, Ray Knitter Assoc. 317-862-2788
LA Mid South Sls. 504-641-7480
MA Eastern Systems 508-435-2151
MI G&D Assoc. 313-684-5233
MN Waltam Sales 612-781-2778
MO Controls Midwest 816-842-4290
NV Vegas, Kachina Ctrls. 702-741-5666
NJ RJM Sales 908-322-7880
NM Kachina Controls 505-260-1741
NY NY (East), Expert Ind. 518-869-3355
NC Sunbelt Instruments 704-375-3132
OH OH (North), Contact Weschler 216-238-2550
OH OH (South), Annett Ind. 513-831-2800
OR McLaren Inc. 503-627-0757
PA PA (East), RJM Sales 215-643-6610
PA PA (West), Contact Weschler 216-238-2550
TX Northern TX, Seaton Corp. 214-980-9860
TX Southern TX, Lynn Elliott 713-499-1571
UT Anderson Controls 801-566-5864
VA Martin Control Equip. 804-321-7143
WA McLaren Inc. 206-827-9400
WV Contact Weschler 216-238-2550
WI WI (East), Knitter Assoc. 414-544-1976

WESCO ELECTRICAL CO., 201 Munson St., Greenfield, MA 01301, Tel: 413-774-4358, FAX: 413-774-4562; FSC No.: 12673; Empl.: 150; *Sls. Mgr.:* James R. DeSanty ..... **A•1150-1151**

Local Sales Offices & Reps

AZ Tempe, ACS of AZ 602-731-9711
CT Milford, Cuming Assoc. 203-878-3946
FL Maitland, EIR, Inc. 305-660-9600
IL Palatine, Houlihan Sls. 708-543-7200
IN Indianapolis, John H. Weaver Co. 317-257-7661
MD Severna Park, Jenco Sls. 301-544-8652
MA Framingham, Bengal Assocs. 617-877-2639
MA Randolph, Bengal Assocs. 617-961-4120
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OH Novelty, Spectro-Com 216-338-5226
PA Montgomeryville, Quick Response Tech Sls. 215-362-9225
TN McMinnville, B & D Mktg. 615-473-7155

WESCORP ANTISTATIC PRODUCTS, 144 S. Whisman Rd., Mountain View, CA 94041, Tel: 415-969-7717, TELEX: 345507, FAX: 415-969-6130; Empl.: 15; *Sls. Mgr.:* Thelma Paxton

WES-GARDE COMPONENTS GROUP, INC., 190 Elliott St., Hartford, CT 06114, Tel: 203-525-6907

WESTAMP, 1542 15th St., Santa Monica, CA 90404, Tel: 213-393-0401, TELEX: 3720078, FAX: 213-451-1058; FSC No.: 12745; Empl.: 100; *Sls. Mgr.:* Michael Mula

WESTBERG MANUFACTURING INC. (WESTACH), 3400 Westach Way, Sonoma, CA 95476, Tel: 707-938-2121; Empl.: 20; *Sls. Mgr.:* R. R. Westberg

WEST COAST ELEC. MFG., 14045 Garfield Ave, Paramount, CA 90723, Tel: 213-633-1010, FAX: 213-633-1018; FSC No.: 81823; Empl.: 25; *Sls. Mgr.:* W. E. Seal

WESTCON, 959 Cheney Ave., Marion, OH 43302, Tel: 614-382-5771, TELEX: 3775688; Empl.: 50

WESTCON, INC., 5101 N. Interstate Ave., Portland, OR 97217, Tel: 503-283-0132, FAX: 503-283-0137; Empl.: 15; *Sls. Mgr.:* Jan M. Rundquist; *Dist. Mgr.:* Jan M. Rundquist

WESTCOR CORPORATION, 485-100 Alberto Way, Los Gatos, CA 95032, Tel: 408-395-7050, FAX: 408-395-1518; *Sls. Mgr.:* Nancy Pepper

WEST ELECTRONIC SALES TEAM, 14340 Bolsa Chica Rd.G , Westminster, CA 92683, Tel: 714-898-0120, 213-495-5569, FAX: 714-894-6544; Empl.: 14; *Sls. Mgr.:* Mark Wickham; *Dist. Mgr.:* Jack Carrigan

WESTERN CASE, INC., 14351 Chambers Rd., Tustin, CA 92680, Tel: 714-838-8460, FAX: 714-838-3039; *Sls. Mgr.:* David B. Horne

WESTERN DIGITAL CORP., 8105 Irvine Center Drive, Irvine, CA 92718, Tel: 714-932-6000, FAX: 714-932-6498; Empl.: 6500; *Sls. Mgr.:* Tom DeMarchi

WESTERN ELECTRO-MECHANICAL CO., INC., 300 Broadway, Oakland, CA 94607, Tel: 415-452-1936, FAX: 415-452-1939; Empl.: 9; *Sls. Mgr.:* Hal Johnson

WESTERN ELCTRN. COMPS. CORP., 1250-A Avenida Acaso, Camarillo, CA 93010, Tel: 805-482-8002, TELEX: 401076, FAX: 805-482-8675; Empl.: 15; *Sls. Mgr.:* Russ Geary

WESTERN ELECTRONIC PRODUCTS CO., 915-G Calle Amanecer, San Clemente, CA 92672, Tel: 714-492-4677, FAX: 714-492-5952; Empl.: 6; *Sls. Mgr.:* Tony English; *Dist. Mgr.:* Shaun Ramsey

GRAPHTEC

FAX: 714-855-0895

WESTERN GRAPHTEC, 11 Vanderbilt, Irvine, CA 92718-2067, Tel: 714-770-6010, 800-854-8385; Empl.: 72 ..... **D•1425**

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AL Huntsville, W. A. Brown Instrs. 205-830-9224
AK Anchorage, Alaska Science & Tech. .. 907-562-2482
AZ Chandler, Vic Myers Assocs. 602-241-9324
CA Irvine, Western Graphtec 714-770-6010
CO Aurora, Mark Myers Assocs. 303-629-9676
CO Colorado Springs, Western Graphtec 719-576-8858
FL Boca Raton, Western Graphtec 407-392-4550
FL Ft. Lauderdale, W. A. Brown 305-776-6661
FL Melbourne, W. A. Brown Instrs. 407-723-0766
FL Orlando, W. A. Brown Instrs. 407-648-9660
GA Norcross, W. A. Brown Instrs. 404-449-7194
IL Arlington Hgts., Comtel Midwest 312-392-4040
IN Indiannapolis, Comtel Midwest 317-253-1681
KS Shawnee Mission, Comtel Midwest ... 913-268-0762
MD Landover, Sel-Tronics 301-341-2700
MA Andover, Western Graphtecs 508-470-1806
MA Hopkinton, Eastern Sys. 508-435-2151
MI Milford, T.M.S. 313-360-1514
MN Wayzata, Comtel Midwest 612-476-1551
MO St. Peters, Western Graphtec 314-279-3915
NM Albuquerque, Vic Myers Assocs. 505-294-1791
NY Cedar Grove, K.L.S. 201-785-4450
NY Kings Pk., K.L.S. 516-724-3155
NC Cary, W. A. Brown 919-460-1120
OH Beavercreek, T.M.S. 513-429-1142
OH Westlake, T.M.S. 216-327-3527
OK Tulsa, J. Wisdom & Assocs. 918-665-8899
PA Bridgeville, T.M.S. 412-221-2338
TX Richardson, J. Wisdom & Assocs. 214-470-9093
TX Round Rock, J. Wisdom & Assocs. 512-255-1167
UT Salt Lake City, Vic Myers 801-581-1760
VA Hampton, Sel-Tronics 804-827-6308
WA Bellevue, Western Instrs. 206-881-5110
WI New Berlin, Comtel Midwest 414-544-6042

WESTERN MULTIPLEX CORP., 310 Harbor Blvd., Belmont, CA 94002, Tel: 415-592-8832, TELEX: 295114 VIA RCA, FAX: 415-592-4249; FSC No.: 94-2620670; Empl.: 33; *Sls. Mgr.:* Graham Barnes

WESTERN RESERVE ELECTRONICS, 2150 Highland Rd., Twinsburg, OH 44087, Tel: 216-425-4951, FAX: 216-425-4956; Empl.: 100; *Sls. Mgr.:* Robert Rhodes

WESTINGHOUSE ELECTRIC CORP., Control Division, P.O. Box 819, Oldsmar, FL 34667, Tel: 813-855-4621, TELEX: 358713; Empl.: 200; *Sls. Mgr.:* E.A. Schiff

WEST INSTRUMENT, A Mark IV Company, 2101 Oxford Road, Des Plaines, IL 60018-1919, Tel: 708-390-7711, FAX: 708-390-7234; Empl.: 150; *Sls. Mgr.:* W. J. Bell, Jr.; *Dist. Mgr.:* W. J. Bell, Jr.

WESTLAKE COMPONENTS INTERNATIONAL, 30961 Agoura Rd., Ste. 309, Westlake Village, CA 91361, Tel: 800-228-1097, FAX: 818-717-1754; *Sls. Mgr.:* Rick Odorfer

WESTON INSTRUMENTS, Electrical Instrument Service, Inc., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35; *Sls. Mgr.:* Gerald D. Frank; *Dist. Mgr.:* Gerald D. Frank ..... **D•1338-1339**

Local Distributors

AL Birmingham, Brownell Instrs. & Controls Co. 205-323-4761
AL Mobile, Brownell Instrs. & Controls Co. 205-479-8581
AL Montgomery, Southern Controls, Inc. .. 205-277-5030
AZ Phoenix, Brownell Electro, Inc. 602-269-8396
AZ Tempe, Crompton Metermaster 602-431-0015
AR Little Rock, Brownell Electro, Inc. 501-562-2061
CA Los Angeles, Brownell Electro, Inc. 213-532-1150
CA Los Angeles, EIL Instrs., Inc. 213-685-7020
CA Palo Alto, Metermaster/Palo Alto 415-960-8500
CA San Diego, Crompton Metermaster ... 619-560-4841
CA Sunnyvale, EIL Instrs., Inc. 408-245-4320
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CT Middletown, EIL Instrs., Inc. 203-346-6646
CT Rocky Hill, Brownell Electro, Inc. 203-721-9343
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FL Orlando, Brownell Instrs. & Controls Co. 407-843-6776
FL Palm Bay, EIL Instrs., Inc. 407-725-8300
GA Atlanta, Brownell Instrs. & Controls Co. 404-762-5181
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IL Bridgeview, EIL Instrs. 708-430-2292
IL Countryside, Inotek/Pacific Indicator .. 708-352-3500
IL Glendale Heights, Crompton Metermaster 708-351-4554
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OH Cleveland, Comtel Instrs. Co. 216-442-8080
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NY Hauppauge, EIL Instrs., Inc. 516-231-6333
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NY New York, Nilsson Labs. 212-675-7944
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NC Charlotte, Brownell Instrs. & Controls Co. 704-597-1270
NC Charlotte, EIL Instrs., Inc. 704-376-2237
OH Hilliard, Comtel Instrs. Co. 614-872-8305
NC Raleigh, Brownell Instrs. & Controls Co. 919-876-6524
OH Cleveland, Crompton Metermaster 216-351-1234
OH Dayton, Comtel Instruments co. 513-426-5310
OH Dayton, EIL Instrs., Inc. 513-435-2134
OK Tulsa, Tri-State Instr. Lab 918-836-0286
OR Portland, Brownell Electro, Inc. 502-226-3286
PA Bridgeville, Brownell Electro, Inc. 412-221-0074
PA Pittsburgh, Comtel Instruments Co. ... 412-922-5720
PA Pittsburgh, EIL Instrs., Inc. 412-823-2255
PA Pittsburgh, Process Engrg. Co. 412-561-5050
PA Trevose, Brownell Electro, Inc. 215-364-1400
SC Columbia, Brownell Electro, Inc. 803-772-6111
TN Knoxville, Brownell Instrs. & Controls Co. 615-966-3441
TN Memphis, Brownell Instrs. & Controls Co. 901-795-8483
TN Nashville, Brownell Instrs. & Controls Co. 615-885-1302
TX Dallas, Butler & Land, Inc. 214-343-8800
TX Dallas, EIL Instrs., Inc. 214-357-0297
TX Garland, Crompton Metermaster 214-271-5671
TX Harlingen, Bush Supply Co. 512-428-1613
TX Houston, Brownell Instrs. & Controls Co. 713-699-1981
TX Houston, Butler & Land, Inc. 713-896-0808
TX Houston, CMI Meters & Instr. 713-644-1631
TX Houston, EIL Instrs., Inc. 713-271-3100
UT Salt Lake City, Brownell Electro, Inc. .. 801-262-8498
VA Bluefield, Brownell Electro, Inc. 703-322-3402
VA Norfolk, Brownell Electro, Inc. 804-855-2400
VA Norfolk, EIL Instrs., Inc. 804-885-9553
VA Richmond, Metermetrics 804-275-1431
TX Lubbock, Brownell Electro, Inc. 806-747-0211
WA Redmond, EIL Instrs., Inc. 206-882-3222
WI Milwaukee, E-M Instrs. 414-272-7799
Can Mississauga, Ont., EIL Instrs., Inc. 416-624-6660

WESTREX PRODUCTS, 25 Denby Rd., Boston, MA 02134, Tel: 617-254-1200, FAX: 617-254-6848; Empl.: 200; *Sls. Mgr.:* Bruce Burgess; *Dist. Mgr.:* Bruce Burgess

WESTRONICS INC. OF TEXAS, A Baker Hughes Co., 5001 Blue Mound Rd., Box 961003, Ft. Worth, TX 76161, Tel: 817-625-2311, FAX: 817-625-1068; Empl.: 180; *Sls. Mgr.:* Jim Bittikoffer

WHEELOCK, INC., 273 Branchport Ave., Long Branch, NJ 07740, Tel: 201-222-6880, FAX: 201-222-8707; Empl.: 200; *Sls. Mgr.:* William L. Goldstein, Sls./Mktg. VP

BRIAN R. WHITE CO., INC., 313 Henry Station Rd., Ukiah, CA 95482, Tel: 707-462-9795, FAX: 707-462-4800; *Sls. Mgr.:* Larry Richmond

WHITE-RODGERS LOGANSPORT DIV., See Stancor/ White Rodgers

S.S WHITE TECHNOLOGIES INC., 151 Old New Brunswick Rd, Piscataway, NJ 08854-3761, Tel: 908-752-8300; FSC No.: 0KZS2; Empl.: 100; *Sls. Mgr.:* Rich Henriksen; *Dist. Mgr.:* Pam Barnhard

WHITE TECHNOLOGY, INC., Bowmar Instrument Corp., 4246 E. Wood St, Phoenix, AZ 85040, Tel: 602-437-1520, FAX: 602-437-9120; FSC No.: 54230; Empl.: 105; *Sls. Mgr.:* Dan Hurd, Steve McComb

WHITMOR WIRE & CABLE, 27737 Ave. Hopkins, Valencia, CA 91355, Tel: 805-257-2400, FAX: 805-257-2495; FSC No.: 15851; Empl.: 29; *Sls. Mgr.:* Mark Lee; *Dist. Mgr.:* Mark Lee

WHITSO, 9326 Byron St., Schiller Pk., IL 60176, Tel: 708-678-5200, FAX: 708-678-0711; Empl.: 170

WHITTAKER CORP., Electronic Resources Div., 1955 N. Surveyor Ave., Simi Valley, CA 93063, Tel: 805-584-4100, TWX: 910-498-2751, FAX: 805-584-9157; FSC No.: 72152; Empl.: 200

WHITTAKER CORP., Providence Chemicals Div., King Philip Rd., P.O. Box 16069, E. Providence, RI 02916, Tel: 401-434-1770, TELEX: 92-7652, FAX: 401-434-8090; Empl.: 25

WICKMANN USA, INC., Wickmann-Werke GmbH, 3800 Camp Creek Pkwy.,Bldg. 2600,Suite 120, Atlanta, GA 30331, Tel: 404-699-7820, TELEX: 269 115 JIC UR, FAX: 404-691-2843; Empl.: 600-650; *Sls. Mgr.:* Michael V. Nagle; *Dist. Mgr.:* Michael V. Nagle ..... **B•1392-1394**

Local Sales Offices & Reps

AL	Athens, WLA & Assocs., Inc.	205-233-7894
CA	Laguna Hills, Bart Budge Assocs.	714-582-8720
CA	San Jose, Kottmeier Assocs., Inc.	408-371-8700
CO	Denver, West Inc.	303-477-8180
IL	Palatine, Goldbeck & Milota Assoc., Inc.	708-705-0602
MD	Baltimore, Manay Sls. Assocs.	301-484-6376
MA	Needham Hgts., Rosen & Assocs.	617-449-4700
MI	Grand Rapids, R.P.Urban & Assocs.	616-245-0511
MN	Minneapolis, RK Sls.	612-571-1001
TX	Dallas, Rem Comps.	214-234-1069

Local Distributors

CA	Sunnyvale, Target Elctrns.	408-733-0384
CA	Van Nuys, Fuses Unlimited/ Fusecom	818-786-8111
CT	Wallingford, Sager Elctrns.	203-265-4600
FL	Ft. Lauderdale, Stock Elctrns.	305-978-9875
IL	Cary, Gama Elctrns.	708-639-3424
MA	Hingham, Sager Elctrns.	617-749-6700
MN	Roseville, Parts 1	612-633-8079
NH	Salem, Sager Elctrns.	603-898-1348
NY	Hauppauge, Sager Elctrns.	516-348-1300
OH	Twinsburg, Schuster Elctrns.	216-425-8134
TX	Dallas, Fuses Inc.	214-341-6407
WI	Milwaukee, Progressive Image, Inc.	414-321-4722
Can	Ontario, PS Comps., Inc.	416-665-9546

WIDE BAND ENGINEERING CO., INC., Box 21652, Phoenix, AZ 85036, Tel: 602-254-1570; FSC No.: 58907; Empl.: 10

WIDE RANGE ELCTRNS. CORP., 174 Chesterfield Indl. Blvd., Chesterfield, Missouri 63005, Tel: 314-532-5887, FAX: 314-532-5492; Empl.: 11; *Sls. Mgr.:* Donald Toone

WIELAND INC., 466 Main Street, New Rochelle, NY 10801, Tel: 914-633-0222, TELEX: 646-186, FAX: 1-800-572-0057; *Sls. Mgr.:* Carl Gruenberg, V.P. Sls. & Mktg.; *Dist. Mgr.:* Steve Vineis

WILBRECHT ELECTRONICS

FAX: 612-222-7639

WILBRECHT ELECTRONICS, 346 Chester St., St. Paul, MN 55107, Tel: 612-222-2791; Empl.: 200; *Sls. Mgr.:* Laurie Wilbrecht ..... **A•2077; B•1211-1213, 1793**

Local Sales Offices & Reps

AL	Huntsville, DTM Inc.	205-539-1485
AZ	Phoenix, Toward Engr. Assoc., Inc.	602-955-3193
CA	Chatsworth, Wes K/ Raltech Inc.	818-700-0933
CA	Milpitas, Advanced Tech., Sls., Inc.	408-946-3208
CO	Broomfield, Connors Co.	303-466-9628
FL	St. Petersburg, JCS Assoc.	813-343-2679
GA	Duluth, DTM Inc.	404-381-5592
IL	Arlington Hgts., Dytec/Central	708-394-3380
IN	Ft. Wayne, Naunas Sls. Co.	219-432-4792
MA	Sudbury, KSA of New England	617-443-5881
MN	St. Paul, Wilbrecht Elctrns.	612-222-2791
NJ	Morristown, Andrews & Andrews Inc.	201-569-8800
NY	Huntington, Andrews & Andrews	516-692-8686
WA	Bellevue, Caruso & Co.	206-455-8811
NC	Raleigh, DTM Inc.	919-781-7004
OH	Cincinnati, Stegman Blaine	513-729-1969
PA	Paoli, Stitzer Assocs.	215-644-5500
TX	Austin, THT Sls. Co.	512-835-2796
Can	Thornhill, Ont., EMX Entprs. Ltd.	416-889-1204

WILCO

FAX: 317-293-9462

WILCO CORP., 6451 Saguaro Court, Indianapolis, IN 46268, Tel: 317-293-9300 ..... **A•1280-1283, 2464**

Local Sales Offices & Reps

CA	San Jose, The Mktg. Co.	408-272-6836
IL	Arlington Heights, M.B. Sls.	708-392-9499
MI	Madison Heights, DEM Elctrn. Sls.	313-583-1500

WILCO WIRE & CABLE CO., INC., 1921 Las Plumas Ave., San Jose, CA 95133, Tel: 408-926-8880, FAX: 408-251-0508; Empl.: 52; *Sls. Mgr.:* Joe Shepherd; *Dist. Mgr.:* Sylvia Neal

WILCOXON RESEARCH, 2096 Gaither Rd., Rockville, MD 20850, Tel: 301-330-8811, FAX: 301-330-8873; Empl.: 90; *Sls. Mgr.:* Bob Haggerson ..... **B•1959**

WILKINSON, P.O. Box 4558, Westlake Village, CA 91359, Tel: 818-889-0050, 800-822-4653, FAX: 818-889-3810; Empl.: 40; *Sls. Mgr.:* R. Cook; *Dist. Mgr.:* R. Cook

W.L. WILLIAMSON & ASSOC., LTD., 528 S. Extension Rd., Mesa, AZ 85210, Tel: 602-833-5202; Empl.: 3

WILLIAMSON CORPORATION, 70 Domino Dr., Concord, MA 01742, Tel: 508-369-9607, FAX: 508-369-5485; FSC No.: 92-3343 WILIAMSON WCRD; Empl.: 25; *Sls. Mgr.:* William R. Barron

WILMAR ELECTRONICS, INC., 2430 Amsler St., Torrance, CA 90505, Tel: 213-326-6668, FAX: 213-326-9147; FSC No.: 25248; Empl.: 25; *Sls. Mgr.:* Zev Heifetz

WILMINGTON RESEARCH & DEVELOPMENT, 461-Boston Road B-3, Topsfield, MA 01983, Tel: 508-887-2501, FAX: 508-887-3249; Empl.: 6

WILMORE ELECTRONICS CO., INC., Box 1329, Hillsborough, NC 27278, Tel: 919-732-9351, TELEX: 292617, FAX: 919-732-9359; Empl.: 48; *Sls. Mgr.:* J. L. Harris ..... **D•2136-2139, 2230-2231**

WILSON COMPANY-SYSTEMS DIVISION, 16301 Addison Road, Dallas, TX 75248, Tel: 214-931-8666, 800-325-4436, FAX: 214-248-1177; Empl.: 9; *Sls. Mgr.:* Dave Pellerin; *Dist. Mgr.:* Dave Pellerin

WILSON, H. F., ENGINEERING CO., 475 Taft Ave., Glen Ellyn, IL 60137, Tel: 708-469-7473, FAX: 708-469-8663; Empl.: 21; *Sls. Mgr.:* Robert W. Carroll

WILSON ELECTRONICS, See Regency Land Mobile, Inc.

WILTRON, 490 Jarvis Dr., Morgan Hill, CA 95037-2809, Tel: 408-778-2000, TELEX: 285227 WILTRON MH, FAX: 408-778-0239; FSC No.: 20944; Empl.: 800; *Sls. Mgr.:* W. Baxter

THE WINATIC CORP., Electro-Technik Industries, Inc., 409 Commerce Rd., Vestal, NY 13850, Tel: 607-729-6318, FAX: 607-729-6446; Empl.: 125; *Sls. Mgr.:* Ted Zaparzynski

WINSYSTEMS, INC., 715 Stadium DR.,Ste. 100, Arlington, TX 76011, Tel: 817-274-7553, FAX: 817-548-1358; FSC No.: 1AU87

WINTEK CORP., 1801 South St., Lafayette, IN 47904-2993, Tel: 317-448-1903, 800-742-6809, TELEX: 15-624-6480 Wintek, FAX: 317-448-4823; Empl.: 13 ..... **D•1122-1123**

WIREBENDERS, INC., 2440 W. Mission Ln., Ste. 9,10, Phoenix, AZ 85021-2824, Tel: 602-861-1856, FAX: 602-870-9242; FSC No.: 5950;FSCS/CAGE 1DA26; Empl.: 22; *Sls. Mgr.:* Charles Middleton

THE WIREMOLD COMPANY, 60 Woodlawn Street, W. Hartford, CT 06110, Tel: 203-233-6251, FAX: 203-232-2062; Empl.: 900; *Sls. Mgr.:* F. D. Casteel

WIRE-PRO, INC., 23 Front Street, Salem, NJ 08079, Tel: 609-935-7601, 609-935-7651, TWX: 510-680-4750, FAX: 609-935-0102; FSC No.: FSCN 50738; Empl.: 225; *Sls. Mgr.:* Russell Morgan, Sls. & Svc. Mgr.; *Dist. Mgr.:* Phil Negrin, Mktg. Mgr.

WIRING ANALYZERS, INC., P.O. Box 417, Edmonds, WA 98020-0417, Tel: 800-221-5979 (excl. CA); Empl.: 15; *Sls. Mgr.:* Norman Wartell

WOLFRAM RESEARCH, INC., 100 Trade Center Drive, Champaign, IL 61820-7237, Tel: 217-398-0700, FAX: 217-398-0747; Empl.: 100ò; *Sls. Mgr.:* Stuart Ariewitz

WONTRONICS, 3048 N. Coolidge Ave., Los Angeles, CA 90039, Tel: 213-660-6230, FAX: 213-913-2299; *Sls. Mgr.:* Frank Phillips

WORLDNET MARKETING INC., 3187 F Airway Ave., Costa Mesa, CA 92626, Tel: 714-545-7118, TELEX: 3781824, FAX: 714-540-9138; Empl.: 7; *Sls. Mgr.:* Frank Buday; *Dist. Mgr.:* Frank Buday

WP®

FAX: 707-996-3380

WORLD PRODUCTS INC., 19654 8th St. East, Sonoma, CA 95476, Tel: 707-996-5201, TELEX: Worldpro snom 171715, FAX: 707-996-3380; FSC No.: 410966309; Empl.: 445; *Sls. Mgr.:* Mark Beynon; *Dist. Mgr.:* Jim Corbett ..... **A•1153, 2011, 2128-2129; B•1030**

Local Sales Offices & Reps

AL	Huntsville, The Novus Grp.	205-534-0044
AZ	Scottsdale, American Mktg.	602-948-2778
CA	Mission Viejo, Jay Mktg.	714-581-1211
CA	Mt. View, Straube Assocs. Inc.	415-969-6060
CO	Westminster, Straube Assocs.	303-426-0890
FL	Tampa, Electramark Florida Inc.	813-889-7775
GA	Norcross, The Novus Grp., Inc.	404-263-0320
IL	Arlington Heights, KMA Sls. Co.	708-398-5300
IA	Marion, Associated Elctrn. Mktg., Inc.	319-377-1129
MA	Burlington, Bob Dean Inc.	617-229-6800
MI	Holland, Comtek Sls. Inc.	616-392-7100
MN	Minneapolis, Tectearn Sls. Inc.	612-854-6616
MO	St. Louis, AEM, Inc.	314-298-9900
NJ	West Caldwell, Grimm. Siegel Assoc.	201-575-9300
NM	Albuquerque, Suntech	505-266-7951
NC	Cary, The Novus Grp., Inc.	919-460-7771
OH	Cincinnati, F.J. Campisano Co.	513-574-7111
OR	Portland, Caruso & Assocs.	503-246-5439
PA	Broomhall, L.D. Lowery	215-356-5300
PA	Coraopolis, F.J Campisano Co.	412-264-5151
UT	Salt Lake City, Straube Assocs.	801-263-2640
WA	Bellevue, Caruso & Assocs.	206-455-8811
WI	Milwaukee, KMA Sls. Co.	414-259-1771

Local Distributors

AL	Huntsville, Reptron Elctrns. Inc.	205-722-9500
CA	Anaheim, Compumech Elctrns.	714-939-9100
CA	Del Mar, Compumech Elctrns.	619-792-7800
CA	Milpitas, Compumech Elctrns.	408-945-9100
CA	San Diego, All American	619-268-1505
CA	San Diego, Neuman	619-695-3005
CA	San Jose, All American Semiconductor Inc.	408-943-1200
CA	Santa Clara, Trinity Elctrns.	408-980-9011
CA	Torrance, All American Semiconductor Inc.	213-320-0240
CA	Yorba Linda, Target Elctrns.	714-692-1630
FL	Melbourne, Pridmore	407-727-2491
FL	Miami, All American Semiconductor Inc.	305-621-8282
FL	Sunrise, All American Semiconductor Inc.	305-572-7999
FL	Tampa, Reptron Elctrns.	813-855-4656
GA	Augusta, Dixie Elctrns.	404-722-2055
GA	Norcross, Reptron Elctrns.	404-446-1300
ID	Boise, Radar Elctrn.	208-336-2227
IL	Lisle, Comps. Inc.	708-852-7707
IL	Schaumburg, Reptron Elctrns.	708-882-1700
MD	Rockville, All American Semiconductor Inc.	800-426-0420,301-251-1205
MA	Norwood, Emtel	617-769-9500
MA	Wakefield, All American Semiconductor Inc.	617-246-2300
MI	Livonia, Reptron Elctrns.	313-525-3209
MN	Eden Prairie, All American Semiconductor Inc.	800-342-7364
MN	Minnetonka, Reptron Elctrns.	612-938-0000
MO	Fenton, Beckwith Elctrns.	314-343-6463
NM	Albuquerque, Betatron	505-821-1122
NY	Canadaigua, Advacom Technlg.	716-396-9050
NY	Ronkonkoma, All American Semiconductor	800-874-2830
NC	Charlotte, Dixie Elctrns.	704-377-4348
NC	Raleigh, Reptron Elctrns.	919-870-5189
NC	Winston-Salem, Dixie Elctrns.	919-727-5961
OH	Columbus, Reptron Elctrns.	614-436-6675
OH	Solon, Reptron Elctrns.	216-349-1415
OH	Stow, Advacom, Inc.	216-688-5311
OR	Portland, Radar Elctrns.	503-232-3404
PA	Harrisburg, Cumberland Elctrns.	717-238-5999
PA	McKean, Advacom Inc.	800-678-0512
SC	Columbia, Dixie Elctrns.	800-868-2236
SC	Greensville, Dixie Elctrns.	800-868-2260
SC	No. Charleston, Dixie Elctrns.	803-868-3336
TN	Gray, Dixie Elctrns.	615-477-3838

TN Oakridge, Dixie Elctrns. 615-481-3393
TX Austin, Omni Pro Elctrns. 512-794-9200
TX Dallas, All American Semiconductor Inc. 800-541-1435
TX Dallas, Omni Pro Elctrns. 214-233-0500
TX Houston, Omni Pro Elctrns. 713-270-1700
VA Charlottesville, Virginia Elctrn. Comp. 804-296-4184
WA Richland, Radar Elctrns. 509-943-8336
WA Seattle, Radar Elctrns. 206-282-2511
WA Spokane, Radar Elctrns. 509-747-3053
Can Calgary, Alb., Zentronics 403-295-8838
Can Missisuga, Ont., Zentronics 613-226-8840
Can Nepean, Ont., Zanin Elctrns. 613-596-2911
Can Nepean, Ont., Zentronics 613-226-8840
Can Richmond, B.C., Zentronics 604-273-5575
Can St. Foy, Que., Zanin Elctrns. 418-681-1262
Can St. Laurent, Que., Zanin Elctrns. 514-342-6211
Can St. Laurent, Que., Zentronics 514-737-9700
Can Toronto, Ont., Zanin Elctrns. 416-695-6850
KS Lenexa, Associated Elctrn. Mktg., Inc. 913-888-0022

WORLD PRODUCTS INC., Systems Devices Grp., 19654 8th St. E., Sonoma 95476, Tel: 707-996-5201; Empl.: 50 ..... **A•1153, 2010-2011, 2128-2129; B•1030**

Local Sales Offices & Reps
AZ Tempe, Spectrum Assocs. 602-966-1788
CA Los Angeles, SPA Elctrn. Sls. 714-863-1193
CA San Jose, Signet Tech. Sls. 408-453-0611
CO Denver, Donohue Sls., Co. 303-455-1719
FL Melbourne, R-Rep Co., Inc. 407-242-9800
IL Arlington, KMA Sls. Co. 312-398-5300
IN Fort Wayne, Berberich Assoc. 219-486-0673
MN Minneapolis, Holmgren Assocs. 612-786-7641
NJ Livingston, Avemark Tech. Mktg. 201-992-5331
OH Dayton, Berberich Assocs. Inc. 513-433-0342
OR Beaverton, Luscombe Engrg./N.W. 503-636-6664
PA Hatboro, AQS Electro 215-674-4421
TX Dallas, Southwestern Tech. Sls. 214-369-0977
VA Herndon, Stinson Assocs. 703-620-1332
WA Bellevue, Luscombe Engrg./N.E. 206-643-1463
WI Milwaukee, KMA Sls. Co. 414-259-1771
Can Montreal, ELI Manis Inc. 514-484-2923

'WORLD' TEST SYSTEMS, INC., P. O. Drawer 1428, Waynesboro, VA 22980, Tel: 703-949-6753, FAX: 703-943-3826; *Sls. Mgr.:* Buford H. Baber

WOVEN ELECTRONICS, Woven Electronics Corporation, 1001 Old Stage Rd., Simpsonville, SC 29681, Tel: 803-963-5131, TWX: 810-963-5131, FAX: 803-963-1761; Empl.: 400; *Sls. Mgr.:* Tommy Little

WYLE LABS, See Electronic Enclosures

XCEL CORPORATION, See Digitran and Computron Display Sys. Divs.

XCEL CONTROLS INC., 1600 W. 6th, Mishawaka, IN 46544, Tel: 219-259-7804, FAX: 219-259-5769; Empl.: 40; *Sls. Mgr.:* Bruce Shepard

XCP, INC., 40 Elm St., P.O. Box 819, Dryden, NY 13053, Tel: 607-844-9143; *Sls. Mgr.:* Diane Rademacher

XEDAR CORP., 2500 Central Ave., Boulder, CO 80301, Tel: 303-443-6441, FAX: 303-443-6444; *Sls. Mgr.:* Andy Zeidler

XELTEK, 764 San Aleso Ave., Sunnyvale, CA 94086, Tel: 408-745-7974, FAX: 408-745-1401; Empl.: 17; *Sls. Mgr.:* Andrew Choi; *Dist. Mgr.:* John Kim

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XENON CORP., 20 Commerce Way, Woburn, MA 01801, Tel: 617-938-3594, FAX: 617-933-8804; Empl.: 45; *Sls. Mgr.:* Louis R. Panico

XENOTRONIX INC., 26074 Ave., Hall No. 10, Valencia, CA 91355, Tel: 805-257-4793, FAX: 805-257-1093; *Sls. Mgr.:* Jeffrey Frotton; *Dist. Mgr.:* Loria Geery

Xentek

FAX: 619-727-8926

XENTEK, INC., Taiyo Yuden USA, Inc., 760 Shadowridge Drive, Vista, CA 92083, Tel: 619-727-0940, TELEX: 910-322-1155; FSC No.: 53279; Empl.: 220; *Sls. Mgr.:* Chuck Henry ..... **D•2140-2143, 2232-2233**

Local Sales Offices & Reps
AL Madison, Lamons Sls. Co. 205-461-7886
CA Glendale, Halbar Assocs. 818-246-8263
CA Huntington Bch., Regan/Munro Sls., Inc. 714-841-1411
CA San Jose, Richards Assocs. 408-452-8171
CA San Jose, Ruppert Sls. & Eng. 408-998-8717
FL Casselberry, Symco, Inc. 407-695-6010
FL Indian Harbor Bch., Post Mktg. 407-777-0994
GA Norcross, Lamons Sls. Co. 404-242-2610
IL Itasca, LTD Technlgs., Inc. 312-773-2900
IA Cedar Rapids, Midtec Assocs. 319-395-0028
KS Lenexa, Midtec Assoc. 913-541-0505
NJ Medford, Mech-Elec. Sls. 609-654-8209
MN Bloomington, Murnco 612-854-4161
MO St. Louis, Midtec Assocs. 314-275-8666
NH Nashua, Bell Controls 603-882-6984
NC Raleigh, Lamons Sls. Co. 919-846-1652
UT Salt Lake City, Pro Rep Mktg. 801-268-3434
NY Syracuse, M. M. Hare 315-457-6859
OH Cincinnati, Tri-State Mktg. 513-761-7993
OR Oregon City, Halbar, PNW 503-656-3714
TN Greenville, Lamins Sls. Co. 615-639-8711
TX Austin, Allied Comps. 512-331-4494
TX Dallas, Allied Comps. 214-238-0408
TX Houston, Allied Comps. 713-974-1903
TX Hurst, Allied Comps. Co. 817-589-0456
VA Richmond, Mech-Elec Sls. 804-231-4006
WA Redmond, Halbar PNW, Inc. 206-882-0990
WI Milwaukee, LTD Technlgs. 414-774-1000
Can Mississauga, Altus Technlgs. 416-858-8509

XERCON, INC., P.O. Box 554, Portland, OR 97207, Tel: 503-292-8682, FAX: 503-292-8697; Empl.: 6; *Sls. Mgr.:* G. Osgood

XEROX CORPORATION, Xerox Square, 0-5, Rochester, NY 14644, Tel: 800-832-6979; Empl.: 100,367

XEROX IMAGING SYSTEMS, INC., Xerox Corp., 535 Oakmead Parkway, Sunnyvale, CA 94086, Tel: 408-245-7900, 800-248-6550, TELEX: 701994 DATACOPY UO, FAX: 415-965-3474; Empl.: 235; *Sls. Mgr.:* Joe Burroughs

XERTEX CORP., See Rosemont Corp., Sensall National Sonics

XETEL CORPORATION, 8100 Cameron Rd., Austin, TX 78753, Tel: 512-834-2266, FAX: 512-834-9250; Empl.: 300; *Sls. Mgr.:* Mark Trutna

EXICO

FAX: 818-709-5235

XICO, INC., 9737 Eton Ave., Chatsworth, CA 91311, Tel: 818-709-4403, TELEX: 709577, ESYLNK: 62253150; Empl.: 21; *Sls. Mgr.:* Ralph Reccia ..... **D•1118**

XICON CAPACITORS, P.O. Box 170537, Arlington, TX 76003, Tel: 800-628-0544, FAX: 817-561-1480; *Sls. Mgr.:* Drey Hayford; *Dist. Mgr.:* A.T. White

XICOR, INC., 851 Buckeye Court, Milpitas, CA 95035, Tel: 408-432-8888, TWX: 910-379-0033, FAX: 408-432-0640; FSC No.: 60395; Empl.: 1010; *Sls. Mgr.:* Bruce Mattern,VP Sls.; *Dist. Mgr.:* Bruce Mattern

XITRON TECHNOLOGIES, 10225 Barnes Canyon Rd., San Diego, CA 92121, Tel: 619-458-9852, FAX: 619-458-9213; Empl.: 10; *Sls. Mgr.:* Stephen Merrill

XKD CORPORATION, 101 Cooper Court, Los Gatos, CA 95030, Tel: 408-395-3700, TELEX: 171946, FAX: 408-354-2606; *Sls. Mgr.:* Skip McLaughlin

XL MICROWAVE, 5811 Racine St., Oakland, CA 94609, Tel: 415-428-9488, FAX: 415-428-9469; Empl.: 6; *Sls. Mgr.:* William J. Artz

XSIS ELECTRONICS, INC., 12620 W. 63rd St., Shawnee, KS 66216, Tel: 913-631-0448, TELEX: 437227, FAX: 913-631-1170; FSC No.: 57051; *Sls. Mgr.:* Jerry Dehnert ..... **A•1491**

Local Sales Offices & Reps
AL Huntsville, Murcota Corp. 205-539-8476
AZ Phoenix, Western High Tech. Mktg. 602-266-2070
CA Los Altos, Kolm Mktg. Assoc. 415-948-2635
CA Mission Viejo, Chaparrah Elctrn. Sls. 714-582-2950
CT Cheshire, Ashworth Assocs. 203-968-0656
IL Schaumberg, Sieger Assocs. 312-310-8844
KS Lenexa, Midtec Assoc. Inc. 913-541-0505
KY Ft. Mitchell, G. W. Thelen Co. 606-341-8181
MD Ellicott City, VPI, Inc. 301-461-2525
MA Shrewsbury, Ashworth Assocs. 617-845-9688
MN Eden Prairie, Aldridge Assocs., Inc. 612-944-8433
MO St. Louis, Midtec Assoc., Inc. 314-275-8666
NJ Wayne, Ramar Assoc. 201-942-0480
NM Albuquerque, Western High Tech Mktg. 505-884-2256
NY E. Syracuse, R. D. Sherman 315-433-1165
NC Winston-Salem, Murcota Corp. 919-722-9445
PA Montgomeryville, Rufo Sys. Comps. 215-368-8495
TX Sherman, Repmaster 214-247-6236
EXP NY, Great Neck, Ad Auriema 516-487-0700

XYLOG CORP., 83 Hobart St., Hackensack, NJ 07601, Tel: 201-489-4040, FAX: 201-489-6745; Empl.: 30; *Sls. Mgr.:* Milton Frank

XYLOGICS, INC., 53 Third Ave., Burlington, MA 01803, Tel: 800-225-3317, FAX: 617-273-5392; Empl.: 200; *Sls. Mgr.:* David Padley; *Dist. Mgr.:* Joe Twardy

XYZ ELECTRONICS, 4700 N. 600 W, McCordsville, IN 46055, Tel: 317-335-2128, FAX: 317-335-2128; Empl.: 5; *Sls. Mgr.:* Gary Bannister

YAMAICHI ELECTRONICS, INC., Yamaichi Electronics Co., Ltd., 1420 Koll Circle, Ste.B, San Jose, CA 95112, Tel: 408-452-0797, FAX: 408-452-0799; Empl.: 19; *Sls. Mgr.:* Bob Million; *Dist. Mgr.:* Jim Bennett

YARDNEY TECHNICAL PRODUCTS, INC., 82 Mechanic St., Pawcatuck, CT 06379, Tel: 203-599-1100, TELEX: 6813114, TWX: 710-470-0260; FSC No.: 87362; Empl.: 250; *Sls. Mgr.:* Rene DuBois

YELLOW SPRINGS INSTRUMENT CO., Box 279, Yellow Springs, OH 45387, Tel: , , , 800-343-4357, TELEX: 205437, FAX: 513-767-9353; Empl.: 359; *Sls. Mgr.:* Michael Flora

YEW CORP., See Yokogawa Corp. of America

YORK METAL PRODUCTS, INC., 34-20 12th St., Long Island City, NY 11106, Tel: 718-932-3660, FAX: 718-932-0007; Empl.: 45

YORK TECHNOLOGY, INC., 210 N. Glenoaks Blvd., Ste. C, Burbank, CA 91502, Tel: 818-955-8927, TELEX: 990-968 York CA, FAX: 818-955-9728; *Sls. Mgr.:* Bradley E. Sousa

YSI INCORPORATED, P.O. Box 279, Yellow Springs, OH 45387, Tel: 513-767-7241, TELEX: 205437, FAX: 513-767-9353; Empl.: 300; *Sls. Mgr.:* Michael Flora; *Dist. Mgr.:* Michael Flora

YUASA BATTERY

FAX: 213-949-5527

YUASA BATTERY (AMERICA), INC., 9728 Alburtis Ave., Santa Fe Springs, CA 90670, Tel: 213-949-4266; Empl.: 5,000; *Sls. Mgr.:* Ron Alonso, Ed Stone; *Dist. Mgr.:* Greg Rapp ..... **D•1499**

Local Sales Offices & Reps

AL	Huntsville, Over & Over	205-837-7105
AZ	Chandler, Lindberg	602-786-9115
AZ	Tempe, Westrep	602-820-9932
CA	San Diego, West Elctrns.	619-233-0236
CA	Santa Clara, Novatronix	408-727-9530
CA	Westminster, West Elctrns.	714-898-0120
CO	Denver, Lindberg Co.	303-758-9033
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Altamonte Springs, Over & Over	407-332-1222
FL	Coral Springs, Over & Over	305-753-7050
FL	Tampa, Over and Over	813-626-9100
GA	Norcross, Over & Over	404-449-6205
GA	Norcross, Over and Over	404-449-6205
IL	Arlington Heights, Brainard Nielsen	708-437-2700
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
IA	Cedar Rapids, R.W. Kunz & Assocs.	319-396-5386
KS	Prairie Vlg., R.W. Kunz & Assocs.	913-648-3535
MD	Lisbon, Samual K. MacDonald	301-982-1088
MN	St. Louis Park, Elctrn. Innovators	612-922-2945
MO	St. Louis, R.W. Kunz & Assocs.	314-966-4977
NJ	Berkeley Hgts., Cambridge Allen & Assocs.	201-464-0203
NJ	Cherry Hill, Samuel K. MacDonald	609-482-2666
NM	Albuquerque, Lindberg	505-881-1006
NC	Charlotte, Over and Over	704-542-9111
NC	Raleigh, Over & Over	919-876-7338
OH	Columbus, McFadden Sls.	614-761-3177
OR	Beaverton, Westmark Elctrns.	503-641-8780
PA	Monroeville, Samuel K. MacDonald	412-373-1723
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
UT	Salt Lake City, Lindberg	801-484-8689
UT	Salt Lake City, Lindberg Co.	801-484-8689
WA	Bellevue, Westmark Elctrns.	206-454-1944
WI	Waukesha, Brainard Nielsen	414-797-7940
WI	Waukesha, Brainard-Wilson Mktg.	414-797-7940
Can	Mississauga, Ont., Tech-Trek Ltd.	416-238-0366
Can	Nepean, Ont., Tech-Trek Ltd.	613-225-5161
Can	Richmond, B.C., Tech-Trek Ltd.	604-276-8735
Can	St. Laurent, Que., Tech-Trek Ltd.	514-337-7540

Local Distributors

AZ	Glendale, Lynntronics	602-931-5981
CA	Buena Park, Cypress Elctrns.	714-521-5230
CA	Costa Mesa, House of Batteries	714-642-8222
CA	Santa Clara, Cypress Elctrns.	408-980-2500
FL	Miami, Elctrn. Equip.	305-871-3500
GA	Norcross, Applied Power	404-263-0421
HI	Honolulu, Elctrl. Equip.	808-533-3881
IL	Downers Grove, Jarbo Battery	312-964-9358
MD	Beltsville, Mark Elctrns.	301-595-5040
MA	Middleboro, Glynn Elctrns.	617-947-4262
MI	Brighton, Applied Power	313-229-6550
MN	Minneapolis, Bergquist Co.	612-835-2322
NH	Salem, Cronin Elctrns.	603-898-4440
NJ	Clifton, Engrd. Assemblies	201-340-0600
NY	Farmingdale, Battery Expeditors	516-752-0111
NY	Flushing, W & W Assocs.	718-961-2103
NY	Rochester, Masline Elctrns.	716-546-5373
NC	Raleigh, Engrd. Assemblies	919-790-9700
OH	Columbus, Whitehead Elctrns.	614-224-1186
OH	Solon, Repco Elctrns.	216-248-8900
OR	Portland, Standard Batteries of Portland	503-234-7251
TX	Allen, Prime Distrbg.	214-231-0170
WA	Redmond, Priebe Elctrns.	206-881-2363
EXP	National & Canada, Newark Elctrns.	800-367-3573
Can	Brampton, Ont., Zentronics	416-451-8445

YUASA BATTERY (AMERICA) INC., Eastern Regional Office, 131 Industrial Ave., Hasbrouck Hgts., NJ 07604, Tel: 201-641-5900, FAX: 201-641-8720; *Sls. Mgr.:* Ed Stone/Cindy Werts; *Dist. Mgr.:* Toshio Hirai

ZAKI CORPORATION, 420 Maple St., Marlboro, MA 01752, Tel: 508-480-0201, FAX: 508-481-0595; *Sls. Mgr.:* Steven Sotsky

ZAMBRE CO., INC., 2134 Old Middlefield Way, Mountain View, CA 94043, Tel: 415-968-9176, FAX: 415-968-4851; FSC No.: 58758; 5950; Empl.: 20 Average

ZAX CORP., 2572 White Road, Irvine, CA 92714, Tel: 800-233-9817, 800-421-0982, FAX: 714-474-0159; Empl.: 25; *Sls. Mgr.:* Robert J. Parente, Dir. of Sls. & Mktg.

Z COMMUNICATIONS, INC., 5450 N.W. 33rd Ave., Ste. 100, Ft. Lauderdale, FL 33309, Tel: 305-735-1000, FAX: 305-735-1094; FSC No.: 1564A; Empl.: 20; *Sls. Mgr.:* Devang Patel

ZEBRA TECHNOLOGIES CORPORATION, 333 Corporate Woods Pkwy., Vernon Hills, IL 60061-3109, Tel: 708-634-6700, TELEX: 206230, FAX: 708-913-8766; Empl.: 175; *Sls. Mgr.:* Kevin O'Donnell

ZEHNTEL SYSTEMS, Div.of Teradyne Inc., 2625 Shadelands Dr., Walnut Creek, CA 94598, Tel: 415-932-6900, FAX: 415-934-0540; Empl.: 350; *Sls. Mgr.:* David Bernstein

CARL ZEISS, INC., One Zeiss Drive, Thornwood, NY 10594, Tel: 914-747-1800, TELEX: RCA 221834, TWX: WV64-6928

ZENDEX CORP., 6780 Sierra Court, Ste. A, Dublin, CA 94568, Tel: 415-828-3000, TWX: 910-389-4009, FAX: 415-828-1574; Empl.: 50; *Sls. Mgr.:* John Marceca

ZENITH

FAX: 708-391-7078

ZENITH MAGNETICS, Zenith Electronics Corp., 1000 Milwaukee Ave., Glenview, IL 60025-2493, Tel: 708-391-7733; *Sls. Mgr.:* Bob Cunningham; *Dist. Mgr.:* Allan Parker ..... **D•2145**

Local Sales Offices & Reps

AL	Huntsville, Macro Mktg. Assoc., Inc.	205-883-9630
AL	Huntsville, Pen-Tech Assoc.	205-881-9298
AZ	Phoenix, Howe & Howe Sls, Inc.	602-264-7971
CA	Laguna Hills, Electro Venture-s	714-581-9244
CA	Santa Clara, Ross Mktg. Assoc.	408-988-8111
CO	Denver, Tech Rep Sls.	303-758-7031
CT	Cheshire, Nesco	203-272-0368
FL	West Palm Bch., Pen-Tech Assoc.	407-640-0800
IL	Arlington Hts., Hill Sls. Corp.	708-255-4400
KS	Roeland Pk., MSB Assocs. Inc.	913-432-2131
MA	Franklin, OEM Mktg. & Sls.	508-528-4983
MI	Ann Arbor, S-Tek	313-572-0516
MN	Minneapolis, Comstrand Inc.	612-788-9234
NH	Salem, OEM Mktg. & Sls.	603-893-1197
NJ	Fairfield, Metro Logic Corp.	201-575-5585
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OR	Portland, Jos. V. Beluski CO.	503-222-4279
PA	Willow Grove, Tech Sls. Assoc.	215-784-0170
TX	Dallas, REM Comps.	214-234-1069
TX	Houston, REM Comps.	713-589-9721
VA	Front Royal, Eltron Sls.	703-635-7201

ZERCOM CORPORATION, P.O. Box 84, Zercom Drive, Merrifield, MN 56465-0084, Tel: 218-765-3151, FAX: 218-765-3900; *Sls. Mgr.:* Jeff Zernov

ZERO CORPORATION

FAX: 818-841-5618

ZERO ENCLOSURES, Zero Corp., 777 Front St, Burbank, CA 91503, Tel: 818-846-4191, 818-841-1825; Empl.: 1400; *Sls. Mgr.:* Doug Griffith, V.P. ..... **C•1130-1144**

Local Sales Offices & Reps

AL	Huntsville, BJR Mfrs. Reps.	205-881-3569
AZ	Phoenix, Howe & Howe Sls., Inc.	602-264-7971
AZ	Phoenix, Sheffler/Kahn	602-581-0884
CA	Burbank, Zero-West Div.	818-846-4191
CA	Los Angeles, Landa & Assocs., Inc.	213-879-0770
CA	San Diego, Luscombe Engrg. Co.	619-292-4337
CO	Boulder, Component Prod. Sls. Co. Inc.	303-530-2800
FL	Maitland/Pompano Beach, Hutto Hawkins Assocs., Inc.	407-831-2474
FL	Pinellas Park, P & M Tech. Sls.	813-546-4175
GA	Norcross, Hollingsworth & Still, Inc.	404-447-1700
IL	Elk Grove Village, Carlson Elctrns. Sls.	708-956-8240
IN	Indianapolis, L.M. DeVoe Co.	317-842-3245
IA	Cedar Rapids, Carlson Elctrns. Sls.	319-378-1450
MD	Baltimore, Marktron	301-628-1111
MA	Monson, Zero-East Div.	413-267-5561
MN	Bloomington, Elctrn. Sls. Agcy.	612-884-8291
MS	Jackson, S. L. Welch	601-856-5471
MO	St. Louis, Cadon Techn. Sls.	314-645-8670
NY	Commack, MTR, Inc.	516-462-9580
NM	Albuquerque, Fry-Gates	505-262-1525
NY	East Syracuse, Fountain Young & Co.	315-437-7733
NC	Apex, Engineering Reps Assoc.	703-632-2365
OH	Cincinnati, K.C. Hoffman Co.	513-931-1686
OR	Tigard, RTS, Inc.	503-244-4123
PA	Boswell, B.E. Gibson	814-629-6772
PA	Huntingdon Valley, Inacker Sls.	215-947-5660
SC	Greenville, Engineering Reps Assoc.	703-632-2365
TX	Austin, Tesco, Inc.	512-834-8374
TX	Dallas, Tesco Inc.	214-553-1200
TX	Houston, Tesco, Inc.	703-690-4909
TX	Richardson, Barry Sls., Inc.	214-234-0255
UT	Salt Lake City, Effective Sls.	801-266-9617
MD	Rockville, Marktron	301-251-8990
WA	Vashon, RTS, Inc.	206-285-1363
Can	Iberville, Que., Lhotellier Canada Inds.	514-358-4376

ZERO CORP., Zero East Div., 288 Main St, Monson, MA 01057, Tel: 413-267-5561, FAX: 413-267-5569; FSC No.: 19178; Empl.: 380; *Sls. Mgr.:* Roger St. Martin ..... **C•1130**

Local Sales Offices & Reps

AL	Huntsville, BJR Mfg. Reps.	205-881-3569
CT	Monson, Zero-East Div.	413-267-5561
IN	Indianapolis, C.C. Electro Sls.	317-355-1508
IN	Indianapolis, Leslie M. Devoe Co.	317-842-3245
MD	Rockville, Marktron, Inc.	301-251-8990
MA	Monson, Zero-East Div.	413-267-5561
MA	Palmer, Benoit-Senecal Co.	413-283-8384
MI	Grosse Pointe Pk., Greiner Assocs., Inc.	313-499-0188
MS	Jackson, S. L. Welch & Assocs.	601-932-5534
NY	Commack, MTR, Inc.	516-462-9580
NY	Syracuse, Fountain Young Co.	315-437-7733
NC	Martinsville, Engrg. Reps Assocs.	703-632-2365
OH	Columbus, Tom Mulligan & Assoc.	614-457-2242
PA	Boswell, B. E. Gibson	814-629-6772
PA	Huntingdon Valley, Inacker Sls.	215-947-5660
SC	Martinsville W. VA, Engrg. Reps Assocs.	703-632-2365
Can	Islington, Ont., Pipe-Thompson Ltd.	416-236-2355

ZERO PLASTICS, A UNIT OF ZERO CORP., 672 Fuller Rd., Chicopee, MA 01020, Tel: 413-267-5561 Ext. 432, FAX: 413-592-5018; Empl.: 100; *Sls. Mgr.:* Brian Nichols

ZETA GRAPHICS CORP., 777 Arnold Drive, Martinez, CA 94553, Tel: 415-372-7568; Empl.: 138; *Sls. Mgr.:* Richard Howell, Natl. Sls. Mgr.

ZETEX, INC., Zetex plc., 87 Modular Avenue, Commack, NY 11725, Tel: 516-543-7100, FAX: 516-864-7630; *Sls. Mgr.:* Joseph M. DeBlasio

ZEUS INDL. PRODS. INC., P.O. Box 2167, Orangeburg, SC 29116, Tel: 803-531-2174, 800-526-3842, TWX: 710-480-9346, FAX: 803-533-5694; FSC No.: 32039; Empl.: 280; *Sls. Mgr.:* Wally Bernardo, OEM Sls. Mgr.; *Dist. Mgr.:* Heather Bernardo, Distr. Sls. Mgr.

ZEVATECH, INC., 2700 Gateway Centre Blvd. Ste., Morrisville, NC 27560, Tel: 919-460-0111, FAX: 919-469-0480; Empl.: 110; *Sls. Mgr.:* Bob Black; *Dist. Mgr.:* Bob Black

ZEXCO, 5526 Murietta Ave., Van Nuys, CA 91401, Tel: 818-997-7895

ZIATECH, 3433 Roberto Ct., San Luis Obispo, CA 93401, Tel: 805-541-0488, FAX: 805-541-5088; Empl.: 65; *Sls. Mgr.:* Ron Giovannelli

ZIERICK MANUFACTURING CORP., 56 Radio Circle, Mt. Kisco, NY 10549, Tel: 914-666-2911, 800-882-8020, TWX: 710-571-2143, FAX: 914-666-0216; Empl.: 120; *Sls. Mgr.:* L. T. Noyes; *Dist. Mgr.:* Jack Becker

ZIPPERTUBING CO., Box 61129, Los Angeles, CA 90061, Tel: 213-321-3901, FAX: 213-321-3086; Empl.: 60; *Sls. Mgr.:* Mike Sullivan

ZIRMEX, See Degussa Electronics, Hybrid Div.

ZI-TECH INSTRUMENT CORP., P.O. Box 391567, Mountain View, CA 94039-1567, Tel: 415-966-8484, TELEX: 334-447, FAX: 415-966-8201; Empl.: 15; *Sls. Mgr.:* J. Ziman

zitel

FAX: 408-262-6754

ZITEL CORPORATION, 630 Alder Drive, Milpitas, CA 95035, Tel: 408-946-9600, 800-622-5020, TELEX: 171607, TWX: 910-338-0567; Empl.: 145; *Sls. Mgr.:* Don Olker; *Dist. Mgr.:* Don Olker ..... **D•1119, 2239**

Local Sales Offices & Reps

CA	Granada Hills, West Coast Reps.	818-368-7385
CA	La Habra, West Coast Reps.	213-690-9960
CA	Meadow Vista, West Coast Reps.	916-878-7454
CA	Milpitas, Zitel	408-946-9600
CA	Norco, West Coast Reps.	714-261-5313
CA	Palo Alto, West Coast Reps.	415-325-6097
CA	San Diego, West Coast Reps.	619-581-2406
CT	Wallingford, Northern Computer Sales, Inc.	203-294-1004
FL	Cocoa Beach, Zitel	407-799-1000
IL	Hoffman Estates, Panatek	708-519-0867
MA	Canton, Northern Computer Sls, Inc.	617-821-2180
MI	Warren, Dietrich & Assocs.	313-751-4990
MN	Plymouth, James R. Johnson & Assocs.	612-478-9442
MO	St. Louis, Panatek Tech. Sls.	314-993-5088
NY	Elmont, Crane & Egert, Inc.	516-872-0800
NY	Fairport, Northern Computer Sls, Inc.	716-377-2650
OH	Cincinnati, Dietrich & Assocs.	513-984-8924
OH	Independence, Dietrich & Assocs.	216-642-7965
OK	Tulsa, Milco Mktg. Inc.	918-664-2188
PA	New Kensington, Zitel	412-795-0900
PA	Pittsburgh, Dietrich & Assocs.	412-892-2992
TX	Austin, Milco Mktg, Inc.	512-835-5359
TX	Houston, Milco Mktg, Inc.	713-469-5156
TX	Plano, Milco Mktg, Inc.	214-578-1996
WA	Snohomish, West Coast Reps.	206-483-5300

Z-LINE POWER CONTROLLERS, See Pulizzi Engineering, Inc.

ZMAN MAGNETICS, 7633 South 180th, Kent, WA 98032, Tel: 206-251-8064, FAX: 206-251-6264; Empl.: 35; *Sls. Mgr.:* Mark Mennella

Z-WORLD ENGINEERING, 1340 Covell Blvd. 101, Davis, CA 95616, Tel: 916-753-3722, FAX: 916-753-5141; Empl.: 9; *Sls. Mgr.:* Carrie Evanoff

ZYLAB CORPORATION, 100 Lexington Dr., Buffalo Grove, IL 60089, Tel: 708-459-8000, FAX: 708-459-8054; Empl.: 21; *Sls. Mgr.:* Beth Harvey

ZYTRON, Zytronics, 70 Tirrell Hill Road, Bedford, NH 03102, Tel: 603-623-8888, FAX: 603-623-4009; Empl.: 100; *Sls. Mgr.:* Jan St. Pierre

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PRODUCT SELECTION GUIDES
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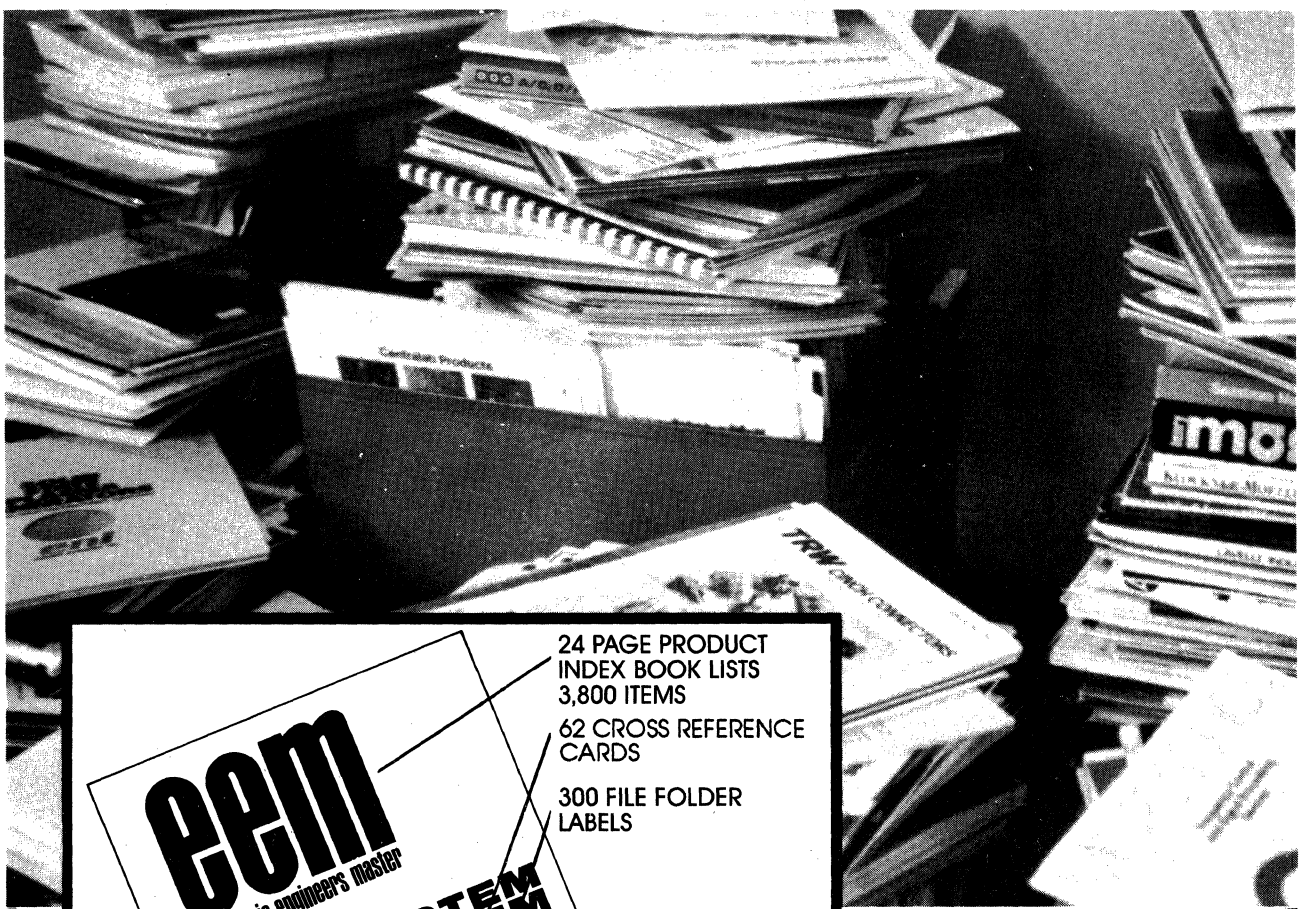

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SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

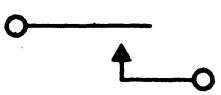
United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

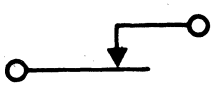
Yugoslavia Federal Institute of Standardization

MINIGLOSSARY
RELAY CONTACT FORMS

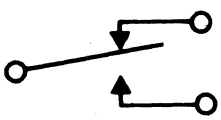
A
Make
SPST-NO



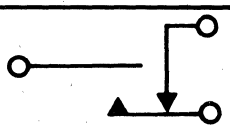
B
Break
SPST-NC



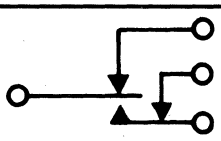
C
Break, Make
(Transfer)
SPDT



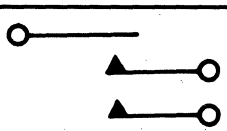
D
Make, Break
(Continuity
Transfer)



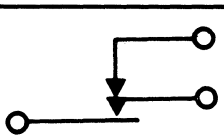
E
Break,
Make,
Break



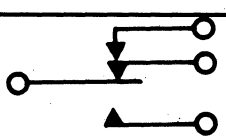
F
Make,
Make



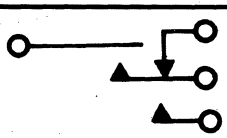
G
Break,
Make



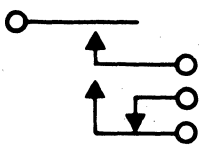
H
Break,
Break,
Make



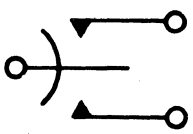
I
Make,
Break,
Make



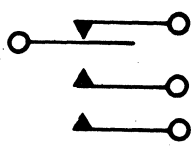
J
Make,
Make,
Break



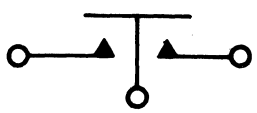
K
Center off
SPDT



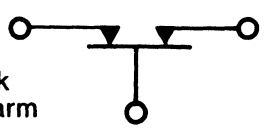
L
Break,
Make,
Make



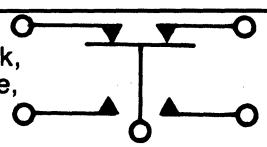
U
Double
make
Contact
on arm



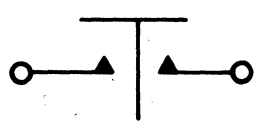
V
Double break
Contact on arm



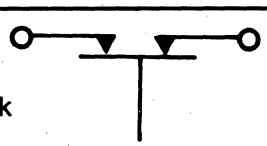
W
Double break,
Double make,
Contact
on arm



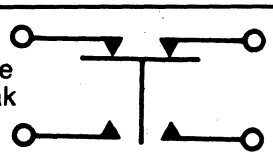
X
Double
make



Y
Double break



Z
Double make
Double break
SPDT-DB



CHARACTERISTICS OF BATTERIES AND FUEL CELLS

System	Anode	Cathode	Theoretical battery		Practical battery		
			Voltage, V	Capacity, Ah/kg	Typical voltage, V	Capacity[a]	
						Wh/kg	Wh/dm³
Primary:							
Leclanche	Zn	MnO_2	1.6	230	1.2	65	175
Magnesium	Mg	MnO_2	2.0	270	1.5	100	195
Organic cathode	Mg	*m*-DNB	1.8	1,400	1.15	130	180
Alkaline MnO_2	Zn	MnO_2	1.5	230	1.15	65	200
Mercury	Zn	HgO	1.34	185	1.2	80	370
Mercad	Cd	HgO	0.9	165	0.85	45	175
Silver oxide	Zn	AgO	1.85	285	1.5	130	310
Zinc-air	Zn	Air (O_2)	1.6	815	1.1	200	190
Li-organic electrolyte	Li	[b]	2.1-5.4	130-660	1.8-3.2	250	400
Secondary:							
Lead-acid	Pb	PbO_2	2.1	55	2.0	37	70
Edison	Fe	Ni oxides	1.5	195	1.2	29	65
Nickel-cadmium	Cd	Ni oxides	1.35	165	1.2	33	60
Silver-zinc	Zn	AgO	1.85	285	1.5	100	170
Silver-cadmium	Cd	AgO	1.4	230	1.05	55	120
Zinc-nickel oxide	Zn	Ni oxides	1.75	185	1.6	55	110
Zinc-air[c]	Zn	Air (O_2)	1.6	815	1.1	150	155
Cadmium-air[c]	Cd	Air (O_2)	1.2	475	0.8	90	90
Zinc-O_2	Zn	O_2	1.6	610	1.1	130	120
H_2-O_2	H_2	O_2	1.23	3,000	0.8	45	65
Reserve:							
Cuprous chloride	Mg	CuCl	1.5	240	1.4	45	65[d]
Silver-chloride	Mg	AgCl	1.6	170	1.5	60	95[d]
Zinc-silver oxide	Zn	AgO	1.85	285	1.5	30	75[e]
Thermal	Ca	[b]	2.8	240	2.6	10	20[f]
Ammonia-activated	Mg	*m*-DNB	2.2	1,400	1.7	22	60[g]
High-	NA	S	2.1	685	1.8	200	[h]
temperature	Li	S	2.2	1,150	1.8	200	[i]
Solid electrolyte	Ag	Polyiodide	0.66	. . .	0.6	180	75[j]
Fuel cell:							
Hydrogen[c]	H_2	Air	1.23	26,000	0.7		[k]
Hydrazine[c]	N_2H_4	Air	1.5	2,100	0.7	800[b]	[l]
Methanol[c]	CH_2OH	Air	1.3	1,400	0.9	175[b]	185[m]

a Delivered capacity when discharged at normal temperatures (20°C) at normal discharge rates.
b Based on fuel consumption only.
c Weight of air not considered in computation of watt hours.
d Water-activated
e Automatically activated; high rate discharge; 2- to 10-min rate.
f Fused salt; heat-activated; high rate discharge; 2- to 10-min rate.
g Four-minute discharge rate.
h β-alumina electrolyte, 300°C operation.
i Fused salt; 350°C operation.
j Solid $RbAg_4I_5$ electrolyte.
k Several different cathode materials used.
l Fuel consumption is based on source of H_2.
m Based on methanol battery-fuel supply in situ.

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

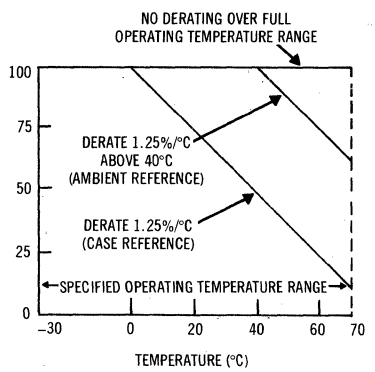


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

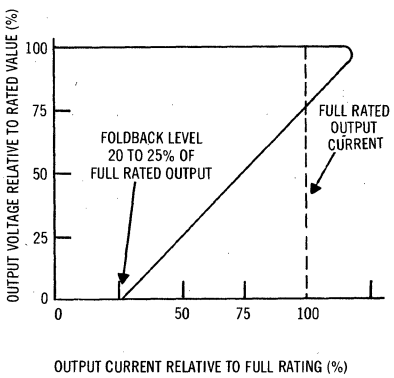


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

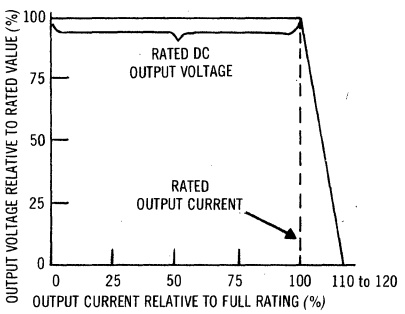


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

THERMAL CONDUCTIVITY OF DIELECTRICS AT ROOM TEMPERATURE

Material	Thermal Conductivity, J/ (m.K)
Diamond	658
BeO	167
Graphite	117-200
Bonded SiC	42
MgO	42
Al_2O_3	33
TiC	33
BN	28
Mullite	6.3
Titania	3.3-4.2
Porcelain	1.7
Fused silica glass	1.5
Soda-lime glass	0.8
Cast epoxies	0.17-1.3
Wood	0.5-2.5
Melamines	0.3-0.7
Mica	0.3-0.7
Phenolics (molded)	0.17-0.67
Polyethylenes	0.33
Nylons	0.17-0.25
TFE fluorocarbons	0.25
Elastomers	0.08-0.17
Foams	0.003-0.04

SI UNITS

RELATIVE QUANTITY SYMBOLS

$\neq$	not equal to
$\approx$	approximately equal to
$\propto$	proportional to
$<$	smaller than
$\leq$	smaller than or equal to
«	much smaller than
$>$	larger than
$\geq$	larger than or equal to
»	much larger than
$\equiv$	identical to or equivalent
$\uparrow$	increases
$\downarrow$	decreases

PREFIXES FOR SI UNITS

Multiple	Prefix	Symbol
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p

Quantity	Symbol	SI Unit	Symbol	Derivation
acceleration	a	m s^{-2}	—	velocity/time
acceleration due to gravity	g	m s^{-2}	—	velocity/time
amount of substance	n	mole	mol	mole fraction (n) used
amplification factor	μ	*a ratio*	—	—
angle	$\theta_1, \varphi_1, \alpha_1$	—	—	—
angle of incidence	i	degree or radian	°	—
angle of refraction	r	degree or radian	°	—
angle, Bragg	θ	number	—	—
angle, critical	c	degree or radian	°	—
anode slope resistance	R_A	ohm	Ω	$\Delta V_a / \Delta I_a$
area	A	metres squared	m^2	$l \times b$
atomic number	Z	a number	—	number of protons
Avogadro constant	L, N_A	number	—	—
breadth	b	metre	m	fundamental unit
capacitance	C	farad	F	charge/p.d.
charge, electric	Q	coulomb	C	current × time
charge on electron	e	coulomb	C	$1{\cdot}6 \times 10^{-19}$ C
conductance	G	ohm^{-1}	Ω^{-1}	reciprocal of resistance
current, electric	I	ampere	A	fundamental unit
decay constant	λ	*a ratio*	—	—
density	ρ	kg m^{-3}	—	m/V
distance along path	s	metre	m	fundamental unit
efficiency	η	*a ratio*	—	work output/work input
electrochemical equiv.	z	g C^{-1}	—	mass/charge
electromotive force	E	volt	V	energy/charge
electron	e	—	—	—
energy	E	joule	J	N m
energy, kinetic	E_k	joule	J	N m. $E_k = 1/2mv^2$
energy, potential	E_p	joule	J	N m. $E_p = mgh$
Faraday constant	F	coulomb mol^{-1}	C mol^{-1}	96,500 C mol^{-1}
field strength, electric	E	V m^{-1}	—	potential gradient: p.d./dist.
field-strength magnetic	H	ampere-turns	—	current × no. of turns
flux, magnetic	Φ	weber	Wb	e.m.f/rate of change of flux
flux density	B	tesla	T	flux/area
focal length	f	metre	m	—
force	F	newton	N	kg m s^{-2}
free energy	ΔG	joule	J	—
frequency	f	hertz	Hz	oscillations/time
gas constant	r	joule	J	energy
half-life,radioactivity	$t_{1/2}$	second	s	fundamental unit
heat capacity	C	J K^{-1}	—	quantity of heat/temp. rise
heat of reaction	ΔH	joule	J	heat energy
heat capacity, specific	c	J K^{-1} kg^{-1}	—	heat capacity/mass
heat, quantity of	q	joule	J	energy

SI UNITS

Quantity	Symbol	SI Unit	Symbol	Derivation
height	h	metre	m	fundamental unit
image distance	υ	metre	m	fundamental unit
inductance, mutual	M	henry	H	induced e.m.f./rate of change of current
inductance, self	L	henry	H	—
intensity of radiation	I	*a number*	—	—
latent heat	L	joule	J	quantity of heat
latent heat, specific	l	J kg^{-1}	—	quantity of heat
latent heat, molar	L_m	joule mol^{-1}	J	quantity of heat
length	l	metre	m	fundamental unit
magnetizing force	H	ampere-turns	—	—
magnetic moment	m	Wb m	—	torque in unit magnetic field
magnification, linear	m	*a ratio*	—	—
mass	m	kilogramme	kg	fundamental unit
mass number	A	*a number*	—	number of neutrons + protons
molar volume	V_m	(dm^3)	—	volume of 1 mole
molar solution	M	*a ratio*	—	moles/dm^3
moment of force	—	N m	—	force × perp. distance
neutron number	N	*a number*	—	number of neutrons
number	n	—	—	—
number of molecules	N	—	—	—
number turns on coil	n	*a number*	—	—
number order spectrum	p	*a number*	—	—
object distance	u	metre	m	fundamental unit
peak current	I_o	ampere	A	see current
peak e.m.f.	E_o	volt	V	see e.m.f.
period	T	second	s	fundamental unit
permeability	μ	H m^{-1}	—	henry/metre
permeability, vacuum	μ_o	H m^{-1}	—	—
permeability, relative	μ_r	*a ratio*	—	$\mu = \frac{\mu}{\mu_o}$
permittivity	ε	F m^{-1}	—	farad/metre
permittivity, vacuum	ε_o	F m^{-1}	—	farad/metre
permittivity, relative	ε_r	*a ratio*	—	$\varepsilon_r = \frac{\varepsilon}{\varepsilon_o}$
potential, electric	V	volt	V	energy/charge
potential difference	V	volt	V	energy/charge
power	P	watt	W	J s^{-1}
pressure	p	pascal	Pa	N m^{-2}: force/area
radius	r	metre	m	fundamental unit
reactance	X	ohm	Ω	E_o/I_o
refractive index	n	*a ratio*	—	—
resistance	R	ohm	Ω	p.d./current
resistivity, electrical	ρ	ohm-metre	—	resistance × length
relative density	d	*a ratio*	—	ρ_{sub}/ρ_{water}
r.m.s. current	$I_{r.m.s}$	ampere	A	see current
r.m.s. voltage	$V_{r.m.s}$	volt	V	see e.m.f.
slit separation	s	metre	m	fundamental unit
tension	T	newton	N	see force
temperature, Celsius	θ	degree C	°C	from kelvin
temp. interval	θ	degree	° or K	—
temp. absolute	T	kelvin	K	fundamental unit
thickness	d	metre	m	fundamental unit
time	t	second	s	fundamental unit
torque	T	Nm	—	see moment
turns ratio	T	*a ratio*	—	n_{sec}/n_{prim}
(unit of electricity)	—	kW h	—	kilowatt × hour
velocity	u,υ	ms^{-1}	—	distance/time
velocity, angular	ω	$second^{-1}$	s^{-1}	angle/time
velocity, e.m.waves	c	m s^{-1}	—	—
velocity of sound	υ	m s^{-1}	—	—
volume	V	metre cubed	m^3	l × b × h
wavelength	λ	metre	m	fundamental unit
work	w	joule	J	force x distance (Nm)
weight	W	newton	N	kg m s^{-2}or mg

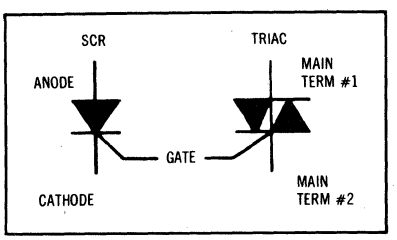
MINIGLOSSARY THYRISTORS/ HIGH POWER DIODES

THYRISTORS

A thyristor is a four-layer semiconductor (pnpn) that can be switched from an OFF to an ON state. This is usually done by a voltage or current pulse to the gate terminal. The device will then continue to conduct so long as the principal current of the device flows through the thyristor's two main terminals.

In many respects a thyristor is analogous to an electromechanical latching relay. In fact, thyristors have largely replaced these relays in newer equipment designs. But, misapplications and/or failure to fully understand the parameters of these and other solid state devices often leads to catastrophic field failures.

The terminology shown on this page has been condensed from common industry data books and is intended to be a guide for the engineer.



di/dt: *Critical rate of rise of ON state current* is the user's maximum design limit (Fig. 1).

di_R/dt: *Rate of decay of ON state current* (Fig. 1 & 2).

dv/dt (critical): *Rate of rise of OFF state voltage*. Lowest voltage rate of rise to cause a thyristor to turn ON.

dv/dt (reapplied) : *Rate of rise of reapplied OFF state voltage.*

I_{FSM}: *Nonrepetitive ON state surge current in diodes.* Maximum peak value of ½ cycles (60 Hz) a diode can withstand up to 100 times in its lifetime.

I_{TSM}: *Nonrepetitive ON state surge current in thyristors.* Maximum peak value of 60 Hz cycles a thyristor can withstand up to 100 times in its lifetime.

I_{DRM}/I_{RRM}: *Maximum peak forward/reverse leakage current* at specified temperature and repetitive conditions.

I_{GDM}: *Continuous gate current not to trigger*. Highest dc gate current that will *not* cause thyristor to switch from OFF to ON at a specific temperature.

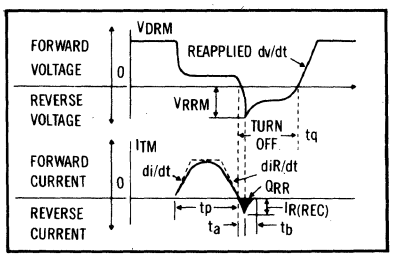


Fig. 1. Concurrent voltage and current waveforms

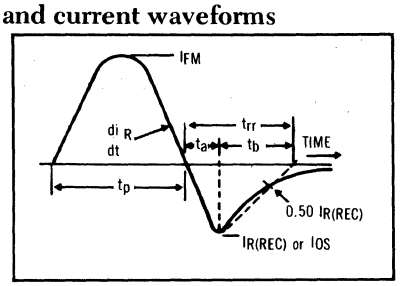


Fig. 2. Recovery current waveform

I_{GT}: *Continuous gate trigger current.* Absolute minimum gate current required to switch thyristor from OFF to ON.

I_H: *Holding Current*. Minimum current required to hold thyristor ON.

I_L: *Latching current*. Minimum current required to hold thyristor ON after removal of gate drive.

$I_{(REC)}$; *Recovery current*. Peak value of reverse current during recovery or turn OFF (Fig. 1 & 2).

I_{OS}: *Overshoot current*. See $I_{R(REC)}$.

I^2t: Maximum ON state, short time thermal capacity of the silicon element for operations less than ½ cycle of 180° conduction angle.

$I_{T(AV)}$: *Average ON state current* (max.)

Q_{RR}: *Reverse recovered charge* (Fig. 1).

$R_{\theta JC}$: *Junction-to-case thermal resistance* in degrees C per watt.

$T_{C(MAX)}$: *Max. allowable case temperature.*

$T_{J(MAX)}$: *Maximum allowable junction temp.*

t_d: *Delay time*. Interval between a specified point at beginning of gate pulse and the instant at which the principal voltage drops to a specified value. (OFF-ON) (Fig. 3)

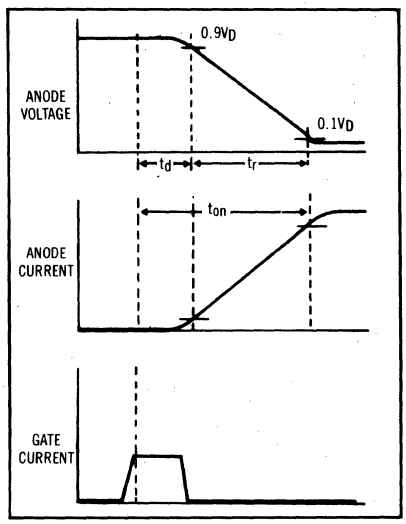


Fig. 3. Turn-on time waveforms

t_{on}: *Turn-on time*. The sum of delay time and rise time. (OFF-ON) (Fig. 3)

t_q: *Turn-off time*. Time between principal current reaching zero and the instant thyristor can block forward voltage without turning ON. (Fig. 1)

t_r: *Rise time*. Time between principal voltage dropping from one value to a second lower value when thyristor turns from OFF to ON. (Fig. 3)

t_{rr}: *Reverse recovery time*. (Fig. 2)

V_{DRM}/V_{RRM}: *Maximum repetitive peak OFF state/reverse voltage* excluding non-repetitive transients.

V_{DSM}/V_{RSM}: *Maximum nonrepetitive peak OFF state/reverse voltage.*

V_{FM}/V_{TM}: *Maximum forward voltage drop* at a specific forward current and case temp.

V_{GDM}: *Gate nontrigger voltage*. Highest dc voltage that will *not* cause thyristor to switch from OFF to ON.

V_{LATCH}: *Latching voltage*. Voltage required for thyristor to latch ON at a given gate current and junction temp.

$V_{TM(DYN)}$: *Dynamic ON state voltage*. Transient ON state voltage of thyristor when triggered into conduction for a given load and time.

MINIGLOSSARY ENCAPSULATION

MATERIALS/HANDLING

Catalyst: A substance which changes the *rate* of chemical reaction. Very small quantities can cause fast change.

Conformal coating Sprayed or dipped. A thin conformal jacket which protects an assembly from moisture or other degrading environments.

Curing agent: See catalyst.

Hardener: See catalyst.

Hermetic: A permanent gas-tight seal.

RTV: Room Temperature Vulcanizing. Associated with silicone rubber sealants which vulcanize at room temperature.

Thermoplastic: Plastic materials which can be made to flow *repeatedly* with the application of heat.

Thermosetting: Plastics which once cured cannot be made to flow again.

Thixotropy: The property of a coating compound which has low viscosity when agitated, but which thickens when the agitation ceases.

Viscosity: Measured in units of *poise* or *centipoise*. The property of a liquid which resists internal flow. Low viscosity equates with thin and vice-versa.

PROCESSING

Casting: Parts or assemblies are placed in a mold. Encapsulating material is added and cured. Part is then removed from the mold.

Dip coating: Part or assembly is dipped into the encapsulating material. Final thickness is determined by number of dips, viscosity, rate of withdrawal, and temperature.

Embedding: Wherein an encapsulant substantially fills all voids in and about an assembly.

Impregnation: A process of encapsulation involving evacuating all air and then allowing the encapsulating material to flow in and fill all voids.

Molding: Similar to casting except this process usually implies multicavity molds and costly machines.

Potting: Wherein the part or assembly is immersed in an encapsulating material contained in a shell which becomes a permanent outer surface after curing.

DIELECTRIC

Arc resistance: An encapsulant's resistance to the formation of a conductive path or track. Measured in time.

Breakdown voltage: The voltage at which an encapsulant fails electrically.

Capacitance: The property of conductors and dielectrics which allows the storage of an electrical charge when the voltage is applied.

Corona: A luminous discharge of electricity due to air ionization when a certain voltage is reached. Can be internal or external. The formation of ozone can cause rapid deterioration of certain materials.

Dielectric: Insulator (Nonconductor.)

Dielectric constant: The property of a material that determines its ability to store electrostatic energy.

Dielectric strength: The ratio of dielectric breakdown to the thickness of insulating material.

Dissipation factor: The ratio of a dielectric material's energy losses.

Flashover: Point at which an electric discharge occurs around an edge or across a surface. Can result in a carbon track and permanent degradation.

Insulation resistance: (IR) An insulating material's total DC leakage.

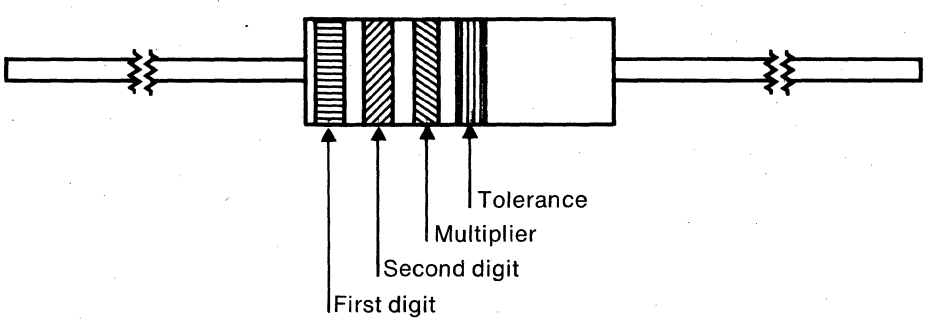
Surface resistivity: The resistance of the surface of an insulating material to the flow of direct current.

Voltage endurance: Sometimes called corona resistance. The ability of a material to withstand the application of sustained high voltage.

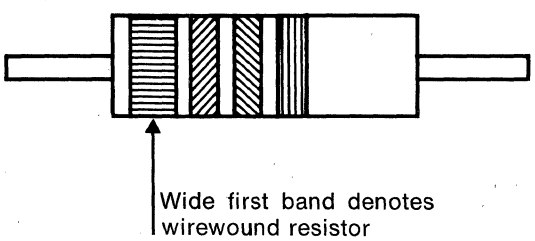
Volume resistivity: The resistance of a material to direct current flow as a measure of volume. Expressed as ohm-centimeters.

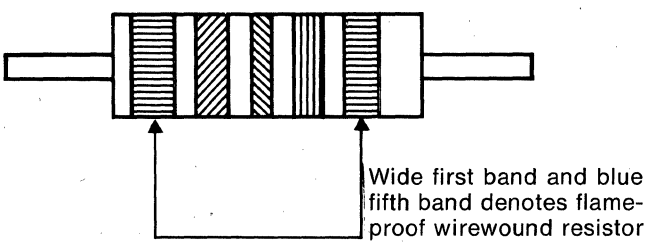
MINIGLOSSARY
RESISTOR COLOR CODES

EIA/MIL Resistor Color Codes



Color code for general-purpose industrial resistors

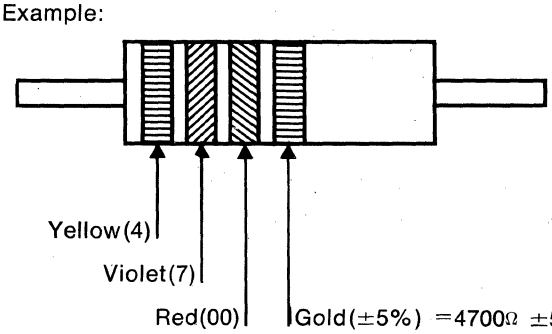




Color code for general-purpose wirewound resistors

Color	Significant digit	Multiplier	Tolerance
Black	0	1	—
Brown	1	10	± 1%
Red	2	100	± 2%
Orange	3	1000	± 3%
Yellow	4	10,000	± 4%
Green	5	100,000	—
Blue	6	1,000,000	—
Violet	7	10,000,000	—
Gray	8	—	—
White	9	—	—
Gold	—	0.1	± 5%
Silver	—	0.01	±10%
No color	—	—	±20%

Example:



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MINIGLOSSARY TIMERS

Accuracy
The variation of unit performance, i.e., time delay, voltage trip point, etc., over the specified conditions of ambient temperature, input voltage range, and time between operations.

Adjustability
The changing of a unit set point, within the specified range of unit operation, by means of internal or external adjustment mechanism (i.e., changing time delay with potentiometer).

Contact Rating
The electrical power-handling capability of relay contacts under specified environmental conditions and for a prescribed number of operations.

Delayed Interval Timing Function
Input voltage is applied continuously. The timing cycle is started by momentarily actuating the control circuit. The functions of separate Delay-On-Operate and interval type timers are combined in one package providing a single OFF-ON-OFF output cycles

Also called: single shot.

Delay-On-Operate Timing Function
Application of the input voltage starts the time delay. At completion of the time delay, the relay contacts transfer.

Also called: Delay-On-Make, On-Delay, Delay Relay, Delay-On-Pickup.

Delay-On-Release Timing Function
Input voltage must be supplied continuously to timer. Actuation of control circuit causes relay contacts to transfer immediately. Time delay starts when control circuit is released. The relay remains energized for the duration of the time delay—then de-energizes.

Also called: Delay-On-Break, Off-Delay, Delay-On-Dropout, Delay-On-Energization.

Frequency Sensor
A device that monitors a predetermined overfrequency and/or underfrequecy condition, and changes output state when these conditions exist.

Hysteresis
The difference between the response of a unit or system to an increasing and a decreasing signal (example: a voltage sensor).

Interval Timer Timing Function
Application of input voltage causes relay contacts to transfer and time delay to begin. At completion of the time delay, the relay contacts return to de-energized state.

Also called: Delay Interval, One Shot.

Output Control
The switching device, either solid-state or electromechanical, used in the unit to control the load connected to the output terminal(s).

Phase Sensor
A device that monitors for proper phase rotation in 3-phase systems.

Programmability
Ability to modify function, time delay or input voltage of a timer.

Recovery Timer

(Delay-On-Operate/Interval Timer)
The minimum time that input voltage must be interrupted *prior* to time-out to insure a successive timing cycle within the specified limits.

(Delay-On-Release)
The minimum duration of time that control circuit must be re-actuated to insure a new timing cycle when the control circuit is released.

Recycle Time

(Delay-On-Operate or Interval Timer)
The minimum time that input voltage must be interrupted after the timing cycle is completed to assure a successive timing cycle within the repeatability specified.

(Delay-On-Release)
The minimum duration of time that control circuit must be actuated to insure a successive timing cycle within the repeatability specified when the control circuit is released.

Repeat Cycle Timer Timing Function
Application of power automatically initiates continuous off-on cycling of the output relay.
Also called: flasher, intervalometer

Reset Time
The time required for the contacts to return to normal position when power is removed.

Reverse Polarity Protection
Blocking circuitry arrangement within the timer to prevent damage or output actuation if reverse polarity input voltage is applied.

Tolerance
The difference between specified and actual timing or sense point (factory setup tolerance).

Transient Protection
Prevents damage to unit if positive or negative transients are applied to the unit. Insures proper operation of the unit during and after transient occurrence. Max. transients are usually specified as to amplitude and duration, i.e., 1000V for 1 second.

Trip Point
The predetermined point at which a sensing device is set to change the output state.

Voltage Sensor
A device that monitors for a predetermined overvoltage and/or undervoltage condition, and changes output state when these conditions exist.

MINIGLOSSARY ELECTROMECHANICAL RELAYS

RELAYS

Hybrid: Isolated input and output either with a solid-state input and an electromechanical output or vice versa. Typically a reed switch is used to trigger a solid-state output or a solid-state amplifier is used to trigger an electromechanical relay.

Differential: Have multiple windings to function when voltage, current and/or power difference reaches a specific level or value.

Close-differential: The dropout value is specified close to the pickup value.

Frequency sensitive: Operates at a set frequency or within specific frequency bands. A resonant reed, for example.

Hermetically sealed: Totally sealed by glass-to-metal or metal-to-metal seals to ensure very low rates of gas leakage over long time periods.

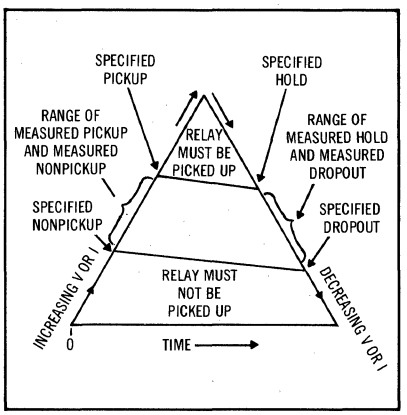
Encapsulated: Imbedded in a suitable potting compound.

Sealed: Enclosed in a relatively airtight cover. (Not the same as hermetically sealed.)

Covered: Unsealed metal or plastic enclosure or housing.

CONTACTS

Dry circuit: contacts that carry current but do not open or close during energizing of the load circuit. Often wrongly used in reference to low level contacts.



Low Level: Contacts controlling relatively low voltages and low currents. Generally below 5 Vdc and 10mA.

OPERATING CHARACTERISTICS

Measured dropout: The value at which all contacts restore to their unoperated position as current or voltage decreases.

Specified dropout: The value at or *above* which all contacts *must* restore to their unoperated position as voltage or current is decreased.

Specified hold: The value that *must* be reached before any contact change occurs as voltage or current is decreased on an operated relay.

Specified nonpickup: The value that *must* be reached before any contact change occurs as voltage or current decreases on an unoperated relay.

Measured pickup: The value at which all contacts function as voltage or current increases on an unoperated relay.

Specified pickup. The value at or *below* which all contacts *must* function as voltage or current increases on an unoperated relay.

Sensitivity: Specified pickup expressed in watts.

Normal bridging: The make-before-break action between adjacent contacts on relays designed for this purpose.

Abnormal bridging: The undesired closing of contacts caused by a metal bridge or protrusion developed by arcing.

Magnetic freezing: Sticking of the armature to the core as a result of residual magnetism.

TIME

Actuation: The interval from coil energization or de-energization to the functioning of a specified contact.

Initial actuation: The interval from coil energization or de-energization to the *first* closing or opening of a previously open or closed contact.

Final actuation: Sum of initial actuation *and* bounce intervals following an actuation.

Contact bounce: The interval from close or opening of a contact to the end of the bounce of "chatter."

Chatter: See bounce.

Operate: Normally taken as the interval between energization and the opening or closing of the last contact to function not including bounce.

Release: Normally taken as the interval between de-energization and the opening or closing of the last contact to function excluding bounce.

Transfer: The interval between opening a closed contact and closing an open contact of a break-before-make relay.

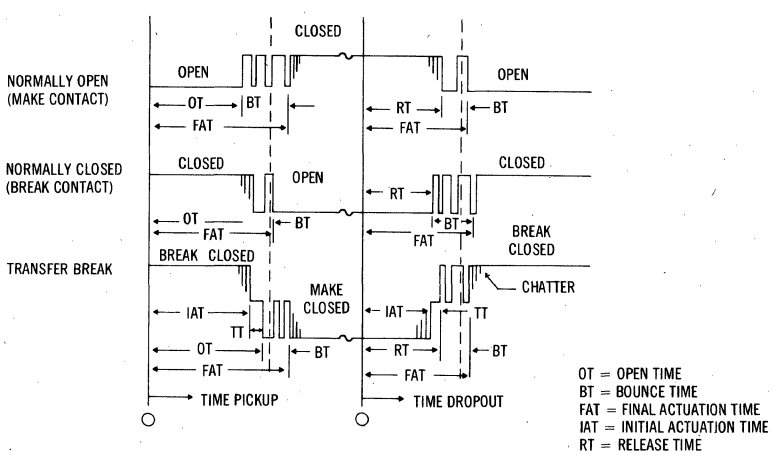


Fig. 2. Typical time vs. current (non-inductive load)

MINIGLOSSARY OPTO SEMICONDUCTORS

Avalanche Photodiode: A photodiode that takes advantage of avalanche multiplication of photocurrent. It is particularly suited to low noise and/or high speed applications.

Contrast: A noticeable difference in color, brightness, or other characteristics in a side-by-side comparison.

Chrominance Contrast: The color contrast between two adjacent surfaces of identical area, shape, texture, and luminance. The human eye is more sensitive to differences in color than it is to differences in brightness.

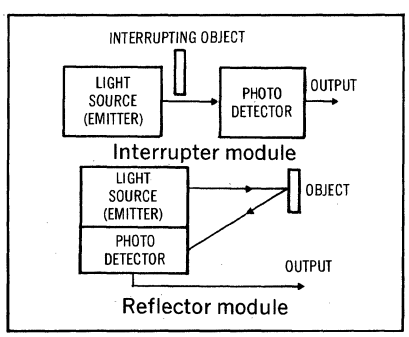
Current Transfer Ratio: The ratio of an optocoupler's output current to input current at a specified bias.

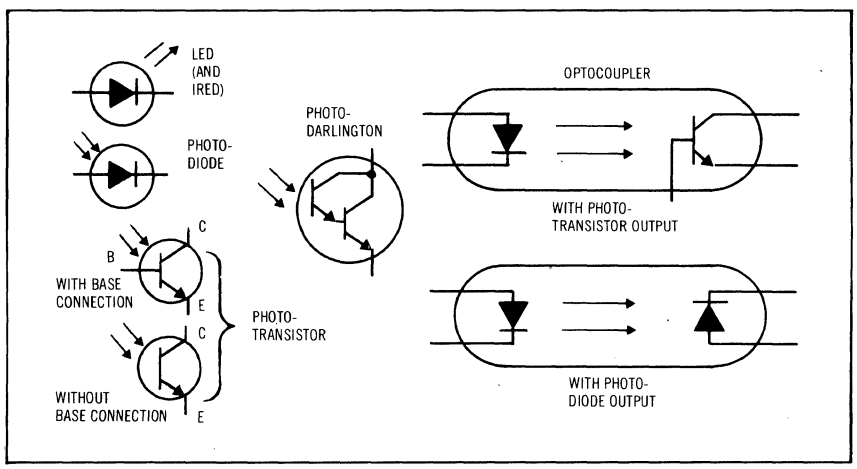
Dark Current: The leakage current of a photodetector with no incident light.

Dominant Wavelength: The wavelength that is a quantitative measure of apparent color of light as perceived by the human eye.

Infrared Radiation: The electromagnetic wavelength region between approximately 0.75 and 100 micrometers longer than the wavelength of visible light.

Interrupter (module): A device that produces an electrical output signal when an object breaks the light (visible or invisible) between a light source and a photodetector.





IRED: An infrared-emitting diode. See light-emitting diode.

Light Current: The current that flows through a photodetector when it is exposed to radiant energy.

Light-Emitting Diode (LED): A semiconductor diode that emits incoherent light at its PN junction when forward biased. The light can be in the visible or invisible (infrared) wavelength region.

Luminance Contrast: The observed brightness of a light-emitting element compared to the brightness of the "surround," an integral part of the device and inseparable from it.

Optocoupler: A device that transmits electrical signals, without electrical connection, between a light source (input) and the receiver (output). The input is generally an LED; the output might be a photodiode, phototransistor, a photo–Darlington, etc. Sometimes referred to as optoisolator.

Peak Wavelength: The wavelength at the peak of the radiated spectrum of an emitter.

Photo–Darlington: A light-sensitive Darlington-connected transistor pair. The photo–Darlington has a very high sensitivity to illumination or radiation.

Photodetector: A device that provides an electrical output signal when subjected to radiation in the visible, infrared, or ultraviolet regions of the electromagnetic spectrum. Photodiodes, phototransistors, and photo–Darlingtons are the most common type of photodetectors.

Photodiode: A junction diode that is responsive to radiant energy. Photodiodes have a high degree of linearity between the input radiation and the output current, and faster switching speeds than phototransistors.

Photothyristor: A thyristor whose switching action is controlled by light applied to the thyristor gate.

Phototransistor: A light-sensitive transister that delivers an electrical output proportional to the light intensity at its input. The low-level photocurrent that is generated is amplified by the current gain of the transistor. The base region (or gate in a FET) may or may not be brought out as an external terminal.

Point Source: A source with a maximum dimension less than one-tenth the distance between sources and detector.

Reflector (module): A device containing a light source and a photodetector that detects any object that reflects light produced by the source back to the detector.

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MINIGLOSSARY
BASIC ASCII CODE

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Control Character Representations

NUL	Null
SOH	Start of Heading (CC)
STX	Start of Text (CC)
ETX	End of Text (CC)
EOT	End of Transmission (CC)
ENQ	Enquiry (CC)
ACK	Acknowledge (CC)
BEL	Bell
BS	Backspace (FE)
HT	Horizontal Tabulation (FE)
LF	Line Feed (FE)
VT	Vertical Tabulation (FE)
FF	Form Feed (FE)
CR	Carriage Return (FE)
SO	Shift Out
SI	Shift In
DLE	Data Link Escape (CC)
DC1	Device Control 1
DC2	Device Control 2
DC3	Device Control 3
DC4	Device Control 4
NAK	Negative Acknowledge (CC)
SYN	Synchronous Idle (CC)
ETB	End of Transmission Block (CC)
CAN	Cancel
EM	End of Medium
SUB	Substitute
ESC	Escape
FS	File Separator (IS)
GS	Group Separator (IS)
RS	Record Separator (IS)
US	Unit Separator (IS)
DEL	Delete

(CC) Communication Control
(FE) Format Effector
(IS) Information Separator

Special Graphic Characters

SP	Space
!	Exclamation Point
|	Logical OR
"	Quotation Marks
#	Number Sign
$	Dollar Sign
%	Percent
&	Ampersand
'	Apostrophe
(	Opening Parenthesis
)	Closing Parenthesis
*	Asterisk
+	Plus
,	Comma
-	Hyphen (Minus)
.	Period (Decimal Point)
/	Slant
:	Colon
;	Semicolon
<	Less Than
=	Equals
>	Greater Than
?	Question Mark
@	Commercial At
[	Opening Bracket
\	Reverse Slant
]	Closing Bracket
^	Circumflex
¬	Logical NOT
_	Underline
`	Grave Accent
{	Opening Brace
¦	Vertical Line (This graphic is stylized to distinguish it from Logical OR)
}	Closing Brace
~	Tilde

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CDM MINIGLOSSARY CAPACITORS

Anode: One of two plates or conductors. In polarized capacitors, the anode should be connected to the positive conductor in the circuit.

Capacitive Reactance: The opposition (in ohms) of capacitance to the flow of alternating current, equal to the reciprocal of the product of the angular frequency (2π times frequency in Hertz) of the current times the capacitance in farads.

Cathode: One of two plates or conductors. In electrostatic capacitors the cathode is metallic. In electrolytic capacitors the cathode is a liquid, gel or other conductive material which is in intimate contact with a metallic cathodic connection.

Dielectric Constant: The ratio of the capacitance of a capacitor with some material other than air between the capacitor plates to the capacitance of the same capacitor with air between the plates. For example, the dielectric constants of air, Teflon®, polystyrene and ruby mica are 1, 2.1, 2.6 and 5.4, respectively.

Electrolytic: A capacitor with one metallic conductor (generally the anode) and with a liquid or semiconductor cathode. Nonpolarized electrolytic capacitors generally have two equal anodes as well as the liquid cathode. These anodes operate alternately as anode and cathodic connection as alternating current is applied.

Electrostatic: One of two general classes of capacitors in which two or more discrete metallic conductors are present and separated by an insulating dielectric material. Examples include: mica, ceramic, film, and paper types.

Farad: The basic unit of measure in capacitors. A capacitor charged to one volt with a charge of one coulomb (one ampere flowing for one second) has a capacitance of one farad. Capacitors are generally rated at portions of a farad (microfarads or picofarads).

1 farad (F) = 1,000,000 microfarads (μF) 1 microfarad (μF) = 1,000,000 picofarads (pF)

Impedance: All capacitors exhibit impedance. It is a function of capacitor type and internal construction. This can be particularly important in certain applications such as filters for switching power supplies. Capacitors used in these applications often have special multiple tab construction to shorten current paths and to reduce internal resistance.

Leakage Current: Expressed as dcl for electrolytic capacitors, a measure of the intrinsic losses in a charged capacitor. Generally speaking, the lower the dcl, the higher quality the capacitor.

Power Factor: A measure of the overall efficiency of a capacitor. Power factor ratings take all internal losses into consideration in a complex formula. This parameter of certain capacitors is often very important in AC applications such as motor-start and/or motor-run capacitors

Rated Voltage: The rated working voltage of a capacitor. Generally expressed in DC Volts (Vdcw). This is the voltage at which a capacitor may be safely operated at 25°C continuously within its overall parameters.

Ripple Current: The total amount of alternating and direct current that may be applied to an electrolytic capacitor under stated conditions. In general, the higher the ripple current applied, the shorter the operating life of the capacitor will be. Application of significantly higher than rated ripple currents can shorten the capacitor life dramatically and may even cause catastrophic failure (explosion).

Surge Voltage: The momentary surge voltage which may be applied for a stated length of time without doing permanent damage to the unit.

Temperature: Capacitors are generally rated at 25°C at sea level under specific humidity conditions. Operating temperature ranges are also given, along with derating (reliability) curves for operation at temperatures other than 25°C.

Temperature Coefficient: Expressed as TC in ppm (parts per million) or in percent (%) from the norm of 25°C. This is seldom a straight line and may vary widely for certain types. Most capacitors have positive TC in that the capacitance increases as temperature increases. Some types, however, have negative TC in that the capacitance decreases as temperature increases.

Ceramic Capacitor Codes
(Capacitance Given In pF)

Color	Digit	Multiplier	Tolerance			Temperature Coefficient ppm°C	Significant Figure	Multiplier
			Class 1					
			10pF or less	Over 10pF	Class 2			
Black	0	1	±2.0pF	±20%	±20%	0	0.0	–1
Brown	1	10	±0.1pF	±1%		–33		–10
Red	2	100		±2%		–75	1.0	–100
Orange	3	1000		±3%		–150	1.5	–1000
Yellow	4	10000			+100% –0%	–220	2.0	–10000
Green	5		±0.5pF	±5%	±5%	–330	3.3	+1
Blue	6					–470	4.7	+10
Violet	7					–750	7.5	+100
Gray	8	0.01	±0.25pF		+80% –20%	+150 to –1500		+1000
White	9	0.1	±1.0pF	±10%	±10%	+100 to –750		+10000
Silver								
Gold								

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

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Broadband rf power from Amplifier Research. A model just right for your needs—now and tomorrow.

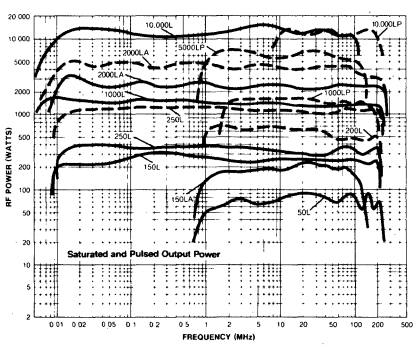
1 watt to 10,000 watts, 10 kHz to 1,000 MHz

For rfi susceptibility testing, NMR spectroscopy, plasma physics, rf heating, and general rf lab requirements, Amplifier Research offers the depth of design experience and the breadth of line to fulfill even the most unusual demands.

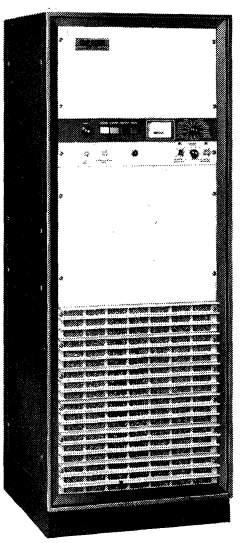
If the rf power amplifier you wish you had designed—with instantly available bandwidth, total immunity to load mismatch, pulse and blanking capability—is not already in these pages, the chances are very good that it can be designed and meticulously built for you at Amplifier Research, singly or in OEM quantities.

Series L • 50–10,000 watts, 10 kHz to 250 MHz

Solid State/Tubes—Medium Power		
Model	*RF Power (watts) cw/pulse*	*Frequency*
50L	50	1-250MHz
150L	150	10kHz-220MHz
150LA	150	1-150MHz
200L	200/400	1-200MHz
250L	250/750	10kHz-220MHz
Solid State/Tubes—High Power		
Model	*RF Power (watts) cw/pulse*	*Frequency*
1000L	1000/2500	10kHz-220MHz
1000LP	200/1000	2-220MHz
2000LA	2000/4000	10kHz-220MHz
2000LM8	2000/4000	1-220MHz
5000LP	400/5000	1-150MHz
10,000L	10,000	10kHz-100MHz
10,000LP	2000/10,000	9-180MHz

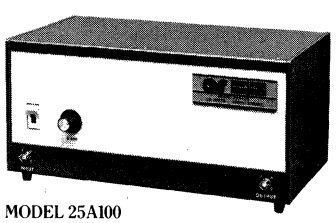


Our original, and largest series, these broadband Class A linear amplifiers are designed with modern solid-state low-power stages skillfully combined with highly reliable tube output stages to deliver moderate to very high power over four decades of bandwidth—50 to 10,000 watts over the frequency range of 10 kHz to 250 MHz.



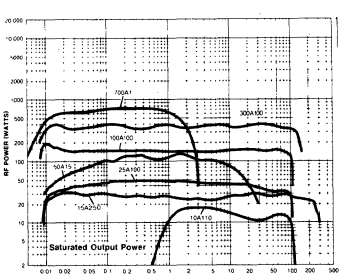
MODEL 1000L

Series A • 15–700 watts, 10 kHz to 250 MHz



MODEL 25A100

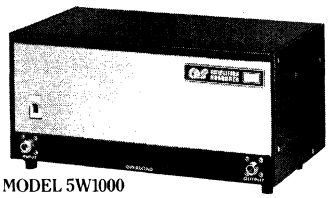
Solid State		
Model	*RF Power (watts)*	*Frequency*
15A250	15	10kHz-250MHz
25A100	25	10kHz-100MHz
100A100	100	10kHz-100MHz
300A100	300	10kHz-100MHz
50A15	50	20kHz-15MHz
700A1	700	10kHz-1MHz; 8kHz-1.5MHz at reduced gain



If it's low to moderate RF power over four decades of bandwidth that you need, turn to Series A, where standard models deliver up to 700 watts. Frequencies for these all solid state amplifiers range from 10 kHz to 250 MHz.

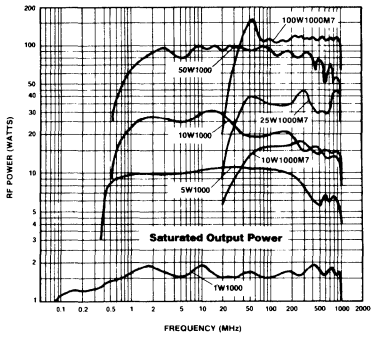
Call toll-free direct to applications engineering: 1-800-933-8181
160 School House Road, Souderton, PA 18964-9990 USA
TEL 215-723-8181 • TWX 510-661-6094 • FAX 215-723-5688

Series W • 1–100 watts, 100 kHz to 1000 MHz



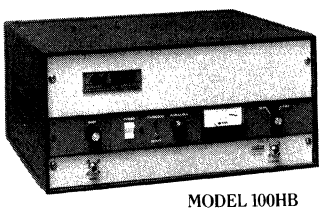
MODEL 5W1000

Solid State		
Model	*RF Power (watts)*	*Frequency*
1W1000	1	100kHz-1000MHz
5W1000	5	500kHz-1000MHz
10W1000	10	1-1000MHz
50W1000	50	1-1000MHz
10W1000M7	10	100-1000MHz
25W1000M7	25	100-1000MHz
100W1000M7	100	100-1000MHz



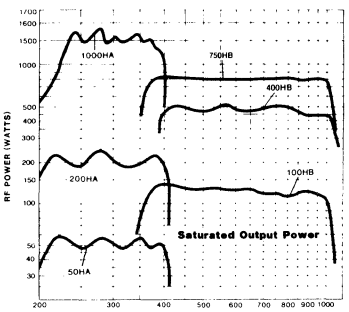
These versatile, ultra-broadband, solid-state linear amplifiers provide RF power over four decades of bandwidth from 100 kHz to 1 GHz. Our newest line, Series W includes standard models rated up to 100 watts. Special or modified units are available to provide even higher useful power.

Series H • 50–1250 watts, 220 to 1000 MHz



MODEL 100HB

Solid State		
Model	*RF Power (watts)*	*Frequency*
50HA	50 nom	220-400MHz
200HA	200 nom	220-400MHz
100HB	100 min	400-1000MHz
400HB	400 min	400-1000MHz
750HB	750 min	400-1000MHz
Solid State/Tubes		
Model	*RF Power (watts)*	*Frequency*
1000HA	1250 min	220-400MHz



Series H amplifiers are an economical solution where a narrower bandwidth will provide adequate performance. They cover the bandwidth from 220 MHz to 1000 MHz. Up to 1250 watts output power.

Accessories and Related Equipment

NEW Model 888

GATED LEVELING PREAMPLIFIER

• 10 kHz to 1 GHz • 30 dB gain control • Pedestal and blanking outputs • Front-panel rf level control, rf delay, threshold control

The remarkable new Model 888 preamplifier fulfills the needs of the most advanced rf laboratory for diverse control functions, in constant-field rf susceptibility testing, power-output control, modulation-envelope feedback, and simulation of voltage or current sources. Its blanking and pulsing control features make the Model 888 especially useful for NMR applications.

Accepts a monitor input voltage of any polarity (+, −, △) from a wide variety of sources, even including electric-field sensor systems or detected output of directional couplers. Versatile and delightful to use, the Model 888 is compatible with all Amplifier Research broadband power amplifiers, as well as with other amplifiers and rf sources within its wide bandwidth and power-handling capabilities.

AT Series antennas

Amplifier Research offers a wide range of antennas designed primarily for rf susceptibility (and emissions) testing in shielded rooms and free space.

The full line (Models AT1000, AT1100, and AT 1200 log-periodic, AT2000 Cavitenna®, AT3000 and AT3001 E-field generators, AT5000 E/H-field generator, AT4000 and AT4001 horns) covers a frequency spectrum from 10 kHz to 1000 MHz, handles input power to 3500 watts, and delivers field strengths as high as 1000 volts per meter.

NEW IEEE-488 Bus Control

New Model CP3000 provides isolated GPIB control for all AR amplifiers equipped with cabled remote-control capability. Optical isolation of all signal lines prevents power-transient and rf interference from reaching the control interface and the bus. Can fit inside the amplifier or be remote-cabled.

Directional couplers

The DC Series of high-power broadband directional couplers permits coupling of oscilloscopes, voltmeters, power meters, and spectrum analyzers to rf amplifiers and test systems, with 25 dB typical directivity. Dual-directional, they allow simultaneous monitoring of forward and reflected power—useful for amplifier leveling and load protection.

Five models cover a cw power range of 50 to 15,000 watts, at frequencies from 10 kHz to 1000 MHz.

Fiberoptic CCTV and Broadband Telemetry Links

For interference-free transmission of color or black-and-white video and broadband analog data from noisy or radioactive environments, the Scout CCTV FOL and the Sentinel and Sentry FOL data links from EOD are sold and serviced in the United States by Amplifier Research. Shielded to over 100 kV/m, both the CCTV and the data links are 100% fiberoptic coupled and battery-powered for 8-hr continuous operation.

Six decades of bandwidth up to 1.1 GHz give the Sentinel and Sentry FOL systems unsurpassed sensitivity to cw or pulsed analog data in the midst of hostile EMI or EMP conditions. All video and data systems are fitted for remote control.

Field Strength Monitor

• Isotropic response • Single E-field probe covers 10 kHz-1 GHz • Up to 4 independent probes • 1- to 300-V/m sensitivity

The new Model FM1000 Field Monitor revolutionizes EMC field measurement. Only the sensor probe(s) go in the shielded room. No need to change probes to sweep the entire rf spectrum to 1 GHz. LED display, multiple digital and analog I/O interfaces, adjustable high-field alarm—all controlled at front-panel keypad.

AMPLIFIER RESEARCH

Call toll-free direct to applications engineering: 1-800-933-8181

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ANALOG MODULES, INC.

Specialists in Analog Electronics and Electro-optics

"HIGH TECHNOLOGY MODULES AND DESIGNS"

SHORT FORM CATALOG

PRODUCT	MODEL	SPECIFICATIONS
AMPLIFIERS 310 Series are AC coupled with a low noise current input. 320 Series are AC coupled with a low noise voltage input. 340 Series are DC coupled with current input. 350 are DC coupled with voltage input including video amplifiers and splitters. 360 Series are variable gain.	110 Series 311 312A 313A 321 322A 324A 341 342A 343A 351 352A 353A 354 362	Range of bipolar transimpedance preamps, 9 to 105 MHz. Noise 1-6 pA/√Hz. 0.7″ x 0.8″ Precision, 100 Hz to 1.5 MHz. Noise down to 7 fA/√Hz. Gains to 1GV/A. GaAs FET, 200 Hz to 200 MHz. Noise down to 0.6 pA/√Hz. Gains to 1 MV/A. Bipolar, 1 KHZ to 350 MHz. Noise down to 6.5 pA/√Hz. 20 KV/A gain. Precision, 100 Hz to 4 MHz. Noise down to 5nV/√Hz. Gains to 80 dB. Bipolar, 100 Hz to 100 MHz. Noise down to 280 pV/√Hz. Gains to 60 dB. J FET, 200 Hz to 60 MHz. Noise down to 500 pV/√Hz. Gains to 60 dB. Precision, DC to 1.5 MHz. Noise down to 7 fA/√Hz. Gains to 1 GV/A. Wideband, low drift, low noise, DC to 100 MHz. Noise down to 2.5 pA/√Hz. 100KV/A Gain. Wideband, current input, DC to 300 MHz. Noise 8pA/√Hz, 20KV/A Gain. Precision, DC to 4 MHz. Noise down to 7 nV/√Hz. Gain to 80 dB. Drift 0.2 µV/°C. Wideband, low drift, low noise, DC to 100 MHz. Noise down to 7.5 nV/√Hz, 40 dB Gain. High bandwidth, low noise, DC to 350 MHz. Noise 3 nV/√Hz, 30 dB Gain. Video amplifier, wide bandwidth, DC to 20 MHz, S/N >50 dB, THD <0.3%, 0 to 20 dB gain, AC powered. Output swing to 30V pk-pk into 50 Ω. Fast programmable, variable gain amplifier, 0 to 40 dB, linear law, low crosstalk.
LOGARITHMIC AMPS 380 Series are wideband true log amps.	381 382 383	90 dB dynamic range, 12 nS to DC response, ±0.5 dB linearity. 80 dB dynamic range, 3 nS to DC response, ±0.5 dB linearity. 90 dB dynamic range, 8 nS to 100 Hz response, ±0.5 dB linearity. { Mil Versions Available }
POWER SUPPLIES from $135. AMI also builds to OEM specs for military and commercial applications.	521/2 531/2 533 562 564 566/568 576/7/8	Low-power, miniature programmable low-noise power supplies for photobiassing, etc. 300-600 V output. 12/15V or 24/28V input. Low ripple; 0.003% typical. Low power miniature modules programmable to 3 KV for biassing applications. PMT PSU, +12/16V input, 0-1.5KV output, 0.006% ripple, 0.1% reg. 6W cap. charger; 12/15V or 24/28V in; 0 to 1 KV out. 2″ x 2″ x 0.74″ PCB mount. 25W cap. charger; 12/15V or 24/28V in; 0 to 1 KV out. 5.25″ x 2.4″ x 1.3″. 75W/150W cap. charger; 18/32V in; 0 to 1.5 KV out. Military versions available. 250W-1.5KW isolated charging modules for laser power supplies. 240-340VDC in; 1.5 or 2.5KV out.
PEAK SENSE AND HOLD	610 613	Measures peak value of a single pulse down to 20 nS and stretches to DC. One or two stages with individual resets. Input gating and scaling preamplifiers available. Hybrid version of 610, pulses down to 20 nS. Hermetically sealed Mil package.
OPTICAL RECEIVERS 710 Series are transimpedance receivers with Si, Ge or In Ga As PIN diodes.	711 712A 713A	Precision, 100 Hz to 1.5 MHz. Gains to 1 GV/W. Low noise. Ga As FET, 200 Hz to 80 MHz. Noise down to 9 fW/√Hz. Gains to 7 V/µW. Bipolar 200 Hz to 300 MHz. Noise down to 0.1 pW/√Hz. Gains to 1.5V/µW.
FIBER OPTIC PRODUCTS 730/740 Series are high performance, low noise, fiber optic transmitters/receivers.	730/740 Series	AMI designs and manufactures special FO transmitters/receivers, including military applications, test equipment, and links. Experience includes high sensitivity 20 MBIT, 100 MBIT receivers; high speed bus test gear for aircraft; 100 MHz analog link and free-space communication components.
LASER RANGEFINDER RECEIVERS 750 Series is optimized for wide dynamic range.	751 752 754/5/6	Temperature compensated, APD, 10nW sensitivity @ 1.06 µm. Time programmed gain, TTL or ECL output, single supply. Military option. PIN diode receiver for eyesafe wavelengths, 50 nW sensitivity, time programmed gain. Excellent overload recovery. Military version available. Miniature hybrid version of 751/2 designed for lightweight rangefinders. PIN and APDs. A single T08 can contains a complete receiver to interface with the range counter.
LASER DIODE DRIVERS Send us your specifications 770 Series for laser diodes and biassing.	760 Series 774 775 776 778	AMI designs and manufactures various high speed, laser diode drivers for rangefinders. light sources, test equipment, military, commercial and medical applications. Ultra low noise for MCT detectors. Can be integrated with 320 Series. High speed programmable, 150 mA in 4 nS, 0 to +5V command. DC to 100 MHz. High PRF to 10 KHz, 50 amps, built-in pulse generator, positive output. 100 Amp driver with low inductance stripline construction; built-in pulse generator, pulses to 1 mS. 330 W average capability. Multi-channel versions available.
LASER ELECTRONICS 800 Series is a complete line of laser electronic modules designed for the OEM, medical, military, laboratory and industrial user. 900 Series is a line of range counters to complement 750 Series receivers.	811 821 824 827 828 851 861A 862A 882 883/883V 892 902/8	Laser energy monitor. Long and short pulse versions. Various detectors. High voltage switch modules for E-O crystals/Pockels' cells, to 3.3 KV, 70 nS risetime. Hybrid Q-switch driver, 50 nS risetime, <25 µS recovery, output to 3 KV. Pockels' Cell Driver, miniature, solid state, built-in power supply to 3.2 KV. Same as 827 with fast rise and fall time to 2 KV, adjustable pulsewidth. Parallel or series trigger modules adjustable to 20 KV, 115 VAC input. Flashlamp simmer supplies, to 1.3 KV open circuit, to 160 mA lamp current, 24/32V input. Complete lab/ind. capacitor charging system. Modular, to 3 KW, to 2500V. Complete lab/ind. laser controller with simmer shots counter, PRF and batch. Var. PFN. CW arc lamp supply up to 6 KW. Available as an OEM module or complete lab unit. 1 meter and 10 cm resolution range counters. Small size. Real time measurements available for processing.

AMI designs and manufactures amplifiers, video splitters and line drivers, power supplies, laser electronics and EO products to government and OEM specifications. Our manufacturing facility operates to Mil-I-45208A

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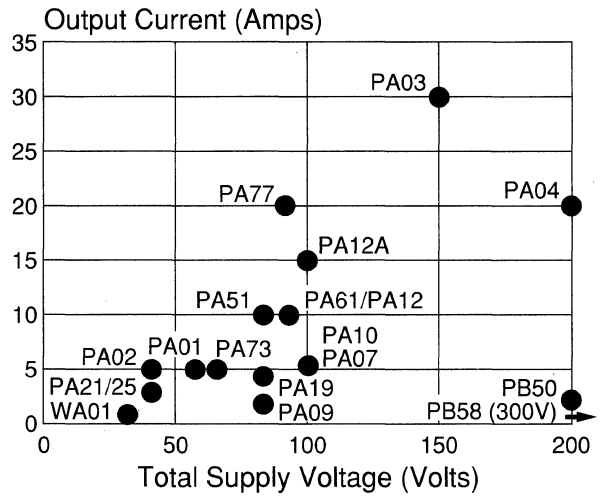
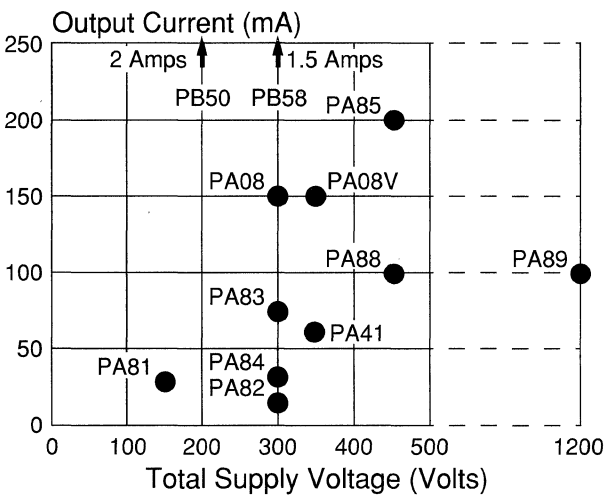
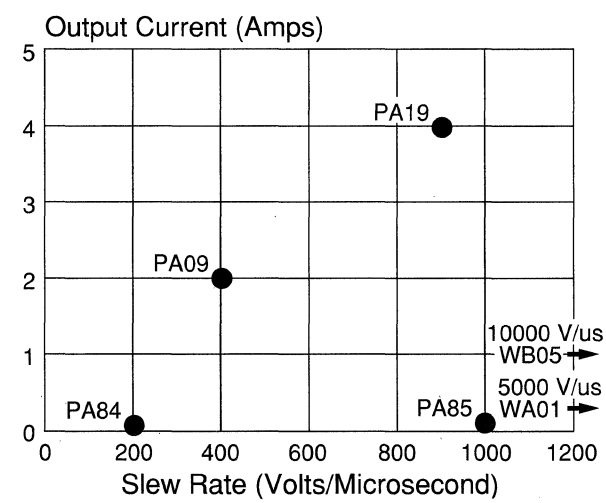
HIGH POWER MATRIX



HIGH VOLTAGE MATRIX



HIGH SPEED MATRIX



- ▲ Up to 30 Amps
- ▲ Up to 1200 Volts
- ▲ Up to 10KV/µs

The Industry's Most Comprehensive Array of High Power/Voltage/Speed Operational Amplifiers

APEX MICROTECHNOLOGY CORP. offers the industry's largest selection of high voltage, high current, and high speed operational amplifiers designed to drive resistive, inductive and capacitive loads. For optimum linearity, most output stages are biased for class A/B operation.

PRODUCT LINE

APEX's product line consists of the highest power and highest voltage integrated circuit amplifiers in the industry. The WB05 and WA01 are unmatched in their combined ability to deliver currents from 400mA to 1A with bandwidths into the 40 to 80 MHz region.

The highest power integrated circuit power amplifier available anywhere is the PA03. For applications needing higher speeds at high power, such as sonar, APEX is the pioneer of MOSFET output power amplifiers with the PA04. In lower power applications the unique power boosters PB50 and PB58 provide wide MOSFET power bandwidths with the flexibility of allowing the designer to define input characteristics with their choice of driver op amp.

APEX is the unquestioned leader in high voltage thanks to our expertise in MOSFET technology. The PA89 at 1200 volts is the highest voltage integrated circuit op amp available anywhere. Piezo drive applications have made the 450 volt PA88 popular. PA85 provides 450 volt ratings along with a 500 KHz power bandwidth. APEX's leadership in high voltage continues with the PA41, the first MONOLITHIC amplifier rated at 350 volts. PA41 is the standard for high voltage amplifiers in the under 350 volt category.

APPLICATION

These hermetic integrated circuits provide the precision associated with Op Amps and the power of discrete multi-component boosters. This improves reliability, performance and cost. Key applications include: Motor Drives, Magnetic CRT Deflection, Programmable Power Supplies, Valve Control, Pin Drivers, Compact Audio Amplifiers and Piezoelectric Drivers.

TECHNICAL SUPPORT

The APEX Applications Hotline is the quickest way to get answers about your specific circuit needs. We can assist you with product selection, design suggestions, schematic review and circuit debugging.

1772 CERTIFIED

For military applications, Apex is MIL-STD-1772 certified and parts are screened to MIL-STD-883C. Some models are available as DESC SMD parts.

TOLL-FREE TECHNICAL ASSISTANCE

In the United States & Canada call 1-800-421-1865, Monday through Thursday, 7 a.m. to 5 p.m. MST, Fridays 7 a.m. to 1 p.m. MST.

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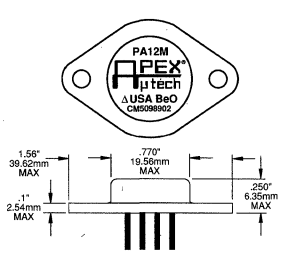
High Power Selector Guide

APEX MICROTECHNOLOGY CORPORATION • TUCSON, ARIZONA • APPLICATIONS HOTLINE (800) 421-1865

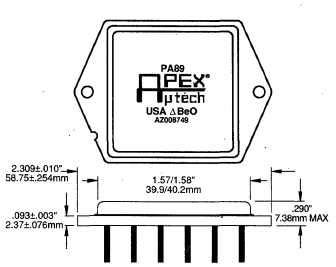
Model	Internal Power Watts Max	Output Current (Cont.) Amps., Min	±Supply Range Volts Min/Max	Saturation @I_OMax (V_S-V_O) Volts, Max	Slew Rate V/µs Typ	V_{OS} Initial mV Max	V_{OS} vs Temp µV/°C Max	Bias Current nA Max	I_q mA Max	Gain BW Product MHz Typ	Current Limit (Amps)	Thermal Shutdown	Temp Range °C Min/Max
PA03	500	30	15/75	7	8	2	30	.05	300	1	Thermal	Yes	-25/85
PA03A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA04	200	20	15/100	5.3/8.8(1)	50	10	50	.05	90	2	Ext Adj	No	-25/85
PA04A	*	*	*	*	*	5	30	.02	*	*	*	*	*
PA77	150	20	10/45	7	30	10	50	100	65	2	Ext Adj	Yes	-25/85
PA77A	*	*	*	*	*	5	30	50	*	*	*	*	*
PA12	125	10	10/45	6	4	6	65	30	50	4	Ext Adj	No	-25/85
PA12A	*	15	10/50	7	*	3	40	20	*	*	*	*	-55/125
PA12M	*	*	10/45	6	*	6	65	30	*	*	*	*	*
PA12H		1	*	4		6		30	100		*	*	-25/200
PA61(2)	97	10	10/45	7	2.8	6	65	30	10	1	Ext Adj	No	-25/85
PA61A(2)	*	*	*	6	*	3	40	20	*	*	*	*	*
PA61M(2)	*	*	*	7	*	6	65	30	*	*	*	*	-55/125
PA51(2)	97	10	10/36	8	2.6	10	65	40	10	1	Ext Adj	No	-25/85
PA51A(2)	*	*	10/40	*	*	5	40	20	*	*	*	*	*
PA51B(2)	*	*	10/36	*	*	10	65	40	*	*	*	*	-55/125
PA51C(2)	*	*	10/40	*	*	5	40	20	*	*	*	*	*
PA51M(2)	*	*	10/36	*	*	10	65	40	*	*	*	*	*
PA07	67	5	12/50	5	5	2	30	.05	30	1.3	Ext Adj	Yes	-25/85
PA07A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA07M	*	*	*	*	*	2	30	.05	*	*	*	*	-55/125
PA10	67	5	10/45	8	5	6	65	30	30	6	Ext Adj	No	-25/85
PA10A	*	*	10/50	6	*	3	40	20	*	*	*	*	-55/125
PA10M	*	*	10/45	8	*	6	65	30	*	*	*	*	*
PA73(2)	67	5	10/30	8	2.6	10	65	40	5	1	Ext Adj	No	-25/85
PA73M(2)	*	*	*	*	*	*	*	*	*	*	*	*	-55/125
PA01	67	5	10/28	10	2.6	12	65	50	50	1	Ext Adj	No	-25/85
PA02	48	5	7/19	4	20	10	50	.2	37	4.5	Ext Adj	No	-25/85
PA02A	*	*	*	*	*	3	25	.1	*	*	*	*	-55/125
PA02M	*	*	*	*	*	10	50	.2	*	*	*	*	*
PA21	36	2.5	2.5/20	3.0	1.2	10	15 typ	1000	90	.6	(3)	Yes	-25/85
PA21A	*	3.0	*	3.5	*	4	10 typ	250	*	*	(4)	*	*
PA21M	*	2.5	*	3.0	*	10	15typ	1000	*	*	(3)	*	-55/125
PA25	36	2.5	2.5/25	3.0	1.2	10	15 typ	1000	90	.6	(3)	Yes	-25/85
PA25A	*	3.0	*	3.5	*	4	10typ	25	*	*	(4)	*	*
PB50	35	2	30/100	11	100	1750	7000	—	18	2.5	Ext Adj	No	-25/85
PB58	80	1.5	15/150	11	100	1500	7000	—	12	2.5	Ext Adj	No	-25/85
PB58A	*	2.0	*	*	*	1000	*	—	*	*	*	*	*

†Specifications apply for T_C = 25°C, unless otherwise stated. *Specification is same as above.

(1) 5.3 with Boost Voltage = V_S + 5V; 8.8 without Boost Voltage (2) Class "C" output—optimized for low cost—not recommended above 1KHz



TO-3
PACKAGE



PROPRIETARY
PD-12 PACKAGE

- CANADA (416) 821-7800
- DENMARK (42) 24 48 88
- GERMANY (6152) 61081
- SPAIN (1) 4094725
- FINLAND (0) 8041-041
- FRANCE (1) 69 07 08 24
- HONG KONG 8339013
- ISRAEL (3) 9345171
- INDIA (212) 339836
- ITALY (2) 99041977
- JAPAN (3) 3244-3787
- NETHERLANDS (10) 4519533
- NORWAY (2) 50 06 50
- KOREA (2) 745-2761
- AUSTRIA (1) 505 15 220
- SWITZERLAND (56) 26 54 86
- SINGAPORE 284-8537
- SWEDEN (8) 795 9650
- TAIWAN (02) 721-9533
- UK (844) 278781
- BELGIUM/LUXEMBOURG (3) 828-3880

APEX® High Voltage Selector Guide

APEX MICROTECHNOLOGY CORPORATION • TUCSON, ARIZONA • APPLICATIONS HOTLINE (800) 421-1865

Model	±Supply Range Volts Min/Max	Output Current (Cont.) mA, Min	Saturation @I_OMax (V_S-V_O) Volts, Max	Internal Power Watts Max	Slew Rate V/µs Typ	V_{OS} Initial mV Max	V_{OS} vs Temp µV/°C Max	Bias Current nA Max	I_q mA Max	Gain BW Product MHz Typ	Current Limit (Amps)	Thermal Shutdown	Temp Range °C Min/Max
PA89	50/600	100	36	40	1.2	2	30	.05	4	2	Ext Adj	No	-25/85
PA89A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA85	15/225	200	10	35	1000	2	30	.05	25	110	Ext Adj	Yes	-25/85
PA85A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA85M	*	*	*	*	*	2	30	.05	*	*	*	*	-55/125
PA88	15/225	100	10	15	30	2	30	.05	2	10	Ext Adj	No	-25/85
PA88A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA41	50/175	60	12	12	40	30	65	.05	2	1.6	Ext Adj	No	-25/85
PA08V	15/175	150	15	17.5	30	2	30	.05	8.5	5	Ext Adj	Yes	-25/85
PA08	15/150	*	*	*	*	*	*	*	*	*	*	*	*
PA08A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA08M	*	*	*	*	*	2	30	.05	*	*	*	*	-55/125
PB58	15/150	1500	11	80	100	1500	7000	—	12	2.5	Ext Adj	No	-25/85
PB58A	*	2000	*	*	*	1000	*	—	*	*	*	*	*
PA83	15/150	75	10	17.5	30	3	25	.05	8.5	5	(.1)	Yes	-25/85
PA83A	*	*	*	*	*	1	10	.01	*	*	*	*	*
PA83M	*	*	*	*	*	3	25	.05	*	*	*	*	-55/125
PA84	15/150	40	7	17.5	200	3	25	.05	7.5	76	(.05)	Yes	-25/85
PA84A	*	*	*	*	*	1	10	.01	*	*	*	*	*
PA84M	*	*	*	*	*	3	25	.05	*	*	*	*	-55/125
PA84S	*	*	*	*	*	*	*	*	*	*	*	*	-25/85
PA82J	70/150	15	5	11.5	20	3	25	.05	8.5	5	(.025)	Yes	0/70
PB50	30/100	2000	11	35	100	1750	7000	—	18	2.5	Ext Adj	No	-25/85
PA81J	32/75	30	5	11.5	20	3	25	.05	8.5	5	(.05)	Yes	0/70

†Specifications apply for T_C = 25°C, unless otherwise stated. *Specification is same as above.

APEX® High Speed Selector Guide

APEX MICROTECHNOLOGY CORPORATION • TUCSON, ARIZONA • APPLICATIONS HOTLINE (800) 421-1865

Model	Slew Rate V/µs Typ	Output Current (Cont.) Amps., Min	±Supply Range Volts Min/Max	Saturation @I_OMax (V_S-V_O) Volts, Max	Internal Power Watts Max	V_{OS} Initial mV Max	V_{OS} vs Temp µV/°C Max	Bias Current nA Max	I_q mA Max	Gain BW Product MHz Typ	Current Limit (Amps)	Thermal Shutdown	Temp Range °C Min/Max
WA01	5000	.4	12/16	4	10.5	10	5.	20000	30	—	(.6)	No	-25/85
WA01A	*	*	*	*	*	5	25	10000	*	*	*	*	*
WB05	10000	1	5/15	6.5	15	100	500	30000	30	250	(1.5)	No	-25/85
PA85	1000	.2	15/225	10	35	2	30	.05	25	110	Ext Adj	Yes	-25/85
PA85A	*	*	*	*	*	.5	10	.01	*	*	*	*	*
PA85M	*	*	*	*	4	2	30	.05	*	*	*	*	-55/125
PA19	900	4	15/40	5	78	3	30	.2	120	100	Ext Adj	Yes	-25/85
PA19A	*	*	*	*	*	.5	10	.05	*	*	*	*	*
PA09	400	2	12/40	8	78	3	30	.1	85	150	(4.5)	Yes	-25/85
PA09A	*	*	*	*	*	.5	10	.02	*	*	*	*	*
PA09M	*	*	*	*	*	3	30	.1	*	*	*	*	-55/125

†Specifications apply for T_C = 25°C, unless otherwise stated. *Specification is same as above.

Instrumentation Amplifiers and Load Cell Electronics

3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone: (415)932-3911 FAX: (415)932-6017

CALEX

LOAD CELL and STRAIN GAGE SIGNAL CONDITIONERS

SPECIFICATION	MODEL 161MK	MODEL 165	MODEL 167	MODEL 430	MODEL 465
Gain	2-5000	10-1000	10-1000	16 to 2000mA/Volt	40-1000
Output	±10V	±10V @ 10mA	0 to 100kHz	4 to 20mA	±10V @ 5mA
Drift	±4µV/°C	±5µV/°C	±0.5µV/°C	±6µA/°C	±2µV/°C
Bridge Supply	+4 to +10V @ 100mA			+4V to +15V @ 100mA	+4 to + 15V @ 150mA
Frequence Response	10, 100 or 1000 Hz	10KHz	10KHz	5Hz	5Hz
Price	$245.00	$155.00	$175.00	$295.00	$275.00

The Models 465 and 430 operate directly from the AC Line.

INSTRUMENTATION AMPLIFIERS

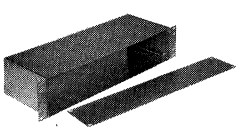
SPECIFICATION	MODEL 176J	MODEL 176K	MODEL 176L	MODEL 178
Gain	10-1000			1-1000
Input Impedance	10MΩ			1000MΩ
Drift @ 1000 Gain	±3µV/°C	±1µV/°C	±0.25µV/°C	±2µV/°C
CMRR @ 100 Gain	100dB min			
Frequency Response	10kHz			5kHz
Size	1.5" x 1.5" x 0.5"H			
Price	$69.00	$78.00	$85.00	$112.00

ALARMS/VOLTSENSORS

SPECIFICATION	MODEL 540	MODEL 545	MODEL 546	MODEL 425-252*
No. of Trip Points	1	2		1
No. of Outputs	1	3 (HI, GO, LO)		2
Trip Point Range	±14V	±10mV to ±1V	±100mV to ±10V	±14V
Trip Point Stability	±40µV/°C	±5µV/°C	±50µV/°C	±100µV/°C
Input Impedance	1M	10M		100KΩ
Output (can source or sink)	100mA			3A @ 115VAC
Size	1.4" x 0.6" x 0.5"	2" x 2" x 0.6"		3.75" x 2" x 3"
Price	$49.00	$155.00	$120.00	$280.00

*The Model 425-252 is AC Powered.

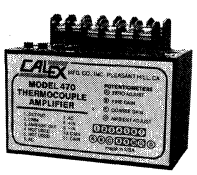
MODEL 8250 Mounting Rack/Card Cage for building small control sub-systems using CALEX control system components, power supplies and mtg. kits. Accepts all CALEX mtg kit connectors. Model 100 Proto Card plugs in to add special purpose customer functions to standard products. Card capacity is 16 on 1" centers. Iridite plated steel cage with blank front panel and hardware. Fits in 3.5" of standard 19" rack space. Price $220.00.



MODEL 4130 Power Supply. Adjustable output TRANSDUCER POWER SUPPLY. Excitation for strain gages, pressure, load and other transducers. 4 to 15VDC output at up to 150mA can be used in many applications. Regulation Line and Load 0.02%. Noise less than 0.5mVrms. AC input of 110, 115, 220 or 230. Rugged encapsulated unit has mounting bolts for NEMA box mounting. Size 2" x 3.75" x 3"H. Price $122.00

"I" SUPPLY MODEL 930 Programmable constant current source. For component, contact resistance, semiconductor, coil, motor, connector and cable testing. Used to power strain gages, slip ring instrumentation and RTDs.

Output 0.5 to 50mA (up to 500mA with special mtg kit). Voltage or resistance programmable. Can be used as a voltage to current converter (4 to 20mA). Compliance voltage 0 to 12V.
Size 1.5" x 1.5" x 0.5". Price $108.00

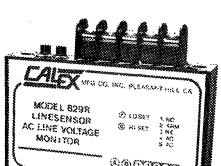


The **MODEL 470** Thermocouple amplifier is an AC line powered amplifier for use with type E, J, T or K Thermocouples. Completely encapsulated for use in rugged environments,. It has built-in cold junction compensation. Gain adjustable 175 to 650. Output ±10Volts CMRR 120dB. Zero stability 2mV/°C. Linearity better than 0.005%. Size 3.75" x 2" x 3"H.
Price $180.00

CM AC/DC Linear Power Supplies CALEX chassis mount AC/DC CM Power Supplies have a unique step down barrier strip. This protects the strip from breakage and allows screw driver connections from the top. Dual mounting modes. Molded-in threaded inserts and thru holes. Perfect for NEMA box mounting. +24VDC at 240mA plus 12 other power combinations. Typical regulation is 0.02%, noise 1mVrms. Size 4" x 2.7" x 1.4"H. Prices $84.00 to $134.00

The **MODEL 829** LINESENSOR monitors the AC line voltage for brown-outs, overvoltages or line drop-outs. Protects against bad data, memory loss, motor burn-out, etc. Relay output responds in 20 milliseconds to power drop-out or in 100 milliseconds to HI/LO excursions of line voltage. Accuracy 0.5VACrms. Size 3.8" x 1" x 3.0". Price $130.00 OEM prices available. Contact the Factory at:

800-542-3355.



CALL or SEND for our 84 PAGE INSTRUMENTATION DESIGN GUIDE AND CATALOG for detailed specifications and application information 800-542-3355.

CML MACARR

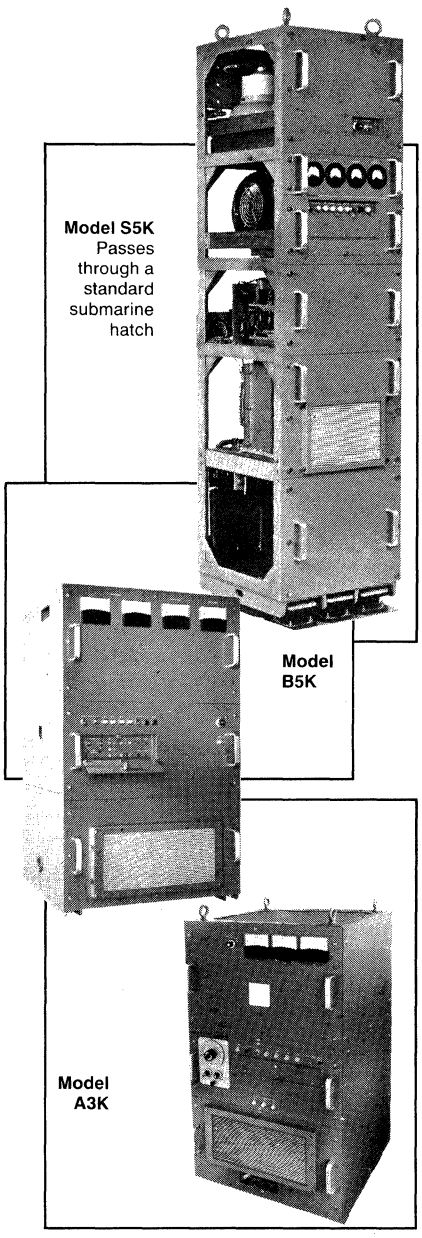
Wide Band Power Amplifiers

For Audio and Ultrasonic testing

SPG Series

FEATURES:
- Power Ratings 1KVA To 100KVA
- Full power into reactive loads.
- Low distortion
- ±0.5db frequency response.
- Ideal for CW and PULSED duty
- Selectable output taps for matching wide range of load impedances.
- Rugged construction for marine or airborne installations.

APPLICATIONS:
- Sonar Testing
- Vibration Testing
- Industrial Process Control
- High Intensity Acoustic Systems
- "S" Models Designed to fit into standard 25" diameter Submarine hatch



DESCRIPTION:

The SPG Series of Wide Band Power Amplifiers have been the standard in the industry for over 30 years. Major applications for these amplifiers include Undersea Propagation Systems, Ultra-Sonic, Sonar and Audio Testing. Power ranges vary from 1KVA to 100KVA with frequency bandwidths from 100HZ to 10KHZ on standard units and between 5HZ and 200KHZ for custom requirements. Other uses include testing sonar transducers, hydrophones, undersea telephone, and mine detection systems. 2KVA and 5KVA amplifiers have been especially designed to fit into a 25 inch submarine hatch.

CML MACARR's SPG Series also have wide application in the industrial field including vibration test machines, audio power amplifiers, and the testing of inductors and capacitors. Commercial and military versions are also offered to suit individual requirements. Our application engineers will be happy to discuss specific needs.

SPG Series-Wide Band Power Amplifiers

SPECIFICATIONS

Output Frequency: Standard full power frequency range is 100-10,000 Hz except for Model A3K which has a 200-15,000 Hz range. *Other frequency ranges* between 5 Hz and 200KHz are available on a custom basis.
Output Configuration: 2 wire floating.
Duty Cycle: Continuous duty at full rated output power. Please consult CML MACARR for pulsed or intermittent duty ratings.
Frequency Response: ±0.5 db, 100-10,000 Hz Model A3K ±0.5 db 200-15,000 Hz.
Harmonic Distortion: Less than 3%, 100-10,000 Hz; less than 1.5% mid-band.
Hum and Noise: At least 60 db below rated output tap voltage.
Output Impedance Selection: Taps are selected by link change. Front panel tap select switches are available at additional charge.
Input Service: Models rated 1KVA to 20KVA require 208/230 volts ±5%, 3 phase, 57-65 Hz. However, the Model S5K is also available with input of 440/460/480 volts, ±5%, 3 phase, 57-65 Hz—specify Model S5KM5963. Models rated at 30KVA output and higher require 440/480 volts ±5%, 3 phase, 57-65 Hz.
Signal Input Voltage: 1.0 volts RMS for rated output.
Signal Input Impedance: 600 ohms, single ended.
Keyed Operation: All models are suitable for operation with keyed input signals.
Metering: All models include complete front panel metering. In addition, models rated at 3KVA to 100KVA have recessed front panel section with test points for critical circuit parameters—to keep down-time to a minimum.
Protective Circuits: CML MACARR instantaneous overload circuitry protects both amplifier and load. Rapid front panel reset permits return to normal operation with minimum down-time.
Finish: Panels are satin blue enamel; cabinets are blue armorhide. Special colors are available on a custom basis.

Model	Output Power KVA	Load Power Factor Range At Rated KVA	Standard Output Impedance Taps OHMS	Dimensions* H x W x D (Approx.) Inches	Weight (Approx.) Lbs.	Type of Cooling
A1K	1	±0.4 to Unity	4/16/36/64/144/576	22¾ x 19 x 20½	345	Forced Air
A2K	2	±0.4 to Unity	4/16/36/64/144/576	22¾ x 19 x 17	400	
S2K	2	±0.4 to Unity	4/16/36/64/144/576	22¾ x 17 x 17	400	
A3K	3	±0.7 to Unity	4/16/36/64/144/576	22¾ x 17 x 17	400	
S5K	5	±0.4 to Unity	16/64/256	68 x 17 x 17	800	
B5K	5	±0.1 to Unity	8/32/72/128/288/1152	45 x 24 x 24	850	
A10K	10	±0.1 to Unity	16/64/144/256/576/2304	47 x 68 x 24	1,700	
A20K	20	±0.3 to Unity	16/64/144/256/576	47 x 68 x 24	2,100	
VA30K	30	±0.1 to Unity	16/64/144/256/576	72 x 72 x 36	3,000	Water Cooled
VA50K	50	±0.4 to Unity	16/64/144/256/576	72 x 72 x 36	4,200	
VA100K	100	±0.1 to Unity	16/64/144/256	2 sections, ea. 90 x 72 x 57	9,400	

*Models A1K and A3K are standard 19" rack mount units; bench adapters available on special order. All other models are furnished complete in cabinet enclosures. Model B5K includes casters. Models S2K and S5K are designed to go through a 25" standard submarine hatch.

CML MACARR
A PRODUCT LINE OF MARINE ELECTRIC RPD INC, A MARINE ELECTRIC SYSTEMS COMPANY
50 Carol St. • PO Box 1135, Clifton, NJ 07014-1135 • Tel: (201) 471-6800 • Fax (201) 471-2811

Instrumentation Amplifiers and Transducer Signal Conditioners

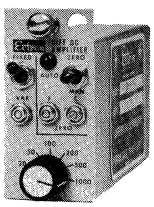
• Thermocouple/MV Calibrators • Thermocouple Signal Conditioners • Strain Gage Signal Conditioners
• Transducer Amplifiers • Computer Controlled Signal Conditioning Systems • Differential DC Amplifiers

VEHICLE TESTING

THE AUTO INDUSTRY STANDARD for on-board vehicle test, these Ectron conditioner amplifiers are small, rugged, and very stable under poor environmental conditions.

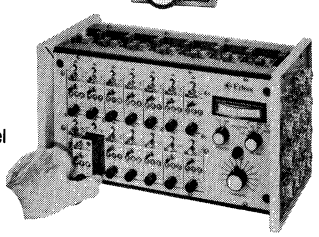
MODEL 418

- 100 g Shock, 20g Vibration
- −25 °C to +71 °C Operation
- Bridge or Thermocouple Conditioning
- 12 or 28V Power
- Isolated Diff. Amplifier
- Integral Excitation Supply



MODEL 352

- 20kHz Bandwidth
- 8 oz Weight
- RFI Protection
- Variable Excitation
- 20M Ω Input impedance
- Bridge Conditioning



4000 SERIES ENCLOSURES

Rugged 14 and 22 channel signal conditioning systems accept Model 418 or 352 amplifiers.

SEVERE ENVIRONMENT

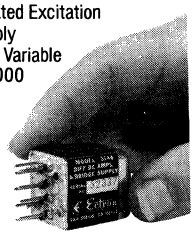
These conditioner amplifiers are for use in missile, aircraft and other severe applications.

MODEL 414

- 100g Shock
- 1″ x 2″ x 3″ Size, 8 Oz Wt.
- Bridge Excitation, Balance
- Thermocouple Conditioning
- RFI Protection
- 12 or 28V Power

MODEL 314B

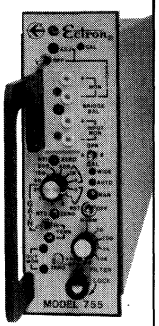
- 2500g Shock
- −25 °C to +71 °C Operation
- 1.2 Cu. In. Vol, 1.7 oz Wt.
- Isolated Excitation Supply
- Gain Variable to 1000



TRANSDUCER CONDITIONER AMPLIFIERS

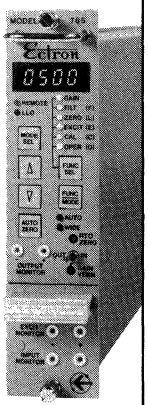
MODEL 755

- Dual Range Auto Zero
- Selectable 4 Pole Filters
- 100KHz Bandwidth
- 300V Common Mode
- Constant Voltage/ Current Excitation
- Ten Wire Input
- Ten Units per Rack



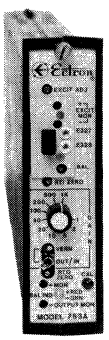
MODEL 765 PROGRAMMABLE CONDITIONER AMPLIFIER

- Manual or IEEE-488
- Gain, Filter, Excitation Zero, CAL
- 100KHz Bandwidth
- 300V Common Mode
- Constant Voltage/ Current
- Ten Wire Input/Dual Output
- DC or AC Coupling
- Ten Units per Rack



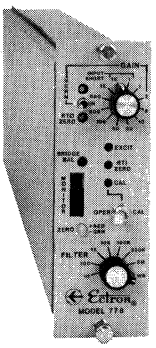
MODEL 753A

- 300V Common Mode
- 140KHz Bandwidth
- Constant Voltage/ Current Excitation
- Remote CAL
- Bridge Completion
- Ten Wire Transducer Input
- Plug-in Conditioner Assembly
- 12 Units per Rack



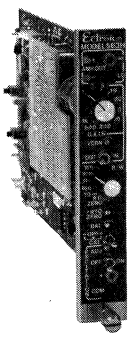
MODEL 778 WIDEBAND AMPLIFIER

- Bandwidth dc to 3MHz
- Optional Transducer Conditioning
- Selectable Gains and Filter
- 300 Volt Common Mode
- 10 Units per Rack



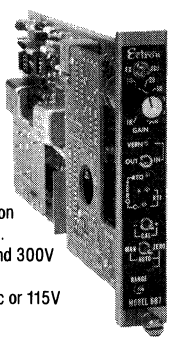
MODEL 563H

- Gains x .01 to x 2500
- Bandwidth to 200KHz
- Variable excitation
- Bridge Completion
- Selectable Filter
- Dual Outputs
- 16 Units per rack



SERIES 680

- Multifunction Amplifiers
- Auto Zero
- Strain Gage Conditioning
- Thermocouple Linearization
- Bridge Excitation and Bipolar Cal.
- 120 dB CMR and 300V CMV
- 12V dc, 28V dc or 115V ac power



THERMOCOUPLE SIMULATOR / CALIBRATOR

MODEL 1120

- 10 TC Types
- 0.005% of Reading Accuracy
- IEEE-488 or RS-232 Interface
- Key Temperature Directly in C or F
- Microprocessor Based
- DC Calibrator Mode

Calibrates any instrument that uses a thermocouple for its input:

Calibrates: Temperature Recorders, Digital Thermometers, Thermocouple Transmitters

PRECISION DIFFERENTIAL DC AMPLIFIER

MODEL 751

- 0.01% Gain Accuracy
- 140dB CM Rejection
- 300V CM Voltage
- 0.4 μV/ °C Zero Stability
- 100 KHz Bandwidth
- Selectable 3 Pole Filter
- Dual Outputs
- 12 Units per Rack

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Programmable Amplifiers and Filters for. . .

Signal Conditioning and Analysis

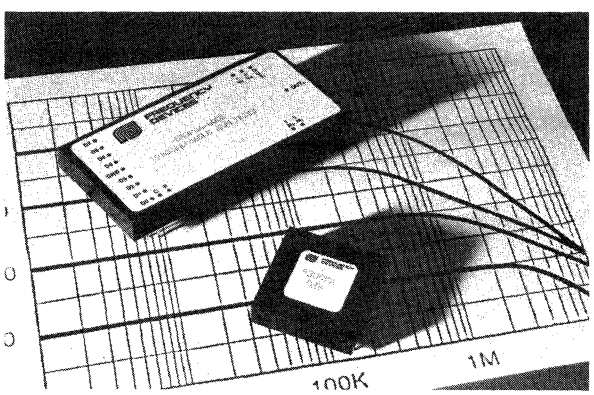
The 800 series digitally tunable signal conditioning modules fit a variety of end-user and OEM applications. These 8-bit programmable amplifiers and filters can be purchased as individual components or in a larger 64-channel, remote programmable instrument (model 9064).
Our 830PGA-60 amplifier is programmable in 2dB steps form 0dB to 60dB and our 848 series of filters offer a 256:1 tunning range and a wide choice of 8 pole transfer functions:

- Butterworth
- Elliptic
- Bessel
- Linear Phase

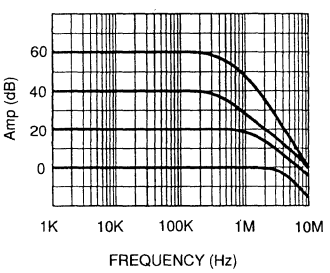
In addition, lower cost fixed gain amplifiers (630dBA series) and fixed frequency filters (680 series) are also available.

830PGA-60

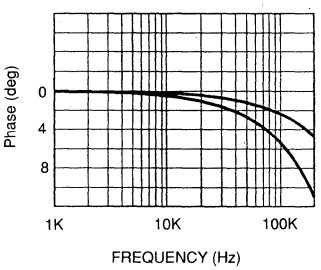
Programmable Amplifiers



Small Signal Gain Bandwith



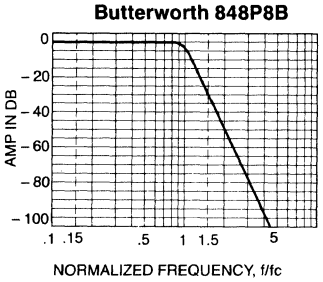
Small Signal Phase Response



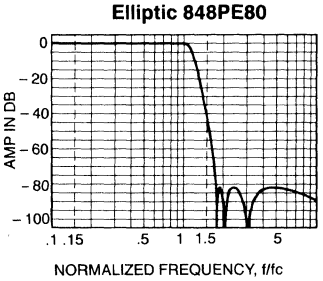
848 Series

Programmable Filters

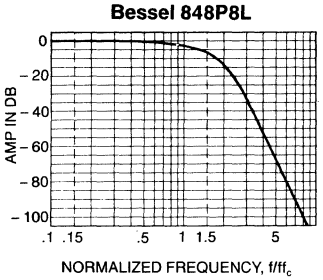
Butterworth 848P8B



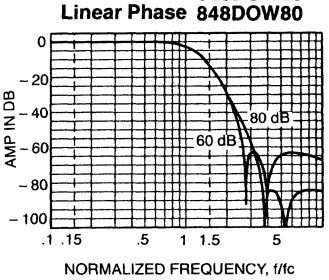
Elliptic 848PE80



Bessel 848P8L



Linear Phase 848DOW60 848DOW80



Highpass Butterworth and Elliptic Models, 878 Series are also available.

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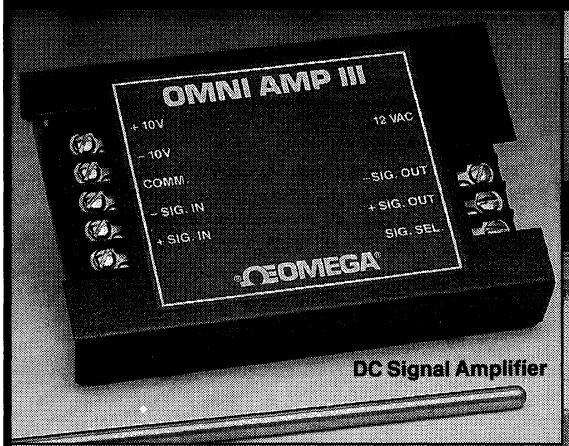
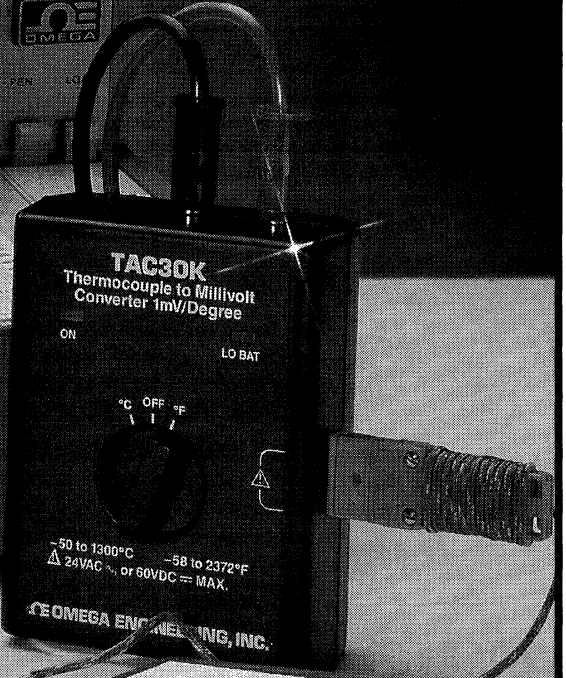
AMPLIFIERS AND SIGNAL CONDITIONERS



DC Signal Amplifier

Thermocouple-to-Analog Converter



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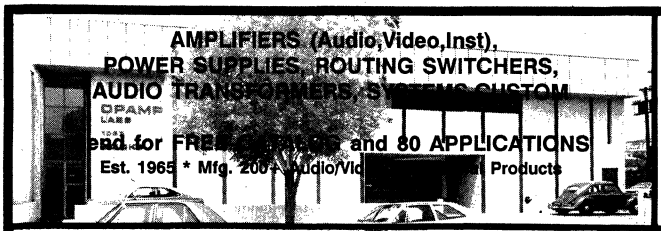

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LOS ANGELES, CA. 90038
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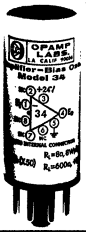
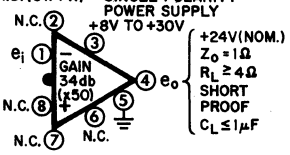
FAX(213)462-6490

MODEL 34 AMPLIFIER-BIAS OSCILLATOR



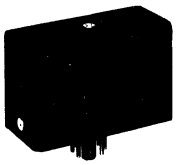
20CY TO 20KC (±1db) 0.25% T.H.D. (+18dbm)
50CY TO 10KC (±3db) 1% T.H.D. (8W PK) SINGLE POLARITY POWER SUPPLY



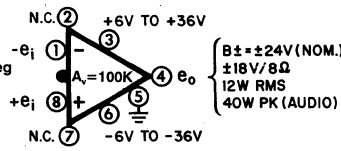
AS 100KC MAGNETIC TAPE BIAS OSC. CONNECT 10K RESISTOR FROM PIN 1 TO PIN 4
e_o = 20V/1K LOAD

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: **$30**

MODEL 423 D.C. OPERATIONAL AMPLIFIER (REPAIRABLE)



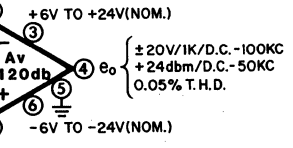
●D.C. TO 150KC ●±20mV OFFSET ●±10μV/°C DRIFT
●2μV(-115dbm) NOISE ●0.1% T.H.D.



OCTAL PLUG-IN
SIZE: 1-1/2" x 3-1/4" x 2-1/2" H. WT: 7 OZ. PRICE: **$45**

MODEL 425 D.C. OPERATIONAL AMPLIFIER

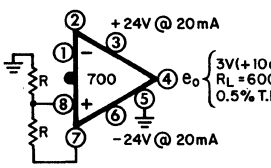
Z_i=200Meg(c.m.)
=20K(Diff)
Offset = ±20μv
I_i=20na
Drift = 1μv/°c
CM = ±20V
Noise:
1nv√HZ @1KHZ



OCTAL PLUG-IN
SIZE: 1" DIA x 1-5/8" H WT: 2 OZ PRICE: **$35**

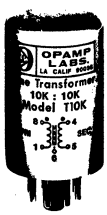
MODEL 700 AUDIO OSCILLATOR (EXTERNALLY ADJUSTABLE)

FREQ	R(±5%)	FREQ	R(±5%)
16CY	NONE	1KC	1.6K
50CY	43K	2KC	800Ω
100CY	20K	5KC	320Ω
200CY	9.1K	10KC	160Ω
440CY	3.6K	12KC	130Ω
500CY	3.2K	15KC	100Ω



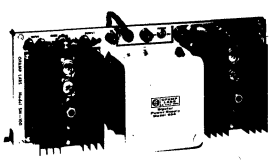
OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: **$40**

AUDIO TRANSFORMERS



MODEL	DESCRIPTION	SIZE	PRICE
T-10K	10K/10K INPUT	1-3/8"D x 2"H	$30
T-18	600Ω/600 Ω +18dbm	1"D x 2"H	$15
T-25	600Ω/600 Ω +24dbm	1-5/8" x 2"H	$25
T-26	150Ω/600 Ω +24dbm	1-5/8" x 2"H	$25
T-28	150Ω/600 Ω +24dbm	1-5/8" x 1-5/8" x 2-1/2"H	$30
T-30	150Ω/150 Ω/600 Ω +30dbm	1-5/8" x 1-5/8" x 2-1/2"H	$35
T-39	16Ω/150 Ω +39dbm	2" x 2-3/8" x 3"H	$50
422	Electronic Trans +24dbm	1"D x 2"H	$40

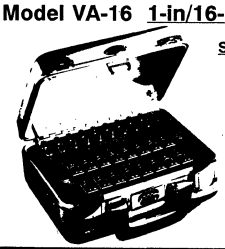
MODEL SM-100 DUAL 50W. OR MONO 100W. D.C. THRU AUDIO OPERATIONAL POWER AMPLIFIER



Description: Rack-Mounted Power Amplifier; consists of two 440 Power Amplifiers, one 536 power supply. Available in either Stereo (50W/Channel) or Mono(100W) configuration.

SIZE: 7"H x 19"W x 7"D
WT: 15 LBS PRICE: **$350 / WIRED**

Model VA-16 1-in/16-out Video/Audio Distribution System

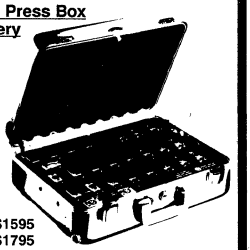


Specifications
Video: BNC Connectors
DC to 8 MHZ(-1db)
Unity gain (in-phase)

Audio: XLR-type connectors
Bal-in(10k),Bal-out(600 ohms)
30 HZ to 15 KHZ(-1db)
Output level: +18dbm
THD: 0.05%
Signal/Noise: >70db
Size: 10" x 12" x 5" Deep "Halliburton" case
WT: 8 lbs. Price: $795

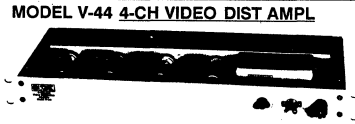
MODEL A-24/2ML 2-in/24-out(mic/line) Audio Press Box
MODEL A-24/2ML/B Internal Rechargeable Battery

Specifications
Inputs: Two balanced microphone
(switchable to line inputs at 10K ohms)
Gain controls
VU Meter
Outputs-24 seperate outputs each one:
"XLR", 1/4"Phone Jack, RCA and 3.5mm Jack
Ground floating (Does not require ground lift)
+18dbm output capability
Transformer isolated
Mic/Line switchable
50HZ to 15KHZ (-2db)
50db Channel Isolation



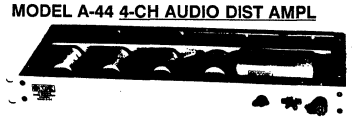
WT: 16 lbs A-24/2ML Price: $1595
Size: 13" x 18" x 6" Deep "Halliburton" Case A-24/2ML/B Price: $1795

MODEL V-44 4-CH VIDEO DIST AMPL



Specifications (per channel):
DC to 8 MHZ (±1DB)
Diff gain: 0.1%
Diff phase: 0.2 deg.
Tilt & overshoot: <1%
Hum & noise: -60 db
Isolation: >40 db @ 3.58mc
Size: 1 R.U. x 19"W x 6"D
WT: 5 lbs. Price: $400

MODEL A-44 4-CH AUDIO DIST AMPL



Specifications (per channel):
Bal(elec) input Imp: 20k ohms
Freq. Resp: 20cy to 20kc (±1db)
Gain: Unity (0dbm)/THD: 0.05%
Output Imp: 600 ohm
Output level: +24dbm
Size: 1 R.U. x 19"W x 6"D
WT: 5 lbs. Price: $440

Model V-44/RGBS/G HIGH DEFINITION RGBS SYSTEM

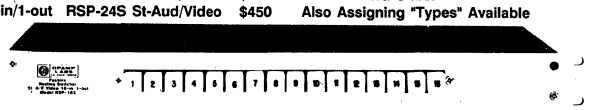
RGB
*DC to 70 MHZ
*2 v p-p
*Output Imp 75 ohm
*6db gain (gain pot)
*BNC connector
SYNC
*DC to 200 KC
*8 v p-p
*Output Imp 75 ohm
*6db gain (gain pot)

Size: 1-3/4"H x 19"W x 6"D Wt: 5 lbs Price: $700

Monitoring "Type" Routing Switchers

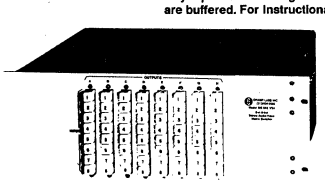
8-in/1-out	RSP-8 Mono-Aud/Video	$175
	RSP-8S St-Aud/Video	$250
12-in/1-out	RSP-12 Mono-Aud/Video	$250
	RSP-12s ST-Aud/Video	$325
16-in/1-out	RSP-16 Mono-Aud/Video	$300
	RSP-16S St-Aud/Video	$375
24-in/1-out	RSP-24S St-Aud/Video	$450

Specifications
Interlock push-buttons
Audio(RCA) follow Video(BNC)
DC to 8 MHZ
Size:1-3/4" x 19" x 6-1/2"D
Wt: 3 lbs.
Also Assigning "Types" Available



Model MS/8X8/VSA Stereo Audio / Video Matrix Switcher

Any input can be assigned to one, two, or more, or all outputs. All outputs are buffered. For Instructional, commercial, and post production



Specifications
8-in/8-out Stereo Audio / Video
Interlock push-button switches lighted
Video DC to 8 MHZ
Audio DC to 20 KHZ

Price:

MS/8X8/VSA	Video-Stereo Audio	$2950
MS/8X8/VMA	Video-Mono Audio	$2750
MS/8X8/V	Video only	$2550
MS/8X8/VSA/B	12v DC operation	$2950

Size: 7" H x 19" W x 14" D Weight: 16 lbs.

Programmable Amplifiers

A selection of amplifiers for the System 6000.

Low-level, wide band, AC

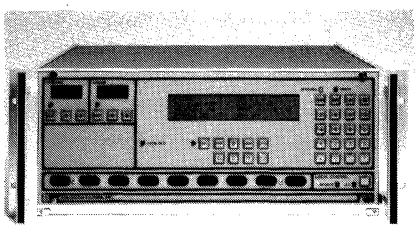
6104 quad low-noise AC differential preamplifier. – 10 to 60 dB gain. Low-noise FET input with rolloff and filter.

Low-cost, wide-band, DC

6114A quad DC post-amp. Provides additional gain after other signal conditioning modules. –9.9 to 60 dB gain.

Low-level, low frequency, DC

6124 quad DC preamplifier. for low-Z source signals. 0 to 70 dB gain. Employs low-drift, low-noise, bi-polar input stage for measuring low-level low impedance sources.



Amplifier Options

- Programmable gain
- Calibration input
- Output monitor
- Rolloff, prewhitening
- Current sources for ICP transducers
- Computer remote control via GPIB or RS-232C serial interface

Transducer Amplifier/Filters

For strain gage, potentiometric, thermocouple, RTD, and magnetic pickup tranducers.

Up to 32 channels. Precision 6310.

Sharper Performance

True anti-alias elliptic filters with 80 dB/octave or time delay filters with 39.1 dB/octave attenuation slope.

Frequencies to 204.7 kHz. 2046 cut-off settings for fine resolution. 1° phase match. 0.1 dB amplitude match. All so you can minimize sampling.

Calibration

Go/no-go test with diagnostics. Programmable source for end-to-end calibration through A/D. 10-wire bridge configuration for accurate shunt cal.

Versatile

Voltage and current excitation. Automatic bridge balance and zero suppression using votage insertion at the input amp. Easy front panel operation or use the computer interface. Thirty-two channels—all in a 7" case. You get twice the capacity.

Features

- 1, 2, and 4 arms; 2- to 10-wire
- ±10 V or ±300 V common mode
- Binary gain: 1, 2, 4, 8, 16,... 1024
- Gain mult. opt.: 0.0025 to 10.2375
- Automatic bridge balance
- Auto-gain ranging
- Zero calibration
- Programmable excitation

Gain Rangers

For acoustic signals with wide dynamic range.

Auto-ranging amplifiers. That's Precision 6201.

6201-1-AMP

Dual automatic gain ranging AC amplifier. Employs a low-noise differential input stage, band-limiting, and pre-whitening to condition wide-band, wide dynamic range signals. Up to 30 channels in a mainframe.

Record data of extremely wide dynamic range within the limits of magnetic recording tape.

6201-2-AMP

Dual programmable AC amplifier. 32 channels in the Precision 6000 mainframe.

Gain Ranger Options

- Rolloff, pre-whitening, equalization.
- Current sources for remote integrated circuit transducers (ICP)
- Overload detectors
- Calibration signal injection
- Output monitors
- System status, Mux/demux
- Calibration subsystem

- See Precision Filter/Amp systems in Section 2750.
- See other data acquisition systems in Section 2325.

PRECISION FILTERS, INC.
240 Cherry Street, Ithaca, New York 14850
607-277-3550 Fax: 607-277-4466 Telex: 646846

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

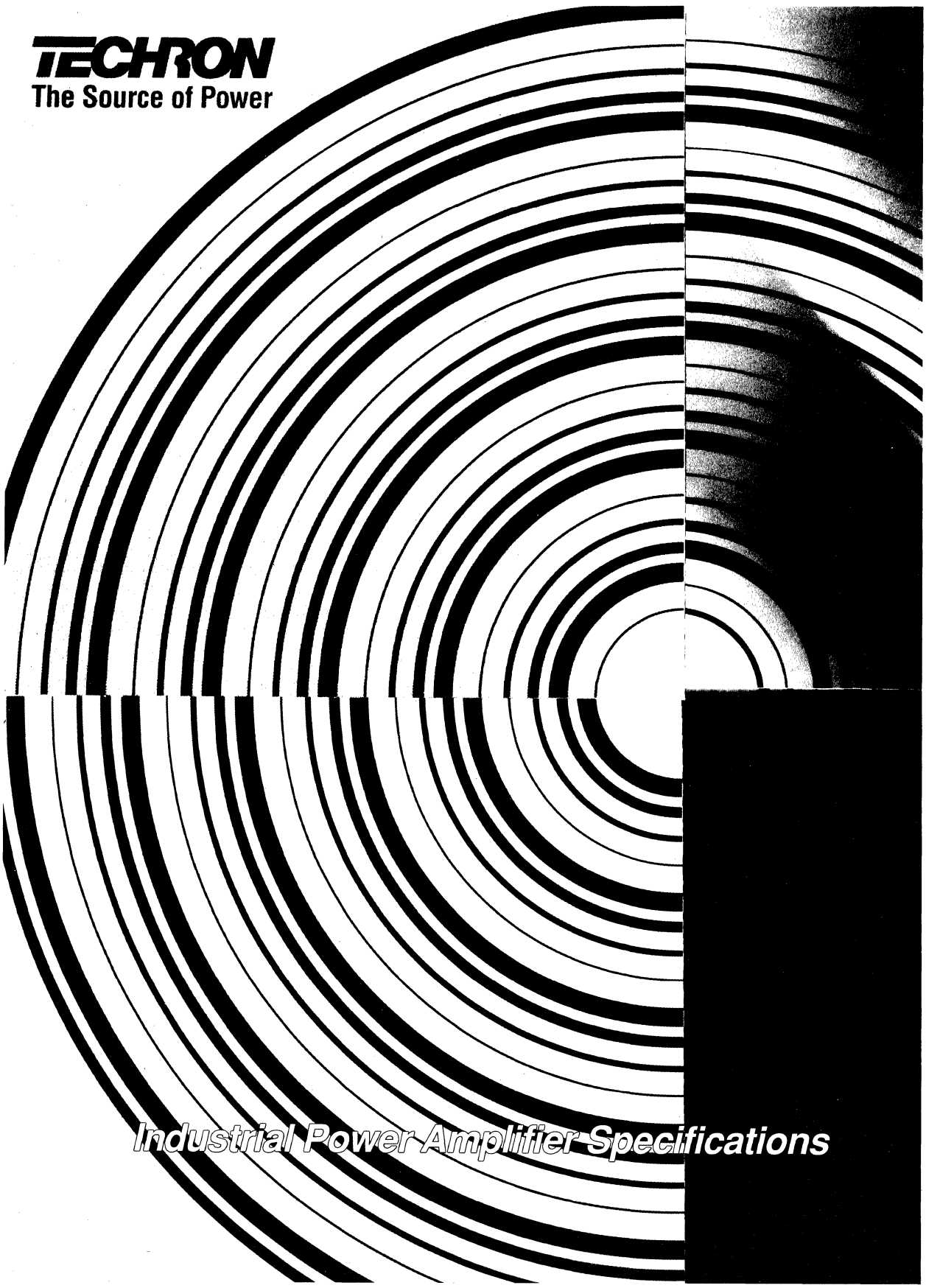
U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force


TECHRON
The Source of Power
Industrial Power Amplifier Specifications

Techron® Power Sources

Low-Noise Linear Single-Level and Bi-Level® Power Amplifiers

MODEL	OUTPUT LOAD (Ω)	MAXIMUM OUTPUT VOLTAGE (VOLTS RMS)	MAXIMUM OUTPUT CURRENT (AMPS RMS)	MAXIMUM OUTPUT POWER (WATTS RMS)	MAXIMUM OUTPUT VOLTAGE (PEAK VOLTS)	MAXIMUM OUTPUT CURRENT (PEAK AMPS)	NUMBER OF CHANNELS	OUTPUT BANDWIDTH	CV/CC (See Note)	SLEW RATE (VOLTS / μS)
7700 family	2	77.5	38.7	3000	109.5	54.8	1	DC – 40 kHz	CV / CC	40
7571	4	63.2	15.8	1000	89.4	22.4	1	DC – 20 kHz	CV / CC	32
7560	4	63.2	15.8	1000	89.4	22.4	1	DC – 20 kHz	CV	32
7550	4	37.4	9.4	350	52.9	13.2	2	DC – 20 kHz	CV, CC optional	30
7541	2	31.6	15.8	500	44.7	22.4	1	DC – 20 kHz	CV / CC	11
7540	4	32.6	8.1	265	46.0	11.5	2	DC – 20 kHz	CV, CC optional	16
7521	2	24.1	12.0	290	34.1	17.0	1	DC – 20 kHz	CV / CC	10
7520	4	23.2	5.8	135	32.9	8.2	2	DC – 20 kHz	CV, CC optional	12
5530	4	33.5	8.4	280	47.3	11.8	2	DC – 20 kHz	CV	8
5515	4	22.8	5.7	130	32.2	8.1	2	DC – 20 kHz	CV	6
5507	4	13.4	3.4	45	19.0	4.7	2	20Hz – 20kHz	CV	6

For all amplifiers:

- Harmonic distortion is less than 0.1% from 20 Hz to 20kHz.
- The amplifier output is short, mismatch, and open circuit protected in voltage mode.
- Limiting is instantaneous with no flyback pulses, thumps or cutouts.
- The phase shift between input and output from DC to 20 kHz is less than –20 degrees.
- All amplifiers have a standard voltage gain of 20.
- CC= controlled current output; CV= controlled voltage output.
- Output specifications in above chart are per channel.

TECHRON®

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OUTPUT IMPEDANCE (LESS THAN)	OPTIMUM LOAD IMPEDANCE FOR MAXIMUM POWER TRANSFER	INPUT IMPEDANCE	RESIDUAL NOISE 20 – 20kHz (LESS THAN)	AC POWER REQUIREMENTS 47–63Hz AC VOLTS (RMS)	TYPE OF COOLING	WEIGHT	DIMENSIONS	PRICE* (US DOLLARS)
0.005Ω	1.0Ω	10kΩ	0.400mV	3 phase 208, 240, 380, 415	Forced Air	128 lbs.	19" wide 18 3/8" deep 10 1/2" high	$6,999
0.005Ω	2.7Ω	25kΩ	0.690mV	100, 120 200, 220, 240	Forced Air	92 lbs.	19" wide 16 1/2" deep 8 3/4" high	$3,730
0.005Ω	2.7Ω	25kΩ	0.690mV	100, 120 200, 220, 240	Forced Air	92 lbs.	19" wide 16 1/2" deep 8 3/4" high	$3,250
0.012Ω	2.7Ω	10kΩ	0.130mV	100, 120, 200, 220, 240	Forced Air	57 lbs.	19" wide 14 3/4" deep 7" high	$2,645
0.030Ω	1.4Ω	10kΩ	0.350mV	100, 120, 200, 220, 240	Convection/ Forced Air	55 lbs.	19" wide 10 1/8" deep 7" high	$2,095
0.007Ω	2.7Ω	30kΩ	0.090mV	100, 120, 200, 220, 240	Convection F/A Optional	55 lbs.	19" wide 10 1/8" deep 7" high	$1,795
0.030Ω	1.4Ω	10kΩ	0.350mV	100, 120, 200, 220, 240	Convection/ Forced Air	28 lbs.	19" wide 10 1/8" deep 5 1/4" high	$1,695
0.015Ω	2.7Ω	30kΩ	0.069mV	100, 120, 200, 220, 240	Convection F/A Optional	25 lbs.	19" wide 10 1/8" deep 5 1/4" high	$1,395
0.015Ω	2.7Ω	25kΩ	0.080mV	100, 120, 200, 220, 240	Convection F/A Optional	45 lbs.	19" wide 9 3/4" deep 7" high	$1,345
0.015Ω	2.7Ω	25kΩ	0.082mV	100, 120, 200, 220, 240	Convection F/A Optional	24 lbs.	19" wide 8 3/4" deep 5 1/4" high	$995
0.030Ω	2.7Ω	25kΩ	0.084mV	100, 120, 200, 220, 240	Convection	10 lbs.	19" wide 8 1/2" deep 1 3/4" high	$675

Techron gives you power you can trust. Not just because we say so, but because we've been in the controlled power source business for over thirty years. And in that time, we've learned how to build the best industrial grade, high efficiency linear power amplifiers.

Our amps are ideal for applications where clean, reliable, DC to 50kHz, high-current power is required.

In fact, one of modern medicine's most important diagnostic tools, the Magnetic Resonance Imaging gradient subsystem, is powered by Techron. Our gradient amplifiers are the choice of major MRI manufacturers—because Techron's advanced engineering combines the efficiency you might expect from switchers with the clean signal of linears.

Techron amplifiers serve as the signal source for testing aerospace electronic systems, and are even used to power tables in vibration analysis systems. In addition, they can be configured as a line voltage generator system for computers or automated test equipment.

If you see the specifications you're looking for, call us. If you don't, call us anyway. Our engineers will be happy to discuss your application requirements, be they off-the-shelf or custom.

Call: (219) 294-8300
Fax: (219) 294-8329

*Prices subject to change without notice.

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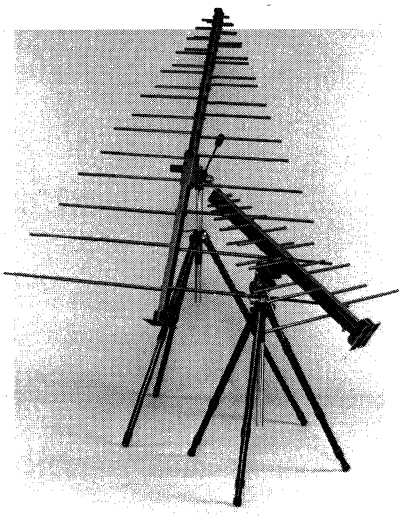
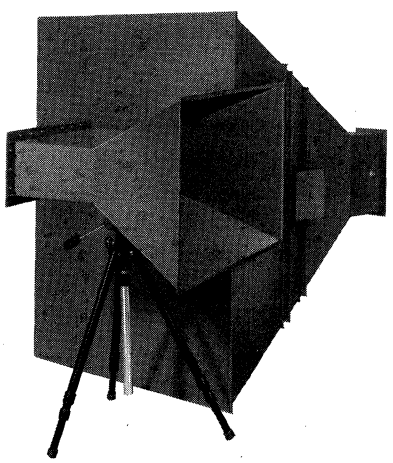
Log-periodic antennas



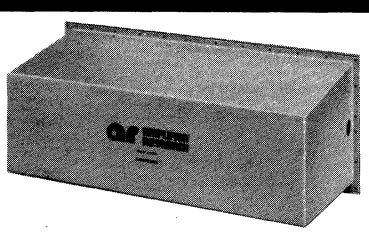
	AT1000	AT1100	AT1200
FREQUENCY RANGE	150 to 1000 MHz	100 to 1000 MHz	20–200 MHz
POWER INPUT (maximum)	2000 watts	2000 watts	3000 watts
POWER GAIN (over isotropic)	6.5 dB min, 7.5 dB avg.	6.5 dB min., 7.5 dB avg.	5.0 dB min., 6.25 dB typ.
GAIN FLATNESS	± 1.0 dB	± 1.0 dB	± 1.25 dB
IMPEDANCE	50 ohms nominal	50 ohms nominal	50 ohms nominal
VSWR	Max. 1.8:1, avg. 1.5:1	Max. 1.8:1, avg. 1.5:1	Max. 2.0:1, avg. 1.5:1
BREAMWIDTH (average)	E plane 60°, H plane 105°	E plane 60°, H plane 105°	E plane 80°, H plane 110°
FRONT TO BACK RATIO (minimum)	15 dB	15 dB	15 dB
CONNECTOR	Type C female	Type C female	Type C female
SIZE (w × h × d)	102 × 13 × 91 cm (40 × 5 × 36 in.)	160 × 13 × 173 cm (63 × 5 × 68 in.)	450 × 15.25 × 307 cm (177 × 6 × 121 in.)
WEIGHT (maximum)	7 kg (15 lb)	7.7 kg (17 lb)	23 kg (50 lb)
MOUNTING	Wall bracket included; optional tripod available.	Wall bracket included; optional tripod available.	Tripod on 90° axis

High-gain horn antennas



	AT4000	AT4001
FREQUENCY RANGE	200 to 1000 MHz	400 to 1000 MHz
POWER INPUT (maximum)	1500 watts	1000 watts
POWER GAIN	10 dB min., typically increasing to 18 dB at 1000 MHz	10 dB min., typically increasing to 15 dB at 1000 MHz
IMPEDANCE	50 ohms nominal	50 ohms nominal
VSWR	2.5:1 max., 1.5:1 avg.	2.5:1 max., 1.5:1 avg.
BEAMWIDTH (front to back)	Typical curves available on request	Typical curves available on request
CONNECTOR	Type C female	Type C female
MOUNTING	Heavy-duty tripod included. Pads with 5/8-11 thread for stand mounting vertically or horizontally	Rear flange for wall mount. Pads with 1/4-20 thread for tripod mount.
WEIGHT (approximate)	46 kg (100 lb)	9.1 kg (20 lb)
SIZE (w × h × d)	109.2 × 145.8 × 175.3 cm (43 × 57 × 69 in.)	56.4 × 79.3 × 73.7 cm (22.2 × 31.2 × 39.0 in.)

AT2000 CAVITENNA®



A top-loaded monopole radiating on ground, the Cavitenna utilizes the entire shielded room as a reverberating chamber. It mounts easily on a wall or ceiling with magnetic clamps. Only four feet wide, the Cavitenna rivals the frequency response, power-handling capability, and gain of antennas four times its size.

FREQUENCY RANGE	30-1000 MHz
INPUT POWER (cw max.)	
30–250 MHz	3500 watts
30–500 MHz	2000 watts
30–1000 MHz	1250 watts
IMPEDANCE	50 ohms nominal
CONNECTOR	Type C female
ELECTRIC FIELD INTENSITY	Curves available, calculated using AR amplifier performance data.
SIZE (w × h × d)	117 × 61 × 51 cm (46 × 24 × 20 in.)
WEIGHT (max.)	14 kg (30 lb)
MOUNTING PROVISIONS	Magnetic clamps included.

Call toll-free direct to applications engineering: 1-800-933-8181
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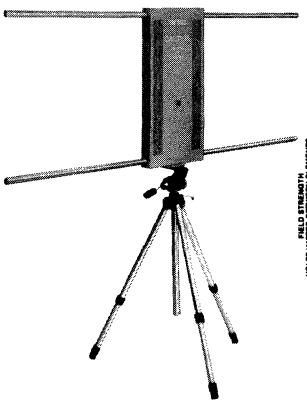
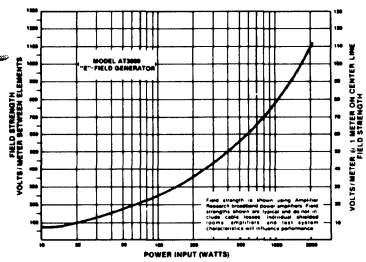
AT3000 E-field generator

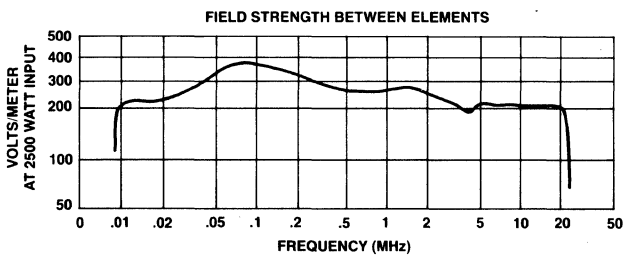




OPERATING RANGE (max.)				
	Without forced-air cooling		With forced-air cooling	
POWER (watts)	DUTY CYCLE (percent)	ON TIME (minutes)	DUTY CYCLE (percent)	ON TIME (minutes)
1000	100	continuous	100	continuous
1600	50	7	100	continuous
2000	25	3	100	continuous
3000	DO NOT USE		50	5

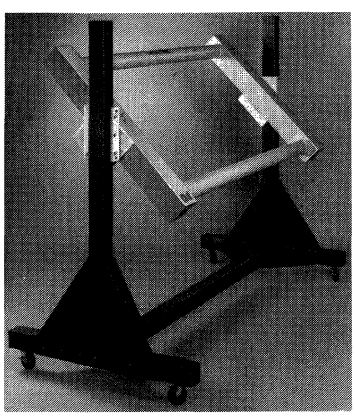
FREQUENCY RANGE	10 kHz–30 MHz
IMPEDANCE	50 ohms, VSWR 2.5:1 max.
ELECTRIC FIELD INTENSITY	Up to 1000 volts/meter, see graph.
CONNECTOR	Type C female
SIZE (w × h × d)	188 × 72 × 7 cm (74 × 28 × 2.5 in.)
WEIGHT (max.)	16 kg (35 lb)
MOUNTING	Optional tripod available.

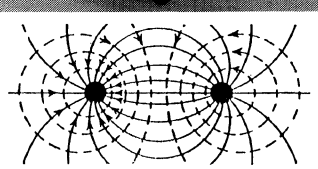
AT3001 E-field generator



POWER INPUT, CW max.	3000 watts
FREQUENCY RANGE	10 KHz–20 MHz
IMPEDANCE	50 ohms, VSWR 2.5:1 max, 1.5:1 avg.
ELECTRIC FIELD INTENSITY (at 2500-watt input)	200 volts/meter min. between elements
RF INPUT CONNECTOR	Type C female
COOLING	Natural convection to 40°C ambient
WEIGHT, approximate	113 kg (250 lb)
SIZE (w × h × d)	102 × 222 × 304 cm (40 × 87.5 × 119.5 in.)

NEW AT5000 E/H-field generator





Simulates free space

• Over 500 volts per meter over 10 kHz to 100 MHz bandwidth with 2500-watt input power.

A 2.4 × 1-meter open area between parallel conductors permits testing of large assemblies such as computers inside a shielded room, under 377-ohm impedance conditions usually associated only with free space. Simultaneous electric field (solid lines in diagram) and magnetic field (dashed lines) are propagated orthogonally.

POWER INPUT, CW	3000 watts maximum
FREQUENCY RANGE	10 kHz–100 MHz
INPUT IMPEDANCE	50 ohms
VSWR	2.0:1 max. 10kHz–100 MHz 6:1 max. 10–20 kHz above 1kW input power
ELECTRIC FIELD INTENSITY	100 V/m (at one meter) @ 2500 watts input 500 V/m center @ 2500 watts input
RF INPUT CONNECTOR	Type C female
COOLING	Natural convection to 40°C ambient temperature
WEIGHT	95 kg (210 lb)
SIZE (w × h × d)	2.65 × 2.4 × 1.2 m (105 × 96 × 49 inches)

Ultra-broadband field monitor system

- **Single isotropic probe covers five decades (10 kHz to 1 GHz)**
- **1– to 300–V/m sensitivity**
- **Up to four independent inputs**

The first electric-field monitoring system that covers the entire rf spectrum to 1 GHz without bandbreaks or pauses for changing sensors. Compact, advanced two-component system—sensor probe/transceiver inside the shielded room, master control outside.

Model FM1000 provides two digital (IEEE-488 and RS-232) outputs, two switch-selectable 0–4 Vdc analog outputs, high-field and power-loss alarm, LED display—all controlled at front panel.

Model FP1000 isotropic sensor probe communicates with control panel through 2-way fiberoptic cable. Up to four 10-kHz-to-1-GHz probes may feed field level information to the monitor from various points in the shielded room. Operator enjoys complete flexibility in choice of signal input for automated EMC testing.

AMPLIFIER RESEARCH

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ANTENNAS Over 200 Models

Japan Electronic Manufacturers Agency represents major Asian and European manufacturers of micro, portable, mobile and stationary antennas and mounts for AM, FM and HF and satellite product applications.

Rubber Duck Portable Cellular Antenna

MP425
4 Section Hand Hold
Cellular Antenna
- 824 – 896 MHz, 890 – 960 MHz
- VSWR less than 1.7:1
- 2.5DB gain
- Black TNC Connector

MP423
¼ Wave Mould
Cellular Antenna
- 824 – 896, 890 – 960 MHz
- 2,5DB gain
- VSWR less than 1.9:1
- TNC Connector

MP430
Adjust 90° Angle
Knuckle Swivel Antenna
- 824 896 MHz
- Black TNC connector
- VSWR less than 1.9:1
- 3DB gain
- Length 200mm

Portable Rubber Duck Cellular Antenna

MP441
Buttom Antenna
TNC Connector
SWR 2:1

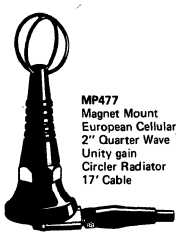
MP439
Buttom Cellula Antenna
Male SMA
SWR 2:1

2 Ways Portable VHF/UHF Communication Antennas

MP411
2 Ways Radio Antenna
Max. Power 50 Watt
VHF 140 – 174 MHz
UHF 406 – 512 MHz
¼ Wave, Moulded
VSWR less than 1.5:1
Length: Approx. 4 inchs.
BNC Connector

European Style Cellular Antenna

MP489
Trunk and roof mount, ¼ wave,
3-¾ detachable mast, 16' cable,
TNC screw-in connector

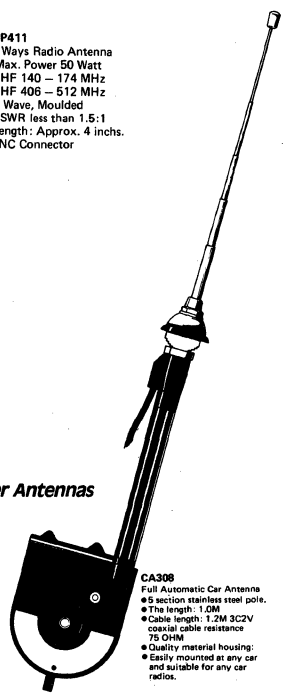


MP477
Magnet Mount
European Cellular Antenna
2" Quarter Wave
Unity gain
Circler Radiator
17' Cable

Glass Mount Cellular Antenna

MP466
Glass Mount
Cellular Antenna
5DB Gain
15' Rg 58U Cable with
TNC Connector

Automatic Car Power Antennas



CA308
Full Automatic Car Antenna
- 5 section stainless steel pole.
- The length: 1.0M
- Cable length: 1.2M 3C2V coaxial cable resistance 75 OHM
- Quality material housing:
- Easily mounted at any car and suitable for any car radios.

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JEMA

JAPAN ELECTRONIC MANUFACTURERS AGENCY, INC.

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ANTENNAS Custom Design Capability

Universal Deluxe Top Mount Antennas

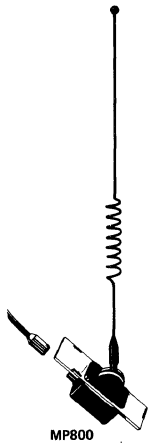
Call for Additional and New Product Information

MA353
Large head
Plastic tube
4 Section
Ext.: 39"
Cable: 48"

Citizens Band Antennas

CB30
Magnetic mount
Rubber coated
Ext.: 14½"
RG58U
Cable: 144"

Cellular Phone Antennas

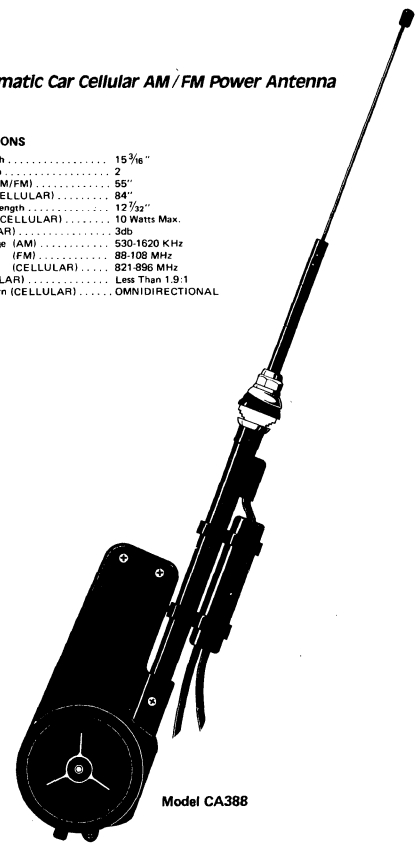


MP800
Thru glass cellular
antenna
Cable: 160"

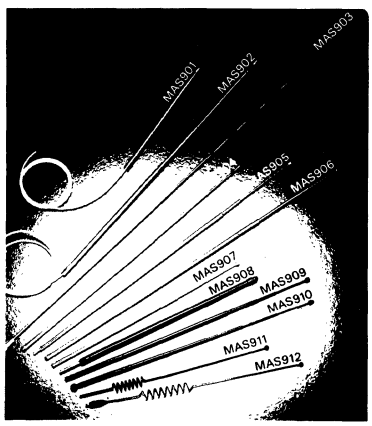
Fully Automatic Car Cellular AM/FM Power Antenna

SPECIFICATIONS

Extended Length	15 3/16"
Antenna Section	2
Cable Length (AM/FM)	55"
(CELLULAR)	84"
Under Fender Length	12 3/32"
Antenna Input (CELLULAR)	10 Watts Max.
Gain (CELLULAR)	3db
Frequency Range (AM)	530-1620 KHz
(FM)	88-108 MHz
(CELLULAR)	821-896 MHz
VSWR (CELLULAR)	Less Than 1.9:1
Radiation Pattern (CELLULAR)	OMNIDIRECTIONAL

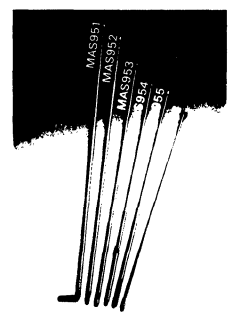


Model CA388



ANTENNA MAST

MAS901	1m 5 section stainless steel with wire
MAS902	1m 5 section stainless steel with gear wire
MAS903	CB antenna wire stainless steel
MAS904	4 section 1m stainless steel
MAS905	3 section 1m stainless steel
MAS906	3 section 1.2m stainless steel
MAS907	4 section 0.8m brass
MAS908	Flexible rubber mast
MAS909	5 section 1m black stainless steel
MAS910	7 section black brass
MAS911	Cellular phone antenna mast
MAS912	Cellular phone antenna mast



MAS951	6 section radio brass antenna collapsed 9½ inch. Ext. 38 inch.
MAS952	5 section brass antenna collapsed 9½ inch. Ext. 40 inch.
MAS953	6 section TV barss antenna collapsed 6½ inch. Ext. 30 inch.
MAS954	6 section TV brass antenna collapsed 5 inch. Ext. 28 inch.
MAS955	5 section TV & radio antenna collapsed 8 inch. Ext. 34 inch.
MAS956	6 section TV brass antenna collapsed 6 inch. Ext. 32 inch.

Rely On Our Over 30 Years Experience!

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JEMA

JAPAN ELECTRONIC MANUFACTURERS AGENCY, INC.

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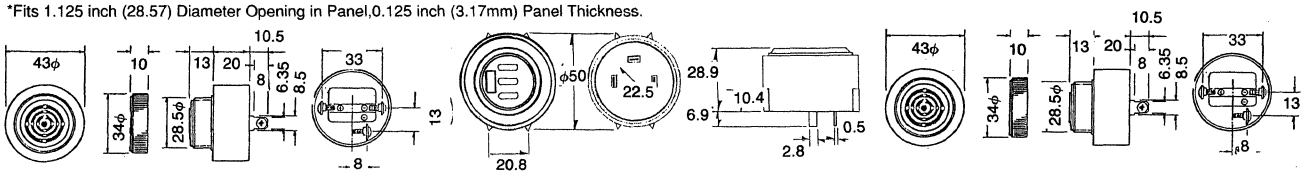
ACCUTECH BENCHMARK SERVICES INC.

AUDIO ALARMS, SIRENS, SPEAKERS, PIEZOS, BUZZERS, AND TRANSDUCERS

ITEM	SPECIFICATION		
1) Model Number	SEP-6613AN	SEP-5500	SEP-6655S
2) Operating Voltge	30 to 120V AC/DC Non-Polar	5 to 13 VDC	6 to 28 VDC
3) Operating Frequency	2900 ± 500Hz	2.6 k Hz ± 0.5 k Hz	2900 ± 500Hz
4) S.P.L. @ 60cm	70 to 85 dB Minimum	85 dB @ 3 M (@ 12 VDC)	70 to 85 dB Minimum
5) Current (Maximum)	4 to 18 mA	70 mA Maximum	4 to 18 mA
6) Type	Internal Drive Circuit	Continuous/Pulsating	Internal Drive Circuit
7) Operating Temp.	-20 to +60°C	-21 to +60°C	-20 to 60°C
8) Storage Temp.	-30 to +70°C	-30 to +70°C	-30 to +70°C
9) Weight	40 g	40 g	38 g
10) Tone	Slow Pulse		Continuous & Fast Pulse
11) Mounting	Panel Mount/Tab Connectors		Screw Type Terminals

*Fits 1.125 inch (28.57) Diameter Opening in Panel,0.125 inch (3.17mm) Panel Thickness.

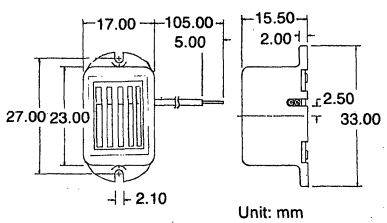


ITEM	SPECIFICATION					
1) Model Number	SEM-3603	SEM-3606	SEM-3612	SEM-3624	SEM-8606	SEM-8612
2) Rated Voltage	3 V DC	6 V DC	12 V DC	24 V DC	6 V DC	12 V DC
3) Voltage Ramge	1.5-4 V	4-8 V	8-16V	20-28 V	4-8 V	8-16 V
4) Current (Max)	17 mA	25 mA	25 mA	20 mA	20 mA	22 mA
5) S.P.L. @ 30 cm	85 dB MIN.				75 dB MIN.	
6) Resonant Freq.	400 Hz ± 100 Hz					
7) Output Tone	CONTINUOUS					
8) Operating Temp.	-20° TO +60°C					
9) Storage Te,mp.	-30° TO +70°C					
10) Weight	10 g				8.5 g	

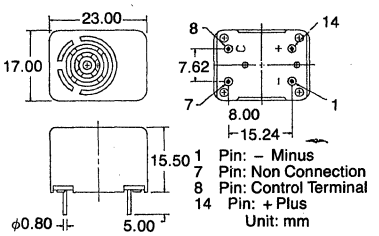
FEATURES

1. An extensive variety of AC/DC, self contained, and externally driven devices are available.
2. Piezo elements are available with or without wire leads.
3. Small dynamic speakers are available in six different impedance values, some are PCB mountable.
4. Request by catalog containing our entire audio line, by mail, phone, or by fax.

SEM-3600 Series

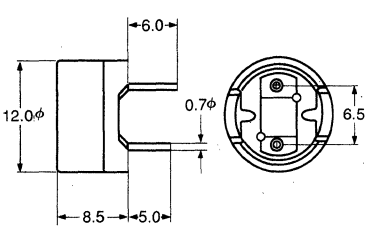


SEM-8606/8612

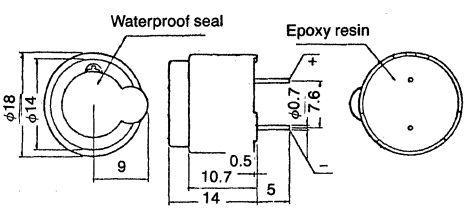


ITEM	SPECIFICATION						
1) Model Number	SEM-1201	SEM-1203	SEM-1206	SEM-1209	SEM-1601	SEM-1606	SEM-1612
2) Rated Voltage	1.5 Vpp	3 Vpp	6 Vpp	9 Vpp	1.5 Vpp	6 Vpp	12 Vpp
3) Voltage Range	1-2V	2-5V	5-8V	7-12V	1-3V	3-8V	6-18V
4) Current (Max)	10 mA	15 mA	27 mA	35 mA	7 mA	25 mA	
5) S.P.L. @ 10cm	85 dB MIN.				86 dB MIN.		
6) Resonant Freq.	2048 Hz ± 500 Hz						
7) Resistance (Ohms)	40	60	80	90	40	68	145
8) Operating Temp.	-20° TO +60°C				-20° TO +75°C		
9) Storage Temp.	-30°C TO +70°C				-30°C TO +85°C		
10) Weight	2 g				5 g		

SEM-1200 Series



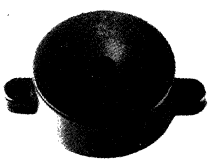
SEM-1600 Series



20C9
75dB min./m/12V
2.5 +0.5kHz
3.0-15VDC
-20°C - +70°C
22.8+0.3
17.8+0.3
12.0+0.3
1.0+0.1
5.5 gr

27225
80dB min. 1 Vrms Sine
Wave 2.5kHz 10cm
30,000pF ±30%
30Vp-p
-20°C - +70°C
-30°C-+80°C

35D1
100dB min./9V/100cm
Dual Tone
7.5-15VDC
-20°C - +70°C
15 gr



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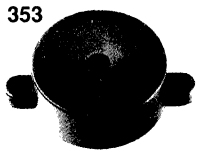
PIEZO ALARMS

353



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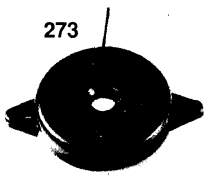
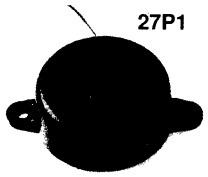


20335

20C5

27P1

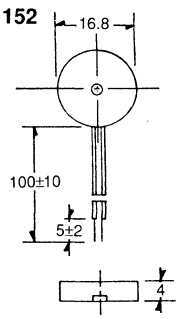


ITEM #	RESONANT FREQUENCY (Hz)	DIMENSION Dϕ X h (mm)	DRIVE CIRCUIT			LEAD WIRE OR PIN PITCH
			INTERN	EXTERN	FEEDBK	
SEP-1110	4100 ± 500	24 X 5		X		Lead Wire
SEP-1117	2500 ± 500	30 X 9.5		X		Lead Wire
SEP-1126	2800 ± 500	30 X 5.2		X		Lead Wire
SEP-1140	1100 ± 500	35 X 10.3		X		Lead Wire
SEP-1142	750 ± 500	52 X 14		X		Lead Wire
FH-152	4096 ± 500	16.8 X 4		X		Lead Wire
FH-20225	4000 ± 500	24 X 5.5		X		Lead Wire
FH-352	2800 ± 500	47 X 16		X		Lead Wire
SEP-1112	4000 ± 500	24 X 7.5		X		10 mm
SEP-1116	2000 ± 500	30 X 10		X		15.24 mm
SEP-1152	5000 ± 500	16.5 X 7		X		11 mm
SEP-1162	4000 ± 500	14 X 6.8		X		7.6 mm
FH-15240	4096 ± 500	17 X 7		X		10 mm
FH-20338	3800 ± 500	24 X 5.5			X	Lead Wire
FH-27328	2500 ± 500	30 X 10			X	Lead Wire
SEP-1173	3600 ± 500	32 X 13.7			X	Lead Wire
SEP-1136	2800 ± 500	42 X 14			X	Lead Wire
SEP-1172	3600 ± 500	32 X 16			X	9 & 7
FH-20335	3000 ± 500	23.4 X 11			X	(Perimeter)
FH-27325	2500 ± 500	30 X 10			X	(Perimeter)
FH-27336	3500 ± 500	30 X 10			X	(Perimeter)
FH-35C2	2800 ± 500	42 X 16	X			Lead Wire
SEP-2260A	3500 ± 500	32 X 13	X			Lead Wire
SEP-3350A	2700 ± 500	42 X 16	X			Lead Wire
FH-35D1	Chime Tone	42 X 16	X			Lead Wire
FH-35P2	Pulsating	42 X 16	X			Lead Wire
SEP-2200A	3000 ± 500	24 X 14.5	X			Lead Wire
SEP-2202A	3000 ± 500	24 X 16	X			15 mm
SEP-2222A	3400 ± 500	23.5 X 10.5	X			15 mm
SEP-2242	4100 ± 500	13.8 X 7.5	X			7.6 mm
SEP-2276A	2500 ± 500	30 X 14.5	X			17.5 mm
FH-20C5	3000 ± 500	24 X 9.5	X			15 mm
FH-27P1	Pulsating	30 X 15	X			15 mm

27210

20C3

152



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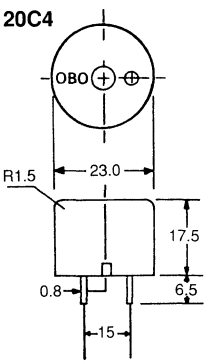

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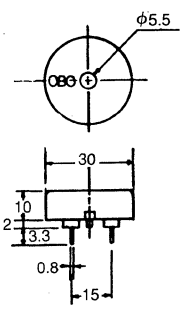
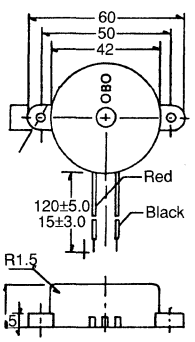
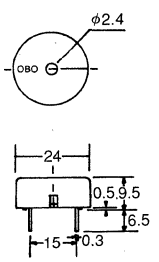


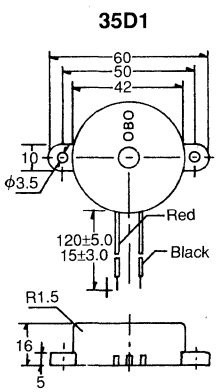
35C2



20C5



35D1



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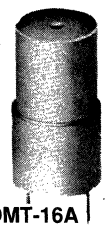
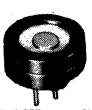
ABS markets a complete line of audio transducer products to include: Piezo products with internal drive circuits as well as those requiring external drive signals, Electromechanical Buzzers, Electromagnetic Transducers with and without internal drive circuits, small Dynamic Speakers, and Sirens. Contact ABS to receive a catalog containing over 200 devices, a must for your product library.

ITEM #	RESONANT FREQUENCY (Hz)	DIMENSION DϕX h (mm)	DRIVE CIRCUIT		SPL (dB) MIN. @ RATED V	LEAD WIRE OR PIN PITCH
			INTERN	EXTERN		
SEP-5500	2600 ± 500	50 X 29	X		95	Trigger Tab
SEP-6600 Series	2900 ± 500	43 X 43	X		91	Panel Mount
SEP-7750 Series	3600 + 500	31.7 X 23.5	X		91	
SEP-8000 Series	1.5k - 3.5k	(Varies)	X		100	Siren Unit
FH-35T Series	(Varies)	(Varies)		X	75	Phone Ringer
ELECTROMAGNETIC TRANSDUCERS						
SEM-1200 Series	2048	12 X 8.5		X	80	6.5 mm /LW
DBT-113	2048	12 X 13		X	80	6.5
DBT-112 Series	2048	12 X 7.8		X	75	6.5
DMT-1200 Series	2200	12 X 9.5		X	80	6.5 (Sealed)
DMT-1200S Series	2300	12 X 9.5			80	6.5 (Sealed)
ABS-1600 Series	2048	16 X 14	X	X	85	7.6 (Sealed)
DMT-1600S Series	2200	16 X 14	X		85	7.6 (Sealed)
DMT-1600A Series	1.8k-2.5k	16 X 22.7		X	85	7.6 (Sealed)
MECHANICAL BUZZERS						
SEM-8600 Series	4 - 16 V	23 X 17 X 15	X		75	Trigger Pin
SEM-3600 Series	1.5 - 28 V	27 X 17 X 15	X		85	Lead Wire
SEM-6600 Series	2 - 30 V	39 X 26 X 16	X		85	Lead Wire
DMS Series	5 - 54 V	44 X 22	X		85	Trigger Pin
DM-04 Series	1.5 - 54 V	42 X 28 X 18	X		80	Lead Wire
SPEAKERS						
	IMPEDANCE		FREQ. BAND			
SDS Series	8, 16, 32	29 X 9.5	700 - 3500 Hz		80	(Speakers)
SDS Series	45, 64, 100	29 X 9.5	700 - 3000 Hz		80	(Speakers)
SMX-2508	8	23 X 8.7	500 - 4000 Hz		75	10 mm (PCB)
SMX-3008 & 30100	8, 100	30 X 13	500 - 4000 Hz		83	15 mm (PCB)
FH-50210 & 50220	HIGH Z	50 X 2	500-20,000 Hz		70	Lead Wire

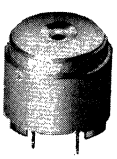


DMT-16A

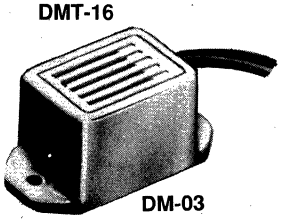
DMT-11



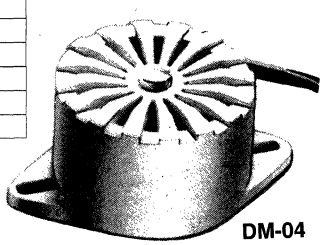
DMT-11-B



DMT-16

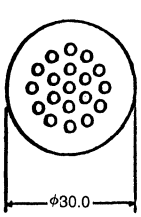


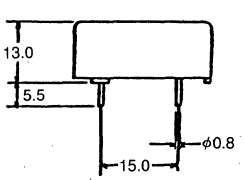
DM-03



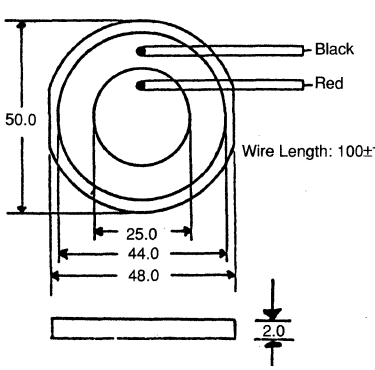
DM-04

SMX-3008





SEB-50D10R



SDS-29

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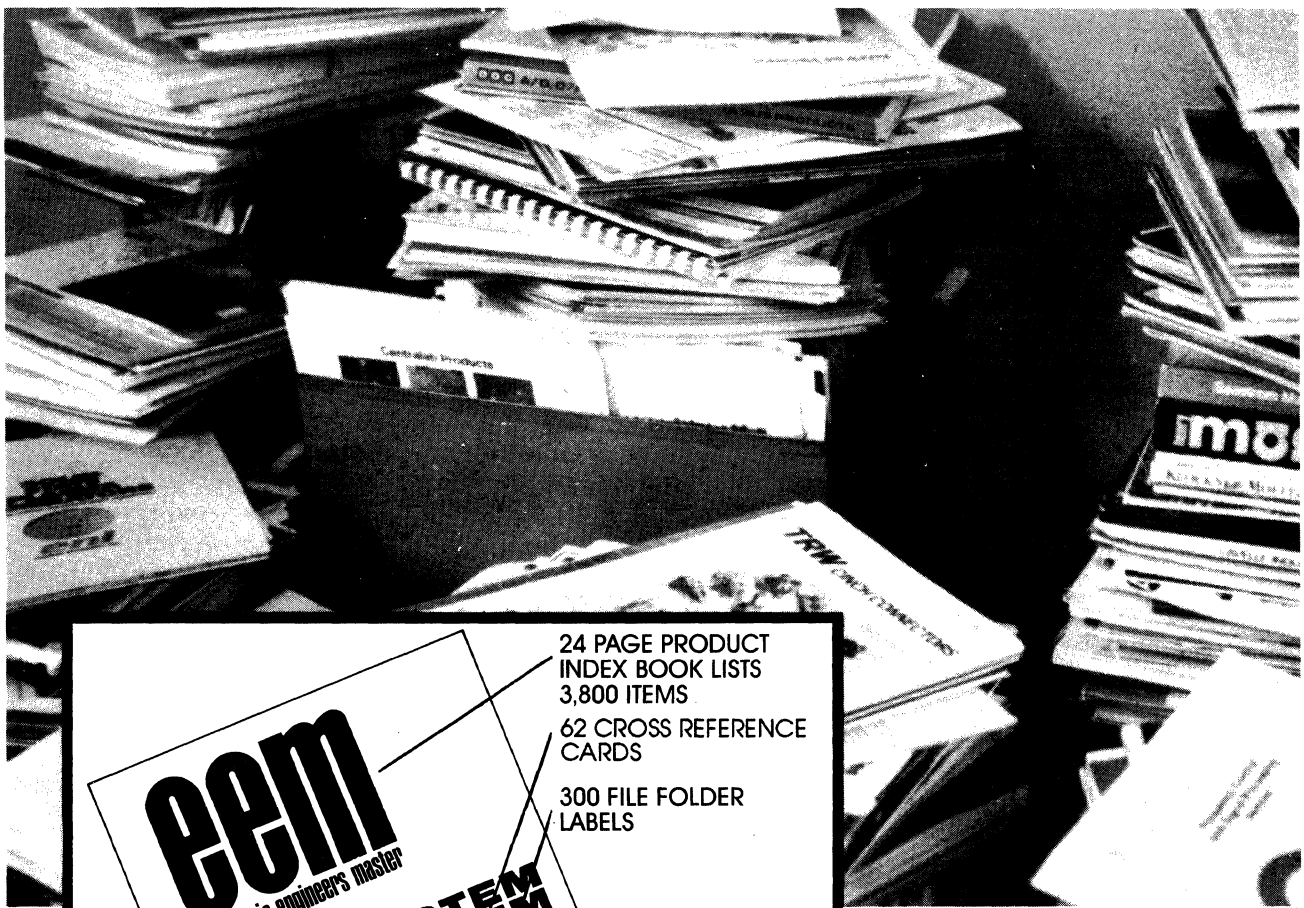

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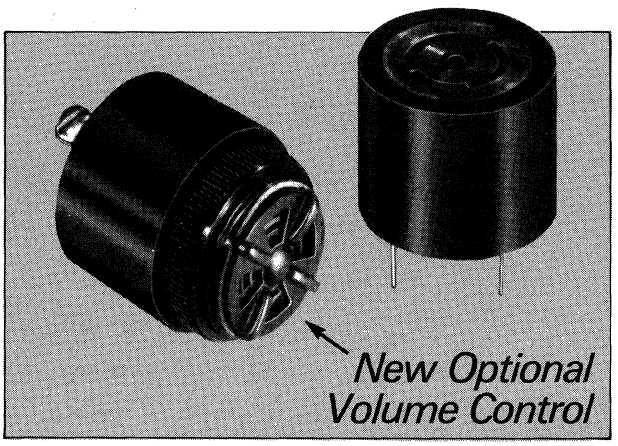

PIEZO ALARMS

from Floyd Bell Inc.

Now, built-in shutter-type volume control lets your customer adjust the sound level to suit his needs. This simple manual shutter provides variable attenuation up to 20 dBa typical.

Optional rotary shutter for volume control is available for all models with case style 07, 09 and 19. When ordering add "V" to case style number. Example: MC-V09-301-Q.

CONTINUOUS TONE

CASE STYLE	MODEL NUMBER	OPERATING VOLTAGE VDC *VAC	TYPICAL SOUND PRESSURE dBa AT 2 FEET At min. V	At max. V	TYPICAL OPERATING CURRENT (mA) At min. V	At max. V	Terminations
EXTRA LOUD CONTINUOUS TONE—FREQUENCY 2900±500Hz							
04	XC-04-212-W	2-12	82	103	8	65	W
04	XC-04-212-T	2-12	82	103	8	65	T
•04	XC-04-330-W	3-30	82	103	6	70	W
•04	XC-04-330-T	3-30	82	103	6	70	T
05	XC-05-212-P	2-12	82	103	8	65	P
•05	XC-05-330-P	3-30	82	103	6	70	P
09	XC-09-212-W	2-12	82	103	8	65	W
09	XC-09-212-Q	2-12	82	103	8	65	Q
09	XC-09-212-S	2-12	82	102	8	65	S
•09	XC-09-330-W	3-30	82	103	6	70	W
•09	XC-09-330-Q	3-30	82	103	6	70	Q
•09	XC-09-330-S	3-30	82	103	6	70	S
•19	XC-19-201-Q	*30-120	82	103		40	Q
•19	XC-19-301-Q	*130-220	82	103		40	Q
LOUD CONTINUOUS TONE—FREQUENCY 2900±500Hz							
04	LC-04-212-W	2-12	76	97	8	65	W
04	LC-04-212-T	2-12	76	97	8	65	T
05	LC-05-212-P	2-12	76	97	8	65	P
09	LC-09-212-W	2-12	76	97	8	65	W
09	LC-09-212-Q	2-12	76	97	8	65	Q
09	LC-09-212-S	2-12	76	97	8	65	S
MEDIUM CONTINUOUS TONE—FREQUENCY 2900±500Hz							
01	MC-01-116-W	1-16	68	93	1	18	W
01	MC-01-116-T	1-16	68	93	1	18	T
02	MC-02-116-P	1-16	68	93	1	18	P
07	MC-07-116-W	1-16	68	93	1	18	W
07	MC-07-116-T	1-16	68	93	1	18	T
07	MC-07-116-Q	1-16	68	93	1	18	Q
07	MC-07-116-S	1-16	68	93	1	18	S
•09	MC-09-516-Q	5-16	85	95	2	20	Q
•09	MC-09-516-S	5-16	85	95	2	20	S
•09	MC-09-516-L	5-16	85	95	2	20	L
01	MC-01-130-W	1-30	68	95	1	13	W
01	MC-01-130-T	1-30	68	95	1	13	T
02	MC-02-130-P	1-30	68	95	1	13	P
07	MC-07-130-W	1-30	68	95	1	13	W
07	MC-07-130-T	1-30	68	95	1	13	T
07	MC-07-130-Q	1-30	68	95	1	13	Q
07	MC-07-130-S	1-30	68	95	1	13	S
•09	MC-09-530-Q	5-30	75	95	2	20	Q
•09	MC-09-530-S	5-30	75	95	2	20	S
•09	MC-09-201-Q	*30-120	68	95		40	Q
•09	MC-09-301-Q	*130-220	68	95		40	Q

INTERMITTENT TONE

When Ordering: Specify Fast, Medium or Slow Beep Rate.
Fast: 3 Beeps Per Second, **Medium:** 2 Beeps Per Second, **Slow:** 1 Beep Per Second

CASE STYLE	MODEL NUMBER	OPERATING VOLTAGE VDC *VAC	TYPICAL SOUND PRESSURE dBa AT 2 FEET At min. V	At max. V	TYPICAL OPERATING CURRENT (mA) At min. V	At max. V	Terminations
EXTRA LOUD BEEP—FREQUENCY 2900±500Hz							
04	XB-04-312-W	5-12	90	104	20	60	W
04	XB-04-312-T	5-12	90	104	20	60	T
•04	XB-04-630-W	6-30	90	104	12	100	W
•04	XB-04-630-T	6-30	90	104	12	100	T
05	XB-05-312-P	5-12	90	104	20	60	P
•05	XB-05-630-P	6-30	90	104	12	100	P
09	XB-09-312-W	5-12	90	104	20	60	W
09	XB-09-312-Q	5-12	90	104	20	60	Q
09	XB-09-312-S	5-12	90	104	20	60	S
•09	XB-09-630-W	6-30	90	104	12	100	W
•09	XB-09-630-Q	6-30	90	104	12	100	Q
•09	XB-09-630-S	6-30	90	104	12	100	S
•19	XB-19-201-Q	*30-120	90	104		50	Q
•19	XB-19-301-Q	*130-220	90	104		50	Q
LOUD BEEP—FREQUENCY 2900±500Hz							
04	LB-04-312-W	5-12	84	97	20	60	W
04	LB-04-312-T	5-12	84	97	20	60	T
05	LB-05-312-P	5-12	84	97	20	60	P
09	LB-09-312-W	5-12	84	97	20	60	W
09	LB-09-312-Q	5-12	84	97	20	60	Q
09	LB-09-312-S	5-12	84	97	20	60	S
MEDIUM BEEP TONE—FREQUENCY 2900±500Hz							
•04	MB-04-516-W	5-16	85	95	2	24	W
•04	MB-04-516-Q	5-16	85	95	2	24	Q
•05	MB-05-516-P	5-16	85	95	2	24	P
•09	MB-09-516-Q	5-16	85	95	2	24	Q
•09	MB-09-516-S	5-16	85	95	2	24	S
•09	MB-09-516-L	5-16	85	95	2	24	L
•04	MB-04-530-W	5-30	75	95	2	18	W
•04	MB-04-530-T	5-30	75	95	2	18	T
•05	MB-05-530-P	5-30	75	95	2	18	P
•09	MB-09-530-W	5-30	75	95	2	18	W
•09	MB-09-530-Q	5-30	75	95	2	18	Q
•09	MB-09-530-S	5-30	75	95	2	18	S
•19	MB-19-201-Q	*30-120	75	95		40	Q
•19	MB-19-301-Q	*130-220	75	95		40	Q
LOUD INTERRUPTED BEEP TONE—FREQUENCY 2900±500Hz							
05	LP-05-516-P	5-16	85	97	15	45	P
09	LP-09-516-Q	5-16	85	97	15	45	Q
09	LP-09-516-S	5-16	85	97	15	45	S
MEDIUM INTERUPTED BEEP TONE—FREQUENCY 2900±500Hz							
05	MP-05-516-P	5-16	78	90	10	20	P
09	MP-09-516-Q	5-16	78	90	10	20	Q
09	MP-09-516-S	5-16	78	90	10	20	S

•Indicates Recognized Component, Underwriters Laboratory

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MANUFACTURER OF QUALITY PIEZOELECTRIC ALARMS SINCE 1972
P.O. Box 12327, 897 Higgs Avenue / Columbus, OH 43212 / (614) 294-4000 / FAX (614) 291-0823

Most Audio II alarms are UL recognized components

PIEZO ALARMS

CHIME TONE

When Ordering: Specify Chime Rate
Fast: 2 Chimes Per Second, **Moderate:** 1 Chime Per Second

CASE STYLE	MODEL NUMBER	OPERATING VOLTAGE VDC *VAC	TYPICAL SOUND PRESSURE dBa AT 2 FEET		TYPICAL OPERATING CURRENT (mA)		Terminations
			At min. V	At max. V	At min. V	At max. V	
CHIME TONE—FREQUENCY 2700±500Hz							
04	CH-04-525-W	5-25	70	90	6	66	W
04	CH-04-525-T	5-25	70	90	6	66	T
05	CH-05-525-P	5-25	70	90	6	66	P
09	CH-09-525-W	5-25	70	90	6	66	W
09	CH-09-525-Q	5-25	70	90	6	66	Q
09	CH-09-525-S	5-25	70	90	6	66	S
•19	CH-19-201-Q	*120	70	90		40	Q
•19	CH-19-301-Q	*220	70	90		40	Q

WARBLE TONE

WARBLE TONE—CENTER FREQUENCY 2700±500Hz							
•04	MW-04-616-W	6-16	80	95	8	18	W
•04	MW-04-550-W	15-36†	75	95	3	8	W
•04	MW-04-201-W	*40-120	75	95	3	8	W
•05	MW-05-616-P	5-16	80	95	8	18	P
•05	MW-05-550-P	15-36†	75	95	3	8	P
•09	MW-09-616-L	5-16	80	95	8	18	L
•09	MW-09-616-W	6-16	80	95	8	18	W
•09	MW-09-616-Q	6-16	80	95	8	18	Q
•09	MW-09-616-S	6-16	80	95	8	18	S
•09	MW-09-550-W	15-36†	75	95	3	8	W
•09	MW-09-550-S	15-36†	75	95	3	8	S
•09	MW-09-201-W	*40-120	75	95	3	8	W
•09	MW-09-201-S	*40-120	75	95	3	8	S
•09	MW-09-301-W	*140-220	75	95	3	8	W
•09	MW-09-301-S	*140-220	75	95	3	8	S

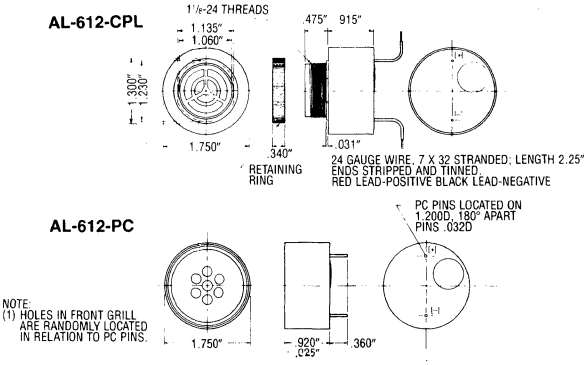
•Indicates Recognized Component, Underwriters Laboratory †Vac-Vdc

WARNING SIREN TONE

The Model AL-612 Audiolarm is a miniature panel or PC mounted alarm that emits a very loud siren-like tone when power is applied. The output tone varies from approximately 2500 to 3500 Hz at a 2.5 Hz rate. The audible output level peaks at about 106 dB(a) when operated from a 12 VDC source; the unit also works well from a heavy-duty alkaline 9V transistor radio battery. Our most attention-getting alarm!!

SPECIFICATIONS

Operating Voltage: 6 to 12 VDC
Operating Current: Up to 100 mA (Voltage Dependent)
Sound Output: Up to 106 dB(a) @ 2 ft with 12 VDC supply; strongly harmonic police-like siren tone.
Operating Frequency: Sweeps from 2500 to 3500 Hz @2.5 Hz rate.
Operating Temperature: -20°C to +65°C
Storage Temperature: -40°C to +80°C
Terminals: Wire or PC pins (see drawings)
Material: Black ABS—KJB thermoplastic case
Mounting: PC—Printed Circuit board mount (see drawing) CPL—Rear panel mount in 1⅛" dia. hole, panel thickness .250" max.
Weight: Two (2) ounces



AudioLarm® II Series

Engineered alarms/exclusive design features

Cases molded from flame retardant engineering grade thermoplastic. Water-proof and shock-resistant solid-state electronics sealed in epoxy resin...100% inspected to ensure premium quality. Quality-made in U.S.A.

GENERAL SPECIFICATIONS

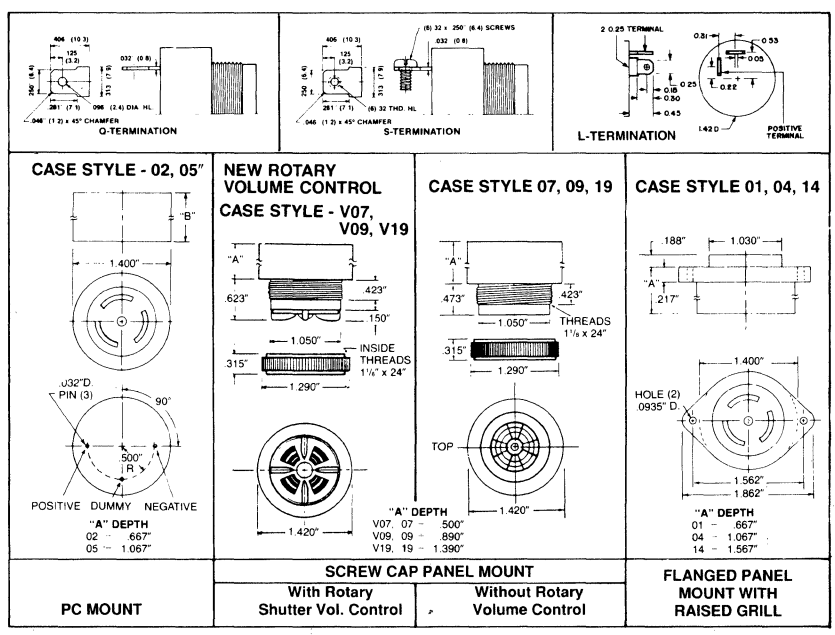
OPERATING TEMPERATURE: -30°C to +65°C.
STORAGE TEMPERATURE: -40°C to +85°C.
REVERSE VOLTAGE: Protected to the maximum operating voltage (some models may sound softly when connected to reverse polarity).
SURGE VOLTAGE: 20% over maximum rated voltage for less than 5 minutes.
LIFE EXPECTANCY: 10 years under normal operating conditions.

TERMINATIONS

W—Leads: 2 wires 24AWG (7 x 32) tinned copper vinyl insulated, 2" long, ¼" end stripped, color coded.
P—PC Pins: 3 PC pins 90° apart on a .500" R from center, .032" diameter.
T—.110 quick connect terminals: .110" width, .020 thickness, brass solder plated for push on attachment or direct solder.
Q—.250 quick connect terminals: .250" width, .033" thickness, brass electro-tin plated for push-on attachment or direct solder.
S—Screw terminals: 6/32 ¼" long stainless steel screw for wires with lug attachments.
L—.250" quick connect terminals oriented at right angles: .250" width, .033" thickness, brass electro-tin plated for push-on (quick connect) attachment.

TO ORDER—Arrange information into the format of the following Sample Model Number.

X B - 09 - 630 - Q (F)
CASE STYLE — TERMINATION
RATE (for Chime and Intermittent Tones only)



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Most Audio II® alarms are UL recognized components

CTS SPEAKERS

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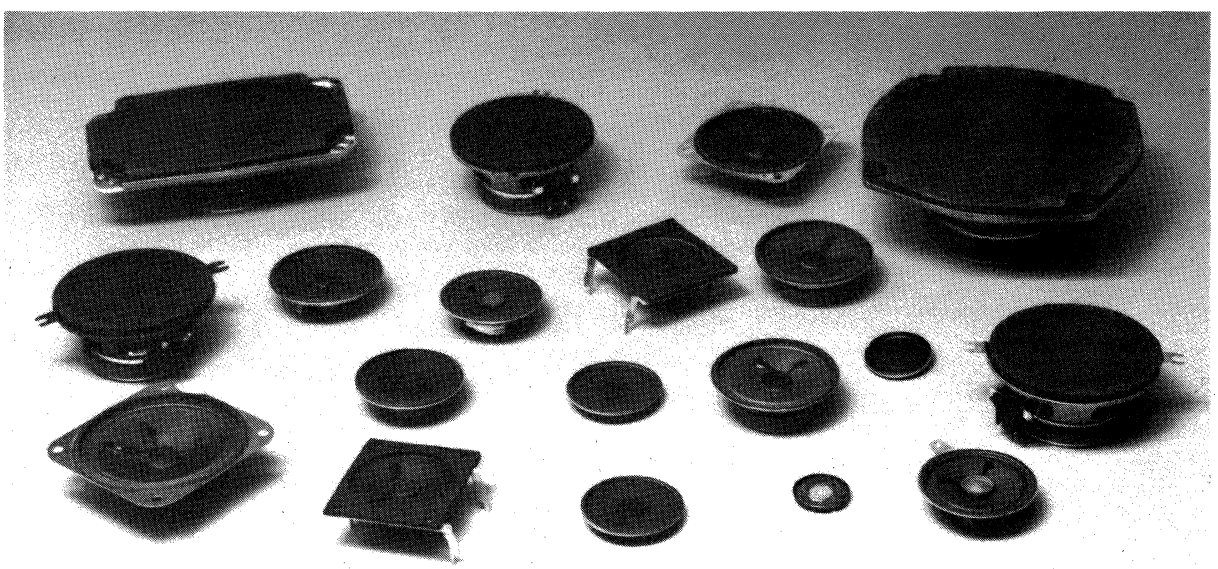
- Communications
- Data Processing
- Intercom
- Industrial Sound
- Security & Alarm
- Stereo
- General Purpose

PRODUCT FEATURES

- Wide Selection, Round & Oval
- Ultra Thin Micro Speakers
- PCB Mount Speakers
- Low Flux Leakage Speakers
- Ferrite, ALNICO, and Rare Earth Magnets



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CUI STACK

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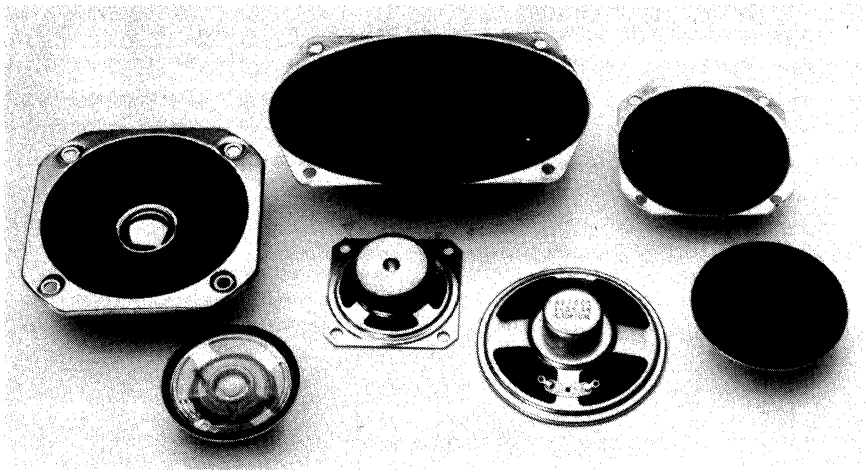
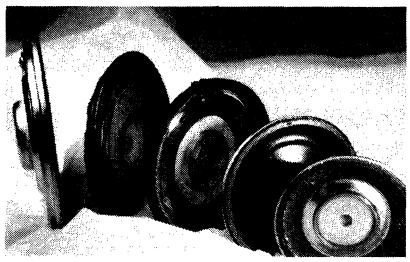




A WIDE VARIETY OF QUALITY (LOW AND HIGH PROFILE) SPEAKERS AND BUZZERS.

PIEZO SPEAKERS
- Low frequency and broad band
- High frequency compared with conventional electro-magnetic type speaker
- Ultra thin and lightweight

SOUND TRANSDUCER
- P.C. Board Mounting
- Very small size and lightweight
- Electro-magnetic type

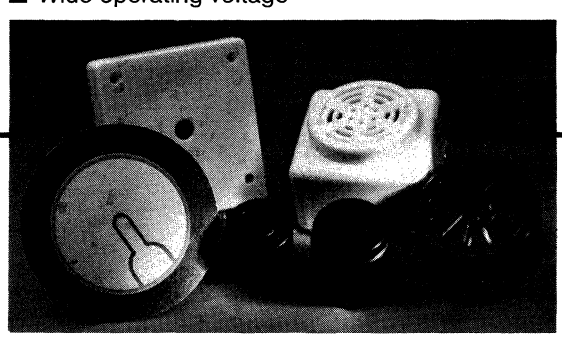
SPEAKER TRANSDUCER
- P.C. Board mounting type
- Wide frequency ranges
- Small and lightweight

PIEZO CERAMIC AUDIO TRANSDUCER (external drive type)
- Small size, lightweight
- Low power consumption
- SEP-1162 Wave Solderable and washable
- P.C. Board mounting
- High efficiency

MINIATURE SPEAKERS
- Speaker: 13mm Mylarcone Colbalt Magnet
- Frequency: 32HMS
- Max Input Power: 100mw

PIEZO AUDIO INDICATOR (panel mounting type)
- Fits 1.125 inch (28.57mm) opening in panels up to 0.25 inch (6.35mm) thick
- 3 different tones and combinations are available
- Supplied with philips-head screws

ELECTRONIC SOLID STATE AUDIO INDICATOR
- Small size and lightweight
- 400HZ
- No RF noise and long life
- Wide operating voltage



PIEZO ELEMENTS AND BUZZERS
- Lowest cost solution for audio signaling applications.
- Buzzers either round or square with wire or pin
- Buzzers size range .47 to 1.75″
- dB ratings up to 90dB min.

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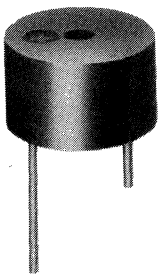
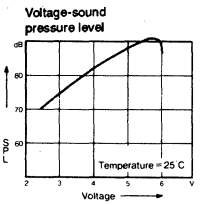
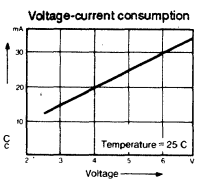
MICRO BUZZERS—MEB SERIES

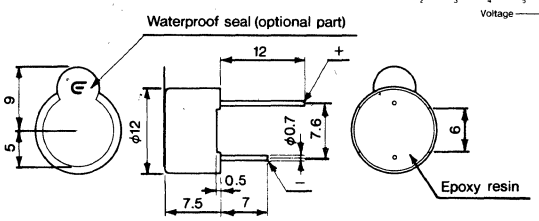
MEB-12C-5







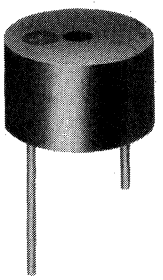
■ OUTLINE DRAWING

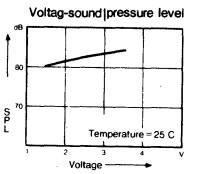


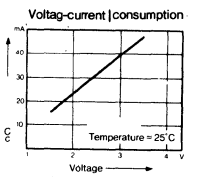
■ SPECIFICATIONS

Rated voltage	(VDC)	5	Operating temperature		−20°C ~ +80°C
Rated current	(mA)	25 (at 5V)	Pin polarity	(+)	Long pin
Sound pressure level	(dB)	min.80 typ. 87 (at 5V DC at 10cm)		(−)	Short pin
Operating voltage range	(VDC)	3 ~ 6	Net weight	(grs.)	1.6

MEB-12F-3







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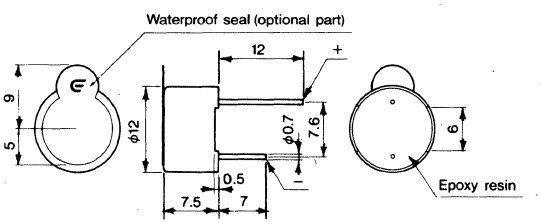
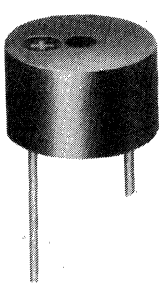


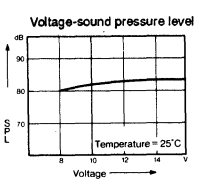
■ SPECIFICATIONS

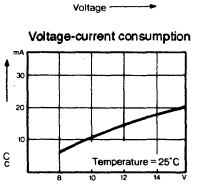
Rated voltage	(VDC)	1.8	Operating temperature		−10°C ~ +60°C
Rated current	(mA)	20 (at 1.8V)	Pin polarity	(+)	Long pin
Sound pressure level	(dB)	min. 75 typ. 83 (at 1.8V DC at 10cm)		(−)	Short pin
Operating voltage range	(VDC)	1.5 ~ 3	Net weight	(grs.)	1.6

SMALL SIZE MAGNETIC SOUND GENERATORS—CB SERIES

MEB-12B-12







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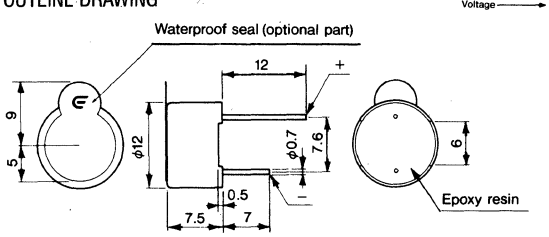
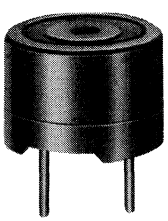


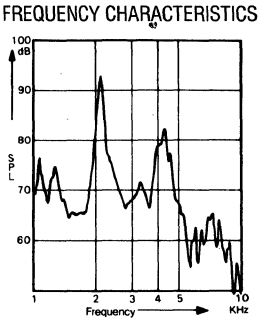
■ SPECIFICATIONS

Rated voltage	(VDC)	12	Operating temperature		−10°C ~ +60°C
Rated current	(mA)	15 (at 12V)	Pin polarity	(+)	Long pin
Sound pressure level	(dB)	min. 75 typ. 85 (at 12V DC at 10m)		(−)	Short pin
Operating voltage range	(VDC)	8 ~ 16	Net weight	(grs.)	1.6

CB-12A

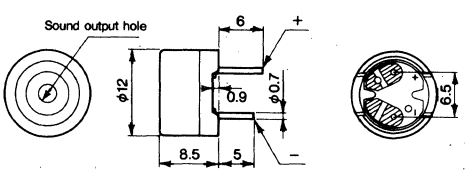


■ FREQUENCY CHARACTERISTICS



Connection Leads: P, W, N

■ OUTLINE DRAWING



■ SPECIFICATIONS

Rated voltage	(VDC)	1.5	DC resistance	(Ω)	42
Average current consumption	(mA)	10	Inductance	(mH)	6.2
Sound pressure level	(dB)	min.80 typ. 88 (at 10cm)	Operating voltage range	(VDC)	1.1 ~ 1.7
Resonance frequency	(Hz)	2,048	Net weight	(grs.)	2

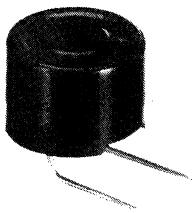
CITIZEN ELECTRONICS CO., LTD.

SOUND GENERATORS CITISOUND™

GOLDEN PACIFIC ELECTRONIC, INC. (714) 993-6970 FAX: (714) 993-6023
560 S. MELROSE ST., PLACENTIA, CA. 92670

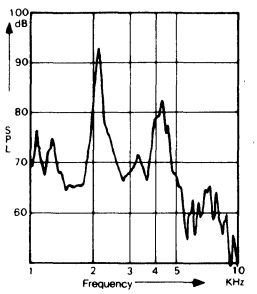
SMALL SIZE MAGNETIC SOUND GENERATORS—CB SERIES

CB-12AP-H



Connection Leads: P

■ FREQUENCY CHARACTERISTICS



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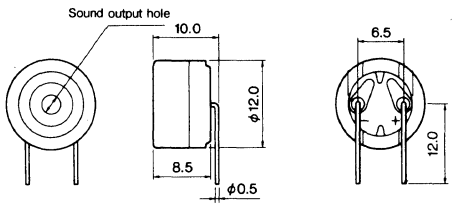
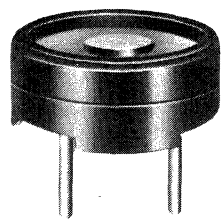


■ SPECIFICATIONS

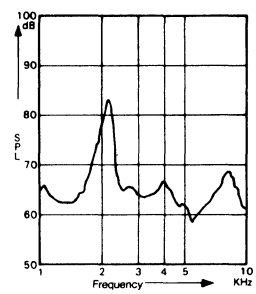
Rated voltage	(VDC)	1.5	DC resistance	(Ω)	42
Average current consumption	(mA)	10	Inductance	(mH)	6.2
Sound pressure level	(dB)	min.80 typ. 88 (at 10cm)	Operating voltage range	(VDC)	1.1 ~ 1.7
Resonance frequency	(Hz)	2,048	Net weight	(grs.)	2

CB-12E



Connection Leads: P, W, N

■ FREQUENCY CHARACTERISTICS



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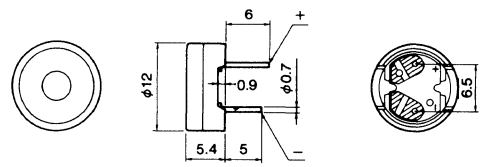
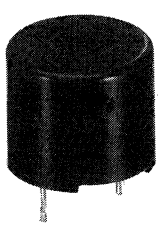


■ SPECIFICATIONS

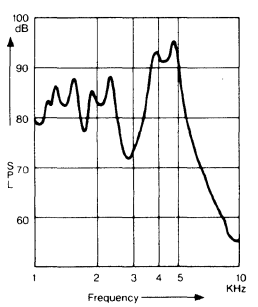
Rated voltage	(VDC)	1.5	DC resistance	(Ω)	42
Average current consumption	(mA)	10	Inductance	(mH)	6.2
Sound pressure level	(dB)	min. 70 typ. 77 (at 10cm)	Operating voltage range	(VDC)	1.1 ~ 1.7
Resonance frequency	(Hz)	2,048	Net weight	(grs.)	1.8

CB-12T



Washable Connection Leads: P

■ FREQUENCY CHARACTERISTICS



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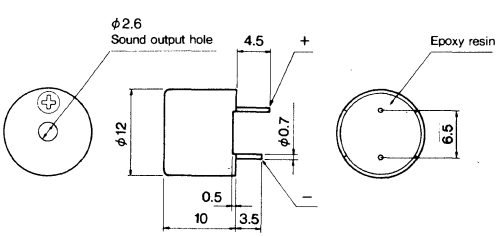
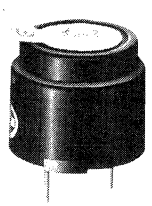


■ SPECIFICATIONS

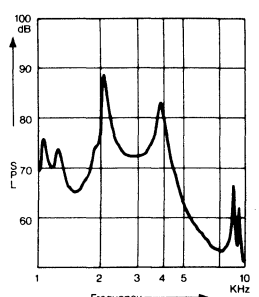
Rated voltage	(VDC)	1.5	DC resistance	(Ω)	51
Average current consumption	(mA)	8.5	Inductance	(mH)	3.8
Sound pressure level	(dB)	min. 85 typ. 89 (at 10cm)	Operating voltage range	(VDC)	1.1 ~ 1.7
Resonance frequency	(Hz)	4,096	Net weight	(grs.)	2

CB-16BP-01D



Washable Connection Leads: P

■ FREQUENCY CHARACTERISTICS



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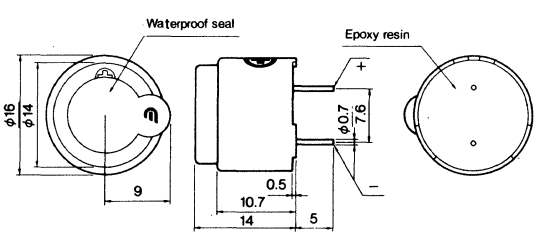

■ SPECIFICATIONS

Rated voltage	(VDC)	1.5	DC resistance	(Ω)	40
Average current consumption	(mA)	6.8	Inductance	(mH)	4
Sound pressure level	(dB)	min. 80 typ. 87 (at 10cm)	Operating voltage range	(VDC)	1.1 ~ 3
Resonance frequency	(Hz)	2,048	Net weight	(grs.)	5

CITIZEN ELECTRONICS CO., LTD.

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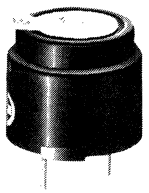
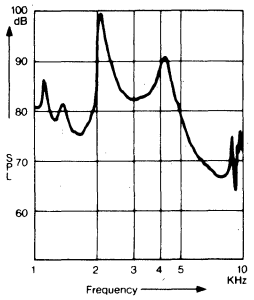
SMALL SIZE MAGNETIC SOUND GENERATORS—CB SERIES

CB-16BP-05D



Washable Connection Leads: P

■ FREQUENCY CHARACTERISTICS



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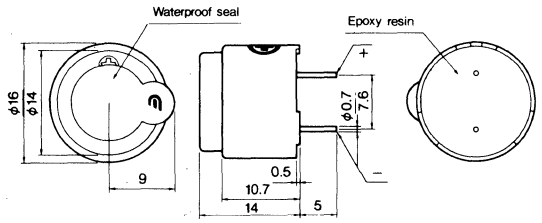
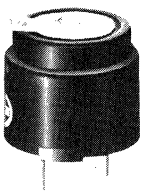


■ SPECIFICATIONS

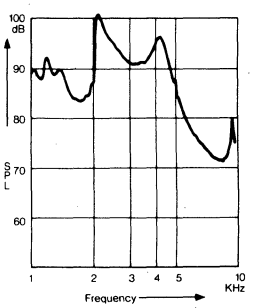
Rated voltage	(VDC)	5	DC resistance	(Ω)	68
Average current consumption	(mA)	25	Inductance	(mH)	4.5
Sound pressure level	(dB)	min. 85 (at 10cm) typ. 95	Operating voltage range	(VDC)	3 ~ 8
Resonance frequency	(Hz)	2,048	Net weight	(grs.)	5

CB-16BP-12D



Washable Connection Leads: P

■ FREQUENCY CHARACTERISTICS



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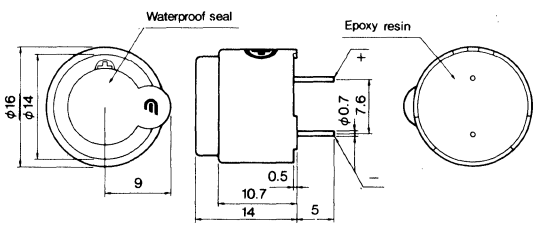
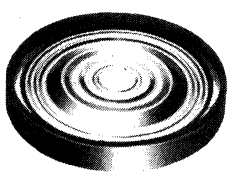


■ SPECIFICATIONS

Rated voltage	(VDC)	12	DC resistance	(Ω)	145
Average current consumption	(mA)	25	Inductance	(mH)	17
Sound pressure level	(dB)	min. 85 (at 10cm) typ. 96	Operating voltage range	(VDC)	6 ~ 18
Resonance frequency	(Hz)	2,048	Net weight	(grs.)	5

DYNAMIC SPEAKERS—CS SERIES

CS-20A



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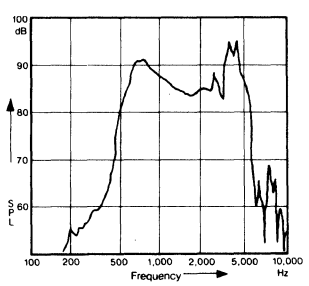

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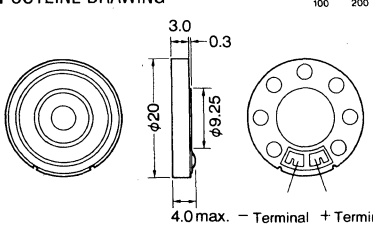
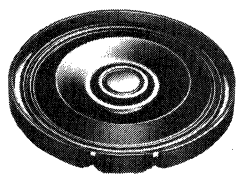


■ SPECIFICATIONS

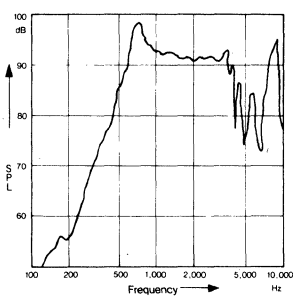
The specs are only for 8Ω version. Please ask for specs for 16Ω and 32Ω versions if you need.

Item		Standard	Condition of measurement
Rated input	(W)	0.07	
Maximum input	(W)	0.15	
Impedance	(Ω)	8±20%	at 1 kHz
Sound pressure level	(dB)	min. 80	Input frequency of 1 kHz, 0.07 W, measured at 10 cm in a box of 400 cm³
Lowest resonance frequency	(Hz)	700 ± 150	0.07
Frequency range		No abnormal sound should exist between 700 ± 150 Hz and 3 kHz.	
Distortion factor		10% / max. 10%	Input frequency of 1.5 kHz, 0.07W
Weight	(grs.)	1.6	

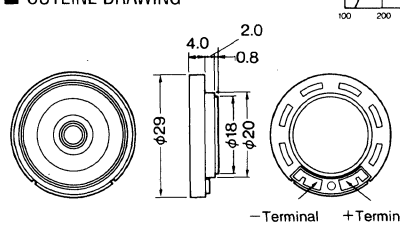
CS-29B



■ FREQUENCY CHARACTERISTICS



■ OUTLINE DRAWING



■ SPECIFICATIONS

The specs are only for 8Ω version. Please ask for specs for 16Ω and 32Ω versions if you need.

Item		Standard	Condition of measurement
Rated input	(W)	0.1	
Maximum input	(W)	0.15	
Impedance	(Ω)	8 ± 20%	at 1 kHz
Sound pressure level	(dB)	min. 85	Input frequency of 1 kHz, 0.1 W, measured at 10 cm in a box of 400 cm³
Lowest resonance frequency	(Hz)	670 ± 150	0.1W
Frequency range		No abnormal sound should exist between 670 ± 150 Hz and 3 kHz	
Distortion factor		10% / max. 10%	Input frequency of 1.5 kHz, 0.1W
Weight	(grs.)	8.2	

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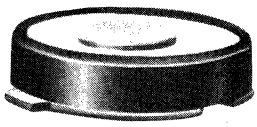
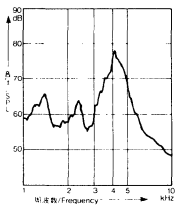
SMALL SIZE MAGNETIC SOUND GENERATORS—CB SERIES

CB-08C

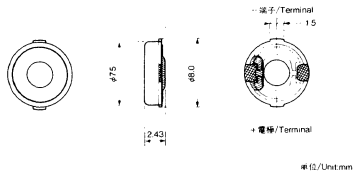


■ FREQUENCY CHARACTERISTICS



Connection Leads: N

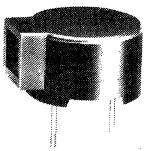
■ OUTLINE DRAWING



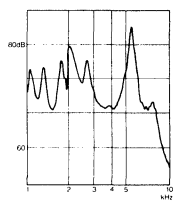
■ SPECIFICATIONS

Rated voltage (VDC)	1.5	**Direct current resistance (Ω)**	100
Average current consumption (mA)	1.5	**Inductance (mH)**	1.6
Sound pressure (dB)	MIN TYP71 (at 10cm)	**Operating voltage range (VDC)**	1.1 ~ 1.7
Resonance frequency (Hz)	4,096	**Net weight (grs.)**	0.4

CB-12QP

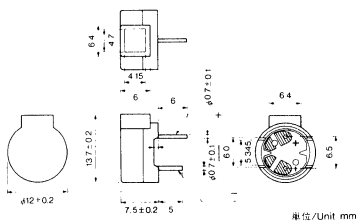


■ FREQUENCY CHARACTERISTICS



Connection Leads: P

■ OUTLINE DRAWING

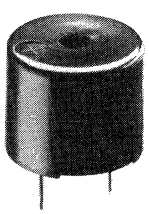


■ SPECIFICATIONS

Rated voltage (VDC)	1.5	**Direct current resistance (Ω)**	42
Average current consumption (mA)	10	**Inductance (mH)**	6.2
Sound pressure (dB)	min 70 typ 76 (at 10cm)	**Operating voltage range (VDC)**	1.0 ~ 2.0
Resonance frequency (Hz)	2,048	**Net weight (grs.)**	2

MELODY UNIT—MU SERIES—Miniature Size Melody Buzzer

MU-12A-1 and MU-12B-1 Series



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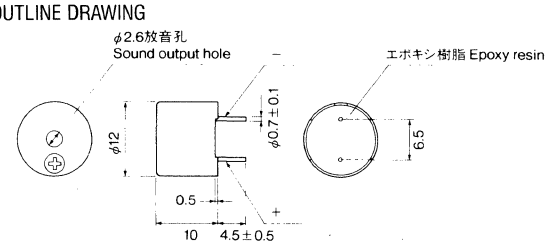


■ SPECIFICATIONS

Items	Description	Remarks
Operating voltage range (VR)	1.25 ~ 3.5	
Sound pressure level (dB)	70 or more	JIS A, FAST, 10cm/Measured nt 10cm in front of sound output hole in JIS A characteristic, FAST mode.
Peak current consumption (mA)	30% /or less	1.5V/ Measured at 1.5 V DC
Operating temperature range (°C)	−10—+70	
Storage temperature range (°C)	−30—+80	
Net weight (grs)	1.7	

■ FEATURES

1. Ultra compact size.
2. Melody is reproduced by application of DC voltage.
3. Wide range of operating voltage
4. Dip soldering and washing are applicable.
5. Pin pitch of 6.5mm enable MU-12(A or B) 1 to replace the CB-12 type CITISOUND physically.

■ APPLICATION

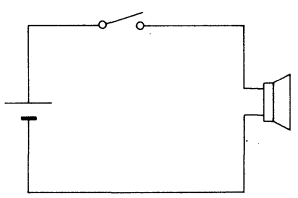
Chime for clock, alarm signal for gas leakage detector, alarm signal for electric household appliances etc.

■ FUNCTION

"A" version (MU-12A-1) Melody is reproduced only once (not repeatedly) when V_{DD} level is applied to (+) terminal, but it ceases whenever the driving signal is turned off.

"B" version (MU-12B-1) Melody is reproduced repeatedly as long as V_{DD} level is applied to (+) terminal, but it ceases whenever the driving signal is turned off.

■ DRIVING CIRCUIT

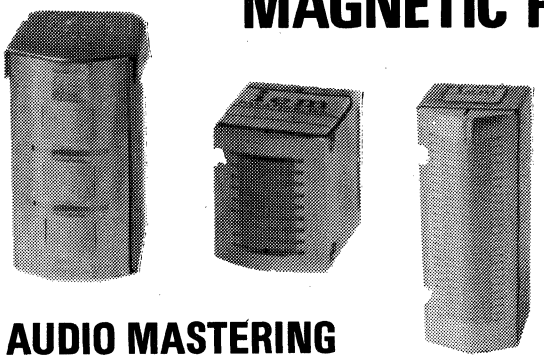


■ STANDARD MELODIES

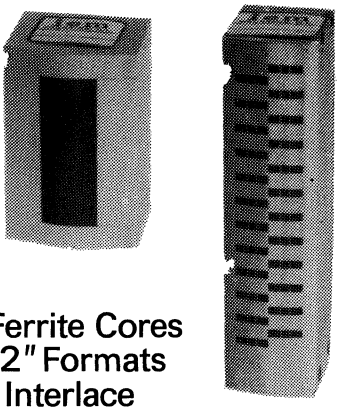
MU-12A (orB)-1-0A	Jingle bells
MU-12A (orB)-1-1B	For Elise
MU-12A (orB)-1-1F	Happy birthday to you
MU-12A (orB)-1-1P	Ave Maria
MU-12A (orB)-1-1D	Music box dancer

INTERNATIONAL ELECTRO-MAGNETICS, INC.
350 N. Eric Drive, Palatine, Illinois (708) 358-4622/FAX (708) 358-4623

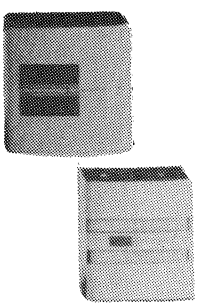
MAGNETIC RECORDING HEADS



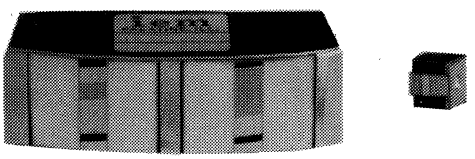
AUDIO MASTERING
- Tape and Film
- Standard Replacement
- Instrumentation Quality
- Custom Formats



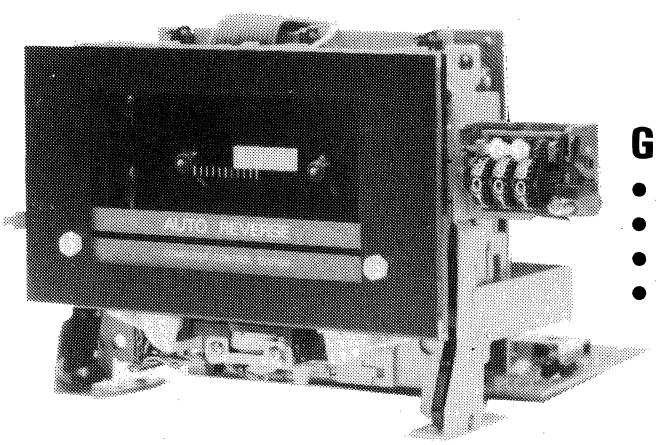
ERASE
- Dual Gap Ferrite Cores
- Cassette—2" Formats
- MultiTrack Interlace
- Full Track 1" Video



TIME CODE
- NeoPilot, FM, SMPTE
- Audio and Video
- Erase with Time Code
- High Wear Construction



MAGNETIC STRIPE
- High Wear
- High Coercivity
- Read After Write



GR-8000 CASSETTE MECHANISM
- Auto-Reversing
- Full Remote Capability
- Infra-red Control Available
- Vertical Mount/Front Load

CUSTOM DESIGN AND PROTOTYPING

We have manufactured over 5,000 different head designs. If we don't have one to suit your requirements, we will design and prototype it quickly and economically. Our toolroom is well equipped to produce precision parts, and our design projects have included flux sensing systems, magnetic disk encoding, and electronic test equipment.

HEAD REPAIR SERVICE
- Electrical Test
- Microscopic Inspection
- Optical Alignment
- 24 Hour Turnaround

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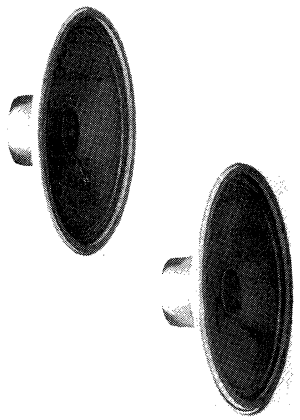
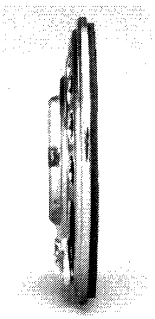
SPEAKERS



TYPE NUMBER	CONE DIAMETER & SHAPE	RATED POWER (Watts)	VOICE COIL IMPEDANCE (Ohms)	FREQUENCY RESPONSE (Hz)	MAGNET MATERIAL	MAGNET WEIGHT (Oz.)	DEPTH
General Purpose Miniature *							
S100RA	1" Round	0.1	8 ± 15%	700~ 5,000	Alnico V	0.21	.625"
S150RA	1½" Round	0.1	8 ± 15%	600~ 5,000	Alnico V	0.34	.705"
S175RA	1¾" Round	0.1	8 ± 15%	470~ 4,500	Alnico V	0.34	.705"
S200RA	2" Round	0.2	8 ± 15%	450~ 4,000	Alnico V	0.34	.705"
S200SA	2" Square	0.2	8 ± 15%	450~ 5,000	Alnico V	0.34	.740"
S225RA	2¼" Round	0.2	8 ± 15%	400~ 5,000	Alnico V	0.34	.740"
S250RA	2½" Round	0.3	8 ± 15%	330~ 5,000	Alnico V	0.34	.830"
S275RA	2¾" Round	0.3	8 ± 15%	280~ 5,000	Alnico V	0.34	.840"
S300RA	3" Round	0.5	8 ± 15%	250~ 5,000	Alnico V	0.34	.915"
S300SA	3" Square	0.5	8 ± 15%	250~ 5,000	Alnico V	0.34	.975"
S350RA	3½" Round	0.8	8 ± 15%	220~ 8,000	Alnico V	0.34	1.100"
S350SA	3½" Square	0.8	8 ± 15%	220~ 5,000	Alnico V	0.34	1.100"
S2X3VA	1.77"x2.76" Oval	0.5	8 ± 15%	280~ 5,000	Alnico V	0.35	1.03"

*Voice Coil Impedances from 3.0 ohms - 100 ohms available on special order.

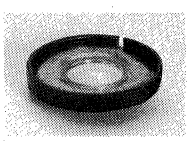


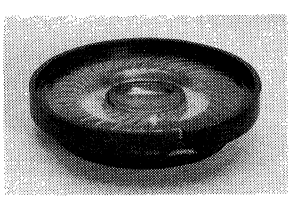
Shown Actual Size

TYPE NUMBER	CONE DIAMETER & SHAPE	RATED POWER (Watts)	VOICE COIL IMPEDANCE (Ohms)	FREQUENCY RESPONSE (Hz)	MAGNET MATERIAL	MAGNET WEIGHT (Oz.)	DEPTH
Low Profile Samarium Cobalt Magnet**							
S100RL	1" Round	0.1	8 ± 15%	220~ 20,000	Sam. Cob.	.023	.394"
S150RL	1½" Round	0.2	8 ± 15%	350~ 7,000	Sam. Cob.	.056	.250"
S150RLS	1½" Round	0.2	8 ± 15%	450~ 8,000	Sam. Cob.	.056	.327"
S175RL	1¾" Round	0.2	8 ± 15%	400~ 7,000	Sam. Cob.	.056	.334"
S200RL	2" Round	0.2	8 ± 15%	300~ 5,000	Sam. Cob.	.056	.350"
S225RL	2¼" Round	0.2	8 ± 15%	200~ 5,000	Sam. Cob.	.056	.445"

**Waterproof Mylar Cones and Moisture Proof Paper Cones available on special order.

TYPE NUMBER	RATED POWER (Milliwatts)	MAGNET WEIGHT (Oz.)	MAGNET TYPE & DIMENSIONS	FRAME DIAMETER (Inches)	FRAME DEPTH (Inches)
Round Plastic Frame					
SR900RMF	10.0	0.025	Ferrite 0.374x0.078	0.91	.177
SR900RMS	10.0	0.028	Sam. Cobalt 0.374x.059	0.91	.177
SR900RMFA	20.0	0.025	Ferrite 0.362x.076	0.91	.236
SR900RMS	20.0	0.028	Sam. Cobalt 0.374x.059	0.91	.236
S100RMA	30.0	0.34	Alnico 0.512x.394	1.063	.236
S100RMF	20.0	0.039	Ferrite 0.472x.075	1.063	.197
S100RMSL	20.0	0.055	Sam. Cobalt 0.492x.059	1.063	.197
S100RMSS	20.0	0.028	Sam. Cobalt 0.374x.059	1.063	.197
S100RMSSA	20.0	0.028	Sam. Cobalt 0.374x.059	1.063	.236
S100RMSLA	20.0	0.055	Sam. Cobalt 0.492x.059	1.063	.236
S150RMF	30.0	0.039	Ferrite 0.472x.075	1.57	.197
S150RMSS	30.0	0.028	Sam. Cobalt 0.374x.059	1.57	.307
S150RMSL	30.0	0.055	Sam. Cobalt 0.492x.059	1.57	.307
S150RMFA	30.0	0.088	Ferrite 0.937x0.606x0.078	1.57	.236
S225RM	30.0	0.19	Ferrite 1.06x0.669x0.118	2.244	.413



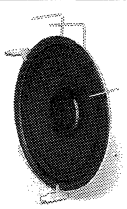


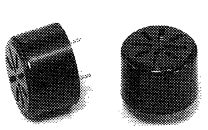
NEW!

PCB Mounting Series

TYPE NUMBER	DIAMETER SIZE (Inches)	FREQUENCY (FQ)	FREQUENCY RANGE	RATED POWER (Watts)	DEPTH (Inches)	SPACING (Inches)	TERMINAL TYPE
S225RA-PC	2.25 (57mm)	400Hz	400 ~ 5KHz	0.2	.6 (15mm)	3 Position Guides	2 Pins
SR900R-PC	.9 (23mm)	800Hz	800 ~ 7KHz	0.1	.4 (10mm)	.4 (10mm)	2 Pins

Now you can consider mounting mini speakers in the same way as you use other components.





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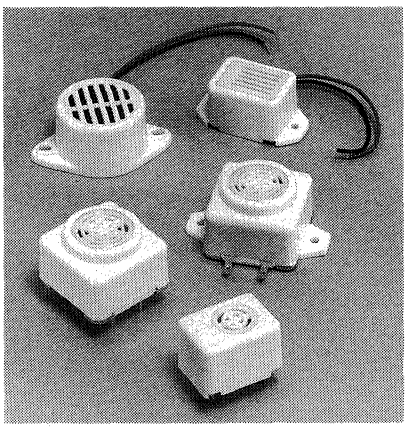
ELECTRONIC BUZZERS

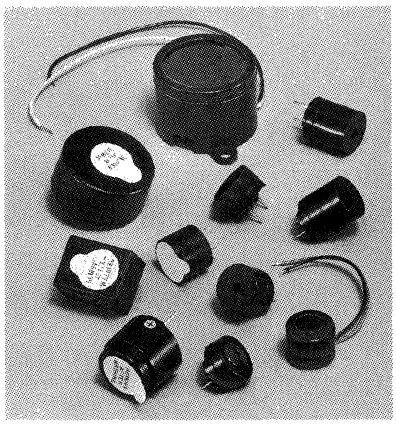
PART NUMBER	RATED VOLTAGE (VDC)	OPERATING VOLTAGE (VDC)	MAX. CURRENT (mA)	SOUND OUTPUT	TERMINAL TYPE	FREQUENCY	OPERATING TEMPERATURE
BS2316L-01	1.5	1.3- 2	25	75 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BS2316L-03	3	2- 5	25	75 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BS2316L-06	6	4- 9	25	75 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BS2316L-09	9	6-15	25	75 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BS2316L-12	12	9-20	25	75 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BS2316L-24	24	10-27	25	75 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BS2316P-06-C	6	4- 8	35	80 @ 30cm dB	4 Pins	400 ± 50 Hz	-40° to +70°C
BS2316P-09-C	9	6-12	35	80 @ 30cm dB	4 Pins	400 ± 50 Hz	-40° to +70°C
BS2316P-12-C	12	8-16	35	80 @ 30cm dB	4 Pins	400 ± 50 Hz	-40° to +70°C
BS2316P-24-C	24	16-27	35	80 @ 30cm dB	4 Pins	400 ± 50 Hz	-40° to +70°C
BS2620FV-03	3	2- 4	70	75 @ 100cm dB	2 Fast-on	400 ± 50Hz	-40° to +70°C
BS2620FV-06	6	4- 8	70	75 @ 100cm dB	2 Fast-on	400 ± 50Hz	-40° to +70°C
BS2620FV-12	12	8-16	60	75 @ 100cm dB	2 Fast-on	400 ± 50Hz	-40° to +70°C
BS2620FV-24	24	20-28	60	75 @ 100cm dB	2 Fast-on	400 ± 50Hz	-40° to +70°C
Low Current Trigger Models (1 mA @ Rated Voltage)							
BS2620PH-03-C	3	2- 4	30	75 @ 100cm dB	4 Pins	400 ± 50Hz	-40° to +70°C
BS2620PH-06-C	6	4- 8	30	75 @ 100cm dB	4 Pins	400 ± 50Hz	-40° to +70°C
BS2620PH-12-C	12	8-16	20	75 @ 100cm dB	4 Pins	400 ± 50Hz	-40° to +70°C
BS2620PH-24-C	24	20-28	20	75 @ 100cm dB	4 Pins	400 ± 50Hz	-40° to +70°C
BR2818L-01	1.5	1.3- 2	35	80 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BR2818L-03	3	2- 5	35	80 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BR2818L-06	6	4- 9	35	80 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BR2818L-09	9	6-15	35	80 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BR2818L-12	12	9-20	35	80 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BR2818L-24	24	20-28	35	85 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C
BR2818L-48	48	30-54	35	85 @ 30cm dB	2 Leadwires	400 ± 50Hz	-40° to +70°C



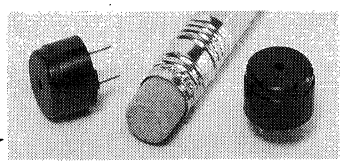
Designed to eliminate the problems inherent in electro-mechanical buzzers, Intervox solid-state buzzers are simple, rugged and low cost. Yet, they produce a rich, broad sound consistent with a wide variety of requirements. High efficiency, custom internal circuits deliver reliable performance and long life. And there are no mechanical points to arc or require maintenance. RF noise is non-existent.

TRANSDUCERS

PART NUMBER	RATED VOLTAGE (VDC)	OPERATING VOLTAGE (VDC)	MAX. CURRENT (mA)	SOUND OUTPUT @ 10cm dB	COIL RESISTANCE (OHMS)	COIL IMPEDANCE (OHMS)	TERMINAL TYPE	FREQUENCY	OPERATING TEMPERATURE
BRT1209PF-01	1.5	1-3	40	75	15	55	2 Pins	2400Hz	-40° to +85°C
BRT1209PF-06	6	4-8	40	85	50	80	2 Pins	2200Hz	-40° to +85°C
BRT1209PF-12	12	7-15	40	85	115	240	2 Pins	2200Hz	-40° to +85°C
BRT1209P-01-C	1.5	1.2-3	30	70	Not Applicable		2 Pins	2500Hz	-20° to +70°C
BRT1209P-06-C	6	4-8	30	80			2 Pins	2300Hz	-20° to +70°C
BRT1209P-12-C	12	7-15	30	80			2 Pins	2300Hz	-20° to +70°C
BRT1615P-01	1.5	1-3	12	80	30	80	2 Pins	2048Hz	-20° to +70°C
BRT1615P-06	6	3-12	40	85	50	110	2 Pins	2048Hz	-20° to +70°C
BRT1615P-12	12	6-18	40	85	115	200	2 Pins	2048Hz	-20° to +70°C
With Driver Circuit									
BRT1615P-01-C	1.5	1.2-2	20	75	Not Applicable		2 Pins	2300Hz	-20° to +70°C
BRT1615P-06-C	6	4-7	30	85			2 Pins	2200Hz	-20° to +70°C
BRT1615P-12-C	12	8-16	30	85			2 Pins	2200Hz	-20° to +70°C
BRT1623P-01	1.5	1-3	12	80	30	100	2 Pins	2048Hz	-20° to +70°C
BRT1623P-06	6	3-12	40	85	45	135	2 Pins	2048Hz	-20° to +70°C
BRT1623P-12	12	6-18	40	85	115	270	2 Pins	2048Hz	-20° to +70°C
BST1811P-01	1.5	1-2	40	80	14 ± 9	22	2 Pins	2000-2500Hz	-30° to +85°C
BST1811P-06	6	3-10	40	85	60 ± 9	90	2 Pins	2000-2500Hz	-30° to +85°C
BST1811P-12	12	6-15	40	85	120 ± 18	170	2 Pins	2000-2500Hz	-30° to +85°C
BRT2513P-06	5	3-5	80	85	27 ± 4	38	2 Pins	730Hz	-40° to +85°C
BRT2513P-06-C	6	3-8	75	85	36 ± 5	48	2 Pins	1000-1500Hz	-40° to +85°C
BRT2513P-12-C	12	8-14	55	85	120 ± 15	155	2 Pins	1000-1500Hz	-40° to +85°C
BRT0907401	1	1-2	80	80	5.5 ± 1	9.5	2 Pins	3100Hz	-20° to +60°C



NEW!



Shown Actual Size

Size: 9.2mm diameter, 7.1mm depth, 4.0mm pin spacing

PART NUMBER	RATED VOLTAGE (VDC)	OPERATING VOLTAGE (VDC)	MAX CURRENT (mA)	SOUND OUTPUT	TONE MODE	RATE (PULSE/SEC)	TERMINAL TYPE	FREQUENCY	OPERATING TEMPERATURE
BRT2821P-03	3	2- 5	35	85 @ 30cm dB	Continuous	Nil	2 Pins	2800Hz ± 0.2KHz	-20° to + 60°C
BRT2821P-06	6	4- 9	35	90 @ 30cm dB	Continuous	Nil	2 Pins	2800Hz ± 0.2KHz	-20° to + 60°C
BRT2821P-09	9	6-11	40	90 @ 30cm dB	Continuous	Nil	2 Pins	2800Hz ± 0.2KHz	-20° to + 60°C
BRT2821P-12	12	9-15	40	95 @ 30cm dB	Continuous	Nil	2 Pins	2800Hz ± 0.2KHz	-20° to + 60°C
BRT2821P-12-S	12	4-15	15	90 @ 30cm dB	Continuous	Nil	2 Pins	2800Hz ± 0.2KHz	-20° to + 60°C
BRT2821P-24	24	15-28	25	95 @ 30cm dB	Continuous	Nil	2 Pins	2800Hz ± 0.2KHz	-20° to + 60°C

Carefully constructed, using highest quality materials, these extremely small and lightweight Intervox devices are designed to fulfill limited-space requirements without sacrificing sound quality. Some are pin type units that are sealed for wave solder washing and are dispensed from auto insertion carrier tubes for P.C. applications. So, if you're looking for dependability and long life, Intervox miniatures are the answer.

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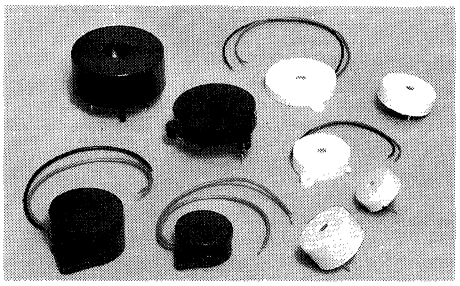
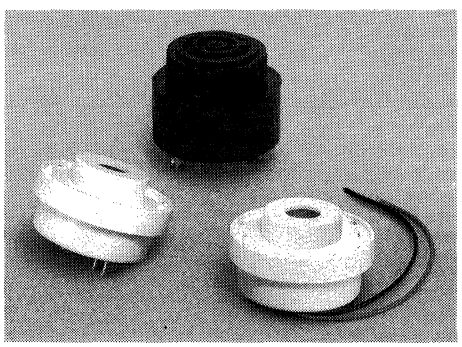
PIEZO ELECTRICS – SELF DRIVE

PART NUMBER	RESONANT FREQUENCY	RESONANT RESISTANCE (OHMS)	ELECTROSTATIC CAPACITY (PF)	MAX INPUT VOLTAGE	TERMINAL TYPE	SOUND PRESSURE LEVEL	OPERATING TEMPERATURE
BRP3408P-30	2500Hz ± 500Hz	300	25000 ± 30%	30Vp-p	3 Pins	95dB @ 30cm 15Vp-p	-20° to +60°C
BRP4016P-30	3200Hz ± 500Hz	200	30000 ± 30%	30Vp-p	3 Pins	95dB @ 30cm 9Vp-p	-20° to +60°C
BRP4216L-30	3000Hz ± 500Hz	300	25000 ± 30%	30Vp-p	3 Leadwires	85dB @ 1M 15Vp-p	-20° to +60°C
BRP4216P-30	3000Hz ± 500Hz	300	25000 ± 30%	30Vp-p	3 Pins	85dB @ 1M 15Vp-p	-20° to +60°C



PIEZO ELECTRICS – NO CIRCUITRY

PART NUMBER	RESONANT FREQUENCY	RESONANT RESISTANCE (OHMS)	ELECTROSTATIC CAPACITY (PF)	MAX INPUT VOLTAGE	TERMINAL TYPE	SOUND PRESSURE LEVEL	OPERATING TEMPERATURE
BRP1708P-30	4500Hz± 500Hz	500	8000 ± 30%	30Vp-p	2 Pins	95dB @ 30cm 10Vp-p	-20° to +60°C
BPR2207P-30	4000Hz± 500Hz	300	12000 ± 30%	30Vp-p	2 Pins	95dB @ 30cm 10Vp-p	-40° to +120°C
BRP2407L-30	5600Hz ± 600Hz	1500	10000 ± 30%	30Vp-p	2 Leadwires	90dB @ 30cm 10Vp-p	-20° to +60°C
BRP2407P-30	5600Hz ± 600Hz	1500	10000 ± 30%	30Vp-p	2 Pins	90dB @ 30cm 10Vp-p	-20° to +60°C
BRP3005L-30	4500Hz± 500Hz	300	20000 ± 30%	30Vp-p	2 Leadwires	95dB @ 30cm 10Vp-p	-20° to +60°C
BSP3206FV-30	3000Hz ± 500Hz	400	16000 ± 30%	30Vp-p	2 Fast-on	95dB @ 30cm 10Vp-p	-20° to +60°C



PIEZO ELECTRICS – INTERNAL CIRCUITRY

PART NUMBER	RATED VOLTAGE (VDC)	OPERATING VOLTAGE (VDC)	MAX. CURRENT (mA)	SOUND OUTPUT	TERMINAL TYPE	TONE MODE	FREQUENCY	OPERATING TEMPERATURE
BRP2211P-12-C	12	3-15	4.5	75 @ 30cm dB	2 Pins	Continuous	4000° ± 500Hz	-20° to + 70°C
BRP2211P-12-CS	12	3-15	4.5	75 @ 100cm dB	2 Pins	Continuous	4000° ± 500Hz	-40° to +120°C
BRP2212L-12-C	12	3-15	4.5	90 @ 30cm dB	2 Leadwires	Continuous	4000° ± 500Hz	-10° to +60°C
BRP2212P-12-C	12	3-15	4.5	90 @ 30cm dB	2 Pins	Continuous	4000° ± 500Hz	-10° to +60°C
BRP3017L-12-C	12	1.5-16	15	90 @ 30cm dB	2 Leadwires	Continuous	3800 ± 500Hz	-20° to +60°C
BRP3017L-24-C	24	1.5-28	20	90 @ 30cm dB	2 Leadwires	Continuous	3800 ± 500Hz	-20° to +60°C
BRP3017P-12-C	12	1.5-16	15	90 @ 30cm dB	2 Pins	Continuous	3800 ± 500Hz	-20° to +60°C
BRP3017P-24-C	24	1.5-28	20	90 @ 30cm dB	2 Pins	Continuous	3800 ± 500Hz	-20° to +60°C
BRP3025L-12-C	12	1.5-16	15	95 @ 30cm dB	2 Leadwires	Continuous	3500 ± 500Hz	-20° to +60°C
BRP3025L-24-C	24	1.5-28	20	95 @ 30cm dB	2 Leadwires	Continuous	3500 ± 500Hz	-20° to +60°C
BRP3922L-12-CT3	12	6-15	95	107 @ 100cm dB	5 Leadwires	3 Tone	2800Hz	-20° to +70°C
BRP3922L-24-CT3	24	16-28	85	109 @ 100cm dB	5 Leadwires	3 Tone	2800Hz	-20° to +70°C
BRP3926L-12-C*	12	3-24	18	101 @ 100cm dB	2 Leadwires	Continuous	3000Hz	-20° to +60°C
BRP3926L-12-CP	12	3-24	18	101 @ 100cm dB	2 Leadwires	Intermitt: 2-7	3000Hz	-20° to +60°C
BRP4016L-12-C*	12	3-24	18	100 @ 100cm dB	2 Leadwires	Continuous	2800 ± 300Hz	-20° to +60°C
BRP4016L-12-CP	12	3-24	18	100 @ 100cm dB	2 Leadwires	Intermitt: 1	2800 ± 300Hz	-20° to +60°C
*Available in Low Current Trigger Model (1mA @ Rated Voltage)								
BRP4222T-24-C	24	1-28	15	85 @ 30cm dB	2 Lugs	Continuous	2900 ± 500Hz	-20° to +60°C
BRP4535S-12-C	12	1-16	30	100 @ 30cm dB	2 Screw Lugs	Continuous	2900 ± 500Hz	-20° to +60°C
BRP4535S-24-C	24	1-28	15	90 @ 30cm dB	2 Screw Lugs	Continuous	2900 ± 500Hz	-20° to +60°C
BRP4535S-12-CP	12	4-16	20	90 @ 30cm dB	2 Screw Lugs	Intermitt:0.8-1.2	2900 ± 500Hz	-20° to +60°C
BRP4535S-24-CP	24	4-28	22	80 @ 30cm dB	2 Screw Lugs	Intermitt:0.8-1.2	2900 ± 500Hz	-20° to +60°C
BRP4535S-12-CP1	12	4-16	20	90 @ 30cm dB	2 Screw Lugs	Intermitt: 4-6	2900 ± 500Hz	-20° to +60°C
BRP4535S-24-CP1	24	4-28	22	80 @ 30cm dB	2 Screw Lugs	Intermitt: 4-6	2900 ± 500Hz	-20° to +60°C
BRP4535S-12-CD	12	4-16	25/20	95/90 @ 30cm dB	3 Screw Lugs	Cont./Interm: 0.8-1.2	2900 ± 500Hz	-20° to +60°C
BRP4535S-24-CD	24	4-28	30/20	85/80 @ 30cm dB	3 Screw Lugs	Cont./Interm: 0.8-1.2	2900 ± 500Hz	-20° to +60°C
BRP4629T-09-C	9	5-13	70	85 @ 3M dB	3 Lugs	Continuous	2000 ± 3000Hz	-20° to +65°C

The Intervox Piezo-Electric series was created to provide the ultimate in buzzer technology. Distinctive in virtually any environment, it features a level of reliability, efficiency and clear, penetrating sound quality that is unavailable in ordinary buzzers. What's more, Intervox piezo-electric buzzers are offered in lightweight, compact packages. Some are self drive types and some with or without circuits.

PART NUMBERING SYSTEM

□□□ □□□□ □□□-□□□-□
Product Code | Size | Termination | Voltage | Special Note

Product	Code
Buzzer, square/rectangular	BS
Buzzer, round	BR
Transducer, round	BRT
Transducer, square/rectangular	BST
Piezo Electric Alarm, round	BRP
Piezo Electric Alarm, square/rectangular	BSP
Buzzer, piezo sounders	BPS

Size
Diameter or Length plus height of buzzer in mm. (4 digits)

Termination	Code
Wire Leads	L
Pins	P
Screw Mounting	S
Fast-on Tabs	F
Vertical Fast-on Tabs	FV
Pins, Horizontal	PH
Pins, Vertical	PV
Lug	T

Voltage	Code
1.5	01
3	03
6	06
9	09
12	12
24	24
48	48
110	110
220	220

Special Note
C = With Driver or Trigger Circuit
S = Special characteristics unique to customer requirements
P = Pulse Tone
D = Dual Tone (single/pulse)

EXAMPLE:

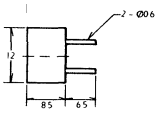
Product	*Size*	*Termination*	*Voltage*	*Special Note*	
Round Buzzer	28mm. dia. x 18mm. hgt.	Wire Leads	1.5v	Trigger Circuit	= **BR2818L-01-C**

TRANSDUCERS / SPEAKERS

Japan Electronic Manufacturers Agency represents major Asian and European manufacturers of speakers and transducers with an extensive tone and frequency range.

Magnetic Transducer
DBX-05

DBX-05 is an electromagnetically activated sound generator. Its efficient and contactless vibration mechanism ensures excellent performance and high reliability. With the Sealed bottom and the top covered by a water-resistant label, DBX transducer is designed for dip soldering and flush washing.



Side View

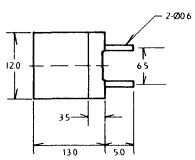
Cordless & Cellular Telephones
Computer Peripherals
Office Equipment
Electronic Cash Registers
Alarm Clocks
Calculators
Printers
Timers

Model Number		DBX-5
Rated Voltage	(VDC)	5.0
Operating Voltage	(VDC)	3 - 8
*Max. Rated Current	(mA)	40
*Sound Pressure Level	(DBA/10cm)	85 (Min.)
*Coil Resistance	(DC ohm)	45 ± 6
Resonant Frequency	(Hz)	2,400
Operating Temp	(°C)	-20 to +60
Weight	(Gram)	2.2

* are measured at rated voltage, 2,400Hz, square wave (50% duty cycle).

Magnetic Transducer
DB-113

DB-113 is an extended version of our magnetic transducer series. It is characterized with its big resonance chamber which improves both the loudness and the frequency response considerably. Same as the other members of DB transducers, DB-113 is free from electric noises, low power consumption, loud sound pressure level, reliable and durable.



Side View

Electronic Games & Toys
Musical & Sound Modules
Security & Warning Devices
Telecommunication Equipment
Electric Household Appliances
Office Equipment
Alarm Clocks
Printers
Timers

Model Number		DB-113
Rated Voltage	(VDC)	1.5
Operating Voltage	(VDC)	1 - 2
*Current	(mA)	30 Max.
*Peak Current	(mA)	70 Max.
*Sound Pressure Level	(dBA)	80 at 10cm
*Coil Resistance	(DC ohm)	16 ± 5
Resonant Frequency	(Hz.)	2,048
Operating Temp	(°C)	-20 to +60
Weight	(Gram)	2.5

*are measured at rated voltage, 2,048Hz., square wave (50% duty cycle)

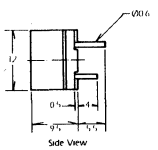
Magnetic Transducers
DB111 Series

TYPE		DB-111G	DB-111
Rated voltage	(VDC)	1.5	1.5
Operating voltage	(VDC)	1.1-1.7	1.1-1.7
*Rated current	(mA)	32	12
Coil resistance (DC)	(Ω)	16±2	42±5
*Sound pressure level at 10cm	(dBA)	Min. 85	Min. 80
Resonant frequency	(Hz)	2048	2048
Temperature range	(°C)	-20 to +60	−20 to +60
Weight	(gm)	2	2

*measured at rated voltage (2048 Hz, ½ duty, square wave)

Applications

- Printers
- Telephones
- Timers
- Paging systems
- Mobile telephones
- Microwave ovens
- Electronic cash registers
- POS equipment
- Electronic typewriters
- Computer peripherals
- Keyboards
- Automatic copiers
- Motor car safety devices
- Battery operated portable equipment

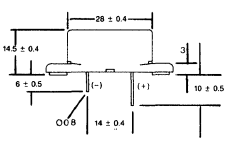


Side View

Electronic Buzzer
TDB Series

Model Number		TDB-01	TDB-03	TDB-05	TDB-09	TDB-12
Rated Voltage	(VDC)	1.5	3.0	5.0	9.0	12.0
Max. Rated Current	(mA)	30	30	30	30	30
Sound Pressure Level	(DBA/10 cm)	75 (Min.)	80 (Min.)	85 (Min.)	85 (Min.)	85 (Min.)
Frequency	(Hz)	2,300 ± 300				
Operating Voltage	(VDC)	1.25 - 2.0	2.5 - 4.0	4.0 - 6.5	7.0 - 11.0	10.0 - 14.0
Operating Temp	(°C)	-20 to + 65				
Weight	(Gram)	2.4				

Economical magnetic buzzer



Model No.	Operating Voltage (VDC)	Rated Voltage (VDC)	Max. Current at Rated Voltage (mA)	Frequency (KHz)	Min. Sound Pressure at Rated Voltage (dBA/30cm)	Pulse Rate at Rated Voltage (Pulse/Sec)	Tone	Terminal
1S3060	4–9	6	35	2.8±0.2	85	NIL	SINGLE	LEAD/PIN
1S3090	6–11	9	40	2.8±0.2	85	NIL	SINGLE	LEAD/PIN
1S3120	9–15	12	40	2.8±0.2	90	NIL	SINGLE	LEAD/PIN
1S3240	15–28	24	20	2.8±0.2	90	NIL	SINGLE	LEAD/PIN
1S3415	4–15	12	15	2.8±0.2	85	NIL	SINGLE	LEAD/PIN

From Prototype to Production ... Count on Japan Electronic!

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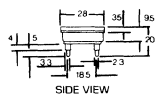
JEMA JAPAN ELECTRONIC
MANUFACTURERS AGENCY, INC.
1000 Skokie Blvd., Wilmette, IL 60091

Magnetic Piezo Dynamic

Mini-speaker

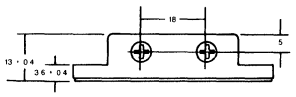


SIDE VIEW

	MS-9.5	MS-30	MS-60	MS-100
Rated Voltage, V	3	4.5	6	9
Operating Voltage, V	1-5	2-6	3-8	3-11
Rated Current, mA	50	40	30	20
Resonant Freq. KHz	2.7±0.2	2.7±0.2	2.7±0.2	2.7±0.2
Min. Sound pressure level, dBA/10cm (*)	90	90	90	90
DC Resistance ohms (±10%)	9.5	30	60	100

JUST RELEASED!
Magnetic Transducer
5.4 mm High
12 mm Diameter
1-2 VDC over 70 dB

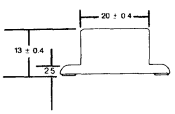
Magnetic switches



SIDE VIEW

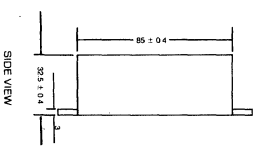
	RS-168A	RS-168B
Contact Rating	5W	3W
Max. Switching Current	500mA	250mA
Max. Switching Voltage	100VDC	100VDC
Min. Breakdown Voltage	250VDC	200VDC
Contact Resistance	200m Ohms	200m Ohms
Insulation Resistance	100M Ohms	100M Ohms
Actuating Distance	10mm	10mm
Terminal Screw	M3 × 6mm	M3 × 6mm
Case Materials	ABS RESIN	ABS RESIN

Rectangular magnetic buzzer



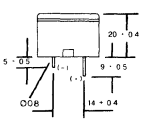
Model No.	Operating Voltage (VDC)	Rated Voltage (VDC)	Max. Current at Rated Voltage (mA)	Frequency (KHz)	Min. Sound Pressure at Rated Voltage (dBA/30cm)	Pulse Rate at Rated Voltage (Pulse/Sec)	Tone	Terminal
8S3120	6–16	12	10	3.4±0.5	80	NIL	SINGLE	LEAD

Two/siren tone



Model No.	Operating Voltage (VDC)	Rated Voltage (VDC)	Max. Current at Rated Voltage (mA)	Frequency (KHz)	Min Sound Pressure at Rated Voltage (dBA/3m)	Pulse Rate at Rated Voltage (Pulse/Sec)	Tone	Terminal
18T3120L	6 – 15	12	120	(2.6 – 2.8) ± 0.5	95	NIL	TWO	LEAD
18T3240L	16 – 28	24	120	(2.6 – 2.8) ± 0.5	95	NIL	TWO	LEAD
18R3120L	6 – 15	12	120	1.5 – 3.1	92	NIL	SIREN	LEAD
18R3240L	16 – 28	24	120	1.5 – 3.1	92	NIL	SIREN	LEAD

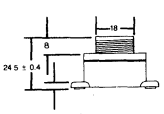
Multi-tone magnetic buzzer



SIDE VIEW
All dimensions are in mm

Model No.	Operating Voltage (VDC)	Rated Voltage (VDC)	Max. Current at Rated Voltage (mA)	Frequency (KHz)	Min. Sound Pressure at Rated Voltage (dBA/30cm)	Pulse Rate at Rated Voltage (Pulse/Sec)	Tone	Terminal
2S3030	2–5	3	35	2.8±0.2	85	NIL	SINGLE	LEAD/PIN
2S3060	4–9	6	35	2.8±0.2	90	NIL	SINGLE	LEAD/PIN
2S3090	6–11	9	40	2.8±0.2	90	NIL	SINGLE	LEAD/PIN
2S3120	9–15	12	40	2.8±0.2	95	NIL	SINGLE	LEAD/PIN
2S3240	15–28	24	25	2.8±0.2	95	NIL	SINGLE	LEAD/PIN
2S3415	4–15	12	15	2.8±0.2	90	NIL	SINGLE	LEAD/PIN
2P3015	1–3	1.5	5	2.8±0.2	70	2–7	PULSE	LEAD/PIN
2P3030	2–5	3	8	2.8±0.2	73	2–7	PULSE	LEAD/PIN
2P3060	4–9	6	10	2.8±0.2	78	2–7	PULSE	LEAD/PIN
2P3090	6–11	9	10	2.8±0.2	80	2–7	PULSE	LEAD/PIN
2P3120	8–15	12	15	2.8±0.2	85	2–7	PULSE	LEAD/PIN
2P3240	15–28	24	20	2.8±0.2	85	2–7	PULSE	LEAD/PIN
2D3060	4–9	6	35/10	2.8±0.2	85/70	2–7	SINGLE/PULSE	3 LEADS
2D3090	6–11	9	35/15	2.8±0.2	85/75	2–7	SINGLE/PULSE	3 LEADS
2D3120	8–15	12	40/15	2.8±0.2	90/80	2–7	SINGLE/PULSE	3 LEADS

Panel-mounted piezobuzzer



SIDE VIEW
All dimensions are in mm

Model No.	Operating Voltage (VDC)	Rated Voltage (VDC)	Max. Current at Rated Voltage (mA)	Frequency (KHz)	Min. Sound Pressure at Rated Voltage (dBA/30cm)	Pulse Rate at Rated Voltage (Pulse/Sec)	Tone	Terminal
7S3120	1.5–16	12	15	3.5±0.5	95	SINGLE	NIL	LEAD
7S3240	1.5–28	24	20	3.5±0.5	95	SINGLE	NIL	LEAD

Rely On Our Over 30 Years Experience!

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JEMA

JAPAN ELECTRONIC MANUFACTURERS AGENCY, INC.

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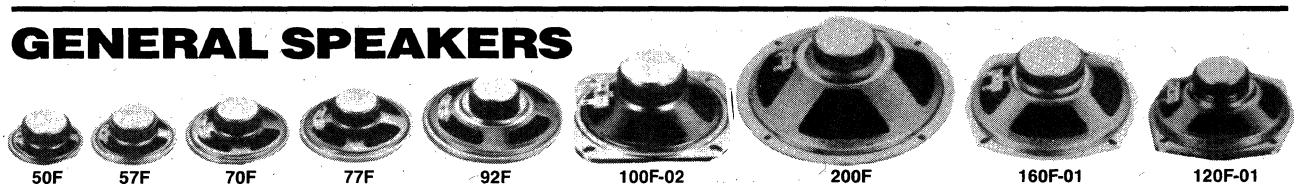
GENERAL SPEAKERS



50F 57F 70F 77F 92F 100F-02 200F 160F-01 120F-01

FERRITE MAGNET SPEAKERS, 8-OHM

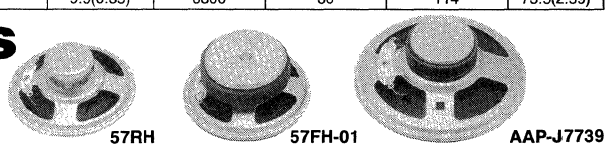
MODEL NO.	NOMINAL SIZE Cm (INCH)	STYLE	RESONANT FREQUENCY Hz	FREQUENCY RANGE Hz	MAX. POWER W	MAGNET WT. g (Oz)	FLUX DENSITY GAUSS	TOTAL HEIGHT mm (INCH)	MOUNTING DIA. mm (INCH)	NET WT. g (Oz)
50F	5 (2)	ROUND	450	F_0-4500	0.2	16.9(0.6)	6300	17.2	–	52.3(1.84)
57F	5.7 (2 1/4)	ROUND	400	F_0-4000	0.2	16.9(0.6)	6300	18	–	53.5(1.89)
66F	6.6 (2 1/2)	ROUND	360	F_0-4000	0.3	16.9(0.6)	6300	20	–	57.5(2.03)
70F	7 (2 3/4)	ROUND	300	F_0-4000	0.5	16.9(0.6)	6300	20.6	–	60(2.12)
77F	7.7 (3)	ROUND	250	F_0-4500	0.5	16.9(0.6)	6300	22.3	–	62(2.19)
87F	8.7 (3 1/4)	SQUARE	200	F_0-10000	0.5	16.9(0.6)	6300	29	100	74.3(2.62)
92F	9.2 (3 1/2)	ROUND	200	F_0-10000	1	16.9(0.6)	6300	26.2	–	72(2.54)
100F-01	10 (4)	SQUARE	190	F_0-10000	1	16.9(0.6)	6300	33.5	114	86(3.10)
100F-02	10 (4)	SQUARE	180	F_0-10000	2	46.2(1.7)	8500	30.5	115	106.5(5.94)
100F-03	10 (4)	SQUARE	160	F_0-12000	3	80(2.8)	10300	36.5	117	255(8.99)
120F-01	12 (5)	PIN CUSHION	140	F_0-12000	3	48.2(1.7)	8500	43.7	119	187(6.601)
120F-02	12 (5)	PIN CUSHION	140	F_0-12000	5	80(2.8)	10300	43.7	119	267(9.42)
160F-01	16 (6 1/2)	PIN CUSHION	90	F_0-12000	3	46.2(1.7)	8500	54	156	250(8.82)
160F-02	16 (6 1/2)	PIN CUSHION	90	F_0-13000	6	80(2.8)	103000	56	156	334(11.8)
200F	20 (8)	ROUND	80	F_0-12000	6	80(2.8)	10300	65	195	425(14.9)

ALNICO MAGNET SPEAKERS, 8-OHM

27R 45R 50R 57R 66R 87S 100S

27R	2.7 (1)	ROUND	800	F_0-6000	0.1	7.1(0.25)	5200	14	–	14.4(0.51)
40R	4 (1 1/2)	ROUND	600	F_0-5000	0.1	9.9(0.35)	5500	15.8	–	23.5(0.83)
45R	4.5 (1 3/4)	ROUND	470	F_0-4500	0.1	9.9(0.35)	5500	16.6	–	24.7(0.87)
50R	5 (2)	ROUND	450	F_0-4500	0.2	9.9(0.35)	6300	18.3	–	39(1.38)
57R	5.7 (2 1/4)	ROUND	400	F_0-4000	0.2	9.9(0.35)	6300	19.2	–	40.5(1.43)
66R	6.6 (2 1/2)	ROUND	350	F_0-4000	0.3	9.9(0.35)	6300	21	–	44(1.55)
70R	7 (2 3/4)	ROUND	300	F_0-4000	0.5	9.9(0.35)	6300	21.6	–	46(1.62)
77R	7.7 (3)	ROUND	250	F_0-4500	0.5	9.9(0.35)	6300	23.2	–	48.5(1.71)
87S	8.7 (3 1/4)	SQUARE	200	F_0-10000	0.5	9.9(0.35)	6300	30	100	62(2.19)
92R	9.2 (3 1/2)	ROUND	200	F_0-10000	1	9.9(0.35)	6300	27.2	–	58.7(2.07)
100S	10 (4)	SQUARE	190	F_0-10000	1	9.9(0.35)	6300	36	114	73.5(2.59)

SPECIAL TYPE SPEAKERS



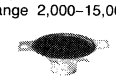
57RH 57FH-01 AAP-J7739

MINI FULL-RANGE SPEAKER, 8-OHM

MODEL NO.	NOMINAL SIZE Cm (INCH)	RESONANT FREQUENCY Hz	FREQUENCY RANGE Hz	MAX. POWER W	MAGNET WT. g (Oz)	FLUX DENSITY GAUSS	DIAMETER mm (INCH)	DEPTH mm (INCH)	MOUNTING DIA. mm (INCH)	NET WT. g (Oz)
57RH	5.7(2 1/4)	220	F_0 – 10000	0.5	9.9(0.35)	6300	57(2 1/4)	21.7(27/32)	—	42 (1.48)
57FH-01	5.7(2 1/4)	220	F_0 – 10000	1	27.2(0.96)	7000	57(2 1/4)	23.5(15/16)	—	90.5(3.19)
77RH	7.7(3)	220	F_0 – 20000	1	9.9(0.35)	6300	77(3)	26.3(1 1/32)	—	49.5(1.75)
AAP-J7739	7.7(3)	220	F_0 – 20000	2	27.2(0.96)	7000	77(3)	27.5(1 5/64)	—	100(3.53)

tweeter speakers

JAP 5203F
2 INCH TWEETER
Nominal Impedance 8 OHM
Power Rating 5 WATT (RMS)
Response Range 2,000–15,000 Hz



IAP 6645F
2 1/2 INCH TWEETER
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 2,000–20,000 Hz

CAP-6645F
2 1/2 INCH TWEETER
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 2,000–20,000 Hz

CAP-7745F
3 INCH TWEETER
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 2,000–20,000 Hz

CAP-7760F
3 INCH TWEETER
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 2,000–20,000 Hz

HAP-8760F
3 1/2 INCH TWEETER
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 3,000–20,000 Hz

middle range speakers

CBP-1045F
4 INCH MID RANGE
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 750–10,000 Hz

CBP-1006F
4 INCH MID RANGE
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range 750–10,000 Hz

CBP-1060F
4 INCH MID RANGE
Nominal Impedance 8 OHM
Power Rating 15 WATT (RMS)
Response Range 700–7,000 Hz

IBP-1260F
5 INCH MID RANGE
Nominal Impedance 8 OHM
Power Rating 10 WATT (RMS)
Response Range f_0–10,000 Hz

CEC-1270F
5 INCH MID RANGE
Nominal Impedance 8 OHM
Power Rating 30 WATT (RMS)
Response Range f_0–6,000 Hz

HEC-1270F
5 INCH MID RANGE
Nominal Impedance 8 OHM
Power Rating 30 WATT (RMS)
Response Range f_0–6,000 Hz

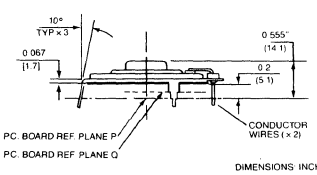
LZRelectronics,inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 **LZR**

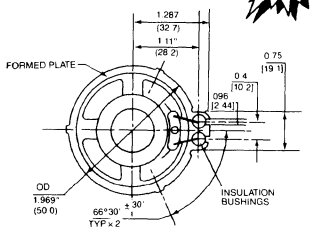
PC BOARD MOUNTED MINIATURE SPEAKERS

STANDARD MODELS ARE 8-OHM IMPEDANCE.
OTHER VALUES ARE AVAILABLE UPON REQUEST.

NEW

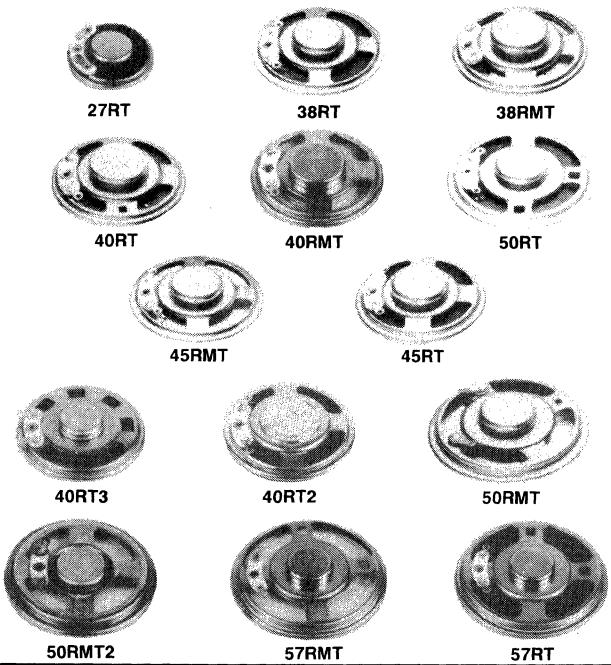
MODEL SHOWN: OG50PC SERIES
PATENTS PENDING





Model No.	Cone Type	Max Power	Nominal Diameter	Resonant Frequency	Frequency Range
OG38PCWP2	Waterproof Paper	0.2 W	38 mm	700 Hz	Fo 5000 Hz
OG38PCWP5	Waterproof Paper	0.5 W	38 mm	700 Hz	Fo 5000 Hz
OG38PCMC2	Mylar	0.2 W	38 mm	700 Hz	Fo 5000 Hz
OG38PCMC5	Mylar	0.5 W	38 mm	700 Hz	Fo 5000 Hz
OG50PCWP2	Waterproof Paper	0.2 W	50 mm	450 Hz	Fo 5000 Hz
OG50PCWP5	Waterproof Paper	0.5 W	50 mm	450 Hz	Fo 5000 Hz
OG50PCMC2	Mylar	0.2 W	50 mm	450 Hz	Fo 5000 Hz
OG50PCMC5	Mylar	0.5 W	50 mm	450 Hz	Fo 5000 Hz

SUPER THIN SPEAKERS



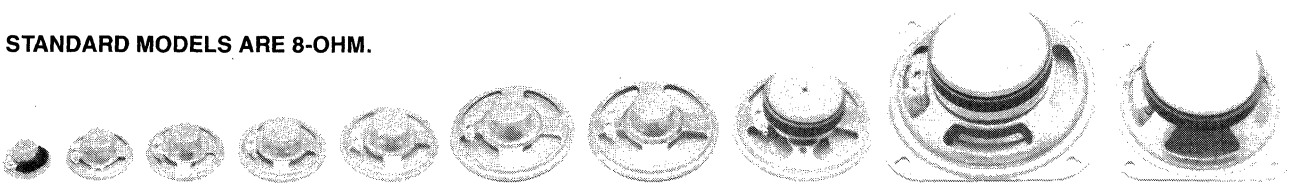
Model No.	Nominal Diameter mm	Resonant Frequency Hz	Frequency Range Hz	Max. Power W	Total Height mm	Magnet Weight g (Oz)	Net Weight g (Oz)
27RT	27	700	F_0~5000	0.1	6.1	0.7 (0.025)	5.4 (0.19)
38RT	38	700	F_0~5000	0.1	8	2.7 (0.056)	10.4 (0.37)
38RMT	38	600	F_0~5000	0.1	8	1.6 (0.056)	10.4 (0.37)
40RT	40	700	F_0~5000	0.1	8	1.6 (0.056)	11.3 (0.4)
40RMT	40	600	F_0~5000	0.1	8	1.6 (0.056)	11.3 (0.4)
40RT2	40	500	F_0~5000	0.1	6.7	1.6 (0.056)	12.2 (0.43)
40RT3	40	600	F_0~5000	0.1	7.4	0.7 (0.025)	8.2 (0.29)
45RT	45	500	F_0~4500	0.1	8.3	1.6 (0.056)	11.8 (0.42)
45RMT	45	500	F_0~4500	0.1	8.3	1.6 (0.056)	11.8 (0.42)
50RT	50	450	F_0~4500	0.2	9	1.6 (0.056)	14.1 (0.50)
50RMT	50	450	F_0~4500	0.2	9	1.6 (0.056)	14.1 (0.50)
50RMT2	50	450	F_0~3500	0.2	6.7	1.6 (0.056)	15 (0.53)
57RMT	57	400	F_0~4000	0.2	9.6	1.6 (0.056)	15 (0.53)
57RT	57	400	F_0~4000	0.2	9.6	1.6 (0.056)	15 (0.53)

RMT Series are Mylar Cone Type

STANDARD MODELS ARE 8-OHM. OTHER VALUES ARE AVAILABLE UPON REQUEST.

WATER-PROOF SPEAKERS

STANDARD MODELS ARE 8-OHM.



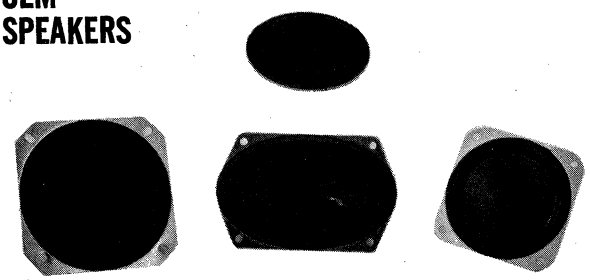
MYLAR CONE SPEAKER

MODEL NO.	NOMINAL SIZE Cm(INCH)	STYLE	RESONANT FREQUENCY Hz	FREQUENCY RANGE Hz	MAX. POWER W	MAGNET WT. g(Oz)	FLUX DENSITY GAUSS	TOTAL HEIGHT mm(INCH)	MOUNTING DIA. mm(INCH)	NET WT. g(Oz)
27RM	2.7(1)	ROUND	600	F_0~6000	0.1	7.1(0.25)	5500	13.7(35/64)	—	12.6(0.44)
38RM	3.8(1 1/2)	ROUND	600	F_0~6000	0.1	9.9(0.35)	5600	15.8(5/8)	—	22(0.78)
45RM	4.5(1 3/4)	ROUND	500	F_0~4500	0.2	9.9(0.35)	5600	16.6(21/32)	—	24.7(0.87)
50RM	5 (2)	ROUND	450	F_0~5000	0.2	9.9(0.35)	6300	18(11/16)	—	38.8(1.37)
57RM	5.7(2 1/4)	ROUND	400	F_0~4000	0.2	9.9(0.35)	6300	19(3/4)	—	40(1.41)
66RM	6.6(2 1/2)	ROUND	350	F_0~4500	0.3	9.9(0.35)	6300	21(53/64)	—	43(1.52)
70RM	7(2 3/4)	ROUND	350	F_0~8000	0.5	9.9(0.35)	6300	21.8(7/8)	—	46(1.62)
ABM-7745	7.7(3)	ROUND	500	F_0~10000	3	48.2(1.7)	8500	29.2(1 1/8)	85.5(3 3/8)	150(5.29)
BDM-8760	8.7(3 1/4)	SQUARE	550	F_0~8500	12	80(2.8)	8500	35.5(1 3/8)	100(3 7/8)	280(9.88)
BDM-1060	10(4)	SQUARE	500	F_0~6000	12	80(2.8)	8500	38.5(1 1/2)	117(4 9/16)	295(10.4)

LZR *electronics, inc.* 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 **LZR**

SPEAKERS & HORNS — FOR OEM OR DISTRIBUTOR

OEM SPEAKERS



- ☐ COMMUNICATIONS
- ☐ COMPUTER APPLICATIONS
- ☐ INTERCOM SYSTEMS
- ☐ ELECTRONIC TOYS AND GAMES

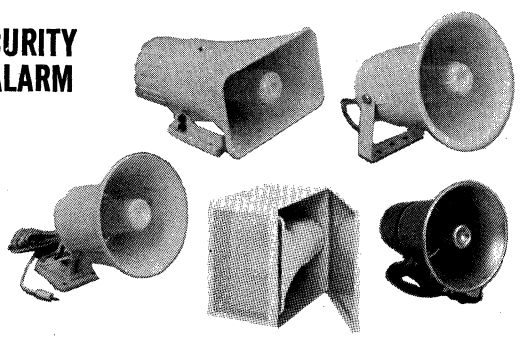
MG's wide range of miniature speakers are available in sizes from 1″ to 4″, round or square. Voice coil impedances range from 3.2 to 100 ohms. Magnets are available in ferrite and alnico V.

LOW PROFILE MINIATURE SPEAKERS, BUZZERS & TRANSDUCERS

- ☐ TELEPHONE SYSTEMS
- ☐ MODEMS
- ☐ ALARMS
- ☐ KEYBOARD APPLICATIONS

These miniature thin line speakers produce a clean and natural sound. The wide frequency response make these speakers ideal for a broad range of O.E.M. applications.

SECURITY & ALARM



- ☐ HORNS AND SIRENS FOR PROTECTION AND SIGNAL SYSTEM APPLICATIONS

MG's paging, signaling horns, and electronic sirens all designed with built in drivers and available in sizes from 5″ to 12″. All constructed with heavy duty ABS or aluminum housings.

GENERAL PURPOSE & COMMERCIAL SOUND SPEAKERS

- ☐ BACKGROUND MUSIC
- ☐ PUBLIC ADDRESS AND PAGING
- ☐ SOUND COLUMNS
- ☐ AUTOMOTIVE
- ☐ COMMUNICATIONS AND GENERAL REPLACEMENT APPLICATIONS

Paging horns are available in a wide range of sizes from 5″ to 12″, in plastic or aluminum housings. Speakers are available in single cone, dual cone and coaxial types in sizes from 4″ to 8″. All 8″ speaker baskets are prestamped for easy transformer mounting. A wide variety of voice coil sizes and magnet weights are available.

MG offers a wide range of high quality loudspeaker products for hundreds of industrial and commercial applications at competitive pricing. Speakers are "manufactured to your specifications" and available in OEM quantities. A broad range of options in configuration, voice coil impedance, magnet type and weight, and cone finish can be specified.

We also maintain a huge "off the shelf" raw speaker inventory of hundreds of assorted speaker types and sizes from 1″ to 18″. — Call us for availability.

ELECTRONICS

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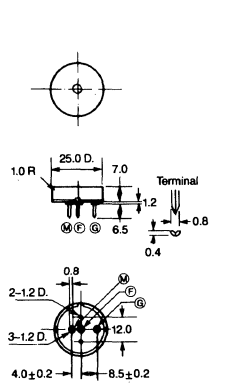
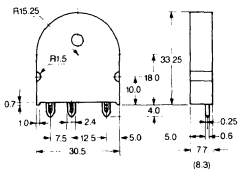
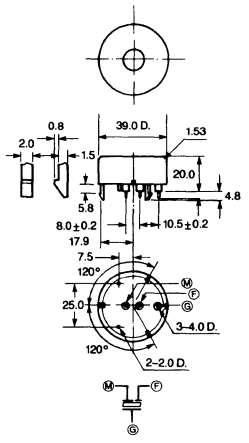
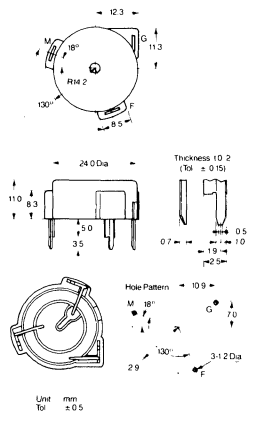
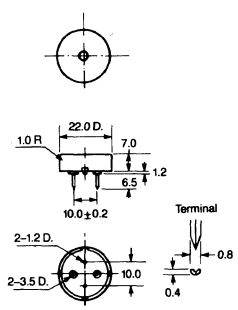
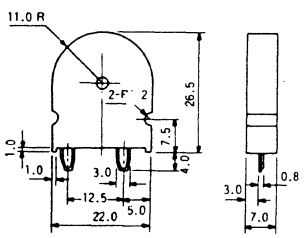
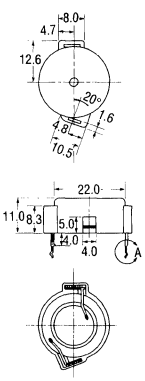
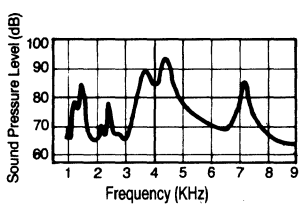
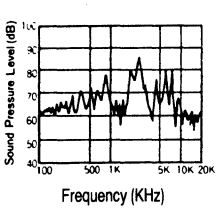
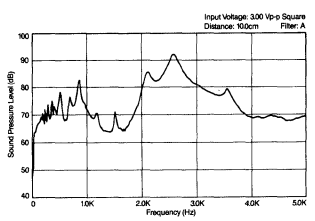
piezoelectric audio alarms

MURATA ERIE NORTH AMERICA

ENCASED PIEZO-ALARMS SELF-DRIVE (no internal circuitry)

Part Number	PKM25-6A0	PKM30SPT-2001	PKM29-3A0	PKM24SP-3805
Sound Pressure Level	85dB min./6.5VDC/10cm	75dB min./12VDC/10cm	85dB min./9VDC/1m	90dB min./12VDC/10cm
Oscillating Frequency	6.8±0.7KHz (6.5VDC)	2.0±0.3KHz (9VDC)	3.40±0.4KHz (9VDC)	3.8±0.4KHz (12VDC)
Current	10mA max.	20mA max.	20mA max.	12mA max.
Operating Voltage	3 to 20VDC	3 to 20VDC	4.5 to 15VDC	3 to 20VDC
Operating Temp. Range	-20°C to +70°C	-20°C to +70°C	-20°C to +70°C	-20°C to +70°C
Storage Temp. Range	-30°C to +80°C	-30°C to +80°C	-30°C to +80°C	-30°C to +80°C
DIMENSIONS: (mm)				

ENCASED PIEZO-ALARMS EXTERNAL DRIVE (no internal circuitry)

Part Number	PKM22EPP-4001	PKM22EPT-2001	PKM22EP-2001
Sound Pressure Level	70dB min. (3Vp-p square wave 10cm, 4KHz)	70dB min. (3Vp-p square wave 10cm, 2.0KHz)	75dB min. (3Vp-p, square wave, 10cm, 2.0KHz)
Current	1.0mA max.	2.0mA max.	2.5mA max.
Capacitance	12000pF±30% (1KHz)	19000pF±30% (1KHz)	17,000pF±30%
Max. Input Voltage	30Vp-p	25Vp-p	25Vp-p
Operating Temp. Range	−20°C to +70°C	-20°C to +70°C	−20°C to +70°C
Storage Temp. Range	−30°C to +80°C	-30°C to +80°C	−40°C to +80°C
DIMENSIONS: (mm)			
SOUND PRESSURE LEVEL VS. INPUT VOLTAGE	 Input Voltage: Square Wave 3Vp-p Measuring Distance: 10cm	 Input Voltage: Square Wave 9Vp-p Measuring Distance: 30cm	 Input Voltage: Square Wave 9Vp-p Measuring Distance: 30cm

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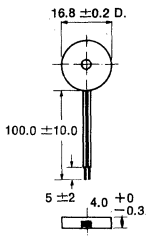
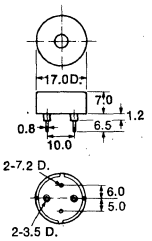
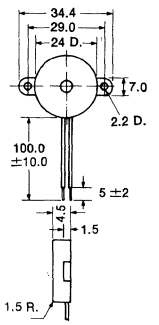
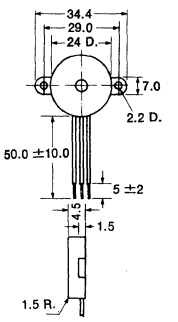
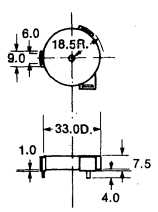
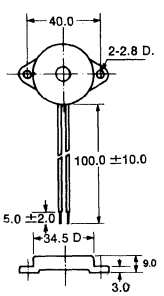
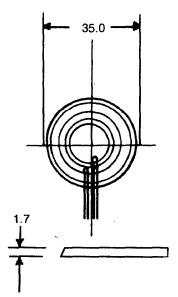
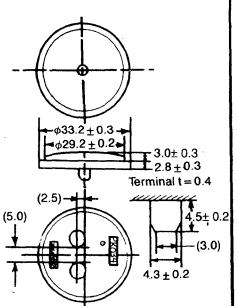
piezoelectric acoustic alarms

MURATA ERIE NORTH AMERICA

Miniature Encased Piezo-Alarms

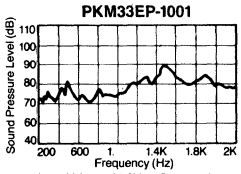
Part Number	PKM35-4A0	PKM17EPP-4001	PKM11-4A0	PKM11-6A0
Input Voltage	3Vp-p square wave	3Vp-p square wave	3Vp-p square wave	3 to 15VDC
Sound Pressure Level	75dB min. (10cm from source)	72dB min. (10cm from source)	75dB min. (10cm from source)	75dB min. (10cm from source)
Current	1mA max.	1mA max.	1mA max.	4mA max. (3VDC in.)
Capacitance	9500pF ±30% (1KHz)	7000pF ±30% (1KHz)	10000pF ±30% (1KHz)	—
Max. Input Voltage	25Vp-p	20Vp-p	25Vp-p	—
Lead Wire	32 AWG UL-1685	—	30 AWG UL-1571	30 AWG UL-1571
DIMENSIONS: (mm)				

Piezo Ringers for Low Frequency Applications

Part Number	PKM33EP-1001	PKM34EW-1101	VSB35EW-0701B	PKD 34 EP-01R
Sound Pressure Level	70dB min./50cm/20Vp-p square wave at 1.0KHz	70dB min./1m/30Vp-p square wave at 1.1KHz	70, ±5dB at 1KHz, 1 Vrms Sine wave at 10 cm	105dB (1Vrms, 1KHz, 6cc coupler)
Allowable Input	30Vp-p max.	40Vp-p max.	4 Vrms max.	40Vp-p max.
Operating Temp. Range	−30°C to +70°C	−20°C to +70°C	−20°C to +70°C	−20°C to +70°C
Storage Temp. Range	−40°C to +80°C	−30°C to +80°C	−30°C to +80°C	−30°C to +70°C
Lead Wire		30 AWG UL-1571	32 AWG, UL-1685	—
DIMENSIONS: (mm)				

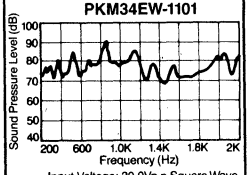
SOUND PRESSURE LEVEL VS. FREQUENCY CHARACTERISTICS

PKM33EP-1001



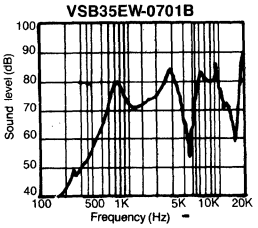
Input Voltage: 20.0Vp-p Square Wave
Distance : 50.0cm

PKM34EW-1101



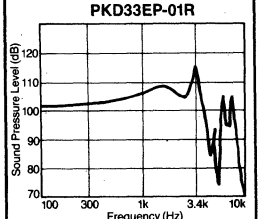
Input Voltage: 30.0Vp-p Square Wave
Distance : 1m

VSB35EW-0701B



Input Voltage: 1.0 Vrms Sine
Distance: 10 cm

PKD33EP-01R



Input Voltage: 1.00 Vrms Sine wave
Coupler: 6cc

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piezoelectric audio alarms

MURATA ERIE NORTH AMERICA

Acoustic Elements

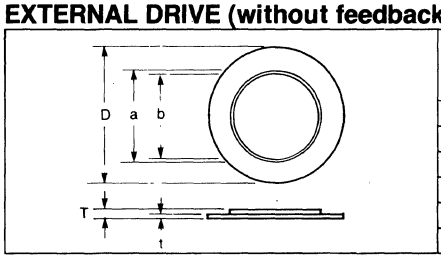
FEATURES

- Extremely clear penetrating sound
- Completely solid state
- One-tenth the power consumption of a comparable electromechanical buzzer
- No electronic noise generation
- Compact size and lightweight
- Variety of models for various tone functions

APPLICATIONS

- Fire alarms
- Gas detectors
- Calculators
- Medical electronics
- Appliances
- Burglar alarms
- Automobiles
- Aircraft
- Clocks
- Watches
- Communications systems
- Data processing
- Instrument and control systems
- Restaurant equipment
- Recreational equipment

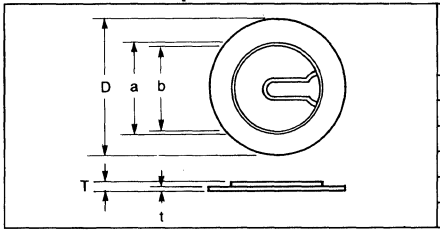
EXTERNAL DRIVE (without feedback electrode)



Part Number	Characteristics (*1, *2)			Dimensions: mm				
	Resonant frequency (KHz)	Resonant resistance (Ω)	Capacitance (pF)±30%	D	a or c	b	T	t
7BB-20-6	6.3±0.6	≤350	10000	20.0±0.2	14.0±0.6	12.8±0.2	0.42±0.1	0.20±0.05
7BB-27-4	4.6±0.5	≤200	20000	27.0±0.2	19.7±0.6	18.2±0.2	0.54±0.1	0.30±0.05
7BB-35-3	2.8±0.5	≤200	30000	35.0±0.2	25.0±0.6	23.0±0.2	0.53±0.1	0.30±0.05
7BB-41-2	2.2±0.3	≤250	30000	41.0±0.2	25.0±0.6	23.0±0.2	0.63±0.1	0.40±0.05
7NB-41-25DM-1	.85±.25	≤300	75000	41.0±0.2	25.0±0.5	23.0±0.2	0.21±0.5	0.10±0.03
—	—	—	—	—	—	—	—	—

*1 Insulation resistance 100MΩmin. (at 100VDC)
*2 Maximum applied voltage 30Vp-p

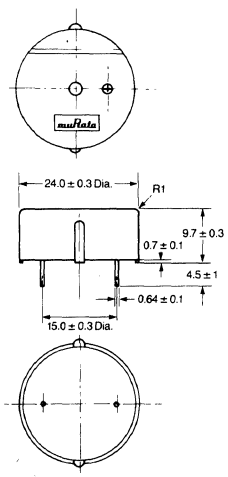
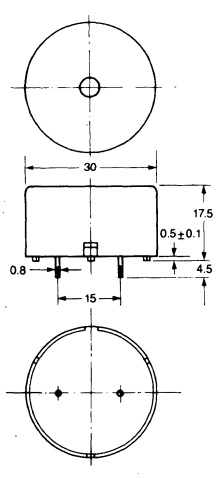
SELF-DRIVEN (with feedback electrode)



Part Number	Characteristics (*1, *2)			Dimensions: mm				
	Resonant frequency (KHz)	Resonant resistance (Ω)	Capacitance (pF)±30%	D	a	b	T	t
7BB-20-6C	6.3±0.6	≤500	8500	20.0±0.2	14.0±0.6	12.8±0.2	0.42±0.1	0.20±0.05
7BB-27-4C	4.6±0.5	≤200	18000	27.0±0.2	19.7±0.6	18.2±0.2	0.54±0.1	0.30±0.05
7BB-35-3C	2.8±0.5	≤200	24000	35.0±0.2	25.0±0.6	23.0±0.2	0.53±0.1	0.30±0.05
7BB-41-2C	2.2±0.3	≤250	24000	41.0±0.2	25.0±0.6	23.0±0.2	0.63±0.1	0.40±0.05
7SB-34R7-3C	3.3±0.3	≤150	40000	34.7±0.2	25.0±0.6	23.4±0.2	0.50±0.1	0.25±0.05
7SB-34R7-3C2	3.1±0.5	≤160	24000	34.7±0.2	25.0±0.6	23.0±0.2	0.50±0.1	0.25±0.05

Concentric circuit feedback electrode type for Molex housing ATM7373.

ENCASED PIEZO-ALARMS WITH INTERNAL CIRCUITRY

Part Number	PKB24SPC-3601	PKB30SPC-2001
Sound Pressure Level	90dB min./10cm/12V	75dB min./1m/12V
Oscillating Frequency	3.6±0.5KHz	2.0±.4KHz
Operating Voltage	3.0 to 15.0 VDC	3.0 to 15 VDC
Operating Temp. Range	−20°C to +70°C	−20°C to +70°C
Diameter	24.0±0.3	30.0±0.3
Height	9.7±0.3	17.5±0.3
Pin Pitch	15.0±0.3	15.0±0.3
Pin Diameter	0.64±0.1	0.8±0.1
DIMENSIONS: (mm)		

MURATA ERIE NORTH AMERICA 2200 Lake Park Dr., Smyrna, Georgia 30080 Tel: (404) 436-1300 Telex: 26-1301 FAX: 404-436-3030

PHI TECH

The Legendary Phi Deck... The Heavy Duty "Building Block" Cassette Tape Transport

Unequaled reliablity and flexibility have made the Phi Deck legendary as the tape transport of choice for custom configuration to handle the most demanding applications.

Our "building block" approach enables customers to specify virtually limitless customization – heads, motors, options, wiring harnesses . . . even internal electronics – while retaining the solid dependability and accuracy of the basic Phi Deck.

10,000-Hour Reliability

While most offshore suppliers – even Studer Revox – quote Mean Time Between Failures (MTBFs) of 500 to 1,500 hours, our Phi Deck customers routinely quote **minimum** MTBFs of 4,000 to 5,000 hours – and often as high as 10,000 to 12,000. In fact, the Phi Deck frequently outperforms other advanced technologies while offering significant cost advantages.

Winchester disk drives, for example, are quoted as having MTBFs of 10,000 to 20,000 hours. But disk drives often must run continuously, even when they're not being actively accessed.

By comparison, the Phi Deck operates only when information is being recorded or retrieved. Consequently, the Phi Deck tape drive, despite its lower MTBF, can significantly outlast the disk drive before requiring service.

Diecast Chassis

One reason for this is the chassis of diecast zinc that is the foundation of the Phi Deck. Diecast zinc is far more rigid than the plastic or sheet metal used by some manufacturers. It's even more rigid than aluminum – and maintains critical dimensions and close tolerances over a longer lifetime.

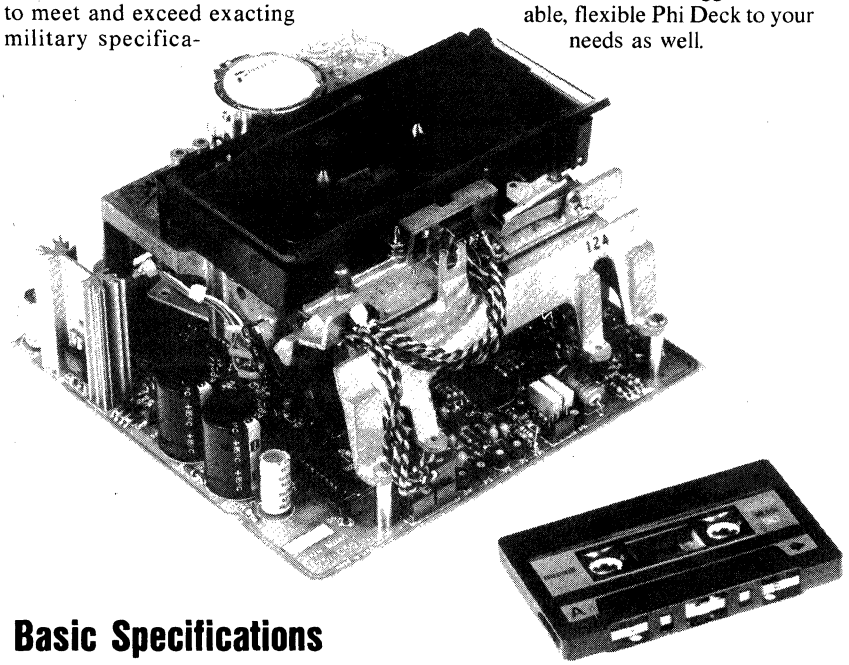
Other reasons for the Phi Deck's outstanding reliability include our unique pivoting headbar design that eliminates the need for continuous power to maintain head engagement, and our four-motor design that enables the Phi Deck to handle tape so gently that we even **encourage** the use of fragile C-120 cassettes when their longer playing time is advantageous.

Customized Engineering

The true strength of the Phi Deck, however, lies in our willingness and ability to **customize** our tape decks and systems to each customer's unique requirements.

We have configured the Phi Deck to meet and exceed exacting military specifications in numerous highly specialized applications, to fulfill critical life-or-death requirements of medical technology, to function in the harsh environment of oil well down holes.

We can customize the rugged, reliable, flexible Phi Deck to your needs as well.



Basic Specifications

Structure:
Zinc diecast chassis, head bar and capstan rest.

Drive Motors:
Two shielded, filtered reel DC drive motors, optional ironless core types; one DC head bar operating motor; one capstan drive motor (AC or DC options).

Capstan:
.0937 precision ground with textured end.

Capstan Bearing:
Oil impregnated sintered bronze, removable.

Capstan Flywheel:
Precision dual machined brass drive surfaces.

Capstan Drive Belt:
Polyether urethane flat belt, .007" T × .150" W.

Motor Drive Pulley:
Machined aluminum, crowned, hard anodized.

Pinch Roller Pressure:
275-325 grams (measured at corner of housing).

Tape Start Time:
110-130 milliseconds.

Tape Stop Time:
100-200 milliseconds (speed-dependent).

Rewind Time:
Less than 30 seconds for quality C-60 tapes.

Dimensions:
6.20" D × 5.40" W × 2.55" H.

Weight:
2 lbs., 10 oz. (typical).

Temperature Range:
−20 to +65 degrees C.

For More Information Contact:
Customer Service, OEM/Systems Division
(405) 521-9000

ComLog-1 Recorder and Reproducer

Unique Features

- 4 Channel/4 Track
- Side-by-Side 19″ Rack Mountability
- RS-232-C/IEEE-488 Controllable
- Rugged Industrial Construction
- Simultaneous Recording/Playback
- Utilizes Patented Phi Deck™
- Multi Speed
- Individual Input Sensitivity
- COR/VOX Control
- Transcription Capability
- ½ Rack Modular Design
- Microprocessor Controlled

PHI TECH

Description

Phi-Technologies **ComLog-1** is the most rugged, reliable multi-channel voice, analog and digital communications recording and reproducing system manufactured in the USA. It is mounted in a single cabinet. Operation is possible on a desk top, equipment rack, and mobile vehicle, airborne or at sea. This unit is commonly utilized in the C³I community.

Multi Speed/Multi Channels

The **ComLog-1** has been designed to provide up to 4 simultaneous record/reproduce channels. It records and reproduces at 15/16, 1 7/8, 3 3/4, and 7 1/2 i.p.s. user selectable.

RS-232-C/IEEE-488 Controllable

Recording can be on any good quality normal bias C60, C90, or C120 Compact-Type audio cassette tape. The **ComLog-1** has multiple control capabilities: manual operations from front panel, COR (Carrier Operated Relay), RS-232-C, IEEE-488, and via foot switch. Each input channel's signal level is independently adjustable. Audio output can be obtained from front or rear panels.

Phi Deck Cassette Drive

The **ComLog-1** utilizes the Phi Deck™. The Phi Deck™ is known worldwide as the most rugged cassette drive manufactured in the USA. Phi Technologies currently has over 250,000 Phi Decks in operation. Phi Tech cassette systems have long been recognized for reliability in harsh environments. The Phi Deck™ utilizes a patented pivoting-head engagement system and four-motor design with a MTBF of 3,000 to 20,000 hours depending upon the application. Phi Technologies's **ComLog-1** is available in Model 9000-059, and Model 9000-059.1 (operates with 12 Vdc power source). No other device in this market offers the combined features, functions, and benefits of the **ComLog-1.**

Phi Tech ComLog-1 Specifications

Cassette Deck Features

Speed: Multi
Option Installed: Record Lock-Out/Cassette-In-Place
Signal Generator/Precision Reel Motors
EOT/BOT
Cassette Types Used: C-120, C-90, C-60
Record Head: 4 Channel, 4 Track
Play Head: 4 Channel, 4 Track

Tape Speed

Run, Slow:	15/16 in/s (23.8 mm/s) +/−1%
Run, Normal:	1 7/8 in/s (47.6 mm/s) +/−1%
Run, Fast:	3 3/4 in/s (95.2 mm/s) +/−1%
Run, Very Fast:	7 1/2 in/s (190.4 mm/s) +/−1%
Scan:	7 1/2 in/s (190.4 mm/s)

Recording Time

(per channel)	W/C-120	W/C-90	W/C-60
@ 15/16 in/s:	120 minutes	90 minutes	60 minutes
@ 1 7/8 in/s:	60 minutes	45 minutes	30 minutes
@ 3 3/4 in/s:	30 minutes	22.5 minutes	15 minutes
@ 7 1/2 in/s:	15 minutes	11.25 minutes	7.5 minutes

Input Signal

With −20 dB/0 dB/AGC switch set to −20dB: 100mV p-p
With −20 dB/0 dB/AGC switch set to 0dB: 1V p-p
With −20 dB/0 dB/AGC switch set to AGC: 01 to 8 V p-p

Frequency Response (With −20dB signal input)

@ 15/16 in/s:	100 Hz to 5 kHz +/−3 dB
@ 1 7/8 in/s:	100 Hz to 10 kHz +/−3 dB
@ 3 3/4 in/s:	100 Hz to 18 kHz +/−3 dB
@ 7 1/2 in/s:	100 Hz to 22 kHz +/−3 dB

Wow and Flutter

@ 15/16 in/s:	0.2% WRMS Maximum
@ 1 7/8 in/s:	0.15% WRMS Maximum
@ 3 3/4 in/s:	0.135% WRMS Maximum
@ 7 1/2 in/s:	0.1% WRMS Maximum

Audio

Input Impedence:	>600 ohm Transformer Isolated
Output Level:	1V p-p (Int. adjustable 0-5V p-p)
Output Power:	0.6 to 1.0 W
Distortion:	<0.5% at 1 kHz, 0 dB
Crosstalk:	>35 dB at 1 kHz, 0 dB
Signal-To-Noise Ratio:	>40 dB NAB Wtd ref 3% Distortion at 1 kHz

Physical

Dimensions: 6.5″ High x 9″ Wide x 16″ Deep
Weight: 13 Lb., 10 oz.
Side by Side Rack Mountability: 6.5″ H x 19″ W x 16″ D

Power

Input Power: 105-127Vd 310-250Vdc 47-400 Hz

For More Information Contact:
Customer Service, OEM/Systems Division
(405) 521-9000

Phi Technologies, Inc. • 4605 North Stiles • Oklahoma City, OK 73105-3328, USA • (405) 521-9000 • TWX 910-831-3286 • FAX (405) 524-4254

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(513) 890-1918
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We manufacture a complete line of audio components for just about every need.

- Audio Indicators
- Audio Transducers
- Electro-Mechanical Buzzers
- Alarms
- Piezo Ceramic Benders

Audio Indicators

Our Audio Indicators are available in three different styles: piezo ceramic, speaker audio indicators, and electro-mechanical buzzers. We have arranged our products by mounting configuration to make your selection easier.

For detailed electrical and dimensional specifications, please request our **Projects Unlimited** complete audio products catalog.

P.C. BOARD MOUNT

Voltage	Fundamental Frequency (Hertz)	Sound Pressure Level	Dimensions (Inches)	Case Style	Part Number	
3-15VDC	2800	90dBA	0.94 Ø x 0.63 H	B	AI-550K	
3-15VDC	2800	90dBA	0.94 Ø x 0.63 H	C	AI-550KS	†1
3-16VDC	2800	83dBA	0.945 Ø x 0.71 H	B	LAI-254K	
3-16VDC	2800	83dBA	0.937 Ø x 0.630 H	C	LAI-254KS	†1
3-16VDC	2800	90dBA	1.67 Ø x 0.63 H	E	AI-437	†2
3-16VDC	3700	91dBA	0.945 Ø x 0.71 H	B	AI-254K	
3-16VDC	3700	91dBA	0.937 Ø x 0.630 H	C	AI-254KS	†1
3-16VDC	4200	75-86dBA	0.543 D x 0.295 H	A	AI-175	
3-20VDC	1800	85dBA	1.18 Ø x 0.69 H	E	AI-278	
3-20VDC	2700	76-92dBA	1.575 x 1.575 x 0.315 H	F	LX-10PK	
3-20VDC	3100	80dBA	0.925 Ø x 0.39 H	E	AI-256K	
3-20VDC	3100	80dBA	0.925 Ø x 0.39 H	E	AI-257K	†3
3-20VDC	3100	80dBA	0.925 Ø x 0.39 H	E	AI-258K	
3-20VDC	3100	80dBA	0.925 Ø x 0.39 H	E	AI-259K	†3
3-28VDC	2800	90dBA	1.67 Ø x .53 H	E	AI-400K	
3-32VDC	3300	84-97dBA	1.575 x 1.575 x 0.315 H	F	X-10PK	
5-13VDC	2500	110dBA	1.67 Ø x 0.63 H		AI-500K	

FLANGE MOUNT

Voltage	Fundamental Frequency (Hertz)	Sound Pressure Level	Dimensions (Inches)	Case Style	Part Number	
1.5-6VDC	3200	89-103dBA	1.969 L x 0.906H	J	X-30K	
1.5-16VDC	2800	90dBA	2.36 L x 0.63 H	D	AI-433	†2
2-20VDC	3500	95dBA	1.10 Ø x 0.98 H	K	XL-450	
3-16VDC	2545-2620	85-99dBA	2.76 L x 1.H	L	XL-960	
3-16VDC	2800	83dBA	1.30 L x 0.669 H	M	LAI-250K	
3-16VDC	2800	90dBA	2.36 L x 0.63 H	D	AI-435	†4
3-16VDC	3700	91dBA	1.30 L x 0.669 H	M	AI-250K	
3-24VDC	2800	90dBA	2.36 L x 0.63 H	D	AI-430	
3-24VDC	2800	100dBA	2.36 L x 0.63 H	D	AI-431	
3-28VDC	3600	85dBA	1.73 L x 0.53 H	D	AI-420K	
3-30VDC	4500	90dBA	1.26 L x 0.445 H	N	AI-251	
6-20VDC	3500	95dBA	1.10 Ø x 0.98 H	K	XL-451	†4
6-20VDC	3500	95dBA	1.10 Ø x 0.98 H	K	XL-453	†2
6-26VDC	600-1100	100dBA	2.80 L x 1.69 H	O	XL-602**	
6-28VDC	2700-3100	100-105dBA	2.80 L x 1.69H	O	XL-600**	
7.5-16VDC	2875	94-104dBA	2.76 L x 1.5 H	L	XL-980	
90-120VAC*	2900	87dBA	1.969 L x 0.906 H	J	X-30ACK	

PANEL MOUNT

Voltage	Fundamental Frequency (Hertz)	Sound Pressure Level	Hole Diameter (Inches)	Case Diameter (Inches)	Case Style	Part Number	
3-12VDC	3200	100dBA	1 1/4	2.1	P	X-70K	
3-32VDC	2800	75-95dBA	1 1/8	1.575	Q	X-20K	
3-32VDC	2800	75-95dBA	1 1/8	1.575	Q	X-21K	†2
3-32VDC	2800	75-95dBA	1 1/8	1.575	Q	X-23K	†4
4-28VDC	2900	85-95dBA	1 1/8	1.70	R	AI-380K	
4-28VDC	2900	85-95dBA	1 1/8	1.70	R	AI-381K	†2
4-28VDC	2900	85-95dBA	1 1/8	1.70	R	AI-381KP	†4
4-28VDC	3500	85-98dBA	1 1/4	1.43	S	AI-750S	
5-15VDC	800	83-94dBA	1 1/8	1.70	R	AI-330	
5-15VDC	2000	83-94dBA	1 1/8	1.70	R	AI-331	†2
5-15VDC	1[illegible]-2000	83-94dBA	1 1/8	1.70	R	AI-362	†5
5-15VDC	530-690	83-94dBA	1 1/8	1.70	R	AI-361	†6
5-15VDC	800	83-94dBA	1 1/8	1.70	R	AI-363	†7
6-28VAC/DC	2900	85-95dBA	1 1/8	1.70	R	AI-383K	
6-28VDC	2700-3100	100-105dBA	1	1.97	T	XL-601*	
15-30VDC	800	87-90dBA	1 1/8	1.70	R	AI-335	
15-30VDC	800	87-90dBA	1 1/8	1.70	R	AI-336	†2
16-26VDC	600-1100	100dBA	1	1.97	T	XL-603*	†2
30-120VAC/DC	2900	85-95dBA	1 1/8	1.70	R	AI-382K	
50-250VAC/DC	2900	80-95dBA	1 1/8	1.70	R	AI-384K	†4

* This part will also operate from 15-130VDC.
** Specify either red or white.
†1 Sealed
†2 Fast Pulse
†3 High Temperature
†4 Slow Pulse
†5 Siren
†6 Hi-lo Siren
†7 Chime

Audio Transducers

Our Audio Transducers are available in three different styles: Piezo ceramic, speaker, and electro-mechanical. All three types require external drives and are very cost effective for high quantity applications. We have arranged our products by mounting configuration to make your selection easier.

For complete electrical and dimensional specifications, please request our **Projects Unlimited** complete audio products catalog.

PIEZO & ELECTRO-MECHANICAL

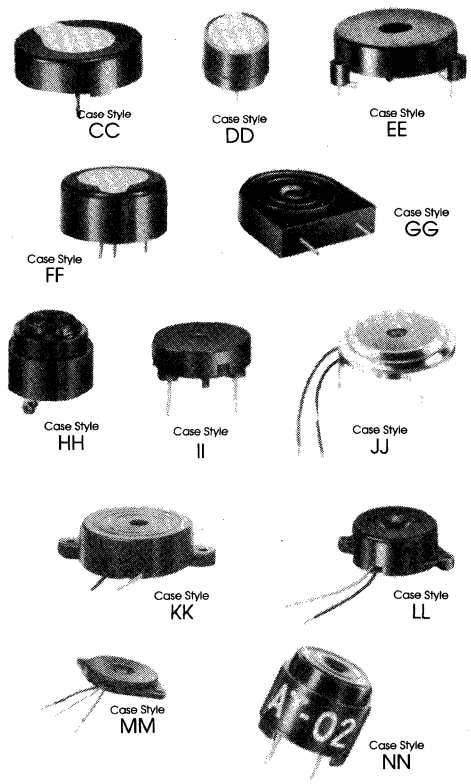
P.C. BOARD MOUNT

Resonant Frequency (Hertz)	Frequency Range (Hertz)	Sound Pressure Level	Voltage (Vp-p)	Dimensions (inches)	Case Style	Notes	Part Number
1300	750-2500	80dBA	1-50	1.73 Ø x 0.67 H	CC	W	AT-148*
1300	750-2500	80dBA	1-50	1.73 Ø x 0.67 H	CC	W	AT-149**
2048	1000-5000	85dBA	1-2	0.472 Ø x 0.334 H	DD		AT-11K
2048	1000-5000	85dBA	1-12	0.630 Ø x 0.551H	NN	W	AT-02
2048	1000-5000	90dBA	6-18	0.630 Ø x 0.551H	NN	W	AT-03
2600	1000-5000	85dBA	30	1.32 Ø x 0.315 H	EE	F/W	AT-33K
2700	2200-3200	80dBA	1-30	0.945 Ø x 0.480 H	FF		AT-22K
2800	2000-5000	88dBA	1-30	1.65 Ø x 0.55 H	CC	W	AT-141
2800	2200-3300	90dBA	3-28	1.67 Ø x 0.55 H	CC	W	AT-138
3000	2500-3500	85dBA	30	1.26 H x 1.17 W x 0.31 D	GG		AT-527
3100	1800-4500	80dBA	30	1.12 Ø x 0.295 H	EE	F/W	AT-23K
3600	3100-4100	80dBA	1-50	0.886 Ø x 0.236 H	EE	F/W	AT-24K
4000	1000-5000	85dBA	1-20	0.543 Ø x 0.268 H	DD	W	AT-17
4000	3000-5000	80dBA	1-25	0.65 Ø x 0.28 H	II		AT-152
4500	4000-5000	75dBA	1-30	0.945 Ø x 0.295 H	CC	W	AT-20K
4600	2000-6000	92dBA	1-30	1.18 Ø x 0.296 H	CC	W	AT-132
5200	3200-5900	85dBA	1-50	0.846 Ø x 0.18 H	JJ		AT-21K
6000	3500-8000	88dBA	1-30	0.945 Ø x 0.177 H	CC	W	AT-124
6000	3500-8000	83dBA	1-30	0.945 Ø x 0.296 H	CC	W	AT-122
6300	5800-6800	75dBA	30	1.04 H x 0.94 W x 0.31 D	GG		AT-520

* Ringer
** Ringer/Hi temperture operation
W Washable
F Feedback

FLANGE MOUNT

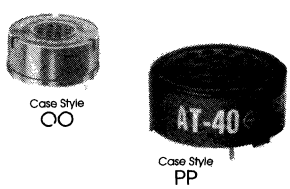
2900	2500-3300	60-71dBA	1-30	2.362 L 0.630 H	KK	AT-14
4500	3000-8000	90dBA	3-30	1.26 Ø x 0.445 H	LL	AT-25
4600	4200-5000	68-73dBA	1-30	1.575 L x 0.169 H	MM	AT-13
6000	4500-7500	68-70dBA	1-30	1.34 L x 0.165 H	MM	AT-12
5000	5000	85dBA	3-28	1.34 L x 0.197 H	MM	AT-121



SPEAKERS

P.C. BOARD MOUNT

Resonant Frequency (Hertz)	Frequency Range (Hertz)	Sound Pressure Level	Max Power	Impedance	Dimensions (Inches)	Case Style	Part Number
700	700-10,000	80dBA	120mW	8 Ω	1.642 Ø x 0.880 H	OO	AT-261
700	700-10,000	90dBA	120mW	100 Ω	1.642 Ø x 0.880 H	OO	AT-262
900	500-4700	55dBA	150mW	8 Ω	1.175 Ø x 0.50 H	PP	AT-41
1100	700-4000	90dBA	150mW	8 Ω	1.25 Ø x 0.59 H	QQ	AT-3108
1200	700-3000	85dBA	100mW	8 Ω	0.91 Ø x 0.34 H	QQ	AT-2308
1400	500-5000	70dBA	150mW	100 Ω	1.75 Ø x 0.50 H	PP	AT-40
1400	1000-5100	70dBA	150mW	32 Ω	1.175 Ø x 0.50 H	PP	AT-42



PANEL MOUNT

Resonant Frequency (Hertz)	Frequency Range (Hertz)	Sound Pressure	Impedance	Hole Diameter	Dimensions (Inches)	Maximum Power	Case Style	Part Number
700	700-10,000	80dBA	8 Ω	1 1/8" dia	1.700 Ø x 0.923 H	120mW	HH	AT-263
700	700-10,000	80dBA	100 Ω	1 1/8" dia	1.700 Ø x 0.923 H	120mW	HH	AT-264

Projects Unlimited • Dayton, OH (513) 890-1918

Electro-Mechanical Buzzers

P.C. BOARD MOUNT

Voltage	Fundamental Frequency (Hertz)	Sound Pressure Level	Dimensions (inches)	Case Style	Part Number
3-6VDC	350	70dBA	0.91 L x 0.61 W x 0.65 H	V	AI-226
8-16VDC	350	70dBA	0.91 L x 0.61 W x 0.65 H	V	AI-227
20-28VDC	350	70dBA	0.91 L x 0.61 W x 0.65 H	V	AI-228

FLANGE MOUNT WITH WIRE LEADS

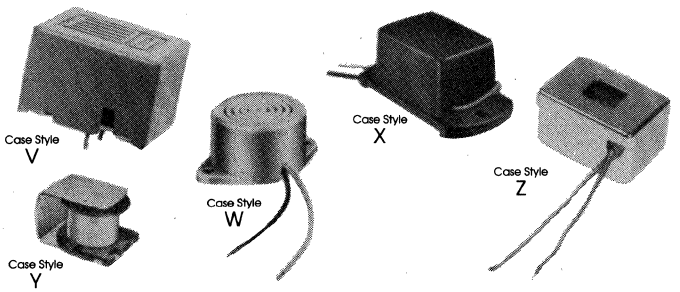
1.1-2VDC	350	70dBA	1.26 L x 0.610 W x 0.698 H	V	AI-220
3-6VDC	350	70dBA	1.26 L x 0.610 W x 0.698 H	V	AI-221
4-8VDC	400	90dBA	1.50 L x 0.63 H	W	AI-606
8-16VDC	350	70dBA	1.26 L x 0.610 W x 0.698 H	V	AI-222
8-16VDC	400	90dBA	1.50 L x 0.63 H	W	AI-612
20-28VDC	350	70dBA	1.26 L x 0.610 W x 0.698 H	V	AI-223
20-28VDC	400	90dBA	1.50 L x 0.63 H	W	AI-624
4-11VAC	120	73dBA	2.38 L x 1.02 W x 1.25 H	X	AI-295
8-18VAC	120	80dBA	2.38 L x 1.02 W x 1.25 H	X	AI-296
18-32VAC	120	80dBA	2.38 L x 1.02 W x 1.25 H	X	AI-297
60-150VAC	120	82dBA	2.38 L x 1.02 W x 1.25 H	X	AI-298
160-260VAC	120	82dBA	2.38 L x 1.02 W x 1.25 H	X	AI-299

SCREW MOUNT W/QUICK DISCONNECT TABS

4-11VAC	120	73dBA	1.18 L x 0.79 W x 0.91 H	Y	AI-290
8-18VAC	120	80dBA	1.18 L x 0.79 W x 0.91 H	Y	AI-291
18-32VAC	120	80dBA	1.18 L x 0.79 W x 0.91 H	Y	AI-292
60-150VAC	120	82dBA	1.18 L x 0.79 W x 0.91 H	Y	AI-293
160-260VAC	120	82dBA	1.18 L x 0.79 W x 0.91 H	Y	AI-294

PANEL OR ADHESIVE MOUNT

8-16 VDC	435	88dBA	0.885 L x 0.46 W x 0.61 H	Z	AI-112



Alarms

Type	Dimension (Inches)	Sound Pressure	Frequency Range Level (Hertz)	Voltage	Part Number
Siren	2.14 Ø + 2.2 H	117dBA	1500-4000	6-16VDC	XL-1600/XL-1600L
Variable tones	3.66 Ø x 2.95 or 4.06 H	105-112dBA	2700-3100	6-24VDC	XL-501*
Fast pulse	3.66 Ø x 2.95 or 4.06 H	105-112dBA	2700-3100	80-240VAC	XL-502*
Variable tones	3.66 Ø x 2.95 or 4.06 H	103dBA	800-950	16-24VAC	XL-503*
Fast Pulse	3.66 Ø x 2.95 or 4.06 H	105-112dBA	2700-3100	6-24VDC	XL-504*
Continuous tone	3.11 Ø x 2.87 H	110dBA	3300	6-15VDC	XL-807
Siren	3.11 Ø x 2.87 H	110dBA	1500-3500	6-15VDC	XL-808
Two-tone	3.11 Ø x 2.87 H	110dBA	3500/2900	6-15VDC	XL-809

* Specify either red or white

XL-1600

XL-1600L

XL-500 Series

XL-800 Series

Piezo Ceramic Benders

Benders are piezo ceramic elements that transform AC voltages into sound when mounted in a tuned Hemolotz chamber or case. They are available in two styles: Standard and Feedback.

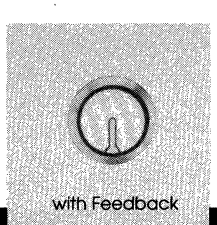
For complete specifications, circuit diagrams and theory of operation, please request our **Projects Unlimited** complete audio products catalog.

STANDARD BENDERS

Resonant Frequency (Hertz)	Electrostatic Capacitance (nF ± 30%)	Dimensions (Inches)	Part Number
600	70	1.732 Ø x 0.009 H	KBI-4406
1000	70	1.614 Ø x 0.009 H	KBI-4110
1300	45	1.181 Ø x 0.009 H	KBI-3013
1500	70	1.378 Ø x 0.009 H	KBI-3515
1800	40	0.787 Ø x 0.005 H	KBI-2018
1800	45	1.063 Ø x 0.009 H	KBI-2718
2600	30	1.378 Ø x 0.021 H	KBI-3526
2700	28	1.063 Ø x 0.013 H	KBI-2727
2800	24	1.968 Ø x 0.017 H	KBI-5028
3400	23	1.063 Ø x 0.017 H	KBI-2734
4100	8	0.591 Ø x 0.009 H	KBI-1541
4400	18	1.063 Ø x 0.021 H	KBI-2744
4800	16	0.787 Ø x 0.013 H	KBI-2048
6400	12	0.787 Ø x 0.017 H	KBI-2064

BENDERS WITH FEEDBACK ELECTRODE

Resonant Frequency (Hertz)	Electrostatic Capacitance (nF ± 30%)	Dimensions (Inches)	Part Number
2000	40	1.063 Ø x 0.009 H	KBI-2720F
2900	21	1.378 Ø x 0.023 H	KBI-3529F
3600	20	0.787 Ø x 0.009H	KBI-2036F
3700	20	1.063 Ø x 0.017 H	KBI-2737F
4300	14	0.787 Ø x 0.011 H	KBI-2043F
4400	15	1.063 Ø x 0.021 H	KBI-2744F
6400	10	0.787 Ø x 0.017 H	KBI-2064F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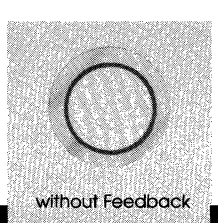

without Feedback

Projects Unlimited • Dayton, OH (513) 890-1918

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

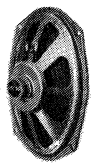
Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
Encapsulation, Miniglossary **C**•1126
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **C**•1601
Fiber Optics, Miniglossary **B**•1224
Fiber Optics, Product Selection Guide **B**•1214
Filters, Power, Product Selection Guide **A**•1609
Filters, Signal, Product Selection Guide **A**•1651
Instruments, Test & Measuring, Product Selection Guide **D**•1207
Interconnection Systems, Product Selection Guide **C**•1678
Keyboards & Keypads, Product Selection Guide **B**•1794
Lamps, Lights, & Indicators, Product Selection Guide **B**•1135
Logofinder & Trademark Directories **C**•901
Microwave Components, Product Selection Guide **A**•1746
Military Qualified Products List **B**•1002
Motors, Drives, & Rotating Components, Product Selection Guide **B**•1233
Opto Semiconductors, Miniglossary **B**•1334
Oscilloscopes, Product Selection Guide **D**•1406
Panel Hardware, Product Selection Guide **C**•1582
Panel Meters, Analog & Digital, Product Selection Guide **D**•1340
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **A**•2013
Power Supplies, Miniglossary **D**•1522, **D**•2184
Power Supplies, AC, Product Selection Guide **D**•2146
Power Supplies, DC, Product Selection Guide **D**•1501
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **B**•1347
Relay Contact Forms **B**•1550
Relays, Electromechanical, Miniglossary **B**•1449
Relays, Product Selection Guide **B**•1397
Resistor Color Codes **A**•1924
Resistors, Product Selection Guide **A**•1835
Servo Components, Miniglossary **B**•1270, **D**•2244
SI Units, Basic Guide To, **A**•2080, **B**•1666, **C**•1362, **D**•2246
Solenoids, Product Selection Guide **B**•1614
Switches, Product Selection Guide **B**•1639
Symbols—International Authorities **A**•1139, **B**•1024, **C**•1156, **D**•1090
Thermal Components, Product Selection Guide **B**•1831
Thermal Conductivity of Dielectrics at Room Temperature **C**•1709
Thyristors/High Power Diodes, Miniglossary **A**•1728, **A**•2084
Timers, Miniglossary **B**•1409, **D**•1149
Trademark & Logofinder Directories **C**•901
Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

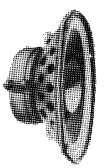
Quam Loudspeakers: The Sound Decision

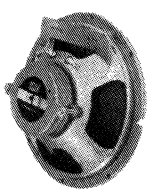
For Industrial Applications

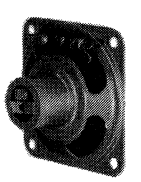
8 ohm impedances

MODEL NUMBER	SIZE (inches) AND SHAPE	FREQUENCY RESPONSE (Hertz)	POWER HANDLING CAPACITY (Watts) FOR PROPERLY ENCLOSED SPEAKERS	VOICE COIL IMPEDANCE (Ohms)	VOICE COIL DIAMETER (inches)	MAGNET MATERIAL AND WEIGHT (Ounces) AV–Alnico V BF–Ceramic	DEPTH (inches)	SHIPPING WEIGHT (Lbs.)
8 ohm impedances								
2A05Z8	2 RD	300 Hz to 6K Hz	1	8–10	9/16	.52AV	7/8	1/4
22A05Z8	2 1/4 RD	300 Hz to 10K Hz	1	8–10	9/16	.52AV	1	1/4
23A05Z8	2x3 Oval CM	250 Hz to 15K Hz	1	8–10	9/16	.52AV	1 1/8	1/4
25A07Z8	2 1/2 SQ	150 Hz to 12K Hz	1 1/2	8–10	9/16	.65AV	1 1/4	1/4
26A07Z8	2x6 Oval CM	130 Hz to 16K Hz	2	8–10	9/16	.65AV	1 19/32	1/2
27A05Z8	2 3/4 RD	150 Hz to 8K Hz	1	8–10	9/16	.52AV	1 1/16	1/4
30A05Z8	3 SQ	150 Hz to 12K Hz	2	8–10	9/16	.52AV	1 9/32	1/4
30A05Z8R	3 RD	250 Hz to 12K Hz	2	8–10	9/16	.52AV	1 1/16	1/4
30C25Z8	3 SQ	150 Hz to 14K Hz	5	8–10	9/16	2.35BF	1 1/16	3/4
3A05Z8	3 1/2 SQ	130 Hz to 12K Hz	2	8–10	9/16	.52AV	1 5/16	1/4
35A05Z8	3x5 Oval CM	130 Hz to 14K Hz	2	8–10	9/16	.52AV	1 1/2	1/4
35C3Z8	3x5 Oval CM	130 Hz to 12K Hz	5	8–10	3/4	3BF	1 11/16	3/4
4A1Z8	4 SQ	200 Hz to 12K Hz	3	8–10	9/16	.65AV	1 5/8	3/4
4C1Z8	4 SQ	200 Hz to 12K Hz	4	8–10	9/16	1.1BF	1 7/16	1/2
4C25Z8	4 SQ	200 Hz to 12K Hz	5	8–10	9/16	2.35BF	1 5/8	3/4
4C5Z8	4 SQ	120 Hz to 15K Hz	7	8–10	3/4	4.8BF	1 5/8	1
46C3Z8	4x6 Oval CM	130 Hz to 10K Hz	6	8–10	3/4	3.0BF	1 3/4	1
48C3Z8	4x8 Oval CM	120 Hz to 12K Hz	6	8–10	3/4	3BF	2 1/16	1 1/2
5A1Z8	5 PC	125 Hz to 12K Hz	3 1/2	8–10	9/16	.65AV	1 13/16	3/4
5C3Z8	5 PC	130 Hz to 14K Hz	5	8–10	3/4	3.0BF	1 7/8	1
52C10Z8	5 1/4 PC	125 Hz to 9K Hz	10	8–10	1	10BF	2 1/4	2 1/4
57C3Z8	5x7 Oval CM	75 Hz to 10K Hz	7	8–10	3/4	3BF	2 5/16	1
6C5Z8	6 1/2 PC	70 Hz to 14K Hz	7	8–10	3/4	4.8BF	3	1 3/4
69C3Z10	6x9 Oval CM	70 Hz to 15K Hz	8	8–10	3/4	3BF	2 3/4	1 1/4
Outdoor								
25C1Z80T	2 1/2 SQ	200 Hz to 8K Hz	4	8–10	9/16	1.1BF	1 1/16	1/2
30C1Z450T	3 SQ	170 Hz to 12K Hz	4	45	9/16	1.1BF	1 3/16	1/2
3A07Z450T	3 1/2 SQ	150 Hz to 10K Hz	2 1/2	45	9/16	.65AV	1 7/16	1/2
4C30T	4 SQ	130 Hz to 9K Hz	4	3–4	3/4	3BF	1 5/8	3/4
4C3Z80T	4 SQ	130 Hz to 9K Hz	4	8–10	3/4	3BF	1 5/8	3/4
8C10PA0T	8 PC	80 Hz to 8K Hz	12	8–10	1	10BF	2 7/8	2 1/2
Miniature speakers								
2A05	2 RD	300 Hz to 6K Hz	1	3–4	9/16	.52AV	7/8	1/4
2A05Z8	2 RD	300 Hz to 6K Hz	1	8–10	9/16	.52AV	7/8	1/4
2A05Z45	2 RD	300 Hz to 6K Hz	1	45	9/16	.52AV	7/8	1/4
22A05Z8	2 1/4 RD	300 Hz to 10K Hz	1	8–10	9/16	.52AV	1	1/4
22A05Z100	2 1/4 RD	300 Hz to 10K Hz	1	100	9/16	.52AV	1	1/4
23A05	2x3 Oval CM	250 Hz to 15K Hz	1	3–4	9/16	.52AV	1 1/8	1/4
23A05Z8	2x3 Oval CM	250 Hz to 15K Hz	1	8–10	9/16	.52AV	1 1/8	1/4
25A07	2 1/2 SQ	130 Hz to 14K Hz	1 1/2	3–4	9/16	.65AV	1 1/4	1/4
25A07Z8	2 1/2 SQ	150 Hz to 12K Hz	1 1/2	8	9/16	.65AV	1 1/4	1/4
25A07Z45	2 1/2 SQ	150 Hz to 12K Hz	1 1/2	45	9/16	.65AV	1 1/4	1/4
25C1Z80T	2 1/2 SQ	200 Hz to 8K Hz	4	8–10	9/16	1.1BF	1 1/16	1/2
27A05Z8	2 3/4 RD	150 Hz to 8K Hz	1	8–10	9/16	.52AV	1 1/16	1/4
27A05Z45	2 3/4 RD	130 Hz to 6K Hz	1	45	9/16	.52AV	1 1/16	1/4









For more than 60 years,

Quam-Nichols Company has been making speakers that make good sound, and supplying them in ways that make good sense. Our product line currently includes more than 3,000 standard models with thousands of others that can be manufactured to meet specific requirements.

Quam speakers are available off-the-shelf through our nationwide distributor network, with a backup inventory of 70,000 standard units at our factory warehouse.

Engineering assistance is available for special applications. Such special designs can be produced in quantities as small as 100.

Quam-Nichols Company

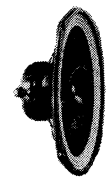
234 E. MARQUETTE ROAD • CHICAGO, ILLINOIS 60637
PHONE: 1 (312) 488-5800 • FAX: 1 (312) 488-6944

Quam Loudspeakers: The Sound Decision

For Sound System Applications

Model No.	4C3PA	4C10PA	8C5PAX	8C10DVPAX	8C10FEPAX	8C10PAFR	8C10PAX	8C10CO
Magnet Weight, ounces	3	10	5	10	10	10	10	10
Material	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic
Structure Wt., lbs.	0.625	2	1½	2	2	2	2	2
Flux Density, gauss	8K	9K	10K	7K	9.5K	9.5K	9.5K	9.5K
Voice Coil Impedance, ohms	8–10	8–10	8–10	8–10	8–10	8–10	8–10	8–10
D.C. Resistance, ohms	7.4	7.4	7.4	7.7–7.7	7.4	7.4	7.4	7.4
Diameter, inches	¾	1	¾	1	1	1	1	1
Electrical Power Handling, Watts, Rms.	7	18	8	15	18	15	15	20
Frequency Response, Hz.	80–12K	50–15K	65–17K	60–12K	30–20K	60–12K	60–16K	40–30K
Resonant Frequency, Hz.	140	75	95	90	50	100	90	65
Sensitivity, db	93	91	93	92	92	95	96	97
Mechanical Diameter, inches	4" sq.	5	8	8	8	8	8	8
Basket Style	Square	Pin Cushion	Pin Cushion	Pin Cushion	Round	Pin Cushion	Pin Cushion	Round
Depth, inches	1⅝	3½	2¾	3	3¼	3	3	3¼
Transformer Mounting, inches	2" centers	1¾–2 13/16	2–2 13/16	2–2 13/16	1¾–2⅜	1¾–2 13/16	1¾–2 13/16	1¾–2⅜
Mounting Hole Circle, inches	4 11/16	4 11/16	7⅝	7⅝	7⅝	7⅝	7⅝	7⅝
No. of Mounting Holes	4	4	4	4	8	8	4	6
Baffle Opening, inches	3¾	4¼	7	7	7	7	7	7
Net Weight, lbs.	1	2¼	1¾	2¾	2¾	2¾	2¾	2¾
Cone	Treated Cloth Surround	Single Foam Surround	Dual	Dual	Dual Foam Surround	Single, molded with flame retardant impregnation	Dual	Single with Piezo Tweeter

Model No.	8C10FECO	8C10Z45	8C10PAOT	12C10PAX	12C20PAX	12C20CO	12C10CO
Magnet Weight, ounces	10	10	10	10	20	20	10
Material	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic
Structure Wt., lbs.	2¼	2	2	2	4¼	4¼	2
Flux Density, gauss	9K	9.5K	9.5K	9K	8K	8K	9K
Voice Coil Impedance, ohms	8	45	8–10	8–10	8–10	8–10	8–10
D.C. Resistance, ohms	7.4	43	7.4	7.4	7.4	7.4	7.4
Diameter, inches	1	1	1	1	1½	1½	1
Electrical Power Handling, Watts, Rms.	15	12	15	18	75	75	30
Frequency Response, Hz.	30–30K	70–12K	80–8K	50–14K	45–11K	50–30K	45–30K
Resonant Frequency, Hz.	50	90	90	75	75	75	55
Sensitivity, db	92	95	95	96	96	95	95
Mechanical Diameter, inches	8	8	8	12⅛	12⅛	12⅛	12⅛
Basket Style	Round	Pin Cushion	Pin Cushion	Round	Round	Round	Round
Depth, inches	3 9/16	3	3	4⅜	4¾	5	4¾
Transformer Mounting, inches	1¾–2⅜	2–2 13/16	1¾–2 13/16	1¾–2 13/16	1¾–2 13/16	1¾–2 13/16	1¾–2 13/16
Mounting Hole Circle, inches	7⅝	7⅝	7⅝	11 9/16	11 9/16	11 9/16	11 9/16
No. of Mounting Holes	6	4	4	4	8	6	6
Baffle Opening, inches	7	7	7	11	11	11	11
Net Weight, lbs.	2¾	2½	2¾	3½	6	6⅛	6
Cone	Foam Surround w/ Piezo Tweeter	Single	Single	Dual	Dual	Single with 1 Piezo Horn	Single with 1 Piezo Horn



Intercom

MODEL NUMBER	SIZE (inches) AND SHAPE	FREQUENCY RESPONSE (Hertz)	POWER HANDLING CAPACITY (Watts)*	VOICE COIL IMPEDANCE (Ohms)	VOICE COIL DIAMETER (inches)	MAGNET MATERIAL AND WEIGHT (Ounces)**	DEPTH (inches)	SHIPPING WEIGHT (Lbs.)
2A05Z45	2 RD	300 Hz to 6K Hz	1	45	9/16	.52AV	⅞	¼
25A07Z45	2½ SQ	150 Hz to 12K Hz	1½	45	9/16	.65AV	1¼	¼
27A05Z45	2¾ RD	130 Hz to 6K Hz	1	45	9/16	.52AV	1 1/16	¼
30A05Z45	3 SQ	130 Hz to 14K Hz	2	45	9/16	.52AV	1 3/16	¼
30C1Z450T	3 SQ	170 Hz to 12K Hz	4	45	9/16	1.1BF	1 3/16	½
3A07Z450T	3½ SQ	150 Hz to 10K Hz	2½	45	9/16	.65AV	1 7/16	½
35A05Z16	3x5 Oval CM	100 Hz to 12K Hz	2	16	9/16	.52AV	1½	¼
4A1Z16	4 SQ	180 Hz to 15K Hz	3	16	9/16	.65AV	1⅝	¾
4A1Z45	4 SQ	180 Hz to 12K Hz	3	45	9/16	.65AV	1 13/16	¾
5A1Z45	5 PC	130 Hz to 9K Hz	3½	45	9/16	.65AV	1 13/16	¾
8C10Z45	8 PC	70 Hz to 12K Hz	12	45	1	10BF	3	2½

*For properly enclosed speakers

**AV-Alcino V
BF-Ceramic

Quam International

For Quality with Economy

15A04Z8	1½ SQ	400 Hz to 6 K Hz	0.5	8	1/2	.35AV	5/8	1/4
2A04Z8	2 RD	280 Hz to 6 K Hz	1.0	8	1/2	.35AV	11/16	1/4
22A04Z8	2¼ RD	220 Hz to 6 K Hz	1.0	8	1/2	.35AV	3/4	1/4
22A04Z100	2¼ RD	220 Hz to 6 K Hz	1.0	100	1/2	.35AV	3/4	1/4
25A04Z8	2½ SQ	180 Hz to 7 K Hz	1.5	8	1/2	.35AV	7/8	1/4
25A04Z45	2½ SQ	180 Hz to 7 K Hz	1.5	45	1/2	.35AV	7/8	1/4
30A04Z8	3 SQ	150 Hz to 12 K Hz	2.0	8	1/2	.35AV	1	1/4
3A04Z8	3½ SQ	140 Hz to 15 K Hz	2.0	8	1/2	.35AV	1-1/6	1/4
4A04Z8	4 SQ	120 Hz to 16 K Hz	2.5	8	1/2	.35AV	1-5/16	1/2

Quam-Nichols Company

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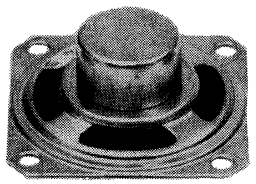
RDI ELECTRONICS INCORPORATED

The following information is excerpted from our catalog. Please contact us for your complete guide to the components available from RDI Electronics.

SPEAKERS



- Micro • Low Profile • Alnico, Ferrite, Samarium Cobalt Magnets • Ovals
- Mylar or Paper Cones • 1/2" Dia-8" Dia
- Custom Designs and Impedances

MODEL NO.	NOMINAL SIZE mm (inch)	MAX POWER W	RESONANT FREQUENCY Hz	FREQ. RANGE Hz	MAGNET WEIGHT g(oz)	MAGNET SIZE mm	FLUX DENSITY gauss	DIAMETER (A) mm(inch)	DEPTH (B) mm(inch)	MOUNTING DIAMETER(C) mm(inch)	NET WEIGHT g(oz)
PR-501	50(2)	0.2	500	F_0~ 5,000	11.7(0.4)	13 x12	6,500	50(1.97)	20.5(0.8)	-	42 (1.48)
PR-502	50(2)	0.2	500	F_0~ 5,000	8.6(0.28)	11.5x10	6,000	50(1.97)	18 (0.71)	-	25.2(0.88)
PR-504	50(2)	0.2	500	F_0~ 5,000	10 (0.35)	13 x10	6,300	50(1.97)	18.8(0.74)	-	39 (1.38)
PR-506	50(2)	0.2	450	F_0~ 5,000	10 (0.35)	13 x10	6,300	50(1.97)	18.5(0.73)	-	31 (1.09)
PR-571	57(2 1/4)	0.3	400	F_0~ 5,000	11.7(0.4)	13 x12	6,500	57(2.24)	22 (0.86)	-	45 (1.58)
PR-572	57(2 1/4)	0.2	450	F_0~ 4,000	10 (0.35)	13 x10	6,300	57(2.24)	19.5(0.76)	-	45 (1.58)

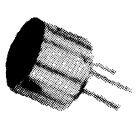
HEADSETS

RDI Electronics offers a complete line of stereo & monaural lightweight and isolation style headsets. Impedances range from 4 to 600 Ohms. Boom Mikes are available in both noise cancelling and standard versions.

MICROPHONES

Microphones from RDI Electronics are available as both complete assemblies and in cartridge form. Electret cartridges and specifications are shown. Dynamic and Ceramic cartridges are also available.

DM12NC
Polar Pattern: Noise Canceller
Impedance Rating ohms: 600
Frequency Response Hz: 300-5,000
Output Level dB = 1KHz: -68
Weight (g): 220



ELECTRICAL SPECIFICATIONS

SENSITIVITY: A: -57 ± 3dB B: -63 ± 3dB C: -69 ± 3dB. (OdB = 1V/μ bar at 1 KHz, RL = 1K Ω. Vcc =6V.)
OUTPUT IMPEDANCE: Same as the load resistance. (May be 150Ω~5KΩ. The sensitivity is proportional to the load resistance.)
DIRECTIONALITY: Omnidirectional.
FREQUENCY RANGE: 20~12,000 HZ.
S/N RATIO: More than 40dB, measured with A curve at 1 KHz 1μ bar.
SELF NOISE LEVEL: Less than 34dB SPL (Referred SPL0dB = 0.0002μ bar).
OPERATION VOLTAGE: 1.5 TO 15 VDC.
CURRENT CONSUMPTION: 0.5 mA or less (Supply voltage 6V).
POLARITY OF POWER SUPPLY: (-) for ground.

FROM PROTOTYPE TO PRODUCTION, SPECIFY RDI ELECTRONICS FOR QUALITY, SERVICE AND COMPETITIVE PRICING.

RDI Electronics, Inc.,/ Dept. E, 56 Harrison St., New Rochelle, NY 10801 Tel: 914-632-7274/ Fax: 914-632-7464

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Your design deserves Shogyo quality and reliability.
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Including a diverse offering of:
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- *Electrical DC buzzers*
- *Piezo buzzers*
- *Electronic buzzers*
- *Piezo elements in housings*
- *Piezo sirens*

And featuring:
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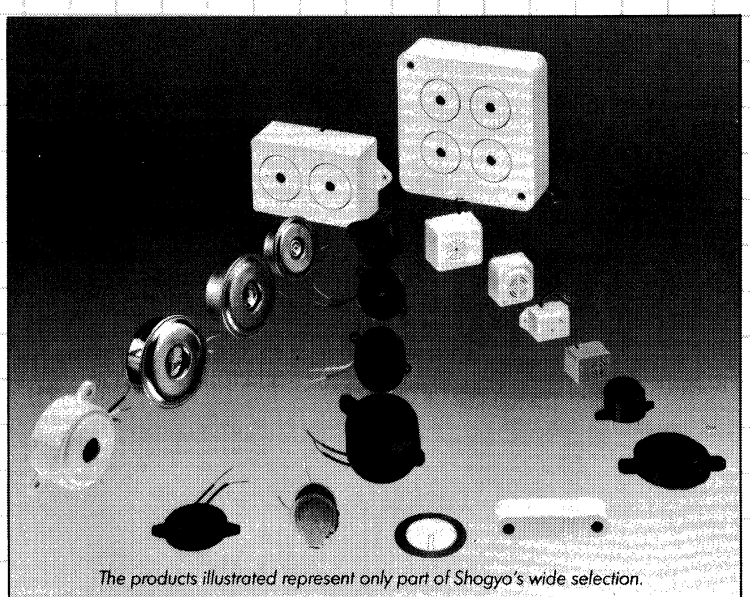
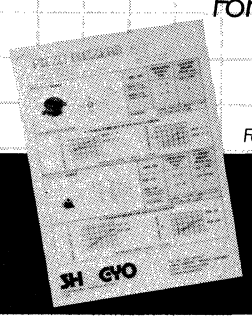
- *Low current drain*
- *No arcing or RF noise*
- *Temperature tolerances from −20°C to +60°C*
- *A wide variety of frequencies, operating ranges, current drains and sound levels*
- *Single, pulse, continuous or siren tone*
- *Elements in brass quality metal or ABS quality plastic housings, with low profiles and thin size mechanical mounting constraints, and high frequency pure tone audible signals*
- *Sirens with warble tone sound outputs up to 100dBa/10 ft., in duplex, quadruplex, 12 and 24 VDC, in operating ranges of 6–15 and 16–28 VDC*



The products illustrated represent only part of Shogyo's wide selection.

For immediate assistance and specific information on the product(s) you require:
Dial 516-466-0911 or FAX 516-466-0922



For complete product listings and specifications, request our free catalog.

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Including a diverse offering of:
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- *Alnico, samarium cobalt, and ferrite magnets*

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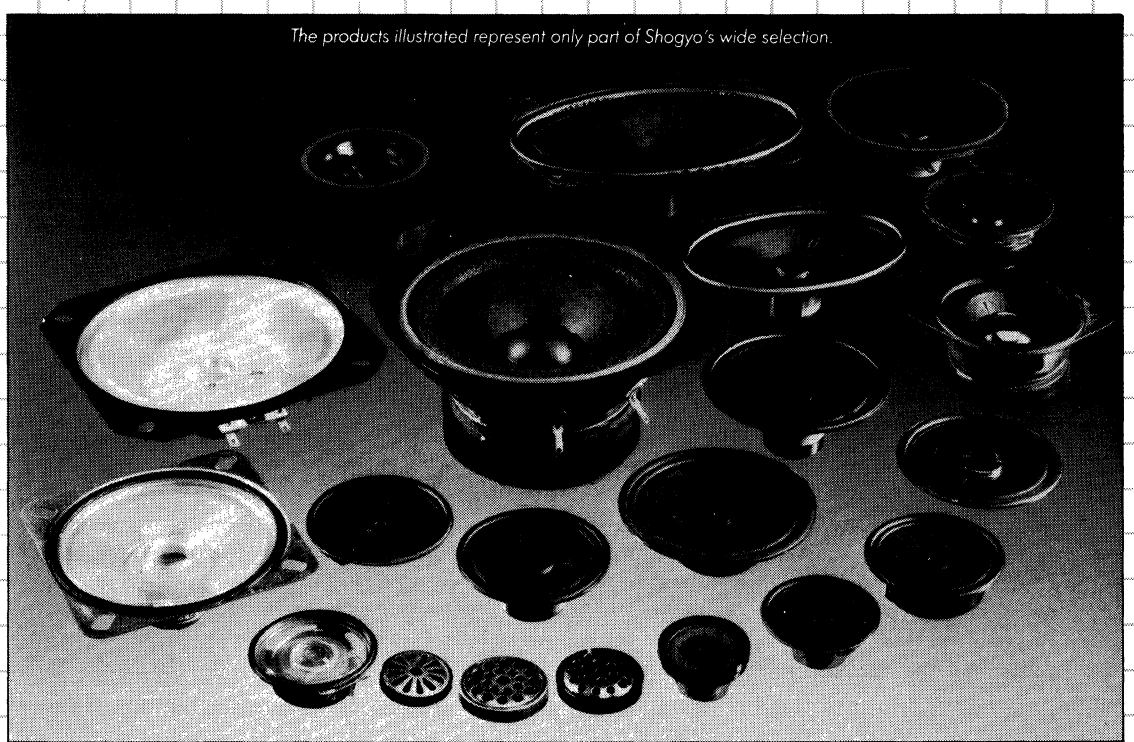

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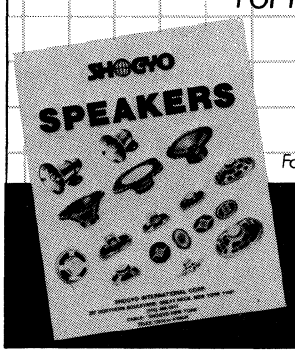

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SHOKAI® is an American company, with over 30 years experience manufacturing and importing components from the Far East. We were serving American manufacturers long before everybody with a fax machine and a foreign telephone book could claim to be an overseas supplier. And we will be here long after they are gone.

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- Cassette Mechanisms
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- LCD's
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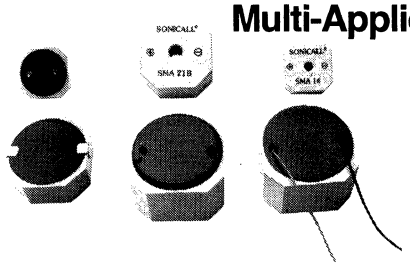
Sonicall inc. HIGH OUTPUT, PIEZO AUDIBLE COMPONENTS

Multi-Application SMD Buzzers and Transducers



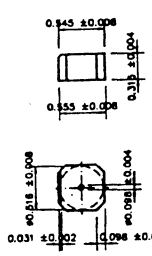
From medical equipment, to computers and measuring instruments, these ultra-compact buzzers and transducers deliver sound outputs to 92dB and are a significant advance in technology. In 9/16" × 9/16" × 5/16" and other sizes with SMD, multi-pin or wire lead terminals. Suited for dense packaging and offered with continuous or intermittent audible signals, depending upon unit. Housings will withstand high temperature infrared reflow or wave soldering. Available in tape and reels; and standard packaging.

PIEZZO BUZZERS

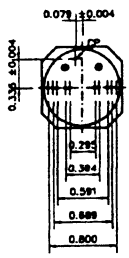
Model	Function	Operating voltage		Frequency Hz ± 15%	Operating current MA		Sound pressure level dB(A) at 1 foot at 12 V	Operating temp. F°	
		Min. DC	Max. DC		At min. V	At max. V		Min.	Max.
SMA-14	Continuous	1.5	16	3800	0.4	8	80 dB	−40	+176
SMA-21 A	Continuous	1.5	24	2800	0.4	14	80 dB	−40	+176
SMAI-21 A	Intermittent	5	24	2800	0.2	7	80 dB	−40	+176
SMA-21 B	Continuous	1.5	24	3500	0.4	14	85 dB	−40	+176
SMAI-21 B	Intermittent	5	24	3500	0.2	7	85 dB	−40	+176
SMA-24	Continuous	1.5	24	2800	0.4	14	92 dB	−40	+176
SMAI-24	Intermittent	5	24	2800	0.2	7	92 dB	−40	+176

	SMAT-14	SMAT-21	SMAT-24
Operating voltage range	20 V pp	50 V pp	50 V pp
Frequency range	1,000-5,000 Hz	600-5,000 Hz	400-5,000 Hz
Static capacitance	15 nF	20 nF	20 nF
Current consumption	1 mA max.	2 mA max.	2 mA max.
Operating temperature °F	−40 +176	−40 +176	−40 +176
Terminals	tinned brass	tinned brass	tinned brass
Distance between terminals	3/10"	4/10" 5/10" 7/10"	4/10" 5/10" 7/10"
Case	PBT/PPS	PBT/PPS	PBT/PPS

SMA – 14
Size (In., Dec.)

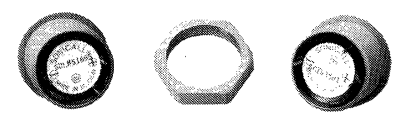


PCB pin distances



Complete Line Of Piezo Telephone Components Also Available

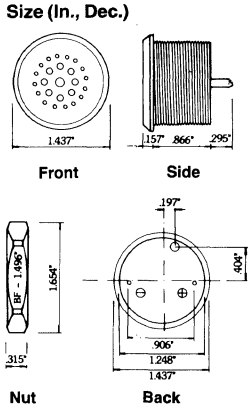
Tough Industrial Buzzers, PCB or Panel Mount



Engineered for rugged, industrial and mil-type applications, these durable, shock – dust – dirt and water resistant buzzers are among the toughest on the market. Available in continuous, intermittent, warbler and cricket sounds, they feature a sound output of up to 95dB with low power consumption. PC board or flush panel mounted, they meet Mil-Standard 202 specifications. Tamper-resistant locking nut design for secure installation. A must for outdoor, in-plant and high noise level applications. ABS plastic case construction.

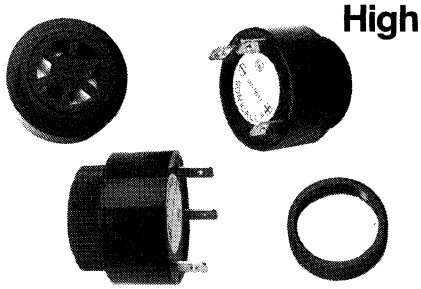
Model	Function	Operating voltage		Frequency Hz ± 15%	Operating current MA		Sound pressure level dB(A) at 3.3 ft at 12 V	Operating temp. F°	
		Min. DC	Max. Dc		Min.	Max.		Min.	Max.
SC 235 A	Continuous	2	35	2,500	0.7	8.3	67	−31	+149
SC 235 B	Continuous	2	35	3,500	0.7	8.3	85	−31	+149
SCI 535 A1	Multifunction	5	35	2,500	0.6	7.4	67	−31	+149
SCI 535 B1	Multifunction	5	35	3,500	0.6	7.4	85	−31	+149
SCI 535 A5	Multifunction	5	35	2,500	0.6	7.4	67	−31	+149
SCI 535 B5	Multifunction	5	35	3,500	0.6	7.4	85	−31	+149
SCR 535 A	Cricket	5	35	2,500	0.6	7.4	67	−31	+149
SCR 535 B	Cricket	5	35	3,500	0.6	7.4	85	−31	+149
SW 535 B	Warbler	5	35	3,500	1.5	11	85	−31	+149
SUC 316 A	Continuous	5	16	2,500	0.5	4	82	−31	+149
SUC 516 B	Continuous	5	16	3,500	0.5	4	88	−31	+149
SULC 516 B	Continuous	5	16	3,500	2	5.4	95	−31	+149
SULI 516 B1	Intermittent	5	16	3,500	2	5.4	95	−31	+149
SULI 516 B5	Intermittent	5	16	3,500	2	5.4	95	−31	+149
SUM 516 A1	Multifunction	5	16	2,500	0.5	4	82	−31	+149
SUM 516 A5	Multifunction	5	16	2,500	0.5	4	82	−31	+149
SULM 516 B1	Multifunction	5	16	3,500	2	5.4	95	−31	+149
SULM 516 B5	Multifunction	5	16	3,500	2	5.4	95	−31	+149

Size (In., Dec.)



Front Side Nut Back

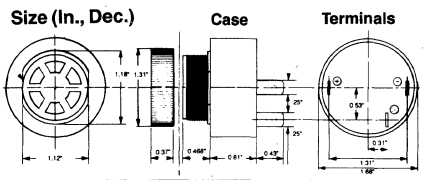
High Quality, MRO Buzzers to 90dB



These highest quality, unusually clear sounding, classic buzzer devices are specifically designed to meet and exceed the demands for retrofit and new applications ranging from safety systems and production equipment to use with trucks or with traffic signals. They're available with sound outputs from 75 to 90dB at 3½ ft. and have low power consumption. Offered in four models, they are made to meet current design parameters and mounting methods. AC voltage versions also available. Cases are constructed of glass filled nylon.

Model	Function	Operating voltage		Frequency Hz ± 15%	Operating current MA		Sound pressure level (Spl) at 12 V-3.3 ft	Operating temp. F°	
		Min. DC	Max. Dc		Min.	Max.		Min.	Max.
SAC 235 A	Continuous	2 DC	35 DC	2,700	0.8	16	75dB(A)	−31	+149
SACI 535 A2	Cp Connected to ⊖ Continuous Cp Open Intermittent	2 DC 5 DC	35 DC 35 DC	2,700	0.8	15	75dB(A)	−31	+149
SACL 716 A	Continuous Loud	2 DC Polarity must be observed	15 DC	2,700	4	36	90dB(A)	−31	+149
SAUC 516 A	Continuous	4 DC	15 DC	2,700	2	12	87dB(A)	−31	+149
SAUI 516 A	Intermittent	4 DC	15 DC	2,700	2	12	87dB(A)	−31	+149
SAC 10-220 A-AC	Continuous AC Version	10 V AC	220 V AC	2,700	0.6	14	85dB(A)	−31	+149
SAC 235 A-DC/AC	Continuous AC/DC Version	2 AC/DC	35 AC/DC	2,700	0.8	16	75dbB(A)	−31	+149

Size (In., Dec.) Case Terminals



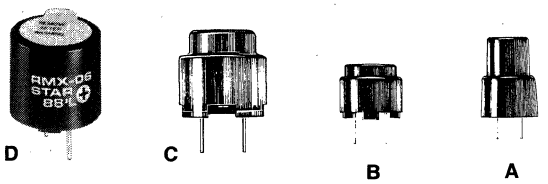
SONICALL, INC. 3288 East Willow Street, Signal Hill, CA 90806 Tel: (213) 490-2143 FAX: 213-490-2145

COMPLETE LINE OF ELECTRONIC AUDIO DEVICES

BUZZERS AND TRANSDUCERS

TRANSDUCERS — MINIATURE AUDIO

SEALED VERSION FOR WAVE SOLDERING



The following Series of miniature electromagnetic audio transducers are sealed against contamination from wave solder washing. They have two PCB pins of different lengths for polarity notation and a tripod base for secure stance on the board. The small size and efficient design suit it for volume production. It is extremely economical for applications where a drive signal, such as a microprocessor clock, already exists.

FEATURES

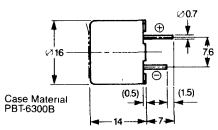
- Sealed against wave solder contamination
- Acoustically & electronically designed for efficiency
- Different pin length for polarity notation
- Small size
- Low cost
- Lower power consumption

APPLICATIONS

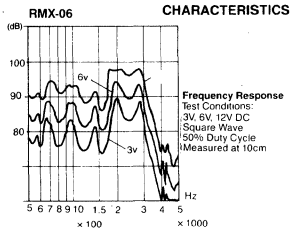
- Pocket pagers
- Telecommunication equipment
- Tone pad-audio feedback
- Computers & peripheral equipment
- Medical instruments
- Automotive safety equipment
- Microwave ovens & other small appliances
- Alarm clocks
- Cash registers & business machines
- Radar detectors

RMX SERIES

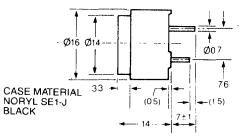
DIMENSIONS (mm)



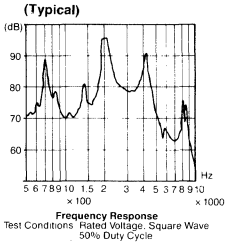
RMX-06 CHARACTERISTICS (Typical)



QMB 16mm SERIES

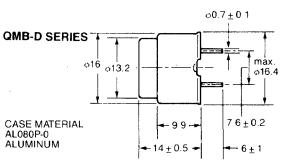


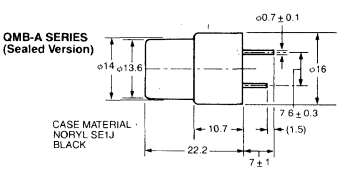
(Typical)



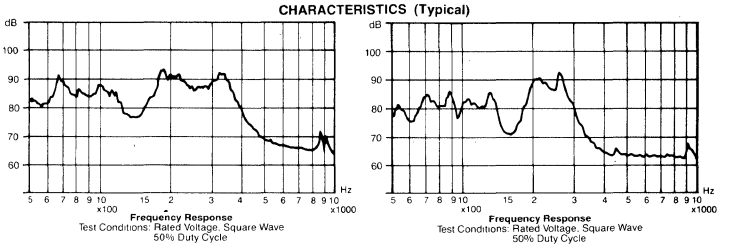
QMB D and A Series

DIMENSIONS (mm)





CHARACTERISTICS (Typical)



SPECIFICATIONS

Item	RMX-06	RMX-12	QMB-01	QMB-06	QMB-12	QMB-01A	QMB-06A	QMB-12A	QMB-06D	QMB-12D
Rated Voltage (V) dc	6	12	1.5	6	12	1.5	6	12	6	12
Operating Voltge (V) dc	3-12	6-18	1-3	3-12	6-18	1-3	3-12	6-18	3-13	6-18
Rated Current* (mA)	Max. 40	Max. 40	12	40	40	12	40	40	40	40
Coil Resistance (Ω)	45	115	30 ± 4.5	45 ± 7	115 ± 17	30 ± 4.5	45 ± 7	115 ± 17	52 ± 8	115 ± 17
Coil Impedance* (Ω)	110	200	80	110	200	100	135	270	120	220
Sound Output @ 10cm* (dB)	Min. 85		80	85		80	85		85	
Resonant Frequency (Hz)	2K ~ 3K		2048			1,850 ~ 2,500			2048	
Operating Temperature (°C)	− 40 ~ + 85		− 30 ~ + 85			− 20 ~ + 70			− 20 ~ + 100	
Weight (g)	7		7			7			7	

*Measured at rated voltage, 2,048Hz, square wave (50% duty cycle)

OEM DIVISION
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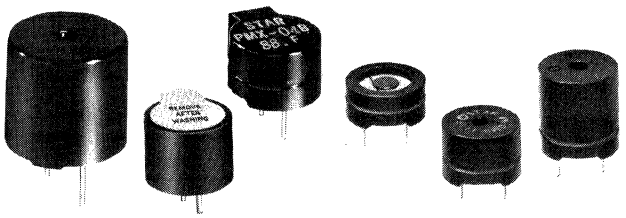
COMPLETE LINE OF ELECTRONIC AUDIO DEVICES

BUZZERS AND TRANSDUCERS

TRANSDUCERS MINIATURE AUDIO–12mm SERIES



The Star 12mm Series are ultra-miniature, electromagnetic audio transducers specifically designed for applications where space limitations are critical.

FEATURES

- Miniaturized design for applications with critical space requirements.
- Very low current drain and operating voltage.
- Pin-type construction for easy PC board soldering.
- Each of these models may be obtained with right angle PCB pins, or longer pins (up to 18mm) or wire leads to facilitate your installation requirements. Please consult Star directly for lead time and pricing.

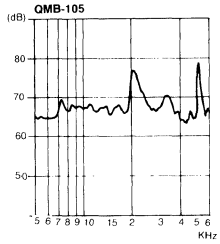
APPLICATIONS

- Radar Detectors
- Clocks
- Small Appliances
- Telecommunication Equipment
- Medical Equipment
- Cash Registers & Business Machines
- Computer Peripherals
- Electronic Toys & Games
- Low Profile Keyboards
- Mobile Phones

QMB 12mm Series

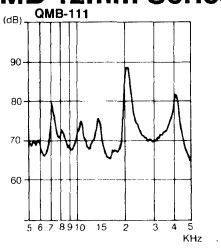
CHARACTERISTICS

QMB-105



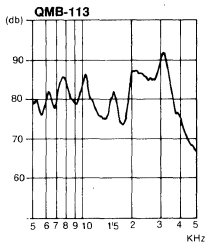
Frequency Response
Test Conditions: 1.5V DC, Square Wave
50% Duty Cycle

QMB-111



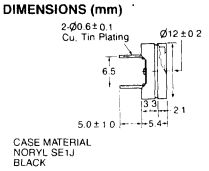
Frequency Response
Test Conditions: 1.5V DC, Square Wave
50% Duty Cycle

QMB-113

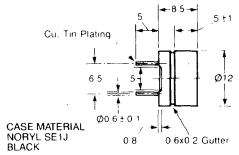


Frequency Response
Test Conditions: 1.5V DC, Square Wave
50% Duty Cycle

DIMENSIONS (mm)



CASE MATERIAL
NORYL SE1J
BLACK



CASE MATERIAL
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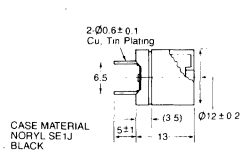

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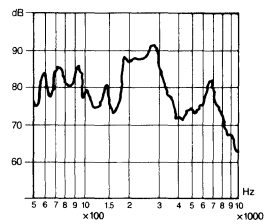
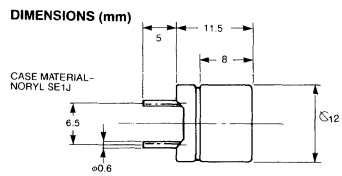
FMX-01

CHARACTERISTICS



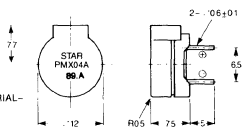
Frequency Response
Test Conditions: Rated Voltage, Square Wave
50% Duty Cycle

DIMENSIONS (mm)



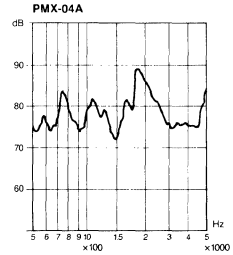
PMX Series

DIMENSIONS (mm)



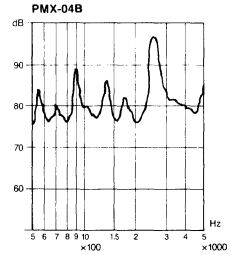
CHARACTERISTICS

PMX-04A



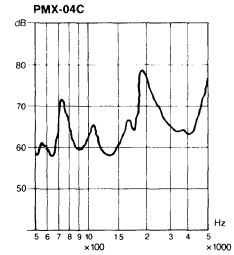
Frequency Response
Test Conditions: 1.5V VDC, Square Wave
50% Duty Cycle

PMX-04B



Frequency Response
Test Conditions: 1.5V VDC, Square Wave
50% Duty Cycle

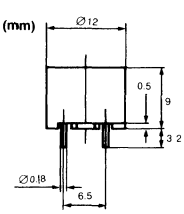
PMX-04C



Frequency Response
Test Conditions: 1.5V VDC, Square Wave
50% Duty Cycle

QMX Series

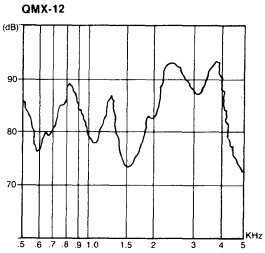
DIMENSIONS (mm)



CASE MATERIAL: NORYL SE1-GFN2J

CHARACTERISTICS

QMX-12



Frequency Response
Test Conditions: Rated Voltage, Square Wave
50% Duty Cycle

SPECIFICATIONS

Item	QMB-105	QMB-111	QMB-113	PMX-04A	PMX-04B	PMX-04C	QMX-05	QMX-12	FMX-01
Rated Voltage (V) dc	1.5	1.5	1.5	1.5			5	12	1.5
Operating Voltage (V) dc	1-2	1-2	1-2	1-2			3~8	6~15	1-2
Rated Current* (mA)	Max. 10	Max. 10	Max. 30	Max. 70		Max 10	Max. 40		70 Max.
Coil Resistance (Ω)	50±7.5	50±7.5	16±4.5	6.5		50	47	140	6.5
Coil Impedance* (Ω)	140	140	40	16	22	140	80	240	14
Sound Output at 10cm* (dB)	Min. 70	80	80	Min. 80	Min. 85	Min. 70	Min. 85 (A-Range)		Min. 85 @ 2.7K Hz
Resonant Frequency (Hz)	2,048			2,048	2,731	2,048	2,400		2-3K Hz (80dB Min.)
Operating Temperature (°C)	−20~+60			−20~+60			−40 to +85		−20~+60
Weight (g)	2			2			2		2

*Measured at rated voltage 2048 Hz square wave (50% duty cycle)

star micronics
OEM DIVISION
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COMPLETE LINE OF ELECTRONIC AUDIO DEVICES

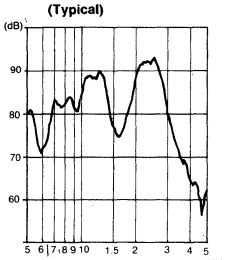
BUZZERS AND TRANSDUCERS

TRANSDUCERS MINIATURE AUDIO

SEALED VERSION FOR WAVE SOLDERING

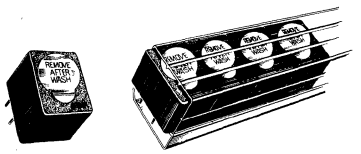
SMX SERIES

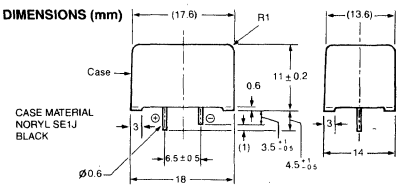
CHARACTERISTICS (Typical)



Frequency Response

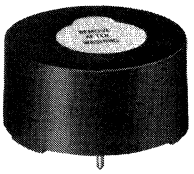
Test Conditions: Rated Voltage, Square Wave 50% Duty Cycle at 10cm.



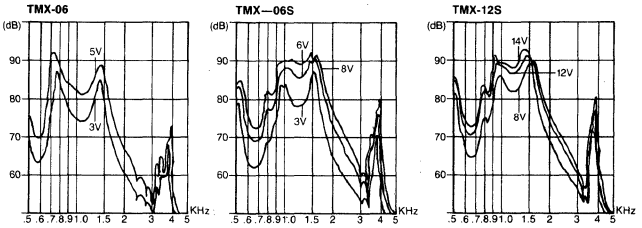


The Star SMX Series, a completely sealed audio transducer, is designed to provide an exceptionally wide frequency response range. A consistent pure tone signal allows the SMX to be used in a variety of applications. SMX transducers are also the first audio components specifically engineered to meet the requirements of automatic printed circuit board production. Forty SMX transducers are packaged in a rigid, plastic easy-feed magazine compatible with automatic insertion equipment.

TMX SERIES



CHARACTERISTICS



The charts above represent the SPL characteristics plotted at minimum and maximum operating voltages throughout the frequency range
TEST CONDITIONS: Square Wave, 50% Duty Cycle, measured at 10cm.

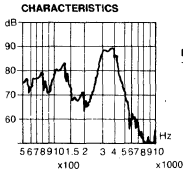
The Star TMX Series are electro-acoustic transducers designed to produce a more pleasing, low frequency tone as an output. The TMX-06 is resonant at 730 Hz while the TMX-S models provide optimum performance between 1KHz and 1.5KHz. The basic TMX is available in only a nominal 5V DC package; the "S" type has nominal DC ratings of 6V and 12V.

MMX-01C

The MMX-01C is an ultra-miniature electro-magnetic audio transducer and the smallest produced by Star. Its small size (9.6x7.1mm) make it a perfect choice for applications with space limitations.

CHARACTERISTICS

MMX-01C



Frequency Responses
Test Conditions:
1.5VDC Square Wave
50% Duty Cycle
Measured at 10cm

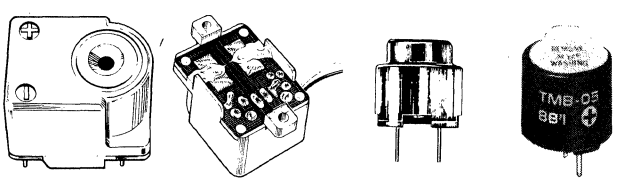
SPECIFICATIONS

Item	SMX-01	SMX-06	SMX-12	MMX-01C	TMX-06	TMX-06S	TMX-12S
Rated Voltage (V) dc	1.5	6	12	1.5	5	6	12
Operating Voltage (V) dc	1-3	3-10	6-15	1-2	3~5	6~8	8~14
Maximum Rated Current* (mA)	40			Max 80	Max. 80	Max. 75	Max. 55
Coil Resistance (Ω)	14±4.5	60±9	120±18	5.5	38	48	155
Coil Impedance* (Ω)	22	90	170	9.5	30	36	120
Sound Output at 10cm* (dB)	Min. 80	Min. 85	Min. 85	Min. 80	Min. 85		
Recommended Freq. Range (Hz)	2000-2500			3,100	730	1000~1500	
Operating Temperature (°C)	-20~+70			-10~+60	-40~+85		
Weight (g)	4			1	10		

*Measured at rated voltage 2048 Hz, square wave (50% duty cycle)

AUDIO TRANSDUCERS WITH BUILT-IN DRIVE CIRCUIT

This series of transducers features built-in oscillation circuits to drive each unit at the correct frequency. They also allow operation from a direct voltage source and can replace older arcing type buzzers. The "pure tone" signal is at a basic frequency of 2200 Hz and is pleasant yet penetrating enough for alert/alarm functions.



SPECIFICATIONS

Item		AMB/KMB-06	AMB/KMB-12	HMB-06	HMB-12	TMB-05	TMB-12
Rated Voltage (V) dc		6	12	6	12	5	12
Operating Voltage (V) dc		4-8	8-16	4-7	8-16	4~6.5	8~16
Rated Current* (mA)		20		Max. 30		Max. 30	
Sound Output at 10 cm* (dB)		85		85		Min. 85	
Resonant Frequancy (Hz)		2150		2200		2300	
Operating Temperature (°C)		-20~+70		-30~+85		-40~+85	
Weight (g)		10		4.8		Min. 1.0	
Connections	Positive (+)	Orange	Red				
(AMB Only)	Negative (-)	White	White				
Trigger Terminal (KMB Only)		3.5V @ 0.4mA	6.0V @ 0.4mA				

The HMB and TMB Series are sealed for wave solder/wash operations.

*Measured at rated voltage

OEM DIVISION
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COMPLETE LINE OF ELECTRONIC AUDIO DEVICES

BUZZERS AND TRANSDUCERS

BUZZERS MINIATURE SOLID STATE ELECTRONIC

Star's electronic buzzers utilize their patented solid state design and precise manufacturing that has made Star the world leader in this technology. The built-in oscillator circuit provides consistant sound output and eliminates RF noise associated with electro-mechanical design.

MMB - 01

Star's MMB series is the state-of-the-art in miniature eletronic buzzers. Tiny size, high efficiency, and value are obtained through use of surface mount components in the drive circuits. As all circuitry is solid state, the MMB's simplicity of design provides high reliability not found in conventional "make and break" type alarms. There are no mechanical points to arc or require maintenance, and RF noise is non-existent.

SPECIFICATIONS

	SMB-01	CMB-06 & SMB-06	CMB-12 & SMB-12	CMB-24 & SMB-24	MMB-01
Operating Voltage (VDC)	1.1≈2	3≈7	7≈17	16≈30	1.1≈2.0
Max current (mA)	17	23	14	16	10
Temperature Range (°C)	−20≈+60	−40≈+80			−30≈+80
Sound Ouput at 20 cm (dB)	70				70 at 1.5V DC
Weight (g)	10				5
Connections Pos. (+)	Red	Orange	Red	Orange	
(SMB Only) Neg. (−)	Black	White	White	Black	
Trigger Terminal (CMB Only)		1 mA Vt ≥3	1mA Vt ≥8	1mA Vt ≥18	

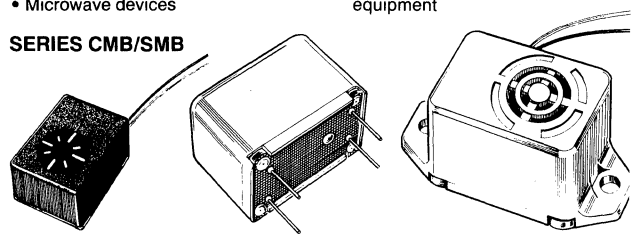
FEATURES

- Solid state design
- High sound output
- PC board pin or screw mounting
- Low current consumption
- High reliability

APPLICATIONS

- Alarm clocks
- Timer and control devices
- Portable and battery operated equipment
- Computer peripherals
- Microwave devices
- Gas detectors
- Aircraft stall indicators
- Automotive warning systems
- Instruments and test apparatus
- Portable and battery operated equipment

SERIES CMB/SMB

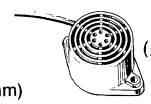


SERIES MMB (18.5L x 14.5W x 11H) **SERIES CMB** (22.5L x 16W x 14.6H) **SERIES SMB** (33L x 16W x 14.5H)

Star series CMB pin-type electronic buzzers fit standard DIP sockets or may be wave-soldered. Model CMB-06 is TTL compatible; Model CMB-12 is CMOS compatible. MMB and SMB series have lead wires.

RMB/IMB Series

IMB (⌀41mm x 28mm)



RMB (⌀41mm x 17.6mm)

Extraordinary audio penetration, long life and compact, rugged construction are combined in Star's unique Series of miniature electronic buzzers. Because all circuitry is solid state, Star buzzers differ significantly from conventional "make and break" type alarms. There are no mechanical points to arc or require maintenance and RF noise has been eliminated.

All three of the IMB Series are available in two models with different sound sequences.

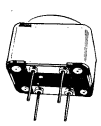
- IMB-06-05, IMB-12-05 and IMB-24-05 emit sound for 1/4 second on, 1/4 second off.
- IMB-06-10, IMB-12-10 and IMB-24-10 emit sound for 1/2 second on, 1/2 second off.

SPECIFICATIONS

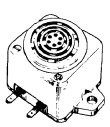
Item		RMB-03	RMB-06	RMB--12	RMB-24	IMB-06	IMB-12	IMB-24
Rated Voltage (V) dc		3	6	12	24	6	12	24
Operating Voltage (V) dc		2-4	4-8	7-16	20-28	4-8	7-16	20-28
Max. Current* (mA)		35	33	23	21	35	23	21
Sound Output at 100 cm* (dB)		75				75		
Operating Temperature* (°C)		−40~+70				−40~+70		
Weight (g)		18				24		
Connections	Positive (+)	Red				Red		
	Negative (−)	Black				Black		

*At Rated Voltage

YMB/PMB Series



YMB (26L x 26W x 20H)



PMB (40L x 26W x 20H)

Star Series YMB and PMB are low-cost, precision-engineered solid state electronic buzzers which provide a minimum audible signal of 75 dB at a distance of 1 meter (39.4"). Each is available in four models rated at 3, 6, 12 and 24 volts DC. The YMB and PMB are similar in operating characteristics and performance, but provide different assembly options: Series YMB is a pin-type buzzer designed to be soldered directly to PC boards without additional wiring. Because the pins include a control, or "trigger" terminal with a maximum starting current of 1 mA, the buzzers create a perfect interface with integrated circuits. The control terminal is logic compatible. Series PMB has connector tabs which may be soldered or inserted in crimp-on connectors. It has flanges with screw holes and may be mounted firmly on any rigid, non-resonant surface.

SPECIFICATIONS

Item	YMB-03	YMB-06	YMB-12	YMB-24	PMB-03	PMB-6	PMB-12	PMB-24
Rated Voltage (V) dc	3	6	12	24	3	6	12	24
Operating Voltage (V) dc	2-4	4-8	8-16	20-28	2-4	4-8	8-16	20-28
Max. Current* (mA)	35	35	25	25	35	33	23	21
Sound Output at 100 cm* (dB)	Min. 75				Min. 75			
Operating Temperature* (°C)	−40~+70				−40~+70			
Weight (g)	17				17			
Trigger Terminal Requirements	1mA, Vt≥2V	1mA, Vt≥4V	1mA, Vt≥8V	1mA, Vt≥20V				

*At Rated Voltage

star micronics
OEM DIVISION
70-D ETHEL ROAD WEST, PISCATAWAY, N.J. 08854 (908) 572-9512 FAX: (908) 572-5095

PIEZOELECTRIC PRODUCTS

TDK®

TDK CORPORATION OF AMERICA 1600 Feehanville Drive, Mount Prospect, IL 60056, U.S.A. Phone: 708-803-6100 **INDIANAPOLIS** Phone: 317-872-0370 **NEW YORK** Phone: 516-625-0151 **LOS ANGELES** Phone: 213-539-6631 **DETROIT** Phone: 313-462-1210 **NEW JERSEY** Phone: 201-736-0023 **BOSTON** Phone 508-624-4262 **HUNTSVILLE** Phone: 205-464-0222 **GREENSBORO** Phone: 919-292-0012 **DALLAS** Phone: 214-506-9800 **SAN FRANCISCO** Phone: 408-437-9585
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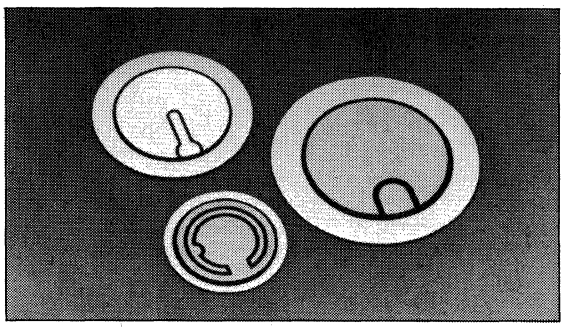
UNIMORPH PIEZOELECTRIC TRANSDUCERS FOR BUZZERS AND SOUNDERS

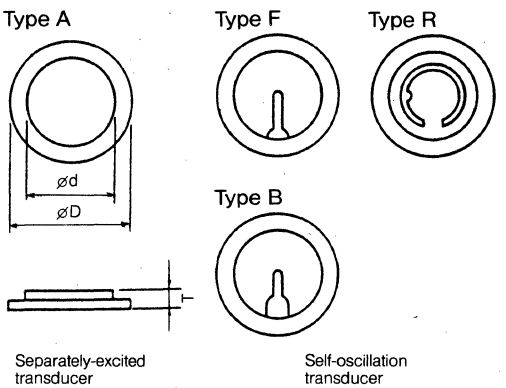
Separately excited oscillation drive Unimorph

Part No.	Resonant frequency Fr (kHz)	Resonant resistance Ro (Ω)) max.	Electrostatic capacitance Cd (nF)	Dimensions (mm) φD	φd	T
UN13BP120A1	12.5±1.0	300	5±30%	13.0±0.3	10.0±0.3	0.37±0.15
UN20BP60A2	6.0±1.0	200	17±30%	20.0±0.3	16.8±0.3	0.40±0.10
UN27BP40A1	4.0±1.0	250	20±30%	27.0±0.3	20.0±0.3	0.38±0.15
UN35BP29A1	2.9±1.0	200	30±30%	34.7±0.3	25.0±0.3	0.50±0.10
UN20SP68A1	6.8±1.0	200	12±30%	20.0±0.3	15.0±0.3	0.41±0.15



Self-oscillation drive Unimorph

Part No.	Resonant frequency Fr (kHz)	Resonant resistance Ro (Ω) max.	Main electrode electrostatic capacitance Cd (nF)	Dimensions (mm) φD	φd	T
UN20BP60R	6.0±1.0	450	10±30%	20.0±0.3	16.8±0.3	0.40±0.15
UN27BP45F1	4.5±1.0	200	16±30%	27.0±0.3	20.0±0.3	0.55±0.15
UN35BP29B1	2.9±1.0	250	25±30%	34.7±0.3	25.0±0.3	0.55±0.10
UN35SP30B2	3.2±1.0	200	21±30%	34.7±0.3	25.0±0.3	0.52±0.10



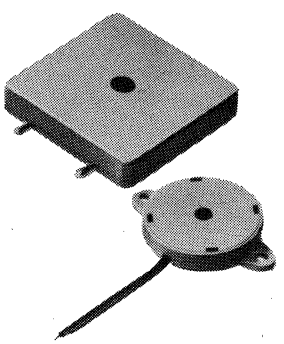
Separately-excited transducer

Self-oscillation transducer

PIEZOELECTRIC SOUNDERS

Typical electrical characteristics

Drive method	Part No.	Resonant frequency (kHz)	Sound pressure (dB/10cm) min.	Test frequency (kHz)	Measuring applied voltage (Vp-p) squarewave	Max. operating voltage (Vp-p)	Dimensions (mm)	Terminal construction
Separately excitation	PS3025P02		85, 80	2.0, 2.5	12 V.d.c.	30	30×34×7	Pin terminal
	PS2225P02		80, 78	2.0, 2.5	12 V.d.c.	25	22×26.5×7	Pin terminal
	PS2440L30		73	4.0	3 V.d.c.	30	φ24.0×4.7	Lead wire
	PS2440P02		73	4.0	3 V.d.c.	30	φ24.0×5.5	Pin terminal
	PS1520L25		70	2.0	1.5 V.d.c.	30	φ14.7×4.8	Lead wire
	PS1740P02		72	4.0	3 V.d.c.	20	φ17.0×7.0	Pin terminal
Self-excitation	PS2335P03	3.4±0.6	90	—	10 V.d.c.	20 V.d.c.	φ25×10.8	Pin terminal
	PS2135L30S3	3.4±0.6	80	—	12 V.d.c.	15 V.d.c.	φ21.4×4.4	Lead wire

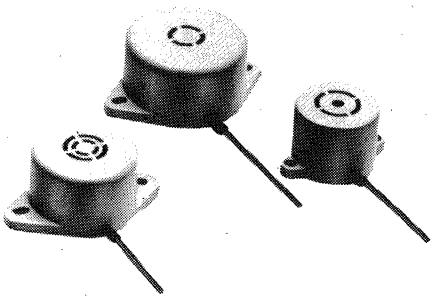


**Measured at 25°C. Operating temperature – 10°C to + 60°C. Resonant frequencies shown for separate excitation are estimates based on excitation frequencies.*

PIEZOELECTRIC BUZZERS

Electrical characteristics

Part No.	Resonant frequency (kHz)	Terminal construction	Operating voltage (V.d.c.)	Sound pressure (dB/100cm) min.	Measuring input voltage (V.d.c.)
PB2130UP002A	3.3±0.8	Pin terminal	4 to 15	75	12
PB2130UL100A	3.3±0.8	Lead wire	4 to 15	75	12
PB2130UP002B	3.3±0.8	Pin terminal	5 to 24	75	24
PB2130UP002C	3.3±0.8	Pin terminal	4 to 15	65	12
PB2328UP002A	2.8±0.5	Pin terminal	4 to 15	70	12
PB2625UP002A	2.5±0.7	Pin terminal	5 to 15	75	12
PB2625UL100A	2.5±0.7	Lead wire	5 to 15	75	12
PB3120UP002A	2.0±0.5	Pin terminal	5 to 18	75	12
PB3120UL100A	2.0±0.5	Lead wire	5 to 18	75	12



**Measured at 25°C. Operating temperature –10°C to +60°C.*

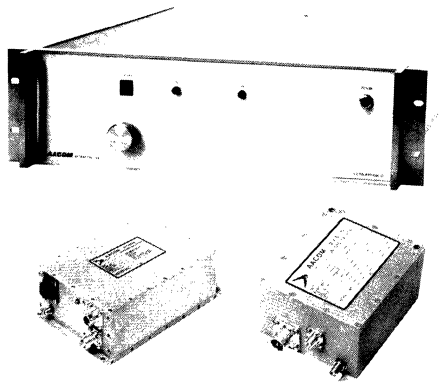
DATA LINKS
AACOM

Transmitters

AACOM manufactures telemetry and video transmitters ideally suited to many applications involving voice, data, time code and video transmission. Available in airborne, rackmount and ATR configurations, these transmitters feature state-of-the-art design for superior performance under adverse environmental conditions.

AT150 Series Telemetry Transmitters offer unmatched carrier frequency stability and modulation capability. These single- and multi-channel synthesized FM transmitters operate in the 130 - 450 MHz frequency range and are suitable for voice, data or IRIG time code transmission.

The AT 2200, AT 4800 and AT 6400 Series Telemetry/Video Transmitters provide the stability necessary for telemetry applications, together with modulation characteristics suitable for video transmission. Available in many frequency ranges from 1400 MHz through 6000 MHz, these compact, light-weight transmitters are ideal for installation in aircraft or other vehicles. Multi-channel units can be provided that enable the user to select up to 1200 channels over a 600-MHz bandwidth.



Transmitters

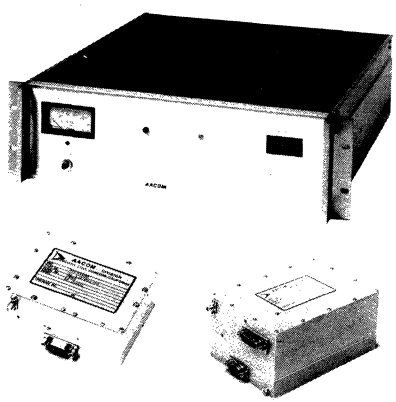
Receivers

Instrumentation, video/data and command/telemetry receivers are available in airborne, rackmount and ATR configurations. Designed for a wide variety of applications, AACOM's receivers range from single-channel, VHF/UHF instrumentation units to 600-channel airborne receivers operating at frequencies to 12000 MHz.

The AR150 Series receivers provide single- or multi-channel VHF/UHF reception for many instrumentation/communications applications.

AR 3000 and AR 5000 Series receivers are designed for airborne command/telemetry applications. Configurations range from economical, single-channel receivers to synthesized 100-channel units. Frequencies range from 1400 to 6000 MHz.

A recent addition to AACOM's family of receivers is the AR 5000-V Airborne Video Receiver. This unit enables users to receive over-the-horizon video, when used in repeater aircraft.



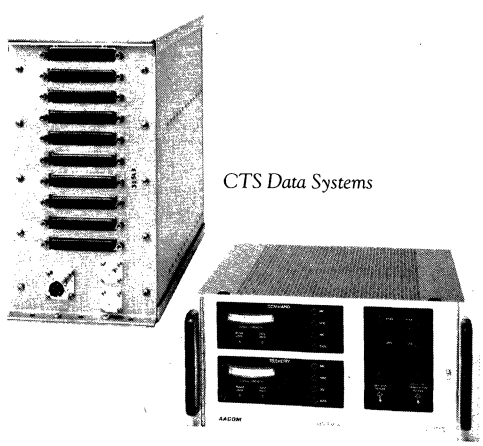
Receivers

CTS Data Systems

AACOM's CTS (Command/Telemetry/Control) Data System is a versatile data/video link system developed through AACOM's extensive experience with unmanned vehicle programs. This equipment is designed to be cost effective, without compromising the reliability essential for applications involving unmanned vehicles.

The CTS Data System concept permits the configuration of unique, one-of-a-kind data links without the high costs usually associated with such efforts. Based on a growing family of programmable circuit cards which implement the encoding/decoding functions, the system comprises a variety of transmitters, receivers, diplexers, modems, and related packages from which the elements of the desired system configuration are selected.

AACOM can provide complete system engineering services for initial design, integration and follow-on support of data link systems. Antenna selection, diplexer design, calculation of link margins, selection of data formats, assistance in gaining frequency allocations, and many other kinds of assistance can be provided by AACOM's engineering staff.



CTS Data Systems

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

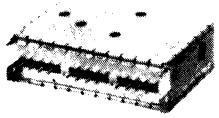
Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

EPD
ELECTRONICS INC.
P.O. BOX 2517, GARDENA, CA 90247
16921 S. Western Ave., No. 110, Gardena, CA 90247 (213) 515-4996

TUNERS AND MODULATORS

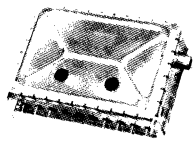
MODEL NO. PIF-45MO6 PICTURE IF



ELECTRICAL SPECIFICATIONS

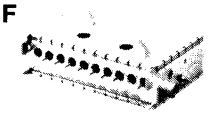
B+ Supply Voltage	+12V ±10%
Total Current (T = 25°C B+ = 12.0V)	120 mA to 160 mA
AFT DC Output Voltage	+6.8V type for Pin No. 7 and Pin No 8 Short
Video Output Syn Tip Level Voltage	2.5V p-p ° 0.3V p-p
Audio Output	T.H.D. = 4% F = 400 Hz
Operating Temperature Range	−20 to +60°C
Storage Temperature Range	−40 to +85°C

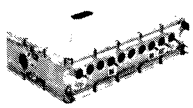
MODEL UHF TUNER



MODEL	EPU202	EPU252 HIGH GAIN
Power Gain	6dB or More	20dB or More
Gain Deviation	8dB or Less	
Gain Reduction	30dB or More	35dB or More
Noise Figure	12dB or Less (Measured with 4dB IF Amplifier)	
Radio Frequency (RF) Bandpass Limits	The picture carrier point shall not be down more than 3dB below the maximum point on all channels. The sound carrier poinnt shall not be down more than 6dB below the maximum point on all channels.	
Image Rejection	40dB or More	50dB or More
Intermediate Frequency (IF) Rejection	60dB or More	55dB or More
Oscillator Frequency Change with Temperature 20°C to 40°C	±1200 KHz Maximum	
Oscillator Frequency Change AFT Voltage	6.8V ±4V 0.5 MHE to 2 MHE	

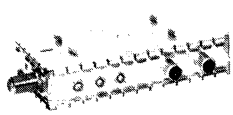
VARACTOR UHF AND VHF TUNERS





MODEL	EPU103 CH-3	UVMA315 VHF
Power Gain	15dB or More	28dB or More
Gain Deviation	8dB Maximum	6dB Maximum
Gain Reduction	25dB Minimum	40dB Minimum
Noise Figure	12dB or Less	8dB or Less
Oscillator Frequency Change with Temperature 25°C to 40°C	±800 KHz Maximum	±300 KHz
Oscillator Frequency Change with AFT Voltage		6.5V ±4V 0.5 MHE to 1.5 MHE
Image Rejection		60dB or More

DBT950 D8T1750

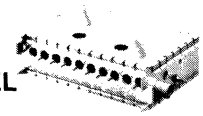


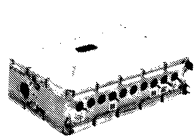
SATELLITE TUNERS

IF = 70 MHz FC = 950 MHz—1.500 MHz	A.I/P Impedance = 75 Ω Unbalanced Output Impedance = 75 Ω Balanced

Prescribe Option by Order.

MODEL VMA3 UHF VARACTOR TUNER CHANNEL 3 OUTPUT

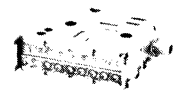




ELECTRICAL SPECIFICATIONS

Power Gain	The Power gain shall be greated than 15dB
Gain Deviation	8dB Maximum
Gain Reduction	25dB Minimum
Noise Figure	The noise figure shall not exceed 12dB on all channels
Oscillator Frequency Change with Temperature 25°C-40°C	±800 KHz Maximum
Oscillator Radiation	The oscillator radiation shall not exceed the FCC limits
Safe Specification	The safe specification shall correspond to UL specification

HL CVMTA139 CATV TUNER



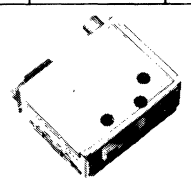
SPECIFICATIONS

GENERAL PERFORMANCE	
Frequency Coverage:	VHF: Band I : CH. 2 to CH. A-1 Band II: CH. A to CH. W UHF: CH. 14 to CH. 83 Intermediate Frequency (I.F.) PIF = 45.75 MHz CIF = 42.17 MHz SIF = 41.25 MHz
Antenna Input Impedance:	VHF/UHF: 75 Ohms unbalanced
I.F. Output Impedance:	75 Ohms unbalanced
Nominal Voltage:	MB=LB=HB=UB=12V AGC=7.5V AFT=6.5V TU=0.8 −29V
Nominal Current:	MB=1 −7mA LB=34 −44mA HB=36 −46mA UB=22 −32mA
Terminals:	With or Without prescaler

NO.	TERMINALS	VOLTAGE VL	VOLTAGE VH	VOLTAGE UHF
1.	IF	—	—	—
2.	MB	12	12	12
3.	AFT	6.5	6.5	6.5
4.	LB	12	OPEN	OPEN
5.	AGC	7.5	7.5	7.5
6.	HB	OPEN	12	OPEN
7.	TU	0.5-30	0.5-30	0.5-30
8.	UB	OPEN	OPEN	12

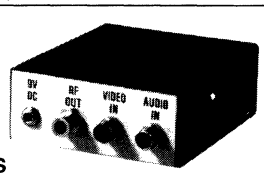
MODEL NO. RF-3405/3406 RF-MODULATOR

CRYSTAL CONTROLLED FOR STABILITY



RATING	
Channel Output:	USA, Channel 3 NTSC USA, Channel 4 NTSC
Supply Voltage	9V ±0.5V
Current Consumption:	45 ma. maximum
RF Output Impedance:	75 ohm unbalanced (phono jack)
Input Voltage:	Video: 1 ±0.2Vpp Sound: 0.5 ±0.1 RMS
Temperature Range:	0-50°C
Humidity Range:	10-80%
PERFORMANCE VIDEO	
Video Carrier Frequency	CH-3 61.25 ±50 KHz CH-4 67.25 ±50 KHz
Video Modulation	75 ±10% VR1 at mid point
Video Carrier Output	66 ±3dbm 75 ohm loaded
Differential Gain	±10% at standard modulation
Differential Phase	±10%
PERFORMANCE SOUND	
Subcarrier Frequency	500 ±5 KHz
Sound Carrier Output	−16 = 3db value against FV
Distortion	3% maximum
Signal To Noise	40db maximum
Dimensions	2″ L x 1.5″ W x ¾″ H

MODEL NO. VM-1000 RF MODULATOR



ELECTRICAL SPECIFICATIONS

Rating: Channel Output:	USA CH 3 NTSC/USA CH 4 NTSC
Supply Voltage:	9 ±0.5 VDC
Current Consumption:	60 ma Max.
RF Output Impedance:	75 ohm unbalanced
Input Voltage:	Video 1 ±0.2 VP-P/Audio 0.5 ±0.1 VRMS
PERFORMANCE VIDEO:	
Video Carrier:	CH 3 61.250 ±50 KHz/CH 4 67.250 ±50 KHz
Video Carrier Output:	66.5 ±2.5 dbu
Video Modulation:	
Smear:	7% max./S/N 45db min.
PERFORMANCE—SOUND:	
Sub-Carrier Frequency:	4500 ±5 KHz
Sound Carrier Output:	−15dB
Sound Modulation:	70 ±10%/S/N 40 db min.
Radiation:	23.5 dbu 1m method
Spurious Response:	−32db max.
Dimensions:	3.375″ L x 3″ W x 1.250″ H Weight: 6 oz.

You are a systems engineer looking for off-the-shelf hardware to integrate into a communication control system. The requirements imposed in the area of communications must be met with equipment that is field proven and capable of future expansion in a building block concept. You need to address at a minimum intercom, remote radio control and telephone functions at various operator stations along with technical, processor and supervisory control.

Just as important, you are looking for one responsible contractor who manufactures the hardware who can also support you in life cycle acquisition and data base management, software development, integrated logistics, training, quality assurance and test and evaluation. GRIM CORPORATION is ready to discuss, demonstrate and deliver a cost effective family of products.

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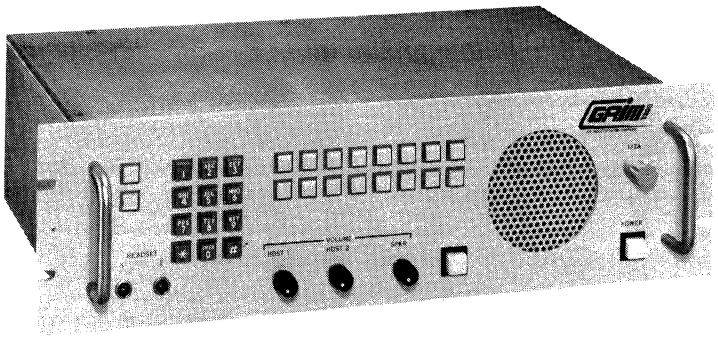
Programmable Intercom ProCom-1400 Series



FEATURES

- Microcomputer Control
- Multiple Simultaneous Conversations
- Voice and Digital Communication
- Telephone Interface: 2 wire or 4 wire, with signalling
- AC or DC Powered
- Direct Pushbutton or Keypad Station Selection plus All Call Paging
- Radio Interface with PTT
- Monaural or Stereo Headset Operation
- Digital Control Bus-Allow Automatic Trunk Selection and Station Address
- Non-Volatile RAM
- Two Wire connection with GRIM's Central Controller

SPECIFICATIONS

Dimensions: Customer Specified
Power: AC: 110/220 VAC 50/60 Hz
.5A @ 110 VAC, .3A @ 220 VAC
DC: 12 to 48 VDC COE input.
Audio Amp: 5 watts into 4 inch internal speaker.
Frequency Range: 200 Hz to 3400 Hz
Total Harmonic Distortion: Less than 1%
Audio I/O Impedance: 600 ohm balanced or unbalanced.
Temperatures: 0 to 50 degrees C (operating), –40 to 70 degrees C (non-operating)
Humidity: 5 to 95% (non-condensing)

ACCESSORIES

Headset/Microphone, Jackboxes, Foot Switches

OPTIONS

- Remote Speaker Connections
- Auxiliary Input/Output
- Random Access Memory (RAM) with Battery Backup
- Stereo Headset
- Field Programmable via RAM
- Digital Control Bus allows automatic trunk selection and dial up station address via standard keypad.
- Internal Telephone Line interface via standard keypad
- Data Transmission (rates up to 9.6K BAUD)

DESCRIPTION

The GRIM PROCOM Communications System provides operator access to a variety of voice equipment and communication, including intercom, radio, and telephone. The system is also capable of handling digital data communications.

The basic design and operation of the GRIM PROCOM Communication System is flexible and adaptable to meet customer specifications. Functions and features can be changed, deleted, and added.

The GRIM PROCOM Communication System consists of two types of components. The Communication Access Unit (CAU) is the operator terminal and allows local access to and control of the communications equipment and external lines. The Communication Control Unit (CCU) is the focal point of the system, handling the communication between operator terminals, various communication equipment, and external communications lines.

APPLICATIONS

The PROCOM 1400 can be used in a wide range of applications from two stations to 999 plus depending on the number of keypad digits desired. This capability is derived from the flexibility of the software (EPROM), and the keypad dial-up feature allowing specific address transmission via the digital interface bus.

With this capability in mind, one can realize the numerous system configurations that can be constructed, providing intercommunications for the small system user up to the most elaborate.

Typical applications would encompass:

- Industrial/Commercial installations
- Communications Shelters
- Training/Simulation Systems.

Contact a GRIM Corporation sales engineer for assistance in developing your custom programmable intercom network.

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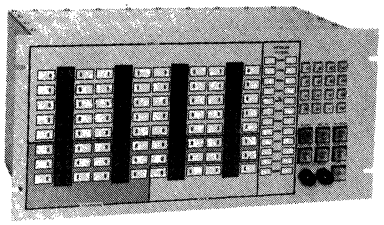
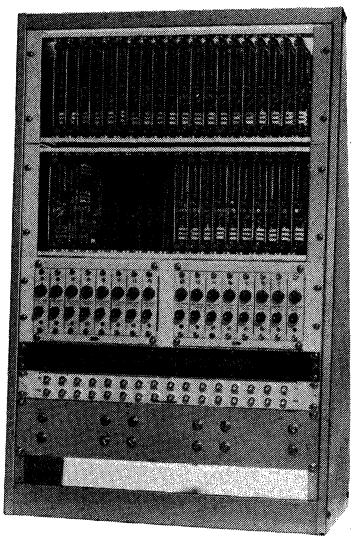
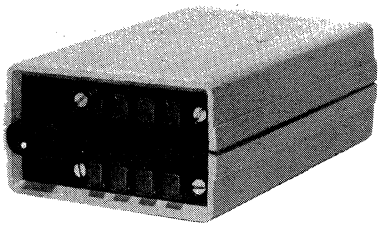
Typical ProCom 1400 Series Components



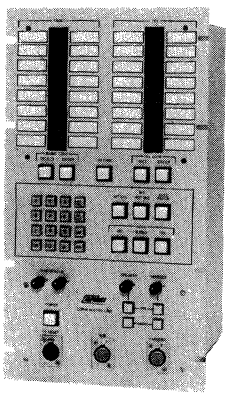
MULTICHANNEL OPERATOR UNIT



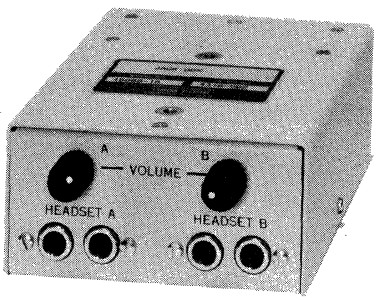
COMMUNICATION CONTROL UNIT



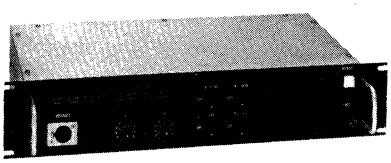
BELT PACK 8 CHANNEL OPERATOR UNIT



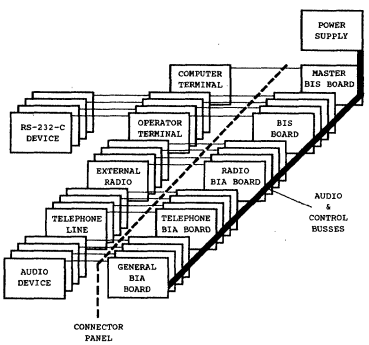
MULTICHANNEL OPERATOR UNIT



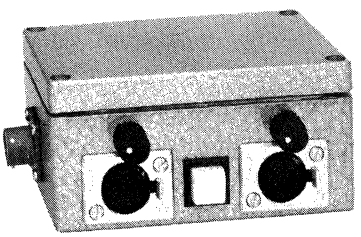
STANDARD DUAL JACK BOX



CUSTOM OPERATOR UNIT



FUNCTIONAL DIAGRAM OF THE GRIM PROCOM COMMUNICATION SYSTEM



WATERPROOF DUAL JACK BOX

THESE OTHER FINE PRODUCTS ARE ALSO AVAILABLE

VoData Comm-80	Provides simultaneous transmission of voice plus multiplexed Digital Control Words.
DATA TRANSCEIVER SET (DTS-300)	A pair of circuit cards which sense/generate DC levels and provide buffering and data communications over voice grade lines. Rates to 300 baud.
TEST MESSAGE GENERATOR	A self contained code generator (ASCII/BAUDOT) for testing data transmission lines. Ideal for GO/NO GO testing.
CUSTOMIZED COMMUNICATION CONTROL CONSOLES	
CUSTOMIZED AUDIO PATCH PANELS	Audio/Data & DC control patch panels.
CUSTOMIZED TEST EQUIPMENT	

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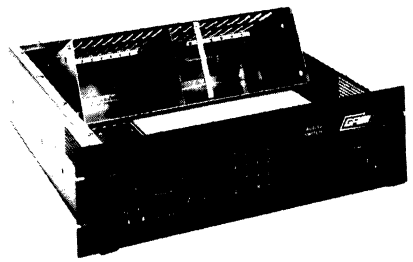
AUDIO SWITCHES 8300 SERIES



MODEL 8300

- Solid state, modular construction, up to 96 x 96
- Space-division, non-blocking, full fanning
- Full remote control via RS232/422 serial line
- Full local control via keypad and display
- Microprocessor controlled with on-line fault detection
- Built-in-test-equipment (BITE) with fault isolation
- Transformer-coupled, balanced/unbalanced inputs and outputs
- 200 to 5,000 Hz ± 1dB response with optional path gain
- Optional battery retention of connectivity memory

GENERAL DESCRIPTION

The 8300 Series Audio Switches provide the capability to connect any of the switch audio input lines to any or all of the switch audio output lines using a solid state non-blocking crosspoint matrix. All input and output lines are transformer coupled and buffered presenting constant input and output impedance and constant output signal level regardless of the crosspoint connectivity. Microprocessor control of the audio switch provides fast local and remote control, interrogation, fault detection, and fault isolation. All switching actions are verified providing fast automatic non-obtrusive fault detection. The high quality of the signal paths provided by space-division switching and the reliability of all solid-state construction permits application of the audio switch in severe government and industrial environments for complex intercom networks, voice logging/playback or training/simulation systems and airspace management applications.

MODULAR CONSTRUCTION

The 8300 Series Audio Switches are composed of the following card sets:

- GPS Microprocessor – provides control, stored program, memory, and remote communication.
- Audio Input Cards – 8 lines per card, maximum 96 inputs.
- Crosspoint Matrix – 16 x 16 per card, 36 cards for 96 x 96.
- Audio Output Cards – 8 lines per card, maximum 96 outputs.
- I/O Backplane – 4 input/output/matrix card interconnect, minimum 3 for 32 x 32 switch.
- Card Shelf – 20 card slots.
  - 1st shelf – GPS and slots for up to 32 x 32 line switch, or GPS and slots for up to 96 output lines.
  - 2nd, 3rd, 4th shelf – slots for up to 32 input lines and 32 x 96 matrix.
- Power Supply and 19 inch rack mount chassis.

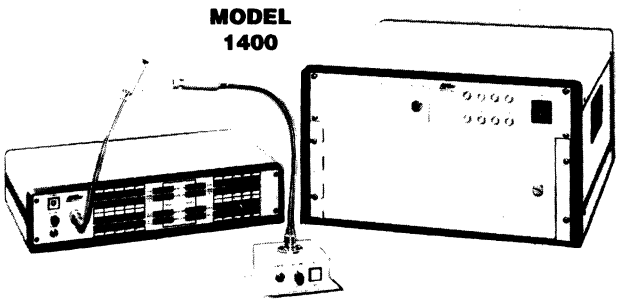
LOCAL CONTROL

A 16 keypad and 8 digit annotated display allows the operator to monitor switch fault detection (errors), determine connectivity, connect/disconnect any input from selected output, select and execute fault isolation tests, and monitor test results. Operator entry is prompted with periods(.) in the appropriate fields and line numbers are range verified to minimize human errors.

REMOTE CONTROL

A jumper selectable RS-232C/RS-422 Serial Line, with full modem control, provides total remote control capability of the Audio Switch by a host processor or any standard terminal with ASCII communication capability. Communication protocol is asynchronous with switch selectable baud, parity, and stop bits. The Audio Switch is unit addressable allowing multiple Audio Switches to be controlled by a single serial port in a multipoint communication network. Communication error control and syntax validation prevents erroneous configuration of the switch. All functions can be performed remotely including configuration, connectivity interrogation, fault detection, execution of fault isolation diagnostics with remote reporting, and test sequence loop construction.

MODEL 1400



PROCOM-1400 SERIES

COMMUNICATION TRAINING SYSTEMS

- Computer based command trainers
- Standard Electronic Modules/P.C. Boards
- Classroom or Shelters
- Custom designed for your workstation
- Distributed Digital Bus
- Voice and Data Switching and Control
- Building block concept to facilitate onsite expandibility
- Reconfiguration supported from your microcomputers
- No single point failure
- Built in test features
- User friendly trainee/operator interface
- Adaptible configurations for small and large systems
- Instructor consoles and user positions
- Red and Black capability

GENERAL DESCRIPTION

As important as cost, the Procom-1400 Communication Training Systems bring greatly enhanced flexibility and expandibility in firmware and hardware design, giving users the opportunity to tailor the communications to meet their specific requirements. The custom panels provided can duplicate layout and functionality of any communication system.

PROCOM-1400 SUPPORT

- Documentation
- Logistics
- Training
- Manufacturing
- Contract Depot Support

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INTEGRATED VOICE/DATA MODEM

IVDM-100 SERIES

A Smart Voice Plus Data Acquisition, Control and Transmission System

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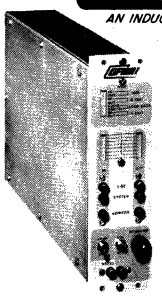
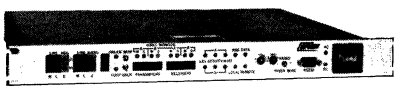


MODEL IVDM-100

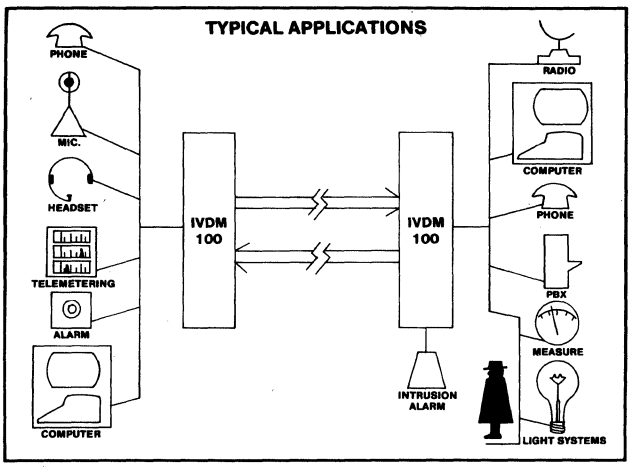
MODEL IVDM-102



TYPICAL APPLICATIONS

Two way voice plus combinations of the following:

- Remote Radio transmitter and receiver control
- Computer to computer interface over long distances
- Remote monitoring and intrusion detection
- Remote radio frequency selection
- Alarm and control functions
- Telemetering • Various other



DESCRIPTION

The IVDM-100 Series Modems are "Smart" voice and data acquisition, control and transmission systems. With many built-in features, the IVDM-100 Series Modems allow stand-alone operation in complex applications. IVDM systems are especially useful when simultaneous voice and control data transmission is required.

FEATURES

- Simultaneous transmission and reception of Voice and Data.
- Basic 2002/3002 4-wire or 2-wire telephone facility compatible, microwave, or other transmission.
- RS-232C bi-directional port with data rates to 600 baud. (Front/Rear Access)
- RS-422-485 multidrop serial port for interfacing multiple equipment. (Rear Access)
- Sixteen (16) digital control inputs/outputs.
- Eight (8) Radio control inputs.
- Six (6) Opto-isolated control outputs.
- Fifteen (15) Analog 0-5V level inputs.
- 2 x 6 built in audio switch.
- Front Panel Status LEDs and Monitor/Test Jacks.
- Automated digital and analog loop back.
- Automatic transmission line compensation over 50dB range with degradation reporting.
- Transparent orderwire with priority override.
- AC and/or DC source powered.

The Audio Subsystem features the following:

Frequency
The audio bandpass is 300 Hz to 1800 Hz + 1/-3 dB.

Audio Input/Output
The audio can be input on any of six lines and output on any of six separate lines. The inputs and outputs can be switched on and off in any combination under firmware control. They are normally configured as a "one of" input and output on a demand priority basis. The lowest priority channel is assigned as intercom/orderwire.

Interface
Audio interface is through a 600 ohm balanced transformer on each input. A trimpot is provided to adjust volume level. Each output is buffered by a separate amplifier and transformer coupled with a 600 ohm impedance.

Loopback
Remote audio and digital features are provided by switch selection or under firmware control.

The Digital Subsystem features the following:

Digital Inputs
The IVDM-102 has 16 non-isolated digital inputs. They are ground referenced and switch with a positive input voltage between 3V and 15V. These inputs can be tied to + V through a resistor allowing them to switch with a ground input.

There are 8 additional control inputs typically used for standard radio functions such as PTT, muting, and main-standby selection.

Analog Inputs
The IVDM-102 includes 15 analog inputs of 0 to 5 volts with a resolution of 0.02 volts. The data from these inputs resides in memory and is available for read-out on demand via the RS-232 or RS-485 data port. Although the normal configuration is for read, report, and output, interactive use and alarm monitoring can be implemented in firmware.

Outputs
There are 16 non-isolated digital outputs capable of sinking 0.5 amps.

There are 6 additional opto-isolated control outputs. There are normally configured in firmware for radio PTT.

RS-232 Port
A multifunction RS-232 Port is included in the system. It is normally a transparent through channel that does not effect other functions. On demand, the port is used to access analog and digital operational data stored within the unit's memory. It can also be configured to interact with and control the system functions.

RS-422/485 Multidrop Port
An RS-485 multidrop serial port is included in the IVDM-102 to allow data access and functional surveillance/control of multiple IVDMs or other external equipments on a common computer port.

Memory
The system uses non-volatile memory to store incoming data and system parameters. The memory operation is totally automatic and will remain valid in excess of 10 years.

IVDM-102 TECHNICAL SPECIFICATIONS

PHYSICAL DIMENSIONS:		
Height:	1-3/4"	
Width:	19" EIA Std. rack mounting	
Depth:	16"	
Weight:	8 lbs.	
PRIMARY POWER:		
Voltage:	12 to 28 VDC and/or 120/240 VAC, 47-63 Hz.	
Power:	8 watts, typical	
VOICE INTERFACE:		
Transmit Level:	-20 to 0 dBm average voice level	
Impedance:	Low for driving multiple loads	
Receive Level:	-20 to 0 dBm average voice level	
Impedance:	Low for driving multiple loads	
Frequency Response:	0.3 to 1.8 khz, + 1dB, -3dB relative to 1 khz at -10 dBm. Intentionally rolled off above 2.0 khz.	
LOCAL AND REMOTE CONTROL INTERFACE:		
Inputs:	16 + 8	
Voltage:	+ 12 VDC ± 5% furnished by terminal	
Current:	5ma.	
Outputs:	16	6
Voltage:	+ 12 VDC ± 5%	Opto-isolated
Current:	500ma. sink.	
ANALOG INTERFACE:		
Inputs:	15	
Voltage Range:	0 to + 5 volts ground referenced	
Resolution:	8 Bits / 0.02 volts	
Access:	Block dump from memory to either RS-232 or RS-485 ports on command	
DATA INTERFACE:		
Type:	RS-232	RS-485
Voltage Level:	± 12 VDC	± 5 VDC
Start Bits:	1	1
Data Bits:	8	8
Stop Bits:	2	2
Sta ndard Rate:	300 Baud	2400 Baud

Note: The Data Channels are totally transparent to the other functions of the IVDM.

Orderwire: Headset Jack or 600 ohm balanced output for external instrument. Priority Control allows use of intercom function transparent to radio audio channels.

Radio Control Access: Front panel headset jacks permit radio interface with keying PTT when ICOM/Radio selector is set for radio.

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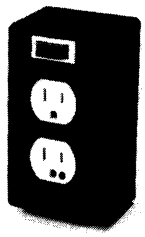
Transient Surge Protection

ACP100BWN3

Performance Specifications

VOLTAGE	120VAC Nominal
CURRENT	15 Amp. (Max.)
VOLTAGE CLAMPING POINT	330 Volt Peak @ maximum power
POWER DISSIPATION	12,000 Watts for 1ms
RESPONSE TIME	< 5 Nanoseconds
FREQUENCY	50/60Hz
OPERATING TEMPERATURE	-20°C TO +50°C
OVERALL DIMENSIONS	6-"L x 3"W x 2- "H

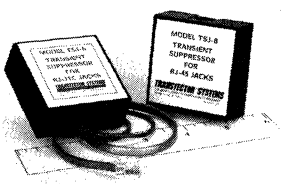
ACP100BLN2



Performance Specifications

PART NUMBER	ACP100BLN2
VOLTAGE	110/120 VAC
CURRENT	15 Amp. (Max)
VOLTAGE CLAMPING POINT	
RESPONSE DISSIPATION	12,000 Watts for 1x1000µs
FREQUENCY TIME	# 5 Nanoseconds
OPERATING TEMPERATURE	0°C to +50°C
SIZE	5"H x 3"W x 2"D

TSJ SIGNAL LINE PROTECTORS

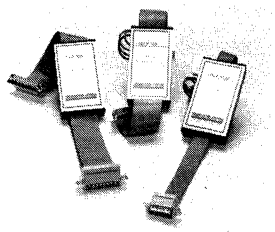


Performance Specifications

PART NUMBER	SIGNAL VOLTAGE (Max)	LEAKAGE @SIGNAL VOLTAGE	CLAMP POINT	RESPONSE TIME
TSJ-6	160 Vpeak	5 u AMP	200 Vpeak	5 nanosec.
TSJ-8	160 Vpeak	5 u AMP	200 Vpeak	5 nanosec.

PART NUMBER	SERIES IMPEDANCE	PEAK POWER DISSIPATION	TEMPERATURE RANGE
TSJ-6	33 ohm	15,000 W	-20°C to +85°C
TSJ-8	33 ohm	15,000 W	-20°C to +85°C

DLP SIGNAL LINE PROTECTORS

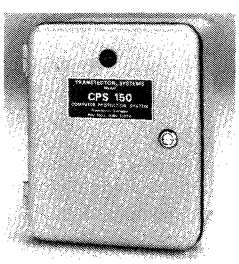


Performance Specifications

PART NUMBER	PINS PROTECTED	SIGNAL LINE VOLTAGE (MAX)	LEAKAGE SIGNAL VOLTAGE	CLAMP POINT
DLP-3	2, 3, 7	15 Vpeak	5 u AMP	16 Vpeak
DLP-4	2, 3, 7, 20	15 Vpeak	5 u AMP	16 Vpeak
DLP-5	2, 3, 6, 7, 20	15 Vpeak	5 u AMP	16 Vpeak

PART NUMBER	RESPONSE TIME	SERIES IMPEDANCE	PEAK POWER DISSIPATION	TEMPERATURE RANGE
DLP-3	5 Nanosec.	33 ohm	15,000 W	-20°C to +85°C
DLP-4	5 Nanosec.	33 ohm	15,000 W	-20°C to +85°C
DLP-5	5 Nanosec.	33 ohm	15,000 W	-20°C to +85°C

CPS150 SERIES



Performance Specifications

PART NUMBER	VOLTAGE	CURRENT	CLAMPING POINT INITIAL	CLAMPING POINT MAXIMUM
CPS150W*†	120VAC	30Amp (MAX)	200VPeak	300VPeak
CPS150R*†	120VAC	15Amp (MAX)	200VPeak	300VPeak
CPS150C*†	120VAC	20Amp (MAX)	200VPeak	300VPeak
CPS150-L515*	120VAC	15Amp (MAX)	200VPeak	300VPeak
CPS150-L520*	120VAC	20Amp (MAX)	200VPeak	300VPeak
CPS150*†	120VAC	15Amp (MAX)	200VPeak	300VPeak

PART NUMBER	FREQUENCY	OPERATING	SIZE
CPS150W*†	50/60Hz	-20°C to +50°C	10"H x 8"W x 6"D
CPS150R*†	50/60Hz	-20°C to +50°C	10"H x 8"W x 6"D
CPS150C*†	50/60Hz	-20°C to +50°C	10"H x 8"W x 6"D
CPS150-L515*	50/60Hz	-20°C to +50°C	10"H x 8"W x 6"D
CPS150-L520*	50/60Hz	-20°C to +50°C	10"H x 8"W x 6"D
CPS150*†	50/60Hz	-20°C to +50°C	10"H x 8"W x 6"D

FSP SERIES

Performance Specifications

L-L LEAKAGE @ MAX LINE TO LINE VOLTAGE	<5µa
L-G LEAKAGE @ MAX LINE TO GROUND VOLTAGE	<5µa
RESPONSE TIME	<5ns
SERIES IMPEDANCE (EACH LINE)	33Ω
PEAK POWER DISSIPATION (L-L) OR (L-G)	15,000W
TEMPERATURE RANGE	-20°C to +85°
DIMENSIONS	2⅛" x 2⅛" x ⅞"

PART NUMBER	LINE-LINE VOLTAGE (PEAK)	LINE-GROUND VOLTAGE (PEAK)	LINE-LINE CLAMP POINT	LINE-GROUND CLAMP POINT
FSP4001	13	13	16	16
FSP4002	27	27	33	33
FSP4003	54	54	67	67
FSP4004	120	120	150	150
FSP4005	160	160	200	200

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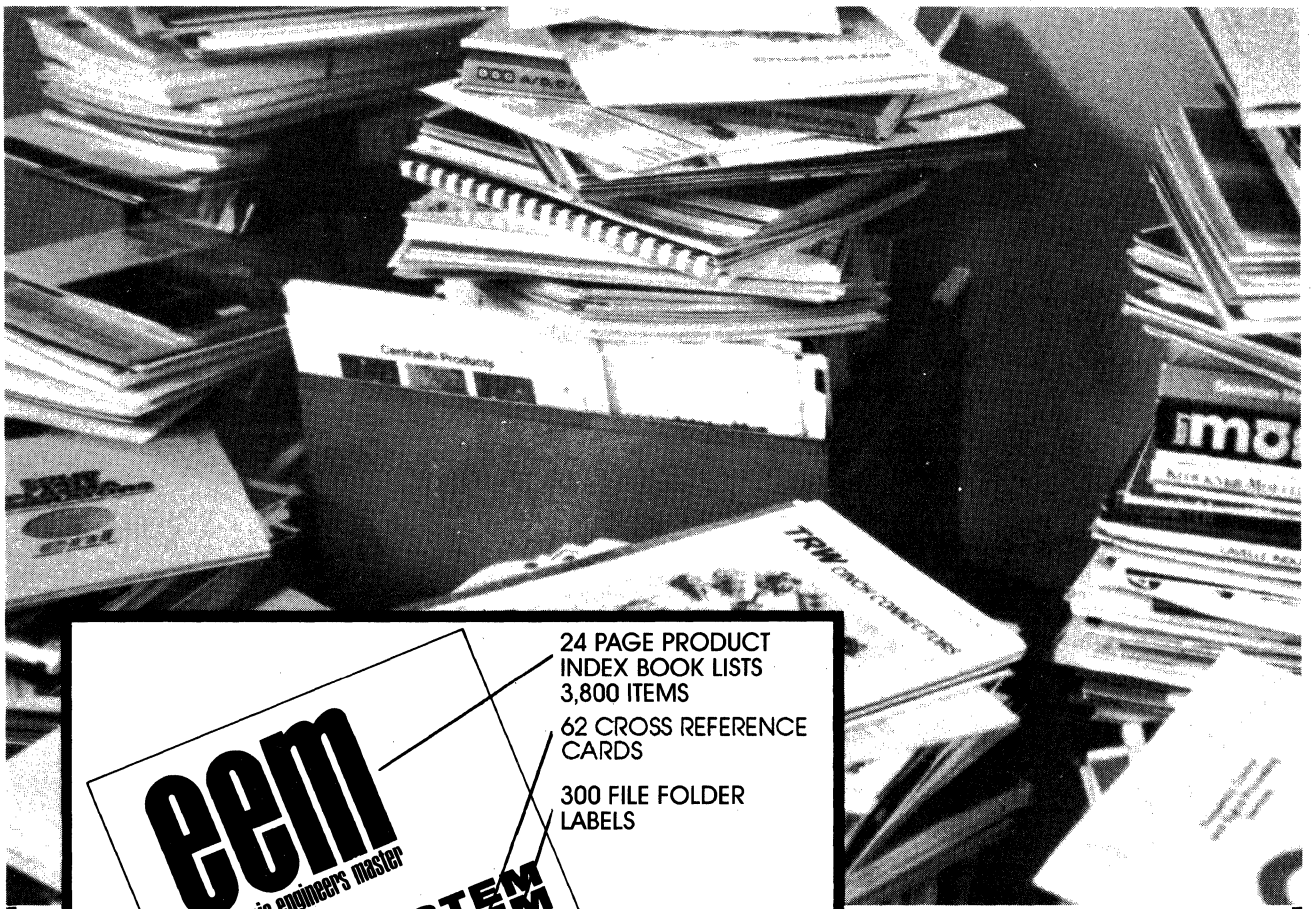

ALL NEW with this edition of EEM

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Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with the System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will be mailed to you under separate cover.

Don't waste any more time. Get organized now!

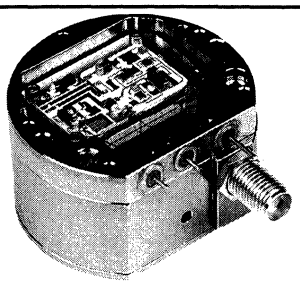
EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

RF SOLUTIONS From SERVO CORPORATION OF AMERICA

Transmitters • Receivers • Filters • Amplifiers • Multicouplers Multipliers • Attenuators • Converters • Switches • Frequency Sources

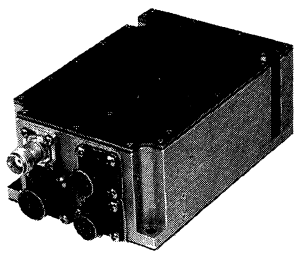
QUALIFIED SUPPLIER CERTIFIED TO MIL-Q-9858A AND MIL-STD-2000 TASK G

S-Band Transmitter



A 2.2 to 2.4 GHz transmitter available for use in Hi-G applications to 30,000 G's. Phase modulation to a modulation index of 5 with rates from 10 KHz to 5 MHz. Power output in excess of + 23 dBm. Optional configuration available to provide bi-phase modulation with a 10 MHz bit rate. Small size resulting from in house hybrid micro-circuitry development.

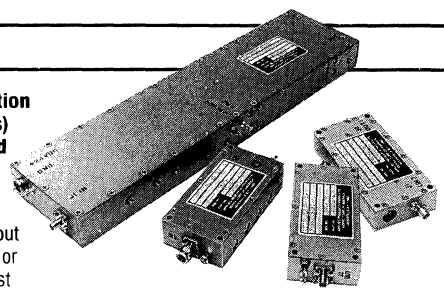
Flight Termination Receiver



FM solid-state UHF band remotely operated receiver, receives an unmodulated RF signal under normal conditions. In the command state, two or three frequency modulated tones are decoded to provide monitor, arm and terminate commands. Optional configuration provides demodulated signal as an output.

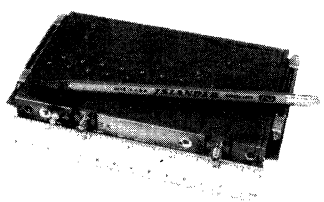
RF Multipliers

Frequency generation through multiplication or phase-lock techniques (A thru J bands) for shipboard, airborne and ground based units.



If your system requires low additive phase noise, wide bandwidth (10%), high power output (10 watts) and multiplications from X2 to X144 or greater, Servo has the design to meet your most stringent requirements.

- Custom Sizes
- Multiple Outputs
- Various Primary Power Sources
- Multiple Selectable Outputs
- Custom Multiplier Chains
- BITE
- Crystal Controlled Sources



Our Phase-Lock loops, comprised of I.C. components, together with RF devices, yield outputs of up to 10 watts at microwave frequencies. Our multipliers are available as passive devices or in combination with amplifiers having multiplication factors from 2 to 2000. In combination with varactor multiplier devices output in Ku-band can be obtained.

In addition, we can supply crystal oscillators or internal drivers to provide a self-contained source.

ELECTRICAL CHARACTERISTICS C-BAND PASSIVE BROADBAND HIGH POWER MULTIPLIERS:

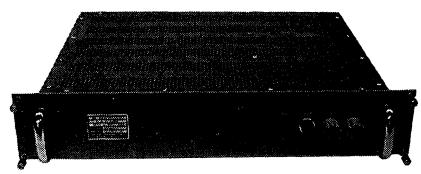
- Input Power: + 40 dBm
  Output Power: + 32.6 dBm ± 0.5 dB
- Spurious Response: -70 dBc inband
- Bandwidth: 5.9 to 6.4 GHz

Frequency sources with multiplication up to 29 and multiples thereof are available deriving signals in the L, S and C-bands.

ELECTRICAL CHARACTERISTICS (TYPICAL):

- Input Frequency: 100 MHz ± 10 MHz
- Output Frequency
  Type 1: 6400 MHz (X64)
  Type 2: 5800 MHz (X58)
- RF Power
  Input Power: + 5 dBm ± 3 dBm
  Output Power: + 5 dBm ± 2 dBm over temperature
- Discrete Spurious Outputs: Harmonics below -60 dBc, others at a maximum of -60 dBc
- Temperature: -54°C to + 85°C

Multicouplers



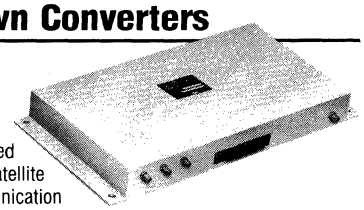
Model HFM-(TX)-1424-8 Multicoupler is one in a series of broadband active multicouplers available. Operating over the Telemetry band, this multicoupler derives 8 outputs which track in amplitude and phase.

PERFORMANCE SPECIFICATIONS:

- Isolation between Outputs: To be specified (30 dB to 70 dB)
- Overall Gain: Nominal 0 dB
- Connectors: To be specified

Model	No. of Outputs	Frequency Range
HFM-2(TX)0532 8/40	6 to 32	500 KHz-32 MHz
HFM-2(TX)232 8/40	6 to 32	2 MHz-32 MHz
HFM-2(TX)140 12/40	6 to 32	10 MHz-400 MHz
HFM-2(TX)2410 8/40	6 to 32	20 MHz-1100 MHz
HFM-2(TX)1415 6/50	6 to 32	1400 MHz-1600 MHz
HFM-2(TX)2223 8/50	6 to 32	2200 MHz-2300 MHz
HFM-2(TX)1423 8/50	6 to 32	1400 MHZ-2300 MHz

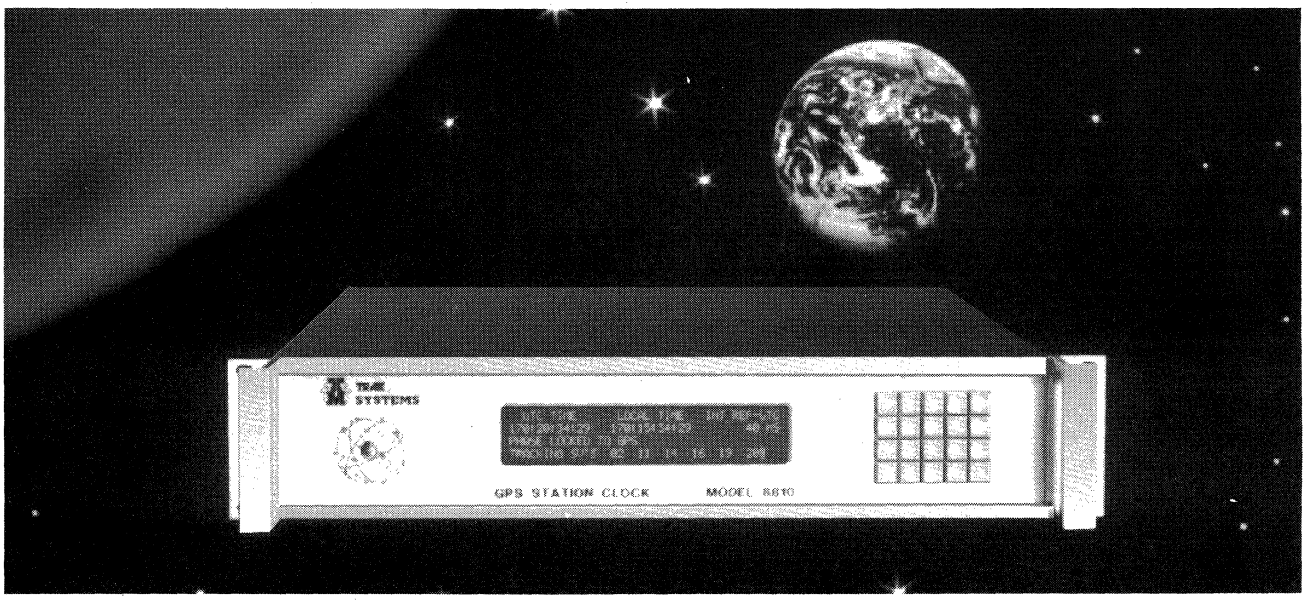
Down Converters



Designed as a Satellite Communication System Converter, this unit is an IF-Hopping down converter for the frequency range of 50 to 1000 MHz. The unit provides I and Q outputs with selectable video low pass filtering.

servo
SERVO CORPORATION OF AMERICA

ELECTRONIC SYSTEMS
Department EM
111 New South Road
Hicksville, NY 11802
(516) 938-9700 • FAX: (516) 938-9644



At last: A complete GPS station clock under $10,000

Everything you want in a GPS station clock, in one neat box:

- **GPS receiver**
- **Disciplined standard**
- **Multiple output timing signal generator, and much, much more.**

What do you expect from a company with more than 30 years of production and field experience in the timing business? You'd expect a one-unit master timing station, capable of tracking six satellites simultaneously — even while moving at 1,000 miles per hour — all inside a 3½ inch rack-mount chassis.

That's the **Model 8810** — a mature product, value-engineered and time-tested, just like the ones we've been providing to NASA and DoD for decades. And there's so much built into this unit, it's hard to describe. Just review the features listed below:

- Automatically determines geographical coordinates — no need to enter position anywhere on earth
- Automatic multi-satellite acquisition
- Time accuracy maintained with platform velocities to over 1,000 mph
- Outputs position data whether stationary or moving
- Multiple time code and rate output options
- User friendly, menu-prompted setup
- 20-key keypad and 4-line, 40 character display allows complete operation, checkout, and status acquisition without ancillary equipment
- Nonvolatile memory stores setup and data indefinitely
- Accurate to within 100 ns worldwide, 24 hours a day
- RS-232 remote control and time output (optional IEEE-488 output)
- RS-232 printer port
- Displays time, position, and REF-UTC/GPS
- Time display is keypad-selectable to UTC, GPS, or local time
- 115/230 VAC with optional 24 VDC backup
- Antenna with 50′ coax cable included
- Built-in test routines
- Fully modularized
- GPS receiver is drop-in replaceable
- Workmanship standards to MIL-STD-454
- Three-year limited warranty
- Plus, a host of desirable options

That's the **Model 8810,** from TRAK Systems. And at this price, there's nothing else like it on the market. So why pay more, and install boxes of equipment, when you can have it all in one neat unit?

For free literature, or more information, contact us at:

TRAK SYSTEMS DIVISION
4726 Eisenhower Blvd.
Tampa, Florida 33634-6391
Phone: (813) 884-1411, extension 248
TLX: 52-827
FAX: (813) 886-2794

TRAK SYSTEMS
DIVISION OF **TRAK MICROWAVE CORP.**

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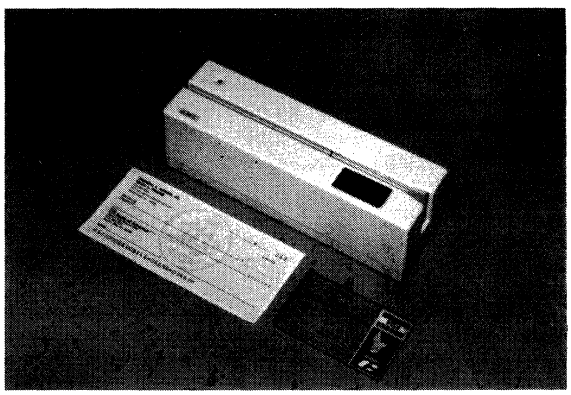
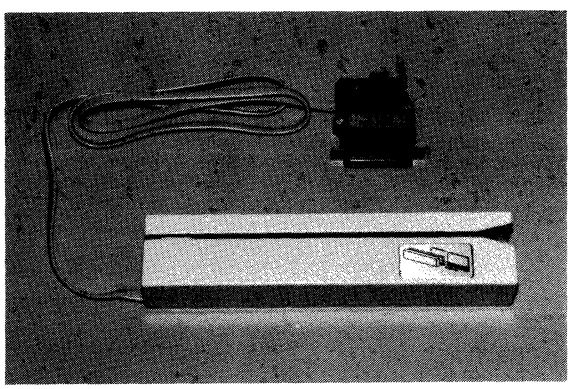
MAGNETIC STRIPE PRODUCTS YOU CAN RELY ON

American Magnetics has developed a wide line of Magnetic Stripe and MICR products to meet the needs of the marketplace. AMC is currently servicing the Airlines (ATB2), Banking, Access Control, POS/EFT, Vending, Telephone, Fueling, and OEM markets.



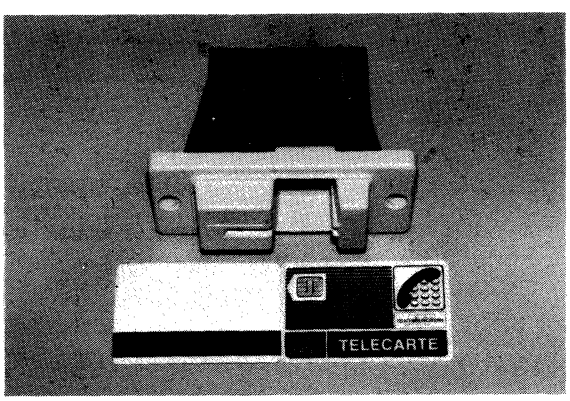
MICR CHECK/ MAGNETIC STRIPE READERS

- Readers for both E13B and CMC7 Fonts
- Magstripe reading capabilities
- Numerous interfaces: RS232, RS422/485, RS485-addressable, PPI, Wedge, custom
- Complementary Keypad w/display is available
- Accurately decodes hard to read checks and other banking documents



MAGNETIC STRIPE SWIPE READERS AND WRITERS

- Reading and writing up to 4 tracks of data simultaneously
- Multiple interfaces: TTL, RS232, RS422/485, RS485-addressable, Wedge
- Reads/writes cards, ATB2 Airline Tickets, badges and passbooks
- Reads and Writes custom data (CA - drivers license)
- Complementary Keypad w/display is available



MAGNETIC STRIPE/CHIPCARD INSERT READERS

- Reads up to 3 tracks of data simultaneously
- Multiple interfaces: TTL, RS232, RS422/485, RS485-multi-drop
- Able to read magnetic stripe and chip cards (ISO, CP8, Contactless)
- Compact designs available

AMERICAN MAGNETICS CORPORATION

740 Watsoncenter Road Carson CA USA 90745-4181

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a system4 company

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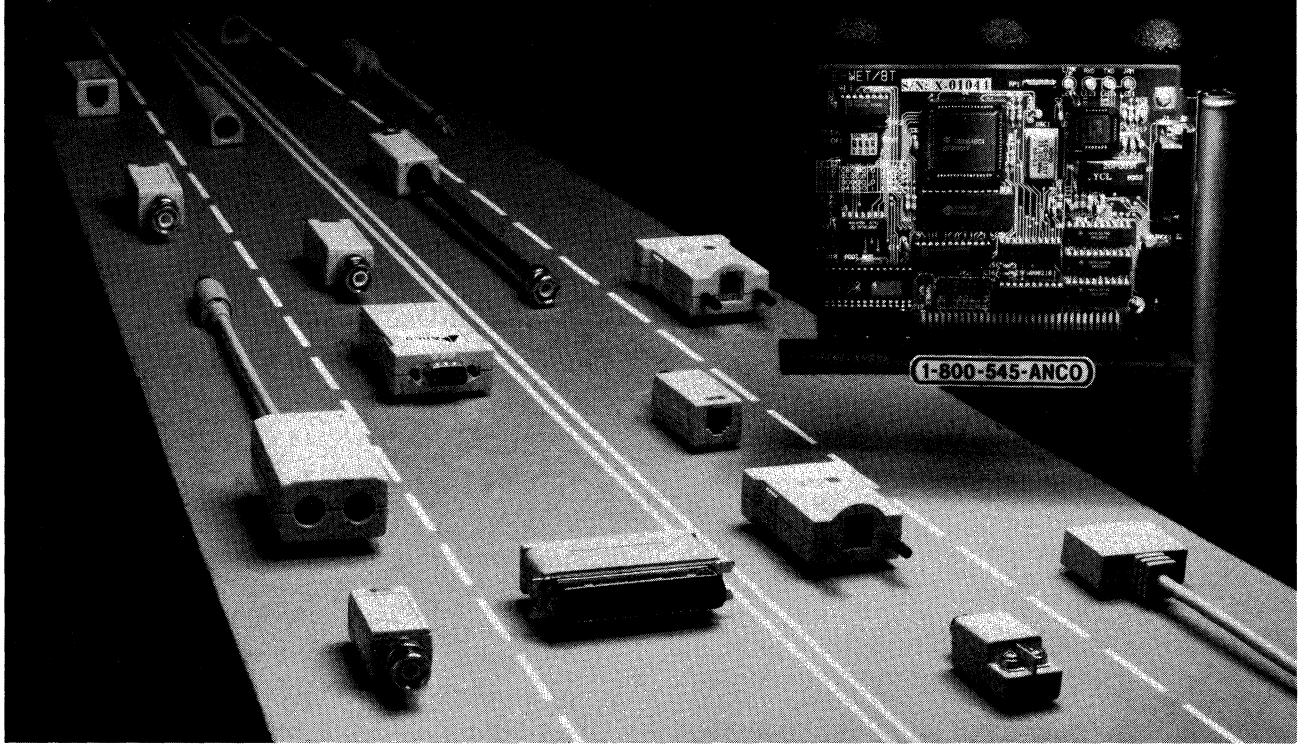
HIGH PERFORMANCE CONNECTIONS FOR THE LAN HIGHWAY



- Baluns
- Media 3 Filters
- Cables and Connectors
- AppleTalk compatible products (with patented locking mini-din)
- Ethernet products (10Base-T,2,5)
- Token Ring Products (16/4 Mbps)
- Software support for NetWare, NetBIOS, UNIX and TCP/IP
- Uninterruptible Power Supplies

Call Anco for high quality and low priced Local Area Network (LAN) products, computer cables and connectors. Since 1979 Anco has been a major supplier of networking solutions to leading computer manufacturers worldwide. To insure you competitive prices our unique global service network combines both high quality domestic and worldwide production sites. Call **1-800-545-ANCO** today for more information.

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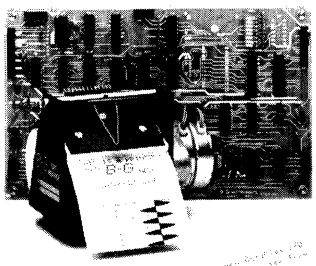
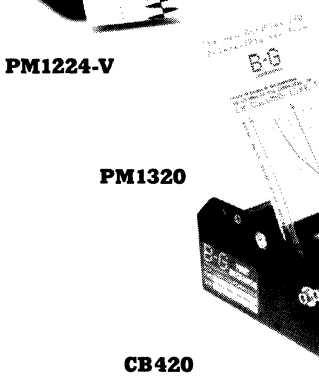
Smart, versatile OEM printer/plotters.

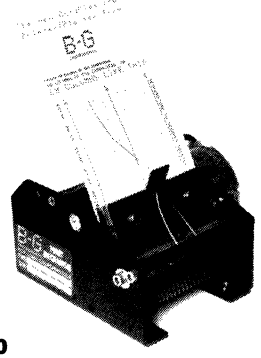
For graphic and alphanumeric data recording.



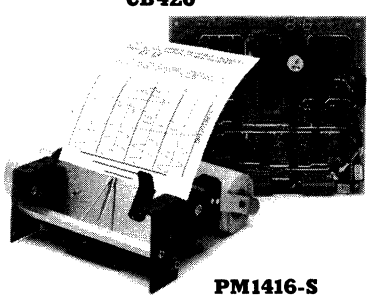
CB1224



PM1224-V



PM1320



CB420

PM1416-S

DataPlot Thermal Print Mechanisms

Model Number	Paper Width	Columns Across[2]	Dots /Inch	Dots /Line	OEM Price[1]
PM1224	2.6 inches	18 to 37	100	224	$311
PM1320	2.6 inches	23 to 53	150	320	$296
PM1416	4.5 inches	29 to 69	100	416	$443

1. This is the 300-piece OEM price. It is subject to change without notice.
2. The maximum number of columns depends on the font and size selected. The higher number is for 5 x 7 characters, approximately 16 characters/in.

DataPlot Printer Control Boards

Model Number	Digital Input	Analog Inputs	OEM Price[1]
CB1224	Parallel & Serial	Optional to 8 channels	$136
CB1320	Parallel & Serial	Optional to 8 channels	$136
CB1416	Parallel & Serial	Optional to 8 channels	$136
CB1100	Parallel & Serial	10-bit, 8-channel std.	$236
CB420	Parallel Only	None	$113

A complete printer normally includes a print mechanism and a control board.

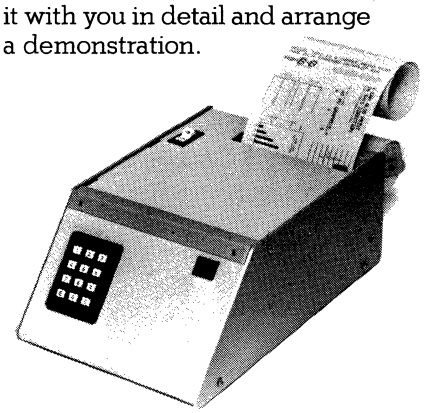
Reliable. All B-G Instruments' printers use fixed-dot, thick-film thermal printheads to achieve fast, quiet operation, long life and reliable performance.

Powerful. B-G's standard DataPlot software makes it easy to print across the paper, print down the paper, and print while you plot data. Simple plotting commands produce curves, grids and bar graphs directly from the input data.

Versatile. For a moderate one-time fixed charge, any B-G printer can quickly be reprogrammed to meet the special requirements of a specific application. Custom character sets, printing stored forms with inserted data, clock/calendar functions, special calculations, conditional operations, these are but a few of the many features that have been included in specially programmed B-G printers.

Custom Instruments. The recording thermograph shown above is built around a DataPlot 1224-V printer with a custom control/interface board that performs A/D conversion, corrects for thermistor non-linearity, drives a panel display and provides the entire logic system. May we design an instrument for your application?

More Information. Detailed brochures, a price list and sample printouts will be mailed to you as soon as we receive your inquiry. If you have an upcoming OEM application, we would be pleased to discuss it with you in detail and arrange a demonstration.



Cabinets and power supplies are also available.

B-G Instruments
P.O. Box 1867 • Vashon, WA 98070 • Phone: (206) 567-5000 • FAX: (206) 567-5010

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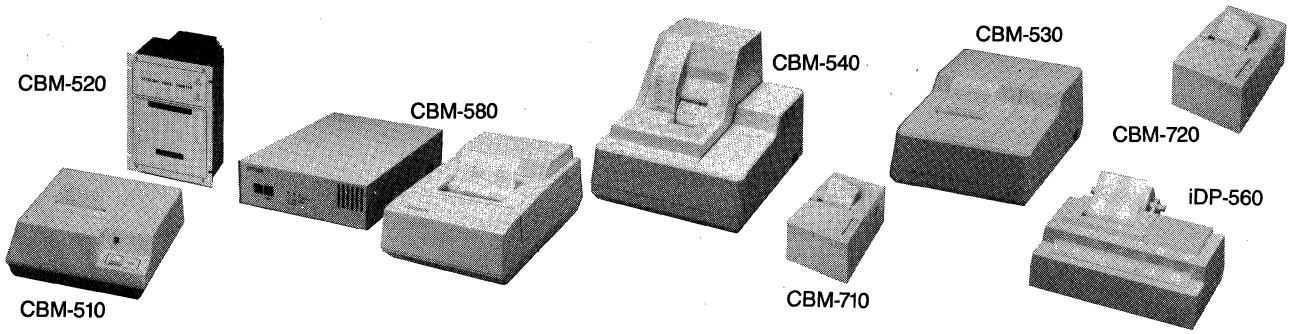
DOT MATRIX PRINTERS • PRINTER MECHANISMS • INDUSTRIAL DISPLAYS



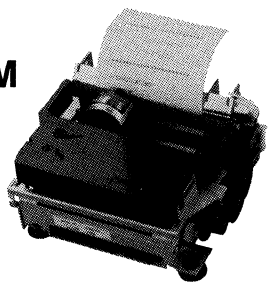
Item \ Model	CBM-510/520	CBM-530	CBM-531	CBM-540	CBM-580	iDP-560	CBM-710	CBM-720
Printing System	Serial dot impact	←	←	←	←	←	←	←
Font	5 x 7 matrix	←	←	←	←	←	7 x 7 Matrix (including half dot)	
Character type	Alphanumeric characters & measuring symbols 160 domestic characters (191 graphic type characters)	Both formats available by switching ←→	←→	←→	←→	Alphanumeric characters & measuring symbols 224 domestic and foreign characters (including spaces)	←	←
Standard character size	Character type (24CH)2.75(H) x 1.7(W)mm (40CH)2.75(H) x 1.25(W)mm	←	←	←	←	←	Character type: 4.23mm (1/6 inch) Graphic type: 2.8mm (1/6 inch)	
	Graphic type (the same as character type)	No Graphic Mode				Graphic type (the same as character type)	10 CPI, 12 CPI, 17 CPI	
Character spacing	Character type: (24Ch) Column spacing: 2mm Line spacing: 5.5mm (40Ch) Column spacing: 1.5mm Line spacing: 5.5mm		←	←	←	←		
	Graphic type: Column spacing: the same as character type Line spacing: Text mode: 5.5mm Graphic mode: 2.75mm	No Graphic Mode				Graphic type: Column spacing: the same as character type Line spacing: Text mode: 5.5mm Graphic mode: 2.75mm	10 CPI: 1.8 x 2.4 12 CPI: 1.8 x 2.4 17 CPI: 1.2 x 2.4	
Printing columns	24 columns, 40 columns	←	←	17 columns x 2 (Expanded character: 8 columns x 2)	24 columns, 40 columns	40 columns only	DP-610: 23 Columns, 230 dots/line DP-612: 28 Columns, 280 dots/line DP-614: 40 Columns, 400 dots/line	
Print speed	40 columns 1.2 lines/sec. 24 columns 1.9 lines/sec. 5 columns 4 lines/sec.	40 columns 1.2 lines/sec. 24 columns 1.7 lines/sec. 5 columns 4 lines/sec.	←	←	←	40 columns 0.8 lines/sec.	10 CPI: 4.2 lines/sec. 12 CPI: 3.6 lines/sec. 17 CPI: 3.0 lines/sec.	
Line feed time	Approx. 8 lines/sec.	Approx. 7.5 lines/sec.	←	←	←	Approx. 6.2 lines/sec.	←	
Print direction	Character type: L series: left → R series: ← right	L series: left → R series: ← right	←	←	←	L series only	Bidirectional	
	Graphic type: From the left for upright characters	None	←	←	←			
Interface	Parallel * Centronics * 8 bit hand shake Serial * RS-232C * Current loop 20mA * TTL	Parallel * Centronics Serial * RS-232C * Current loop 20mA * TTL	←	←	←	Parallel * Centronics Serial *RS-232C	Parallel: Centronics Standard type Serial: RS-232C, Current Loop 20mA RS-422, RS-485	
Input buffer	1 line + 1 byte	N type: 1 line + 19 bit B type: 7K bit	←	←	←	1 line	7K bytes, with battery back up	
Input buffer back-up	None	B type: contained	←	←	←	None	contained	
Paper end detection	Option	equipped (with buzzer)	←	←	←	None	equipped	
Ink ribbon	Red/black: 13mm(W) Spool dia. (30 or 35mm)	←	Single Color	→	→	Red/black: 13mm(W) Spool dia. (30 or 35mm)	CARTRIDGE: Two color (red/black) Single color (black or purple)	
Paper Size	(Outer dia. 60mm or less) (2.4') 24 Character Width 57.5±0.5mm (2.25') 40 Character Width 69± 1mm (2.75')	(Outer dia. 80mm or less) (3.2') ←	← ←	← 17 Character Width 38±0.5mm (1.5')	← 24 Character Width 57.5±0.5mm (2.25') 40 Character Width 69±1mm (2.75')	← ← Width 69±1mm (2.75') With outside paper roll	Width : Friction Feed: 3 inches Sprocket Feed: 3.5 inches Type: Friction Feed: Rolled Paper Sprocket Feed: Fan fold paper (Single paper)	
Paper Feed	FRICTION	←	←	←	←	←	Friction Feed & Sprocket Feed	
Validation	NONE	←	←	←	←	←	One line Validation (option)	
Paper Cutter	NONE	←	←	←	←	←	none: Equipped — : Partial cut or Full cut programmable	
Paper Winder	NONE	←	EQUIPPED	←	NONE	←	Option	
Input power	AC100V ± 10%, 50/60Hz AC115V, AC220V AC240V, DC12V	AC100V ± 10%, 50/60Hz AC115V AC230V	←	←	←	←	AC 100V, AC 150V, AC 230V, 50/60Hz	
Power consumption	20W	approx. 30W	←	←	←	32W *3AX	approx. 30W	
Operating temp. range	5°C, 40°C, 41°F, 104°F	←	←	←	←	←	←	
Storage temp. range	-20°C, 70°C, -4°F, 158°F	←	←	←	←	←	←	
Humidity	20%, 80% (No condensation)	←	←	←	←	←	←	
Weight	approx. 3kg (6.6 lbs.)	approx. 2.5kg (5.5 lbs.)	←	←	Printer approx. 1 kg (2.2 lbs.) Power Supply/°F approx. 2kg (4.4 lbs.)	approx. 2kg (4.4 lbs.)	approx. 3.0Kg	approx 3.1Kg
Noise	70 dB or less when operating	←	←	←	←	←	←	
Insulation resistance	Not less than 50 megaohms at 500V DC	←	←	←	←	←	←	
Dielectric Strength	150V or less at 1000V, 1min. 150-300V at 1500V, 1 min.	←	←	←	←	←	←	
Reliability	1.5 million lines or more	←	←	←	←	1 million lines or more	Printer: MCBF 2.5 million lines Head: 50 million characters Auto Cutter: 1 million (CBM-720)	
Dimensions	197(W) x 240(D) x 74(H)mm 7.8(W) x 9.5(D) x 2.9(H) in.	205(W) x 265(D) x 185(H)mm 8.1(W) x 10.4(D) x 7.3(H) in.	205(W) x 265(D) x 185(H)mm	← 9.5(W) x 6.9(D) x 3.3(H) in.	Printer 145(W) x 260(D) x 85(H)mm Power Supply/°F 106(W) x 152(D) x 70(H)mm	240(W) x 176(D) x 81.5(H)mm	176(W) x 225(D) x 125(H)mm	176(W) x 255(D) x 146.5(H)mm
Case material	510-Die cast aluminum 520-SPW	Inflammable ABS	←	←	←	←	←	

CITIZEN

CBM America Corporation 2020 Santa Monica Bl., Suite 410 Santa Monica, CA 90404
Tel. (213) 828-8245 (800) 421-6516 FAX (213) 828-0846

DOT MATRIX PRINTERS • PRINTER MECHANISMS • INDUSTRIAL DISPLAYS

DP-600 SERIES PRINTER MECHANISM



General Specifications

- **Print Method:** Serial dot impact method
- **Printing Direction:** Bidirectional
- **Printing Speed:** 7 x 7 10 cpl (23 ch.): Approx. 4.0 line/sec.
  12 cpi (28 ch.): Approx. 3.5 line/sec.
  17 cpi (40 ch.): Approx. 3.0 line/sec.
  9 x 7 10 cpi (23 ch.): Approx. 3.6 line/sec.
- **No. of Columns:** DP-610 23 No. of Columns, 230 dot/line
  DP-611 23 No. of Columns, 276 dot/line
  DP-612 23 No. of Columns, 280 dot/line
  DP-614 40 No. of Columns, 400 dot/line
- **Font:** 7 x 7 Matrix or 9 x 7 Matrix (include half dot)
- **Character Size:** 7 x 7 10 cpl: 1.8 x 2.4
  12 cpl: 1.5 x 2.4
  17 cpl: 1.2 x 2.4
- **Line Spacing:** 1/6 inch
- **Motor:** Terminal Voltage: 24V DC±½V DC
  Current Peak current: Max. 1A (24V DC 25°C)
  Mean current: Approx. 0.2A or less
  Note: Current should not be carried for more than two minutes under motor lock state.
- **Dot Pulse Sensor:** Photo interrupter
- **Home Position Sensor:** Photo interrupter
- **Paper Feed Solenoid:** The paper feed solenoid is driven for 30 dot pulses (30DP), Approx. 20 ms, starting from the dot pulse following the printing of the last column.
  Terminal Voltage: 24V DC±½V DC
  Direct Current Resistance: 480 (36°C)
  Driving Pulse Width:
  30DP, Approx. 20ms (Current should not be carried continuously for 5 seconds more.)
- **Color Change Solenoid:** Terminal Voltage: 24V DC±½V DC
  Direct Current Resistance: 48Ω (24V DC, 25°C)
- **Printing Solenoid:** Terminal Voltage: 24 ±1V DC
  Direct Current Resistance: 170 (24V DC, 25°C)
- **Connector Terminals:** Connector 1 (MMP-7R-1: Counterpart MMH7-1 Manufactured by BURNDY)
  Connector 2(MMP7R-1: Counterpart MMH7-1 Manufactured by BURNDY)
- **Paper Feed:** Friction Feed & Sprocket Feed
- **Paper Width:** Friction Feed: 3 inches
  Sprocket Feed: 3.5 inches
- **Paper:** Friction Feed: Rolled paper
  Sprocket Feed: Fan fold paper
  (Single paper)
  High quality paper with smooth surface
  45Kg-55Kg/1,000 sheets x 788mm x 1,091mm
- **Copy:** No-carbon paper (1+2 copy) each 34 Kg
  (Total thickness: 1 less than 0.2mm)
- **Paper Feed Power:** More than 100g (Citizen recommended paper)
- **Ink Ribbon:** Two colors (red/black)
  Single color (black or purple)
- **Quick Feed Speed:** DP-610 Approx. 25 lines/sec.
  DP-611 Approx. 21 lines/sec.
  DP-612 Approx. 21 lines/sec.
  DP-614 Approx. 15 lines/sec.
- **External Dimensions:** Two colors: 137(W) x 136(D) x 63.5(H)mm
  Single color: 134(W) x 136(D) x 63.5(H)mm
- **Weight:** Approx. 690g
- **Allowable Operating Temperature:** 0°C-50°C
- **Reliability:** Printer: MCBF 2.5 million lines
  Head: 50 million characters

*When using actually, see the detailed specifications.

EXCLUSIVE CONTROL BOARD/CONTROL CHIP

- **CBM-505-PF12-0** Based on Centronics specifications
- **CBM-505-HF12-0** 8 bit parallel handshake
- **CBM-505-RF12-0** RS 232C, TTL level, Current loop

•CBM-505PC-0

- Direction of letters { O—Horizontal type, left to right / A—Vertical type }
- Voltage: (12V or 17V)
- Character set: (F for Roman Letters.)
- Interface specification

Support for the Citizen DP-505 Series

This exclusive control board makes it much easier to use DP-505 Series Dot Printers

Specifications

Model		CBM-505-PF12(G)	CMB-505-HF12(G)	CBM-505-RF12(G)
Applicable printers		Citizen DP-575L/R, DP-555L/R (12V specifications)		
Interface		Based on Centronics specifications	8 bit parallel handshake	RS-232C, TTL current loop
Number of characters		183 characters		
Commands		7 types: paper feed, print, expanded print, clear expanded print, initial setting, inverted character, red character.		
Power Source	Printer	13 ± 1V DC, Approx. 2A at peak, 700mA average		
	Board	6 ± 0.25V DC, 400mA maximum, 200mA average		
Overall Size		135mm × 95mm		155mm × 119mm

For the graphics model, specify "G."

LCT-64 LIQUID CRYSTAL DISPLAY TERMINAL

LCT-64 Industrial Terminal Display. Equipped with one-chip micro processor and RAM (ROM version also available as option) able to store 100-screen memories. Various applications include computer CRT, operation guide of a factory production line, monitor of factory's controlling devices, alarm display, among other useful functions.

Features

- Compact, low power consumption, easy to install in operating unit.
- Easy connection by 5V single drive.
- 100 x 32 dot (64 characters max./screen), 100-screen messages, memory, RAM back-up battery also installed.
- High resolution, back lit for easy viewing.

Specifications

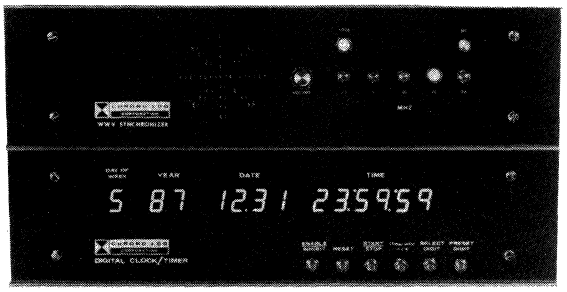
		LCT-64
Character Format		16 × 4 (Max.) 64 Characters (One message)
Character Size (mm)		7.65 × 4.7
Display Size (mm)		35 (H) × 95 (W)
Characters		Alphabet, Numeral and Special Characters
Memory		100 Screens (Option 200 screens)
Interface	P	Centronics (8 bit parallel)
	R	Serial (RS-232C)
	C	8-bit parallel (Sequencer type) 24V
Command Code	P	JIS standard
	R	
	C	BCD (HEX)
Power Supply	P	5.0V±5%, 5W
	R	
	C	24.0V±10%
Operative Temperature		0°—45°C
Weight		400g
Dimension (mm)		144 (W) × 72 (H) × 60 (D)

DIGITAL TIMING INSTRUMENTS

VERSATILE MULTI-SYSTEM CLOCK/TIMER

Five Independent Communication Ports

NEW IRIG-B TIME CODE OUTPUT



NEW AUTO-SYNCHRONIZATION TO WWV

AUTOMATIC SYNCHRONIZATION TO WWV

Accuracy – within 30 milliseconds of Coordinated Universal Time (UTC)
Frequency Diversity – automatically monitors all five WWV frequencies and locks to the signal with the best data content

OTHER TIME BASE OPTIONS

External Frequencies
- 50, 60 or 100 Hz TTL – can count down higher TTL signals
- 1, 5 or 10 MHz Cesium or Rubidium 1 V RMS signals

Internal Crystal Oscillators
Line Frequency – 50 or 60 Hz

OUTPUT OPTIONS

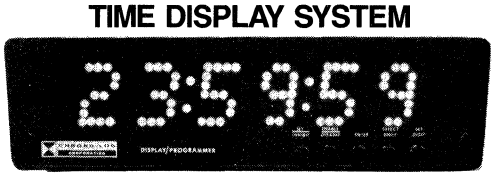
IRIG B – 1 KHz modulated carrier
BiDirectional – RS232C/20ma Current Loop, RS422, RS485 and RS423
Parallel BCD – TTL or Tristate
Byte Serial – 4, 8 or 16 Bit, TTL or Tristate
Remote Display Driver – RS422 line driver output for Chrono-log Remote Displays

BATTERY BACKUP

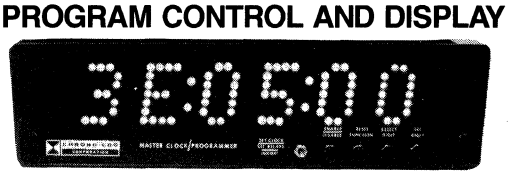
Internal – 4 or 30 days

PROGRAMMABLE CONTROLLERS, MASTER CLOCKS AND REMOTE DISPLAYS

TIME DISPLAY SYSTEM



PROGRAM CONTROL AND DISPLAY



MASTER CLOCK

- Full front panel control
- 1.5″ high LED dot matrix shaped characters
- RS422 line driver transmits time message to five Displays
- Low-voltage, three-wire cabling

REMOTE DISPLAYS

- Available with 6", 4" or 1.5" high digits
- Receive and retransmit time message to five or more Displays, up to 4,000 feet apart.

PROGRAMMABLE MASTER CLOCK/DISPLAY

- Eight programmable relay contacts per unit, programmable from front panel controls
- Each relay can be set to three specific on/off times or to a periodic closure
- Duration of closures can be 1, 2, 5, 10 or 30 seconds or 1, 5, 10, 15 or 30 minutes
- Relay contacts N.O., rated at 500 milliamps, 100 volts (DC or AC Peak), 10 VA max.

IRIG TIME CODE INSTRUMENTS AND VIDEO CHARACTER GENERATORS

IRIG A, B and E TIME CODE GENERATORS/READERS for analog tape recorders and serial data transmission systems. Single and multiple IRIG code units also provide a parallel BCD output to milliseconds at TTL levels.

VIDEO CHARACTER GENERATORS accept up to 16 BCD characters at TTL levels from Chrono-log instruments or other sources and insert the data into a video signal. Fixed alphanumeric characters can be included in the display. Up to 31 characters can be displayed on one line, or 15 characters each on two lines.

Call 1-800-247-6665 for assistance with your digital timing needs.

CHRONO-LOG CORPORATION

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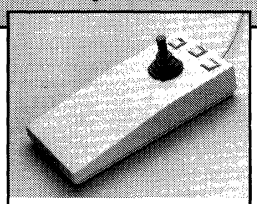
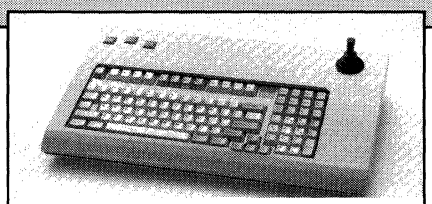
Joysticks, Touchscreens, & Trackballs

• Joysticks & Touchscreens for Harsh Industrial Environments

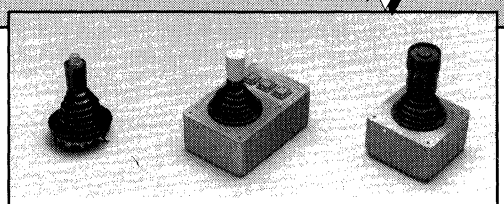
NEW!



INDUSTRIAL MOUSE™



SEALED PC® KEYBOARD WITH BUILT-IN INDUSTRIAL MOUSE



H0000-N30 M30X9 M18X0

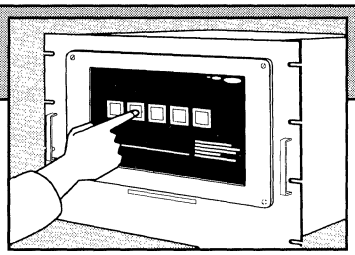
- **CTI's mouse replacement for all popular computers in harsh industrial environments**
- **NEMA 12 rated, NEMA 4 available**
- **No moving electrical parts, patented design**
- **Sophisticated interfaces for any pointing device, mouse simulation**
- **Custom keyboard assemblies for shelf mounting in a 19" rack**
- **Electrohydraulic control handles**
- **One year limited warranty**
- **Custom designs welcomed**

Representative Joysticks

Model	Description	Voltage Req. Vdc	Enclosure w/ Interface Card
FX000	Finger tip control with analog output	+12	2.5 x 2.5 x 1.5D
H0000	Inductive control analog output	+8 to +32	-
H0000-N3X	Inductive control w/pushbutton	+8 to +32	-
H0600	Inductive control single axis	+8 to +32	-
H0800	Inductive control w/3rd axis	+8 to +32	-
L0401	Large Inductive, interlock & PB	+8 to +32	-
M10X0	Inductive cont. w/reprogrammable interface	+5, +12	3.5 x 3.5 x 2.0D
M30X3	Inductive cont. w/interface & 3 switches	+5, +12	3.5 x 5.25 x 2.0D
M70X3	Dual handle control, interface & up to 8 switches/keypad option	+5, +12	5.0 x 7.0 x 2.6D
M80X9	Industrial mouse™	+5	4.5 x 9.8 x 2.0D

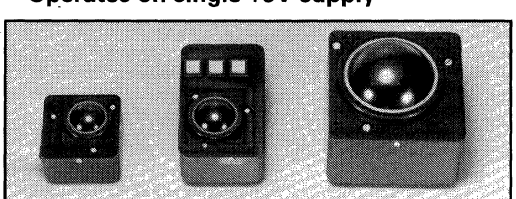
• Touchscreen Mouse

- **NEMA rated 4 and 12**
- **Rack mountable**
- **Full mouse emulation (patent pending)**



• Trackballs for High Reliability Requirements

- **Stand alone or integrated into keyboards**
- **High reliability • Water resistant**
- **Operates on single +5V supply**



T60X0 T70X3 T40X0

Representative Trackballs & Trackmarbles

Model	Ball Diameter	DIM. w/ Interface Card
T60X0	1.3"	2.50 x 2.50 x 1.5D
T70X0	1.5"	2.62 x 2.62 x 1.7D
T70X3	1.5"	2.75 x 4.50 x 1.7D
T10X0	2.0"	3.50 x 3.50 x 2.0D
T10X3	2.0"	3.50 x 5.25 x 2.0D
T80X3	2.0"	4.50 x 9.80 x 2.0D
T30X0	2.5"	4.25 x 4.25 x 2.75D
T40X0	3.0"	4.25 x 4.25 x 2.75D
T40X3	3.0"	4.25 x 6.00 x 2.75D

PC is a registered trademark of the International Business Machines Corporation.

CTI ELECTRONICS CORPORATION
Interfacing people and machines

200 Benton Street • Stratford, CT 06497 • (203) 386-9779 • Fax (203) 378-4986

eem

MINIGLOSSARY
BASIC ASCII CODE

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Control Character Representations

NUL	Null
SOH	Start of Heading (CC)
STX	Start of Text (CC)
ETX	End of Text (CC)
EOT	End of Transmission (CC)
ENQ	Enquiry (CC)
ACK	Acknowledge (CC)
BEL	Bell
BS	Backspace (FE)
HT	Horizontal Tabulation (FE)
LF	Line Feed (FE)
VT	Vertical Tabulation (FE)
FF	Form Feed (FE)
CR	Carriage Return (FE)
SO	Shift Out
SI	Shift In
DLE	Data Link Escape (CC)
DC1	Device Control 1
DC2	Device Control 2
DC3	Device Control 3
DC4	Device Control 4
NAK	Negative Acknowledge (CC)
SYN	Synchronous Idle (CC)
ETB	End of Transmission Block (CC)
CAN	Cancel
EM	End of Medium
SUB	Substitute
ESC	Escape
FS	File Separator (IS)
GS	Group Separator (IS)
RS	Record Separator (IS)
US	Unit Separator (IS)
DEL	Delete

(CC) Communication Control
(FE) Format Effector
(IS) Information Separator

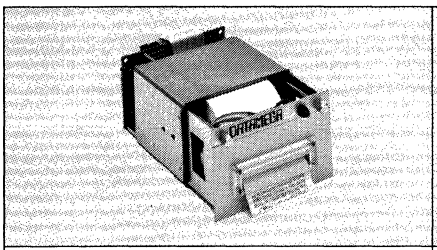
Special Graphic Characters

SP	Space	<	Less Than
!	Exclamation Point	=	Equals
|	Logical OR	>	Greater Than
"	Quotation Marks	?	Question Mark
#	Number Sign	@	Commercial At
$	Dollar Sign	[	Opening Bracket
%	Percent	\	Reverse Slant
&	Ampersand	]	Closing Bracket
'	Apostrophe	^	Circumflex
(	Opening Parenthesis	¬	Logical NOT
)	Closing Parenthesis	_	Underline
*	Asterisk	`	Grave Accent
+	Plus	{	Opening Brace
,	Comma	¦	Vertical Line (This graphic is stylized to distinguish it from Logical OR)
-	Hyphen (Minus)		
.	Period (Decimal Point)		
/	Slant	}	Closing Brace
:	Colon	~	Tilde
;	Semicolon		

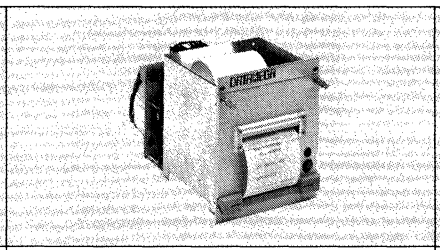
DATAMEGA INC.

ALPHANUMERIC SMALL PRINTERS ARE US

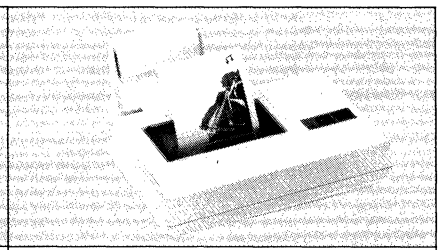
Datamega–4 and 6 pin printers are available in a wide variety of enclosures with several low cost universal printer controllers or powerful micro-terminal controllers. The modular system allows delivery from stock. Many accessories such as paper cutters and paper-rewinders are available individually and are suppported by the various controllers. Remember, no requirement is too small and none too large. Data mega specializes in small quantities from 1 to 200 pieces from stock.



DPN 240-xx DPN 2240-xx
4/6 pin panel printer
Metal case plug-in for all 250/2250 series printers. DPN 176/2176/179/2179 fit rear lid for complete printer package.



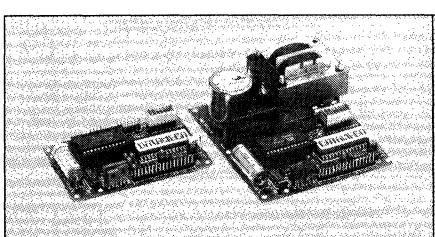
DPN 270-xx DPN2270-xx
4/6 pin plain paper printer
Metal-case for 19" rack mounting available also with front paper cutter. DPN 176/2176,179,2179 fit rear lid for complete printer package.



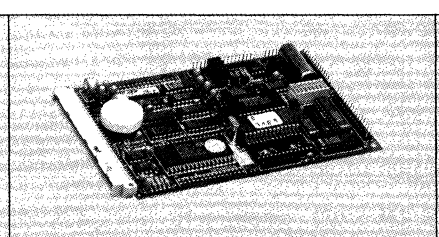
DPN-233/DPN2233-xx
Complete printer-package
Super-low cost with built in controller, RS-232C or centronics, internal and external paper holder, 5VDC external plugs in 115V power supply. Front panel for 19" rack available.

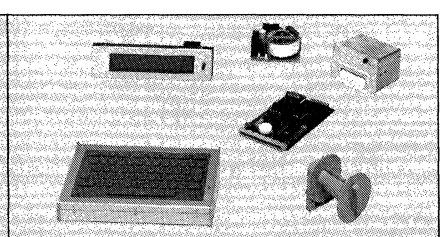
TECHNICAL SPECIFICATIONS FOR MINIATURE-4/6 PIN PLAIN PAPER PRINTERS

Pins	4	4	4	6	6	6
Order Code	**250-24**	**250-32**	**250-40**	**2250-24**	**2250-32**	**2250-42**
Character/line	24	32	40	24	32	42
Graph. points/line	144	192	240	144	180	252
Speed line/sec.	0.7	0.5	0.4	1.6	1.3	1.0
Dot Spacing (mm) Horizontal Vertical	 0.35 0.33	 0.25 0.33	 0.20 0.33	 0.33 0.37	 0.26 0.37	 0.19 0.37
Character Size 5 x 7 Matrix	1.7 x 2.4 mm	1.3 x 2.4 mm	1.1 x 2.4 mm	1.7 x 2.6	1.4 x 2.6	1.1 x 2.6
Paper Size	58 mm wide	58 mm wide	58 mm wide	58 mm	58 mm	58 mm
Diameter of Paper Roll	50 mm	50 mm	50 mm	50 mm	50 mm	50 mm
Motor Voltage	4.5 + 0.5 – 0.7 VDC	4.5 + 0.5 – 0.7 VDC	4.5 + 0.5 – 0.7 VDC	4.8 + 0.7/1 – 1.5 VDC	4.8 + 0.7/1 – 1.5 VDC	4.8 + 0.7/1 – 1.5 VDC



Low cost controllers for centronics RS-232C, 20 mA and TTL-serial DCN 176, 2176, 179, 2179.





DCN-180 Microterminal controllers for 4 needle printers LCD, VFD, RS-232C, parallel, TTL-serial, paper winders, alphanumeric keyboard.

Datamega plain paper interface controllers are microprocessor based. Character sets including IBM 2, Arabic, Russian, French, German and addressable dot-graphics are available. The microterminal controller allows the combination of alphanumeric LCD and VFD displays with printers, keyboards, voice and 8 channel data acquisition boards.

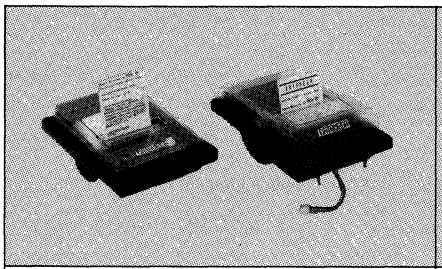
32 PAGE ENGINEERING CATALOG AVAILABLE UPON REQUEST

DATAMEGA INC. • 790 Maple Lane • Bensenville, Illinois 60106
Telephone (708) 860-6509 • Fax (708) 860-3672

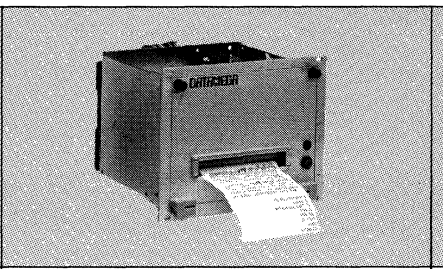
DATAMEGA INC.

ALPHANUMERIC SMALL PRINTERS ARE US

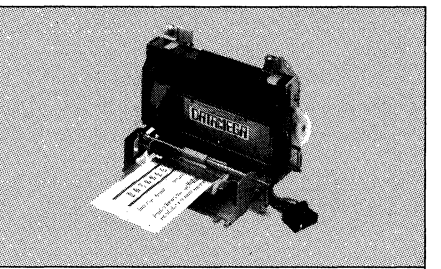
The series 2600 alphanumeric matrix printers are compact, fast 7 needle plain paper printers for industrial applications. Black, black and red printing and several housing-possibilities are available. Integrated paper-cutter and single-line printing are options.



DPN 2614 DPN 2624
7 pin matrix-printer in plastic enclosure w/o paper cutters.
35/42 characters per line
76mm paper width
Print speed: 2,3 lines/s
Graphics possible
Half-dot graphics possible
210 dots per line
66.2 mm print width
Fast paper feed: up to 7.4 lines/s



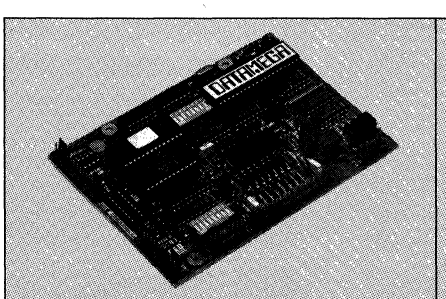
DPN-2639
7 pin matrix printer in 19" rack metal enclosure
35/42 characters per line
76mm paper width
Print speed: 2,3 lines/s
Graphics possible
Half-dot graphics possible
210 dots per line
66.2 mm print width
Fast paper feed: up to 7.4 lines/s



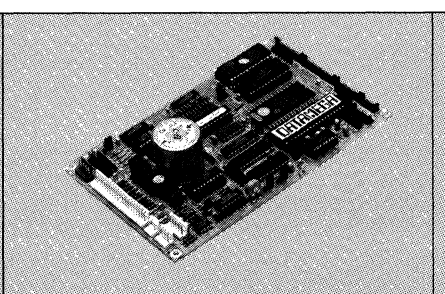
DPN-2651
Ticket printer for credit cards with longitudinal or lateral print
22 characters per line (longitudinal format)
L x W x T 86 x 54 x 0.23 mm³ card format
Print speed: 2.3 lines/s
5-needle shuttle printing mechanism
Stepper motor drive
2 position-indicators
Triggering per DCN-2681-KD
Graphics with 132 dots per line

Datamega plain paper interface controllers are microprocessor based. Character sets including IBM2, Arabic, Russian, French, German and addressable dot-graphics are available. The microterminal controller allows the combination of alphanumeric LÇD and VFD displays, with printers, keyboards, voice and 8 channel data acquisition boards.

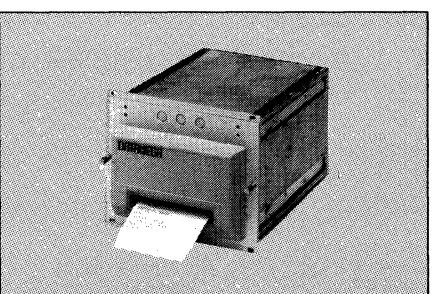
The universal printer controller DCN2676 is low cost. It supports paper-cutter and paper rewinder. The DCN-2681 acts as a microterminal printer controller. Both are available with real time clock and many other features.



DCN-2676
Low cost controller for DPN-2600 series
Centronics RS232C, 20mA, TTL-Serial



DCN-2681
System controller, keyboard, LCD, VFD
Parallel/serial interface



DPN-2670-PA
Cassette printer with paper cutter, paper holder or paper rewinder

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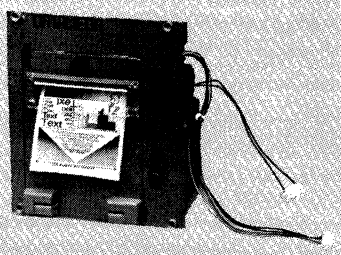
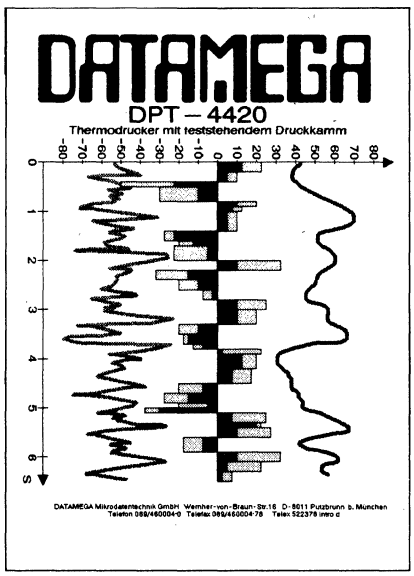
ALPHANUMERIC SMALL PRINTERS ARE US

DPT-4710
DPT-4710HG
22 char/line

DPT-4720
DPT-4720HG
44 char/line

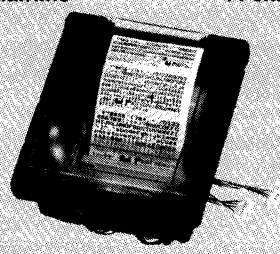


DPT4710/DPT4720
Silent thermal printers in metal enclosures for 19" rack mount
60/112 mm paper width
Print speed: 60 mm/s
Printhead position monitored
Temperature sensor in the printhead
Strong contrast
320/640 dots per line
Dimensions: L x W x H 156 x 50 x 32 mm³ (DPT-4420)

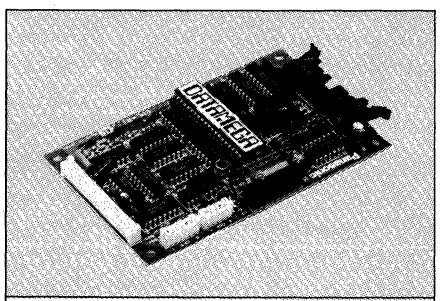


DPT-4414
DPT-4414HG
22 char/line

DPT-4424
DPT-4424HG
44 char/line



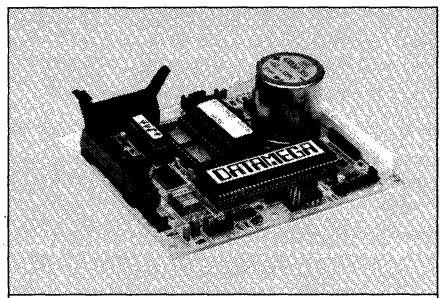
DPT4414/DPT4424
DPT-4414HG/DPT-4424HG
Silent thermal printers in plastic enclosures
22/44 characters per line
60/112 mm paper width
Print speed: 23.2/11.6 mm/s—60 mm/sec (HG)
320/640 dots per line
High resolution of 6 dots/mm
Operation voltage: 24VDC ± 5%
End-of-form detector
Bar code possible



DCT-4482
Controller for the DPT 4000 thermal printer parallel interface

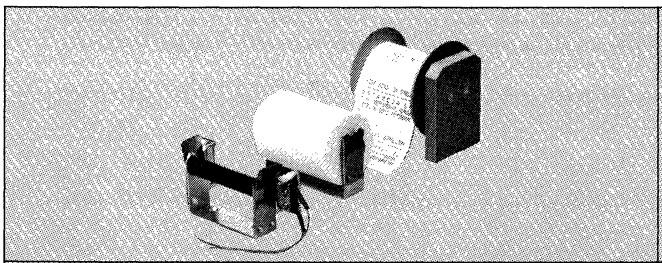
Datamega DPT-4000 series thermal printers come in standard speed as well as high speed, enabling fast and silent printing without ribbon changes. They are available in plastic enclosures for general purpose or in a metal enclosure for 19" rack mounting.

Options include universal controllers, microterminal controller for integrated LCD, VFD, keyboard and printer interfaces.

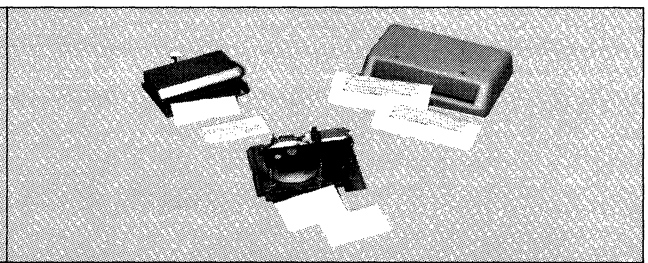


DCT-4481
Microterminal printer controller for DPT4400 Series, LCD, VFD, keyboard

General Printer Accessories (for all models)



Paper roll holders: with or without end-of-form detector.
Paper winders: with or without stand



Paper cutter: 60/89/120 mm cutting width.
Perforation or cutting. Easy triggering.

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eem SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

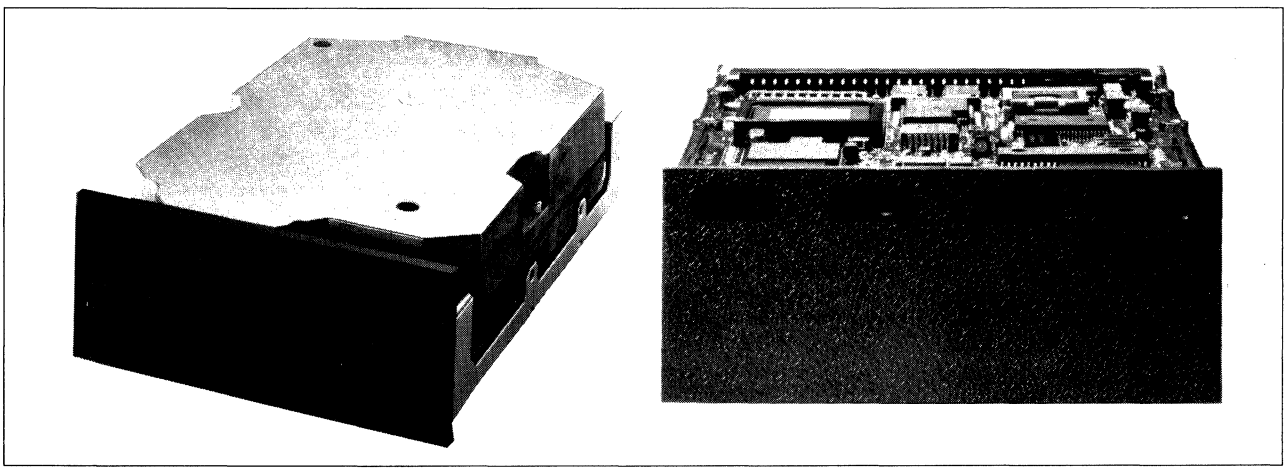
United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

FUJITSU 3.5″ WINCHESTER DISK DRIVES



OVERVIEW

Compact and reliable, FUJITSU's series of 3.5″ hard drives offer the high performance of our larger drives in compact form factors. The capacity, performance and power consumption make the 3.5″ line ideal for high-end PC-systems, minicomputers, super micro, workstations as well as AC powered portable and laptop computers.

The FUJITSU series of 3.5″ drives spans the formatted capacity range of 182 to 520 MB with SCSI-1 and -2, MAC-SCSI as well as AT interfaces. This variety makes the FUJITSU 3.5″ series ideal for a broad range of systems applications.

In addition to the standard 3.5″ form factor, one-inch high, 3.5″ drives are also available with AT or SCSI interfaces.

Other features in the AT and SCSI drives include read ahead cache, solenoid actuator locks, self-diagnostics, as well as automatic defect management, demonstrating that FUJITSU is developing technology for you.

SPECIFICATIONS

		M2614 SA/T	M2616SA/T	M2622SA/T	M2623SA/T	M2624SA/T
Drive Capacity	unformatted formatted	— 182.4	— 105 MB	— 330.2 MB	— 425.1 MB	— 520.1 MB
Disks		4	2	4	5	6
Heads	read/write	8	4	7	9	11
Track Capacity	unformatted formatted	 17,408 B	— 17,408B	—	— 28672–35,840 B	—
Cylinders		1,334	1,542	1,435		
Sectors		34	34	56/62/66/70 (4 zones)		
Positioning Time	track to track average maximum	8 ms 20 ms 36 ms	8 ms 20 ms 36 ms	3 ms 12 ms 25 ms		
Average Latency		8.6 ms	8.6 ms	6.82 ms		
Rotational Speed		3,490 RPM	3,490 RPM	4,400 RPM		
Recording Density		29,571 BPI	32,069 BPI	46,383 BPI		
Track Density		1,681 TPI	1,681 TPI	1,751 TPI		
Data Transfer Rates		SCSI @ ASYNC: 1.5 MB/Sec SNYC: 2.5 MB/Sec	SCSI @ ASYNC: 1.5 MB/Sec SYNC: 2.5 MB/Sec	ASYN: 3.0 MB/s SNYC 5.0 MB/s		
Recording Code		RLL (1,7)	RLL (1,7)	RLL (1,7)		
Interface		MAC-SCSI, SCSI, AT	SCSI/AT	SCSI-1/2, AT		
Start Time		15 ms	< 15 sec	< 15 sec		
Stop Time		25 ms	< 25 sec	< 30 sec		
Power Requirement		+12V ± 5% 0.45A (type) 2.0A (max) +5V ± 5% 1.0A (typ)	+12V ± 5% 0.35A (type) 1.5A (max) +5V ± 5% 1.0A (typ)	12VDC ± 5% o.5A (typical), 2.0A (max) 5VDC ± 5% 1.3A		
Dimensions		1.63 in. (H) × 4.0 in W × 5.75 in (D)	1 in. (H) × 4.0 in W × 5.75 in (D)	1.63 in. (H) × 4.0 in W × 5.75 in (D)		
Weight		2.2 lbs.	1.6 lbs.	2.64 lbs.		

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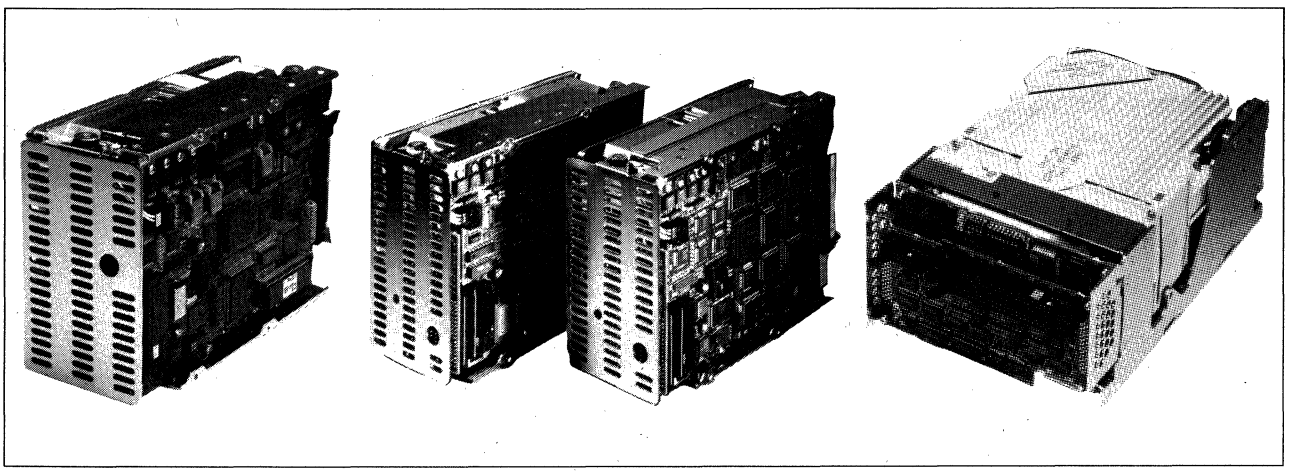
FUJITSU 5.25″ WINCHESTER DISK DRIVES



OVERVIEW

Fujitsu's M226X family of 5.25″ disk drives are designed for micro computer systems requiring high performance combined with exceptional reliability. Available in capacities ranging from 415MB to 1.2GB. Along with M226X family, Fujitsu announced a new M2652 family which was designed especially for a broad range of computer systems including supercomputers, mainframes and engineering workstations. The M2652 drive achieves a capacity up to 2GB, one of the highest capacity in the world and delivers fast access time, 11ms. A balanced light rotary actuator and DSP control servo systems ensure constant performances. The M226X and M2652 family have the highest reliability rating in the industry—200,000 hours MTBF.

SPECIFICATIONS

		M2261E/SA	M2263E/SA	M2266SA/HA	M2652S/H/HD	M2652P
Drive Capacity	unformatted formatted	415 MB —	778 MB —	1.2 GB —	2.1GB —	2.0 GB —
Disks		5	8	8	12	12
Heads	read/write	8	15	15	20	20
Track Capacity	unformatted formatted	31,296 B —	31,296 B —	50,910 B	52,864 B —	52,864 B —
Positioning Time	track to track average maximum	4 ms 16 ms 30 ms	4 ms 16 ms 30 ms	4 ms 14.5 ms 30 ms	2 ms 11 ms 22 ms	2 ms 11 ms 22 ms
Average Latency		8.3 ms	8.3 ms	8.3 ms	5.56 ms	5.56 ms
Rotational Speed		3,600 RPM	3,600 RPM	3,600 RPM	5,400 RPM	5,400 RPM
Recording Density		28,816 BPI	28,816 BPI	28,816 BPI	50,257 BPI	50,257 BPI
Track Density		1,712 TPI	1,712 TPI	1,712 TPI	1,840 TPI	1,780 TPI
Data Transfer Rates		ESDI 1,88 MB/s	SCSI ASYN 1.75 MB/s SYNC 4.0 MB/s	ASYNC 2.0 MB/s SYNC 4.8 MB/s	3.0 MB/s 10 MB/s	4.758 MB/s —
Recording Code		RLL (1,7)	RLL (1,7)	RLL (1,7)	RLL (1,7)	RLL (1,7)
Interface		ESDI/SCSI	ESDI/SCSI	SCSI	SCSI	IPI
Start Time		<20 sec	<20 sec	<20 sec	<30 sec	<30 sec
Stop Time		<15 sec	<15 sec	<15 sec	<30 sec	<30 sec
Power Requirement		12VDC±5% 1.65A 5VDC±5% 1.6A	12VDC±5% 1.65A 5VDC±5% 1.6A	12VDC±5% 1.9A 5VDC±5% 1.4A	12VDC±5% 2.6A 12VDC±5% 2.0A	12VDC±5% 2.6A 12VDC±5% 2.0A
Dimensions		3.3 in. (H)×5.7 in (W)×8 in (D)			3.3 in (H)×5.7 in (W)×8.7 in (D)	
Weight		7.7 lbs.	7.7 lbs.	7.7 lbs.	8.8 lbs	
MTFB		200,000 power-on hour				
CYLINDERS		1,658	1,658	1,658	1,893	1,893

Specifications are subject to change without notice.
*User determined

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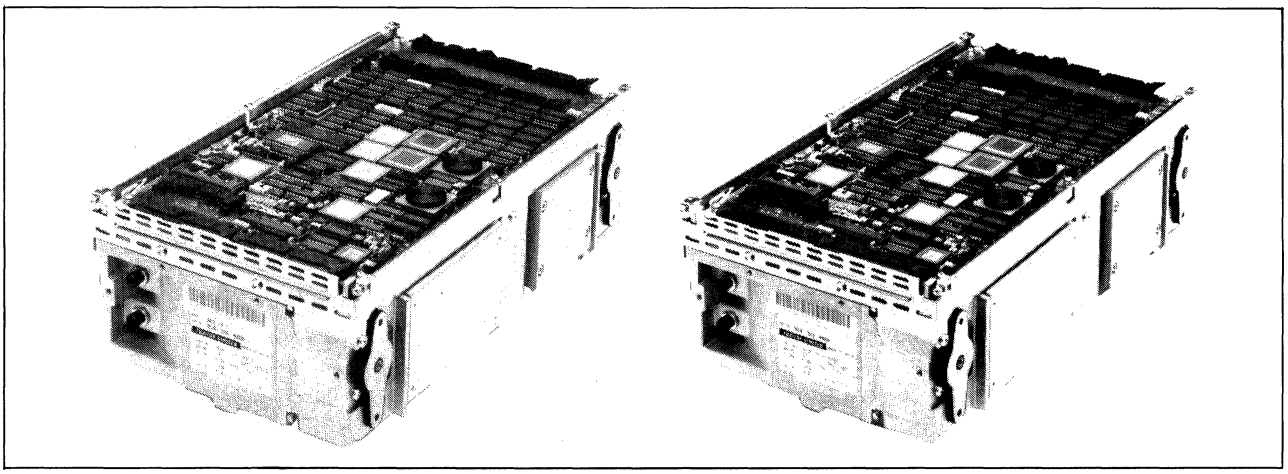
FUJITSU 8" WINCHESTER DISK DRIVES



OVERVIEW

Fujitsu's 8" WInchester disk drives feature large storage capacity, fast access, and superb reliability. They are designed to provide cost-effective storage for small computer systems and high performance workstations.

The M2392 has the highest reliability rating in the industry—200,000 hours MTBF—providing maximum uptime and minimum downtime. The M2382 provides the new performance ESMD transfer rate of 3.0 Mb/s, substantially increasing I/O throughout.

Two drives can be mounted side by side in a 19-inch rack to provide increased storage in a compact package. Dual port is embedded so that one drive can be accessed by two computers.

SPECIFICATIONS

		M2372K	M2382K	M2392K
Drive Capacity	unformatted formatted	824 MB 1	1.0 GB —	2,027 MB —
Disks		8	8	12
Heads	read/write servo	27 1	27 1	21 1
Track Capacity	unformatted	40,960B	49,728B	50,400B
CYLINDERS		745	745	1,916
Positioning Time	track to track average maximum	4ms 16ms 33ms	4ms 16ms 33ms	2ms 12ms 25ms
Average Latency		8.3ms	8.3ms	8.33ms
Rotational Speed		3,600 RPM	3,600 RPM	3,600 RPM
Track Density		1,045 TPI	1,193 TPI	1,456 TPI
Data Transfer Rates		2.46MB/sec	3.0MB/sec	3.0MB/sec
Recording Code		RLL (2,7)	RLL (1,7)	RLL (1,7)
Start Time		< 50 sec.	< 50 sec.	< 50 sec.
Stop Time		< 40 sec.	< 40 sec.	< 50 sec.
Interface		HSMD	ESMD	ESMD
Power Requirement		3.5A	3.5A	+36/±12/+5/−5.2
Dimensions		5 in (H)×8.5 in (W)×15 in (D) 0.8 in (H)×7.7 in (W)×13 in (D) max. 7 m (host), max. 15 m (drive)		4.9 in (H)×8.5 in (W)×15 in (D)
Weight		39 lbs	39 lbs	37 lbs

1. Depends on format efficiency.

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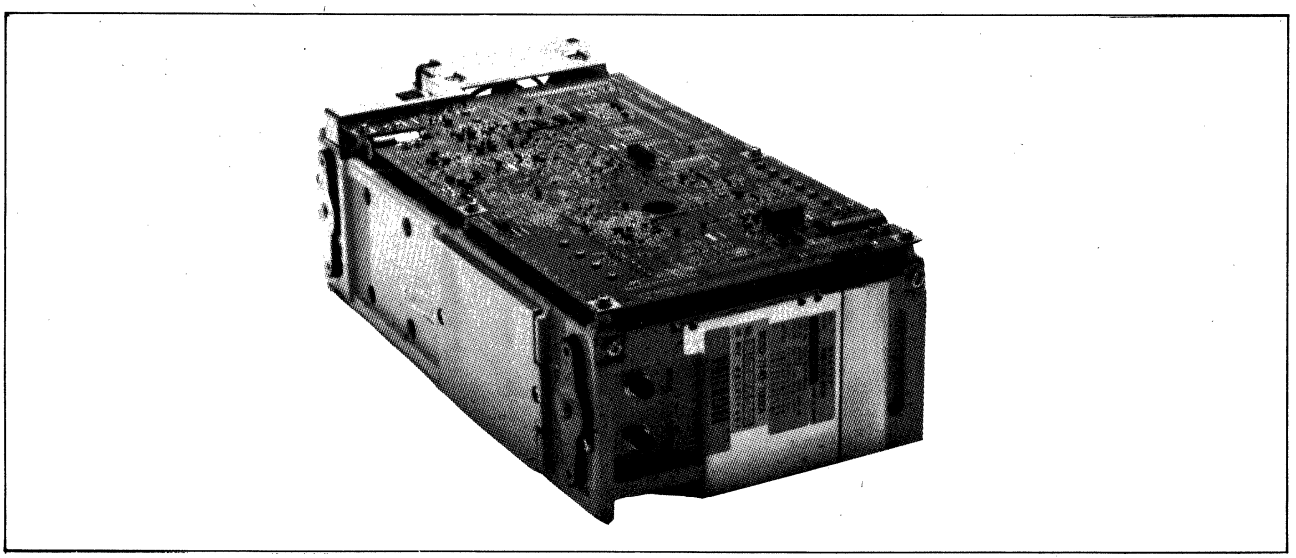
FUJITSU

IPI-2 WINCHESTER DISK DRIVES



OVERVIEW

Fujitsu's IPI-2 Winchester drive provides the capacity, performance and reliability you need for the optimum data storage subsystem.

With 2.6 gigabyte capacity and 4.78 megabytes per second data transfer rate, Fujitsu drives will keep pace with the most sophisticated CPU.

SPECIFICATIONS

	M2671P
Device interface	IPI-2
Device data transfer rate	4.78 MB/sec
Interface Mode	Voltage differential
Features	2.6 GB capacity 12 ms average positioning 6.9 ms average latency
Power	+5 VDC 4.5 A −5.2 VDC 3.0 A +12 VDC 1.5 A −12 VDC 1.0 A +36 VDC 3.5 A
Dimensions (H × W × D)	5″ × 8.5″ × 15″
Cable length	160 feet
Weight	39 lbs.

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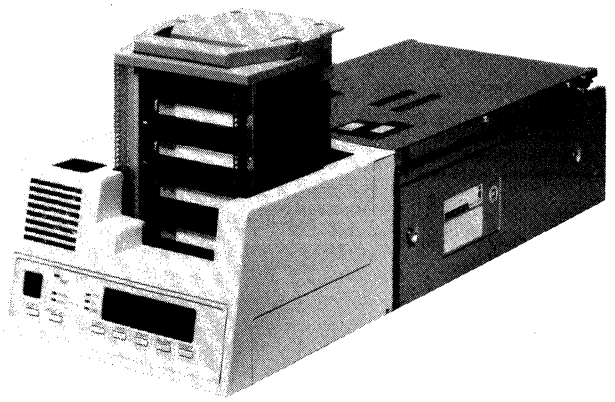
FUJITSU 3480-FORMAT COMPATIBLE TAPE DRIVES



OVERVIEW

Workstations, minicomputers, mainframes —any system processing high volumes of data—requires back-up daily. But, it's not that easy. The need to transfer information amongst a variety of computer platforms compounds the problem.

A new tape standard has emerged to address this situation: the half-inch 3480 tape cartridge format. It is convenient, well-adapted to high-volume backup and archiving, and permits true data interchange between a variety of computer systems.

No other manufacturer offers a more elegant 3480 solution than Fujitsu America. We've reshaped the 3480 into something better: the Fujitsu M2480 tape subsystem.

Now the 3480 choice no longer means a bulky unit. The trim M2480 tape drive and controller slip right into any standard 19-inch rack. All controls are easily and immediately accesible.

Its new shape and SCSI interface also make the M2480 the ideal—and simple—way to add all the benefits of the 3480 format to systems presently using 9-track GCR units.

You can order the M2480 with either a 1.5 MB/sec or 3.0 MB/sec native transfer rate. These rates exceed that of traditional reel-to-reel units. A proprietary Fujitsu data compression algorithm adds a new dimension to both. With the 1.5 MB units, compression effectively doubles the transfer rate to 3.0 MB/sec. The same option with the 3.0 MB version allows you to push the transfer rate right up to the SCSI limit of 4.0 MB/sec! As an added bonus, in both cases, the capacity of your cartridges increases to an average of 400 MB.

The tape cartridge approach eliminates extra tape-handling steps. Now, Fujitsu eliminates a few more: one of the options the 2480 gives you is an Auto Cartridge Loader. This attachment allows unattended operation with optional five- or ten-cartridge magazines. Using the ACL and compression, it is possible to back up as much as 16 GB of data in approximately an hour.

SPECIFICATIONS

Drive Unit	**M2481A**	**M2481B**
Tracks	18	18
Tape Speed	1 meter/sec. (39.4 ips)	2 meters/sec. (78.8 ips)
Transfer Rate	1.5 MB/s	3.0 MB/s
Capacity	200 MB/cartridge (average 400 MB with compression)	
Load Time	7 sec.	7 sec.
Unload Time	48 sec.	48 sec.
Auto Cartridge Loader Option M2481A11		
Dimensions (H×W×D)	5.0 in.×8.6 in.×8.8 in.	
Weight	13 lbs.	
Magazine (Option)		
Capacity	5 or 10 cartridges	
Dimensions (H×W×D)	9 or 15.2 in.×4.9 in.×5.4 in.	
Weight	6.7 or 11 lbs.	
Control Unit	**M1016A**	**M1016B**
Interface	SCSI	SCSI
Dimensions (H×W×D)	3.5 in.×19 in.×27 in.	
Buffer Size	2 MB	
Transfer Rate		
Asynchronous:	1.5 MB/sec.	1.5 MB/sec.
Synchronous:	4.0 MB/sec.	4.0 MB/sec.
Subsystem		
Max. Configuration	1 controller × 4 drives	

*The M2480 subsystem consists of the 2481A/B tape unit and the M1016A/B controller.

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San Jose, CA 95134-2022
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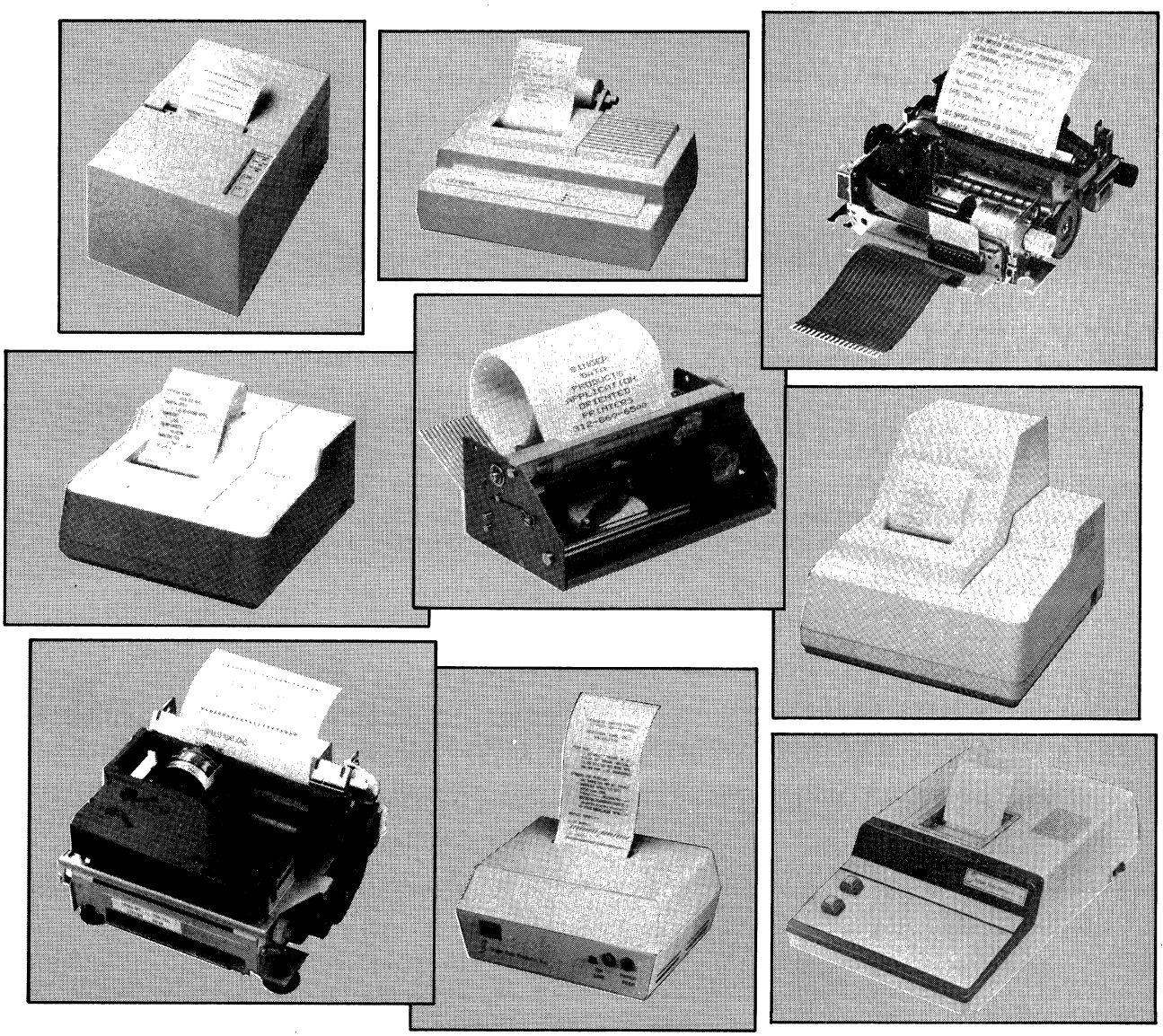

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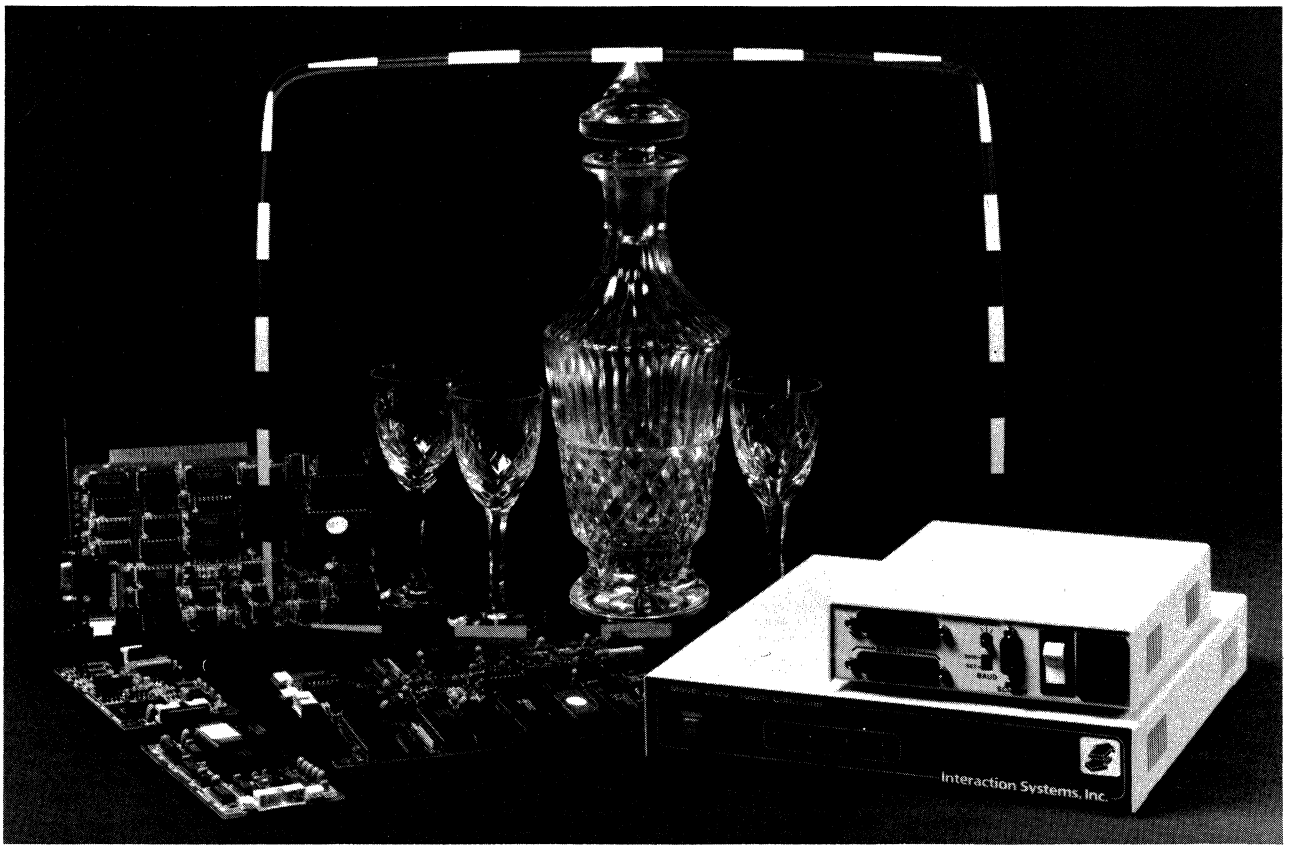

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Keltron Miniprinters incorporate many features not usually offered in panel mounted printers. Scientific applications include analytical instrumentation, patient monitors and diagnostic testers; industrial applications include logging temperature, pressure, frequency, power and other parameters. Characters are formed in a 5 x 7 dot matrix on 1.75" wide (16 column) or 2.25" wide (24-42 column) paper.

- Available Interfaces Include: RS232C, RS422, 20ma Current Loop, Centronics, BCD Parallel
- Rugged Metal Exterior Case
- +5VDC Power; 120VAC, 220 VAC or 9-40VDC
- Membrane Switch Front Panel
- Dipswitch Selected Printer Functions
- Software Clock/Calendar, Line Counter, Interval Timer Standard; Event Counter Optional
- Battery Backed-up Clock/RAM Option
- Plain Paper Rolls/Ink Ribbon Cartridge
- Double Height/Width Characters
- Graphics Available
- Paper Takeup Optional
- Size: 4.45"(W) x 2.75" (H) x 8"(D) Standard (DS Series Larger)
- Vertical Mounting Available (less than 4" deep)
- Available in Kit Form for OEM Assemblies at **Lowest Cost**

PRINTOUT DATA

	Number of Columns	Speed (lpm)	MTBF (lines)
MM Series (Standard Speed)	16, 24, 32, 40	25 to 60	500,000
MH Series (High Speed)	24, 30, 36, 42	60 to 102	500,000 to 700,000
DS Series (Very High Speed)	35, 42	138	1,500,000

MODEL FEATURES

MH-XX8Y/4 Centronics® Compatible, Byte Serial, Complete Handshaking
MH-XX8Y/5 RS232C, 20ma Current Loop, RTS, CTS, XON, XOFF Protocols
MH-XX8Y/7 RS422, 20ma Current Loop, RTS, CTS, XON, XOFF Protocols
DM-XX6Y 16 Parallel BCD Inputs (Standard Speed only)
DSXX9Y/Z 3″ wide, two color

XX = Number of Columns
Y = Power Option:
0 = 5VDC; 1 = 110VAC; 2 = 220VAC; 3 = 9-40VDC

Z = Interface Options: Same as for MH units (4, 5 and 7)
MH items also available as MM units at standard speed

XX8Y/4, /5, /7 (SERIAL) UNIQUE FEATURES

- Full 256 Character ASCII Set
- Dot Addressable Graphics
- 8192 Character Buffer
- Software Clock/Calendar, Line Counter

XX6Y (PARALLEL) UNIQUE FEATURES

- Addressable Columns
- Clock w/Auto Timebase Selection (opt.)
- Timer with 16 Intervals
- Alternate Engineering Character Set

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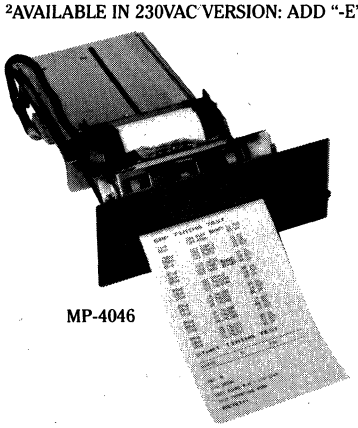
MEMODYNE THERMAL PRINTER SELECTION GUIDE

	Columns	Interface	Input Voltage	Dimensions w/h/d (in.)	Weight lb.	Print Rate Lines/Sec.	Char. Buffer	Oper. Temp. Range	Real Time Clock	Battery Backup	Graphics
STANDALONE THERMAL PRINTERS											
Silent Partner™ Table Top Thermal Printer											
MP-430[9]	42	CENT or RS232C	115 or 230 VAC	8.0/4.5/11.5	7.5	6.0	7168	0+50°C	N	N	Y
Silent Partner Point-of-Sale Thermal Printer											
MP-434[9]	42	CENT or RS232C	115 or 230 VAC	8.0/4.5/11.5	7.5	6.0	7168	0+50°C	N	N	Y
RangeWriter™ Portable Thermal Printers											
MXP-4051[2]	42	CENT/RS232C[3]	115 VAC	10.3/3.7/10.8	6.8	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
MXP-4052[2]	42	CENT/RS232C[3]	115 VAC	10.3/3.7/10.8	6.8	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
Unattended Kiosk Thermal Printer											
MP-4047C	40/42	CENT or RS232C	+5,+24 VDC	10.4/8.4/6.9[5]	3.5[6]	6.0	1024[7]	0+50°C	N	N	Y
Bench Top Thermal Printers											
MP-401[2]	40	CENT/RS232C	115 VAC	8.45/3.44/13.5	10.0	6.0	1024	0+50°C	Y	N	Y
MP-401-I[2]	40	IEEE-488/RS232C	115 VAC	8.45/3.44/13.5	10.0	6.0	1024	0+50°C	Y	N	Y
MP-401-R[2]	40	CENT/RS422A	115 VAC	8.45/3.44/13.5	10.0	6.0	1024	0+50°C	Y	N	Y
CONFIGURE 404™ SERIES											
Pre-Engineered Thermal Printers (for OEM Applications)											
MP-404A	40/42	RS232C SER[4]	+5,+24 VDC	See Below	1.2	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
MP-4040	40/42	RS232C SER[4]	+5,+24 VDC	6.7/3.5/5.4	1.6	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
MP-4042	40/42	RS232C SER[4]	+5,+24 VDC	7.1/4.2/6.2	1.6	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
MP-4044	40/42	RS232C SER[4]	+5,+24 VDC	6.8/4.2/7.7	2.4	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
MP-4046	40/42	RS232C SER[4]	+5,+24 VDC	6.7/4.2/7.8	3.4	6.0	1024[7]	0+50°C	Y[8]	Y[8]	Y
PANEL MOUNT THERMAL PRINTERS											
MAP-20PAC	20	PARALLEL	115 VAC	4.4/2.8/7.8	4.2	2.0	20	0+50°C	N	N	N
MAP-20PEC	20	PARALLEL	230 VAC	4.4/2.8/7.8	4.2	2.0	20	0+50°C	N	N	N
MAP-20PBC	20	PARALLEL	11-40 VDC	4.4/2.8/7.8	2.7	2.0	20	0+50°C	N	N	N
MAP-20SAC	20	RS232C SER	115 VAC	4.4/2.8/7.8	4.2	1.8	20	0+50°C	N	N	N
MAP-20SEC	20	RS232C SER	230 VAC	4.4/2.8/7.8	4.2	1.8	20	0+50°C	N	N	N
MAP-20SBC	20	RS232C SER	11-40 VDC	4.4/2.8/7.8	2.7	1.8	20	0+50°C	N	N	N
MAP-20IAN	20	IEEE-488	115 VAC	6.0/4.0/8.8	5.5	2.0	20	0+50°C	N	N	N
MAP-20IEN	20	IEEE-488	230 VAC	6.0/4.0/8.8	5.5	2.0	20	0+50°C	N	N	N
MAP-40	40	PAR/RS232C	115 VAC	4.4/2.8/7.8	3.7	0.6	40	0+50°C	Y	N	Y
MAP-40E	40	PAR/RS232C	230 VAC	4.4/2.8/7.8	3.7	0.6	40	0+50°C	Y	N	Y
MAP-40DC	40	PAR/SER	11–14 VDC	4.4/2.8/7.8	3.7	0.6	40	0+50°C	Y	N	Y
Low-Temperature Thermal Printers											
MAP-20SBCL	20	RS232C SER	11-40 VDC	4.4/2.8/7.8	3.0	2.0	20	−40+50°C	N	N	N

Specifications subject to modification without notice.

MP-404A Dimensions (w/h/d [in]): PC Board 7.0/0.6/5.0
Print Mechanism 6.1/1.5/2.1

[1]CASH DRAWER ACTIVATOR, AUDIBLE SIGNALING DEVICE WITH VOLUME CONTROL
[2]AVAILABLE IN 230VAC VERSION: ADD "-E" TO MODEL NUMBER
[3]CENTRONICS OR RS232C, OR BOTH
[4]OPTIONS: RS422A, CENTRONICS PARALLEL, SERIAL TTL, IEEE-488
[5]WITH 6-INCH DIAMETER PAPER ROLL
[6]WITHOUT PAPER
[7]1024 STANDARD, 7168 OPTIONAL
[8]CLOCK WITH BATTERY BACKUP OPTIONAL
NOTE: ALL UNITS HAVE 5 x 7 DOT MATRIX CHARACTERS
[9]OPTIONAL PAPER CUTTER



MP-4046

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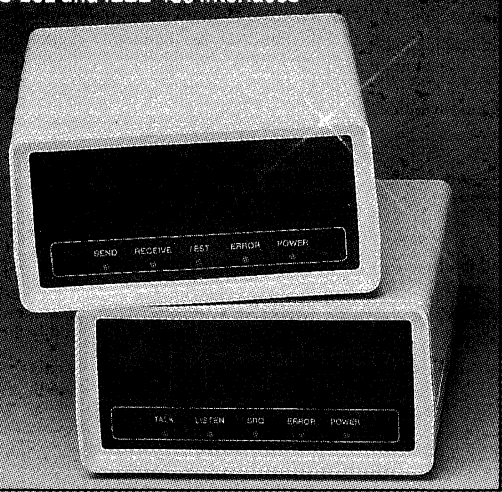
MAP-20

COMPUTER INTERFACE

RS-232 and IEEE-488 Interfaces



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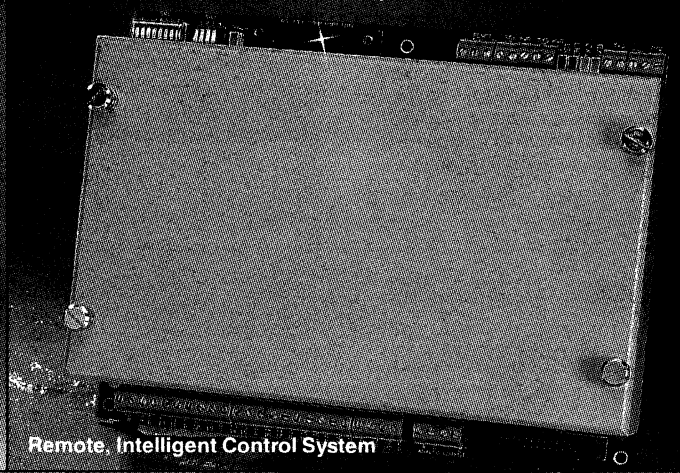

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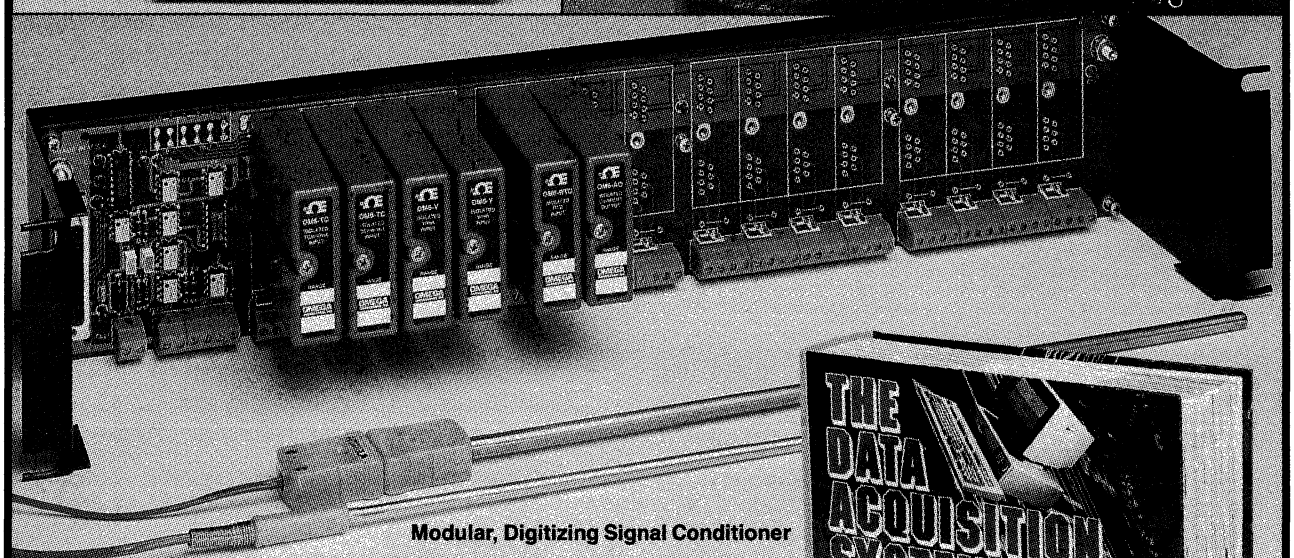

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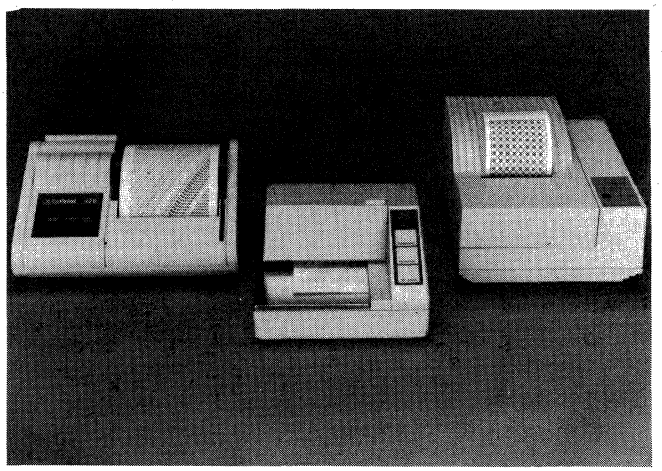


STANDALONE PRINTERS

Packaged thermal and impact printers for OEM, system and industrial applications incorporating the well-proven Epson, Seiko, or Olivetti high quality printers.

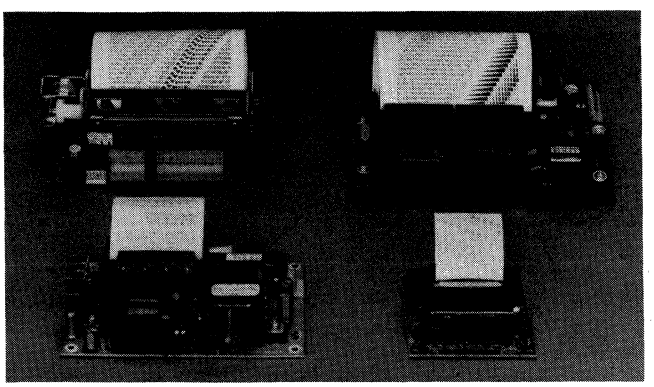
OM 267
Cost effective multicopy 2-color receipt printer with outstanding features and options.

OM 426
Extremely reliable thermal line printer, fast and quiet with 256 bit mapped dots per line.

TM 290
The world's smallest slip printer with excellent cost to performance ratio.

PX 40
Low cost, compact, battery powered. 40 (compressed 80) columns.

OM 40, OM 20, TM 210, and more.
Options include: Internal drivers for cash drawers, paper rewind device, auto-cutter, extended memory, custom characters, multiple interface, etc.

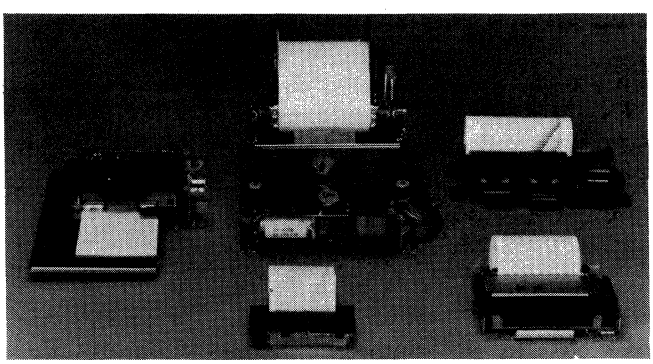


CONTROL BOARDS and CHIPS

A series of controller boards and microprocessors are designed to control a number of Epson and Olivetti dot matrix printers. Combination of board and mechanism as sub-assembly allows for maximum ease in product integration or replacement of less satisfactory printers in existing installations.

- Serial or parallel
- 5,12, or 24 VDC
- CMOS, Low Power Consumption
- Multiple Hand Shakes
- Bit Image Graphics
- Print Direction Switching
- AC or DC
- Single Power Source
- Compact and Reliable

Modification to operation software instruction or special user commands are convenient and easy to accomplish.



MECHANISMS

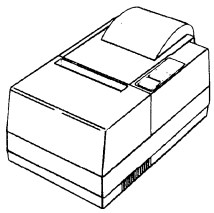
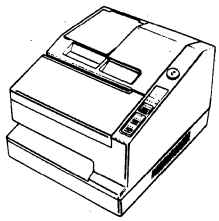
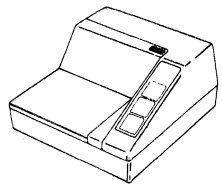
A wide variety of Epson and Olivetti dot matrix thermal and impact print mechanisms provides the OEM's with an optimum solution to virtually any hard copy requirement.

- Fast, up to 6 lines per second
- Reliable, up to 100 million characters
- Graphics, up to 150 DPI
- 20-42 (compresses 80) columns
- Low Power Consumption
- Low Cost
- Compact
- Multicopy
- 1 or 2 color

Options such as auto-cutter, validation sensor, low paper detection, paper rewind device, etc. are also available.

OMNIPrint

POS Printers

Item \ Model			TM-267	TM-930	TM-290
Appearance					
Print method			7-pin, Shuttle impact dot matrix	9-pin, serial impact dot matrix	7-pin, shuttle impact dot matrix
Print front	Font		5 × 7/7 × 7	Journal or receipt: Slip: 7 × 7/9 × 9	5 × 7/7 × 7
	Column capacity		35/42 columns	Journal or receipt: 30/40 columns Slip: 66/88 columns	35/42 columns
	Character size		1.6(W) × 2.9(H)mm/1.3(W) × 2.9(H)mm	1.3(W) × 3.1(H)mm/1.6(W) × 3.1(H)mm	1.6(W) × 1.3(H)mm/1.3(W) × 2.9(H)mm
	Character set		96 ASCII characters 32 International characters 128 graphic characters	95 Alphanumeric characters 32 International characters 128 × 3 Extended graphic characters	96 ASCII characters 32 International characters 128 × 3 Graphic characters
	Column spacing		13.5 CPI/16.2 CPI	16.7 CPI/12.5 CPI	13.5 CPI/16.2 CPI
Interface			RS-232C/Centronics	RS-232C/RS-422/Centronics	RS-232C/Centronics
Data buffer			Approx. 4K bytes	2K bytes	4K bytes
Print speed			2.1 LPS	Journal or receipt: Slip: 211/158 CPS	2.1 LPS
Paper	Dimensions		76.0 ± 0.5mm(W) × max. 83.0mm dia.(roll)	Journal or Receipt: 57.5 ± 0.5mm or 69.5 ± 0.5mm(W) × max. 83.0mm dia. (roll) Slip: 80.0(W) × 80.0(L)mm to 210.0(W) × 296.0(L)mm	80.0(w) × 80.0(L)mm to 182.0(W) × 257.0(L)mm
	Thickness		0.06 to 0.085mm (Normal paper) 0.05 to 0.08mm (Pressure sensitive paper)	Journal or receipt: 0.06 to 0.09mm Slip: 0.09 to 0.2mm	0.09 to 0.35mm
Copy capability			One original and two copies	One original and two copies	One original and two copies
Inked ribbon			ERC-23 (Purple, black, or red and black)	ERC-31 (Purple)	ERC-27 (Purple or black)
Power			100/120/220/240 VAC	24 VDC	24V DC
Power consumption			Approx. 28W	Approx. 30W	Approx. 25W
Reliability	Mechanism (MCBF)		1.5 × 10^6 lines	5 × 10^6 lines	1.5 × 10^6 lines
	Head (Life)		100 × 10^6 strokes/pin	70 × 10^6 characters	100 × 10^6 strokes/pin
Overall dimensions/Weight		A	175.0(W) × 299.0(D) × 147.0(H)mm/3.0kg	251.0(W) × 298.0(D) × 197.0(H)mm/Approx. 6.0kg	180.0(W) × 190.5(D) × 101.5(H)mm/1.6kg
		B	175.0(W) × 267.0(D) × 124.0(H)mm/2.6kg		
		C	175.0(W) × 299.0(D) × 147.0(H)mm/2.8kg		
		D	175.0(W) × 267.0(D) × 124.0(H)mm/2.4kg		
Option		A	Journal lock	PS-120 (power supply unit 100/120/220/240V AC) Journal lock Separate receipt cover	PS-110 (power supply unit 24V DC)
		B	Wall-hanging bracket, receipt holder		
		C	Journal lock		
		D	—		
Safety standard			UL114-478, CSA220, TUV380-950, NEMCO (applied), SETI	UL114-478, CSA220, TUV380-950, NEMCO (applied), SETI	UL114-478, CSA220, TUV380-950, NEMCO (applied), SETI
EMI standard			FTZ class B, VCCI #1, FCC class A-B (applied)	FTZ class B (applied), FCC class A (applied)	VCCI #2, FCC class A-B

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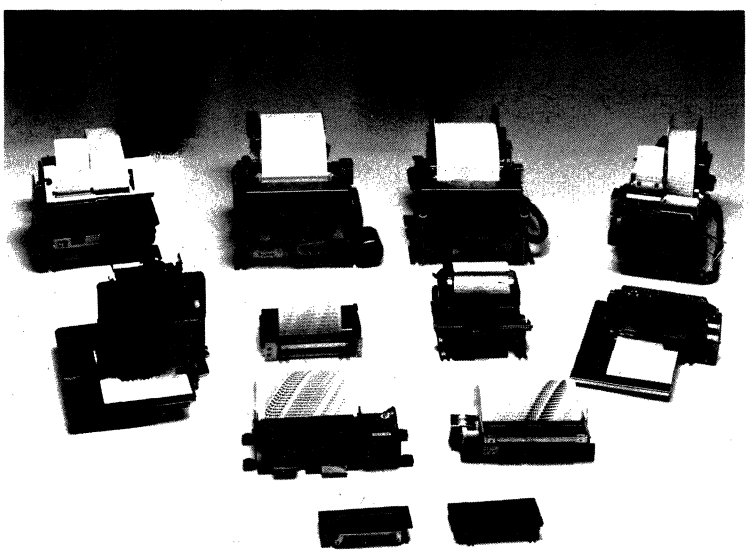
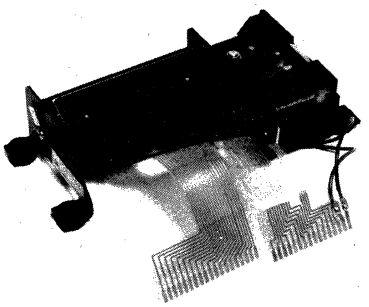
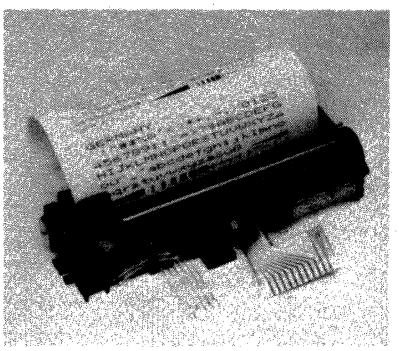
OMNIPrint *SPECIALITY PRINTERS FOR THE OEM*







PRINTER MECHANISMS

	Model*	Column Capacity	Graphics Dots/Line	Paper Width, mm(in)	Speed LPS	Voltage VDC +/- up to 10%	Overall Dimensions WXDXH (mm)	MCBF (Mil Chr Line)	Features
Thermal	PU 1800	20	140	60(2.4)	1.8	6	130x70x34	1	Over 4 million sold (of this family)
	PU 1840/2	40	320	110(4.3)	1.8	18	181x70x34	1	Low cost, easily replaceable heads
	PU 1840/4	40	280	110(4.3)	3.6	18	181x70x34	1	
Impact	PU1300	16x2	No	44.5(1.75)	2.0	18	170x145x65	2	ECR Printer, (Rcpt/Journal) Options: 6 line Validation, Auto Cutter
	PU1336	34	No	89(3.5)	2.0	18	170x145x65	2	Credit Card Slip and Roll Printer
	PU 1700	24x2	Yes	44(1.73)	2.1	24	220x130x85	1.5	3 Station ECR Printer (Rcpt/Journal, Validation)
	PU1790	52	Yes	90(3.54)	2.1	24	220x130x85	1.5	Slip Printer Versions, 56 char., cutter & take-up opt.
	Model**								
Thermal	Model-1221	40	480	112(4.4)	0.8	4.45.6	140x46x22	0.5	Battery Operation
Impact	Model-150	16	96	44.5(1.75)	1.0	4.5	73x42x12	0.5	Receipt Printers
	Model-160	24	144	57.5(2.25)	0.7	4.5	91x42x12	0.5	Micro Size
	Model-170	40	240	69.5(2.75)	0.4	4.5	103x45x15	0.4	Battery Operation,
	Model-180	24	144	57.5(2.25)	1.7	4.8	91x46x15	0.7	Graphics
	Model-183	42	252	57.5(2.25)	1.0	4.8	91x47x16	0.5	
	Model-210	31	158/315	76(3)	2.4	24	122x280x153	2	Excellent Cost Performance Ratio,
	Model-211	40	392	76(3)	2.4	24	122x281x153	2	Multiple Options available
	Model-240	31	315	Min 210x(297)	2.4	24	138x156x136	2	Model 240: Slip Printer
	Model-250	30	150	57.5(2.25)	2.3	12 or 24	122x84x26	1.5	Compact, Fast Options: Cutter, Rewind
	Model-260	42	210/420	76(3)	2.3	12 or 24	122x83x25	1.5	Light, Compact, Low Priced Options: Cutter, 2 Color, Take-up
	Model-280	18x2	90+90/180+180	37.5 (1.5) Min	2.3	24	126x271x114	1.5	ECR Printer, several options
	Model-290	42	210/420	80X80	2.3	24	138x71x60	1.5	Slip Printer, several options
	Model512-G	40	240/480	88.5 (3.5)	3.0	24	170x156x94	5	Long Life Print Heads (100 milion Chrs)
	Model-542-G	40	240/480	Min 108X(210)	3.0	24	74x120x144	5	Multiple Options available including Auto Cutter

*Olivetti line ** Epson line

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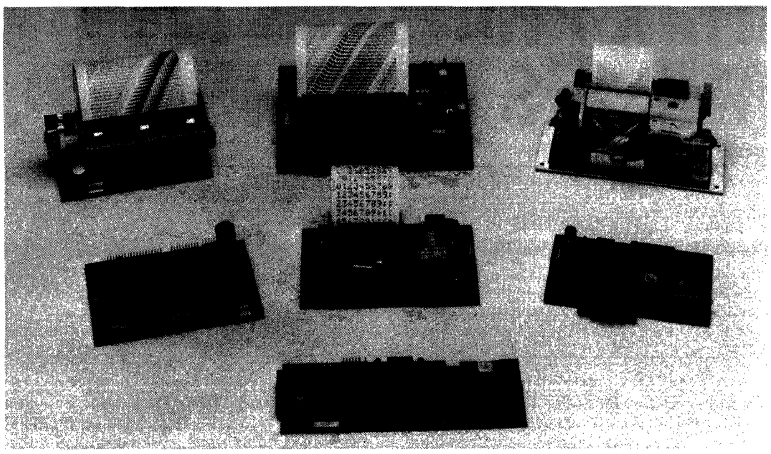
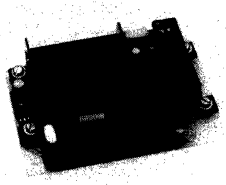
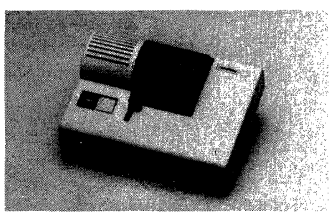
Sunnyvale, CA 94089
408/745-6400
Telex: 350165
Fax: 408-747-0358

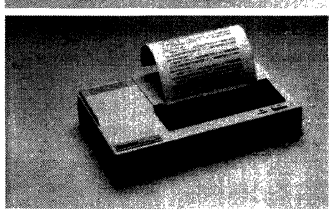


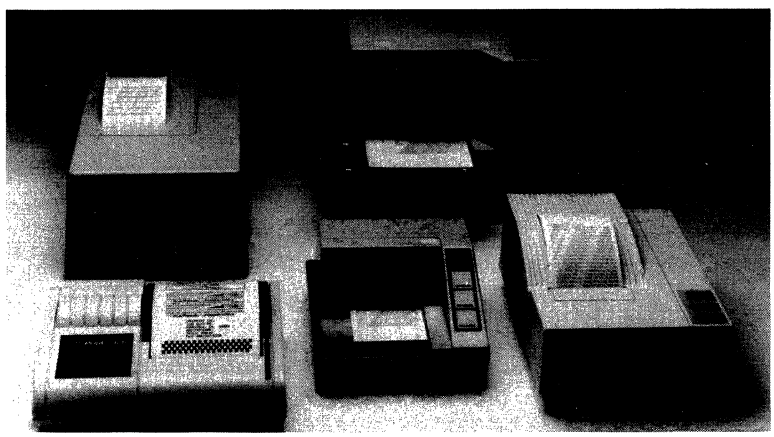


CONTROLLERS

	Model	Column Capacity	Graphics (Dots/Line)	Paper Width, mm(in)	Speed LPS	Voltage(VDC) +/- up to 10%	Overall Dimensions WxDxH(mm)	LSI Model	Interface	Features
Thermal	OPC 1800	20	140	60(2.25)	1.8	12	133x99x37	R1070	Serial/Parallel	Sideways and Upside Down
	OPC 1822	20	140	60(2.25)	1.8	24	152x101.6x38	R1070	Serial/Parallel	Printing, Multiple Character
	OPC 1844	40	280	110(4.3)	3.6	24	188x127x38.10	NA	Serial/Parallel	Sizes, Custom CHR set
	OPC 1451	42	256	112(4.4)	6.0	24	143x102x50	NA	Serial/Parallel	Quiet, Fast, Graphics
	BA-1200	40/80	480	112 mm (4.4)	1.12	5.0	140x34x19	NA	Serial/Parallel	Compact
Impact	OPC 267	35/42	210/420	76(3.0)	2.3	24	Approx. 125x175x20	LSI-267	Serial/Parallel	2 Color Multipart Options: Auto cutter, buffering
	BA-170	150,160,170 Family	ASCII/ Graphics	-	-	4 to 5.25	90x94x16	LA170	Serial/Parallel	Compact, Low Cost,
	BA-180	180 Family	ASCII/ Graphics	-	-	4 to 5.75	88x80x20	LA180	Serial/Parallel	Reliable
	BA-260 II	250 & 260 Family	ASCII/ Graphics	-	-	5 & 12 or 24	120x150x20	LA260	Serial/Parallel	Ready to interface







COMPLETE PRINTERS

	Model	Column Capacity	Graphics (Dots/Line)	Paper Width, mm (in)	Speed LPS	Voltage +/- up to 10%	Overall Dimensions WxDxHx (mm)	MCBF (Mil Chr Line)	Interface	Features
Thermal	OM 20	20	140	60(2.4)	1.8	12 VDC	191x142x79	1	Serial/Parallel	Low cost, desktop models
	OM 40	40	280	110(4.3)	3.6	110 or 220 VAC	267x191x97	1	Serial/Parallel	
	OM426	42	256	112(4.4)	6.0	110 or 220 VAC	241x191x76	3	Serial/Parallel	Quiet, Fast,Reliable
	P40	40	320/640	112(4.4)	1.12	5 VDC	216x128x46	0.5	Serial/Parallel	Battery Operation
Impact	TM-210A	35	158	76(3.0)	2.4	110 or 220 VAC	210x358x144	2	Serial/Parallel	Options: Wall Bracket
	TM-290	42	210	Min. 80(W)x80(H)	2.3	24 VDC	180x191x99	1.5	Serial	Compact, Low Cost A/C Power supply option
	TM-545B	40	240	Min. 100(W)x80(H)	3.0	110 or 220 VAC	282x62x215	4	Serial/Parallel	Heavy Duty, Reliable
	OM267	35/42	210/420	76(3.0)	2.3	110 or 220 VAC	203x254x114	2	Serial/Parallel	Low cost desk top for POS/data logging Options: RS422/423, 2 cash drawer kick, customization

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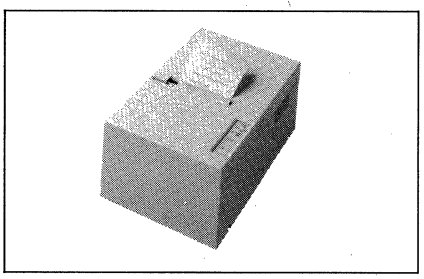
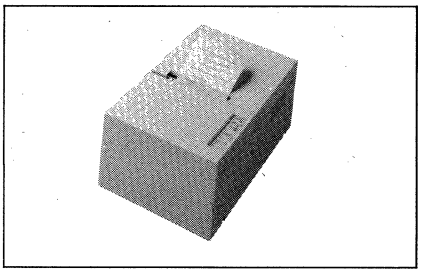
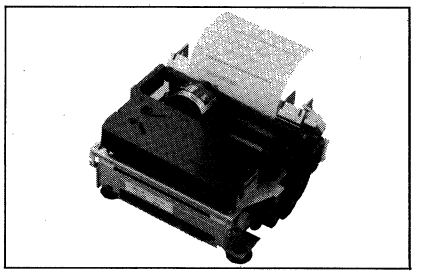
IMPACT DOT MATRIX PRINTERS AND PRINTER MECHANISMS FOR THE OEM.



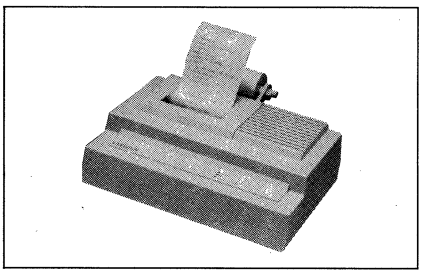
CBM-710 23/28/40 column printer



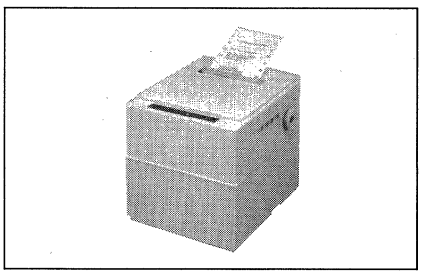
CBM-720 23/28/40 column printer with autocutter



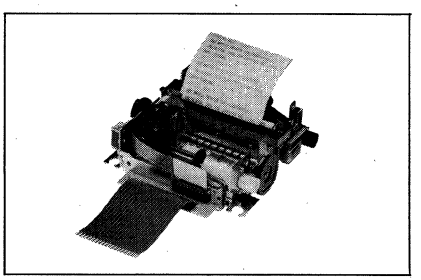
DP-600 Series 23/28/40 column printer mechanisms



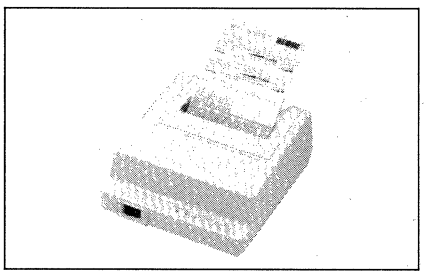
iDP-560 40 column printer with graphics option



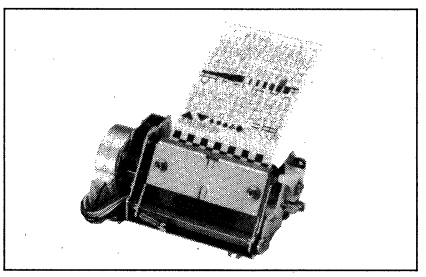
iDP 3530 23/28/40 column sprocket feed printer



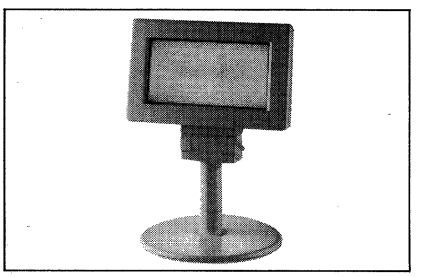
DP-555/575 24/40 column panel mount printer with graphics option



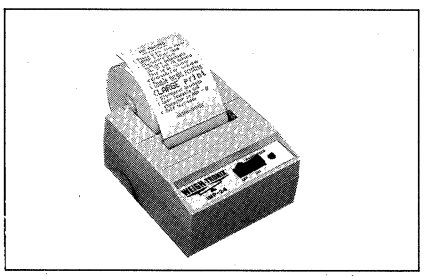
CBM 210 40 column thermal printer



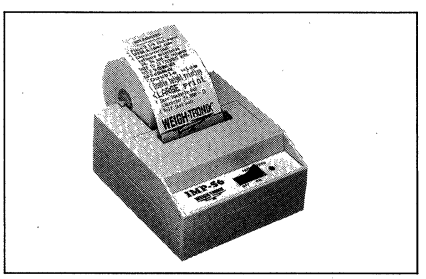
LT-280 thermal printer mechanism



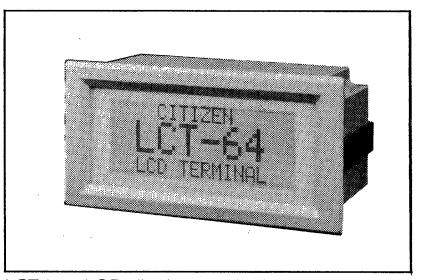
LCT 6000 LCD 80 column display terminal



IMP-24 24/32/40 column printer



IMP-56 24/36/42 column printer



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PAN's vertically integrated manufacturing system is one of the largest, off-shore factories which handles wire and cable fabrication, mold tooling, connector manufacturing and complete cable assembly, all in-house! Our workforce of over 1200 assembly and manufacturing personnel along with our Technical and Support Team of over 200 offer the highest quality products, with reliable service and support. Our worldwide manufacturing and technical support centers in Taiwan, Malaysia, Thailand, Ireland and the U.S. extend our service abilities to the entire world including the U.S.A., Europe and Asia.

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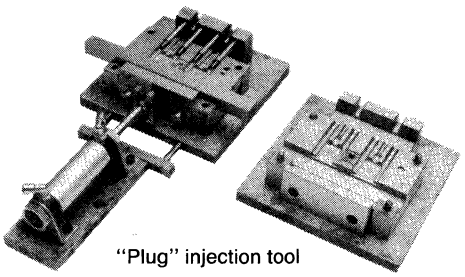
For your custom OEM molded cable applications and requirements, let our Technical Support Team help you develop the exact cable assembly you need. Custom and special connector requirements, strain relief molds to fit your application are available. We specialize in making your product requirement to meet UL, CL2, CSA and FCC specifications and approvals.

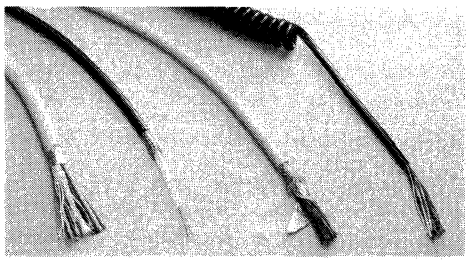


"Plug" injection tool

CABLE FABRICATION

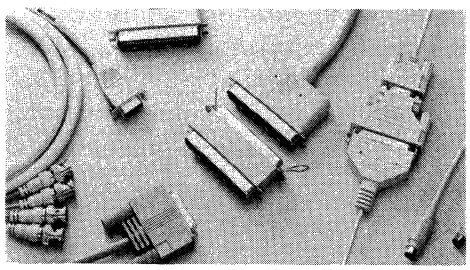
Our in-house integrated manufacturing begins at the wire and cable fabrication. We draw our own wire, custom plate, have braiding and weaving ability, jacket and extrude the insulation.

All to exacting UL and industry standard specifications. Our capabilities include PVC, P-P, PU, Neoprene style wire in standard configurations as well as in custom combinations.



CABLE ASSEMBLY

Computer, commercial, industrial and medical applications for molded cable assemblies using all styles of standard and special connector configurations. Our customer applications include almost every style computer and peripheral connection, including D-subs, DIN, Mini-din, and card edge connectors. Our products are well known for use in the OEM keyboard, mouse, disk drive, modem, video monitor, joystick, SCSI, microphone, LaN and medical sensor markets.



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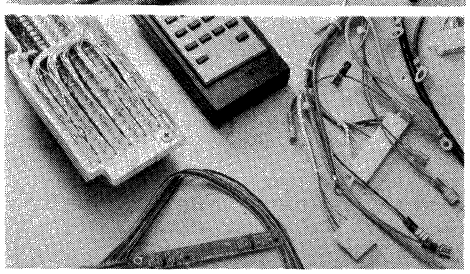
We take pride in our wire harness and custom wiring products used in many applications. Power and control harness assemblies including PCB and other electronic assembly is a major product we supply to your custom prints.



For Further Information, Contact Our U.S. Division:

Pan-International (U.S.A.) Inc.

9477 E. Archibald Ave.,
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OUR FAMILY OF FACTORIES INCLUDE:

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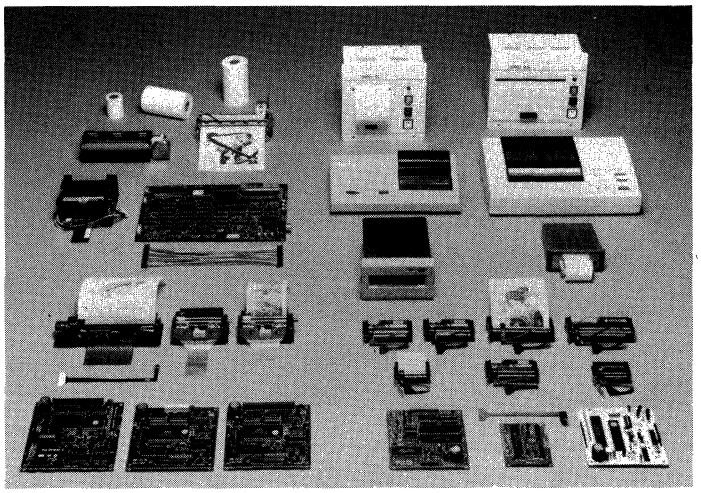
- Uniform Ind. Corp. (Taiwan) - OEM product development and service with facilities for SMT, COB and thru-hole PCB assy.
- Congreat Div. Co. (Taiwan) - Tooling metal parts, plastic injection molded parts and a full range of connectors.

SII

Seiko Instruments



The Sound Of Our Thermal Printer.

MTP SERIES PRINTERS

Item \ Model	MTP102		MTP201		MTP401	MTP201G		MTP401G
	CHARACTER PRINTERS					GRAPHIC PRINTERS		
	13 Col.	16 Col.	20 Col.	24 Col.	40 Col.	128B Dots	166 Dots	280 Dots
Character Size (HxW) (mm)	2.4x1.4	2.4x1.1	2.4x1.5	2.4x1.3	2.4x1.1	2.4x1.6	2.4x1.3	2.4x1.1
Dot Composition/Line	91x7	112x7	140x7	166x7	280x7	128x8	166x8	280x8
Paper Width (mm)	38^{+0}_{-1}		58^{+0}_{-1}		80^{+0}_{-1}	58^{+0}_{-1}		80^{+0}_{-1}
Character Matrix	5x7 Dots					5x7(Character) 8 Dot Graphics		
Printing Direction	Left to Right (Uni-Directional)					Left to Right (Uni-Directional)		
Printing Supply/Voltage (V)	DC 5.0 ± 1					DC 5.0 ± 1		
Printing Speed (Room Temp 5.0V) (Lines/Sec)	Approx. 1.5		Approx. 0.8		Approx. 0.6	Approx. 0.9	Approx. 0.8	Approx. 0.6
Dimensions (WxDxH) (mm)	48x31x13.8		70x34x14.4		91.5x35.5x20	70x34x14.4		91.5x35.5x20
Weight (g)	Approx. 35		Approx. 40		Approx. 50	Approx. 40		Approx. 50
Operating Temperature Range (°C)	0–50°C							

STP SERIES PRINTERS (Stepper Printer)

Item \ Model		STP211		STP411	
		144 Dots	192 Dots	256 Dots	320 Dots
Character Size (HxW) (mm)		2.4x1.5	2.4x1.2	2.4x1.6	2.47x1.88
Paper Width (mm)		58^{+0}_{-1}		112^{+0}_{-1}	
Character Matrix		5x7 Dots		5x7 Dots	7x9 Dots
		8 Dot Graphics		8 Dot Graphics	9 Dot Graphics
Printing Direction	Character	Bi-Directional Logic Seeking			
	Graphics	Uni-Directional Logic Seeking			

Item \ Model		STP211		STP411	
		144 Dots	192 Dots	256 Dots	320 Dots
Printer Supply Voltage (V)		4.0 to 5.5		5 ± 0.5	
Printing Speed (CPS)		46		41	31
Dimensions (WxDxH) (mm)		80x47x27		153x44.5x20	
Weight (g)		Approx. 110		Approx. 135	
Operating Temperature Range (°C)		0–50°C			

LTP SERIES PRINTERS (Line Printer)

Item \ Model	LTP251	LTP451	LTP452
Character Size (HxW) (mm)	2.25x1.75	2.45x1.75	
Dot Composition/Line	192	256	640
Paper Width (mm)	58^{+0}_{-1}	112^{+0}_{-1}	
Printing Width (mm)	48.0	89.6	89.6
Printing Speed (Dot Lines/Min.)	13,000	3,000	12,000

NEW! Ask about our LTP 5000 Series thermal printer mechanisms.

Item \ Model		LTP251	LTP451	LTP452
Dimensions (WxDxH) (mm)		86.8x90x39.5	156x56x31	135.4x84.6x42.5
Weight (g)		Approx. 200	Approx. 350	Approx. 480
Paper Out Detection		Photo Interrupter		
Operating Voltage Range V DC	Logic	5 ± 0.5	5 ± 0.5	5 ± 0.5
	Thermal Head	19.1–20.9	24 ± 2	12.0–13.2

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Punched Card Readers

Serial... Serial/Parallel...

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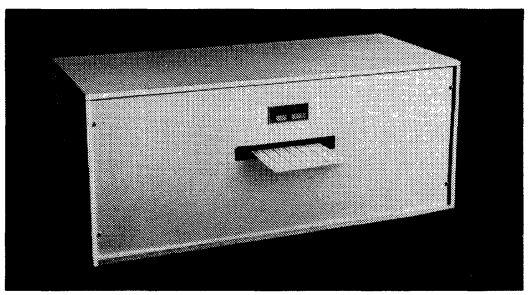
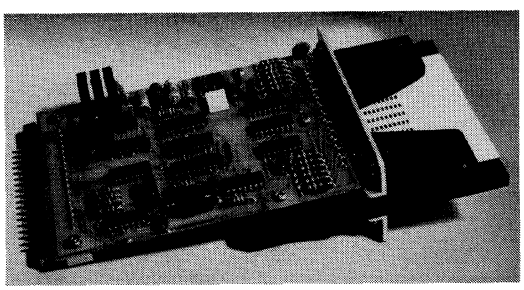
A complete line of readers for OEM, system and industrial applications



Serial Readers—Micro Processor Controlled

RS 232 or Current Loop
Easily Field Modified—with socketed proms
Flexible Application—card handling modes and read out rates in BAUD are jumper selectable
Self Contained—cabinet or rack models
Thorough Documentation

Designed for industrial environments, these devices are very rugged and usable in conditions that are not suitable for ordinary card readers. They are ideal for a multitude of uses including OEM and systems applications in warehousing, data handling, industrial and process control, and manufacturing. They are microprocessor controlled so operation and read out are flexible. Field reconfiguration is simple and inexpensive.

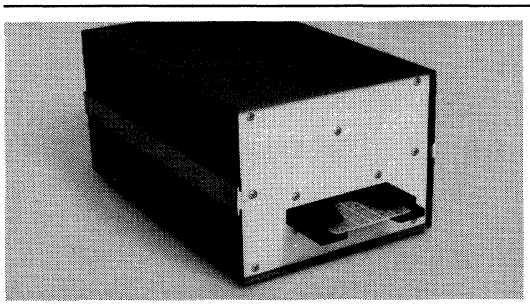


Badge/Card Readers... Series H

Read cards/badges of up to 12 rows and 10 to 68 columns. Optical reading with no moving parts, error-free readout, long life, minimum maintenance. Completely self-contained. To operate, insert badge or card fully and withdraw. Readout is character (column) serial, bit (row) parallel.

Can easily replace less satisfactory readers in existing installations. Designed for OEM and system applications. Custom-feature models can be supplied.

The 10-column Model H-10 is pictured. For complete details on our complete badge/card reader line, request Series H Catalog. Patent No. 4,132,352

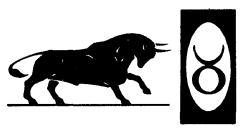


Series H Readers with RS232C or 20ma Loop Interface

Series HT are complete, self-contained manual Card or Badge Reader terminals designed for industrial applications in factory data collection systems, warehousing assembly floors, and the like.

Completely and thoroughly documented, they are particularly well suited for system developers who require an inexpensive, flexible terminal for low to moderate usage, or where a manual terminal is suitable. Because the terminals are micro-processor based, their application is extremely flexible, and modifications to meet particular system requirements are simple and straightforward.

Taurus Readers .... now manufactured, sold, and serviced by Signal Research Inc.



SIGNAL RESEARCH INC.
P.O. Box 357 • River Rd.
Titusville, N.J. 08560
(609) 737-1917

MINIGLOSSARY
BASIC
EBCDIC CODE

Bit Positions 4, 5, 6, 7	Second Hexadecimal Digit	Digit Punches	00				01				10				11				
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 0, 1
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 2, 3
			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	First Hexadecimal Digit
			12				12	12		12	12	12		12	12				Zone Punches
				11				11	11	11		11	11	11		11			
					0		0		0	0	0		0	0			0		
			9	9	9	9	9	9	9	9									Digit Punches
			①	②	③	④	⑤	⑥	⑦	⑧					⑨	⑩	⑪	⑫	
0000	0	8-1	NUL	DLE	DS		SP	&	-									0	8-1
0001	1	1	SOH	DC1	SOS				⑬		a	j			A	J	⑭	1	1
0010	2	2	STX	DC2	FS	SYN					b	k	s		B	K	S	2	2
0011	3	3	ETX	TM							c	l	t		C	L	T	3	3
0100	4	4	PF	RES	BYP	PN					d	m	u		D	M	U	4	4
0101	5	5	HT	NL	LF	RS					e	n	v		E	N	V	5	5
0110	6	6	LC	BS	ETB	UC					f	o	w		F	O	W	6	6
0111	7	7	DEL	IL	ESC	EOT					g	p	x		G	P	X	7	7
1000	8	8		CAN							h	q	y		H	Q	Y	8	8
1001	9	8-1		EM							;	r	z	`	I	R	Z	9	9
1010	A	8-2	SMM	CC	SM		¢	!	⑮	:									8-2
1011	B	8-3	VT	CU1	CU2	CU3	.	$	,	#									8-3
1100	C	8-4	FF	IFS		DC4	<	*	%	@									8-4
1101	D	8-5	CR	IGS	ENQ	NAK	(	)	_	'									8-5
1110	E	8-6	SO	IRS	ACK		+	;	>	=									8-6
1111	F	8-7	SI	IUS	BEL	SUB	I	¬	?	"									8-7
			12				12				12	12		12	12	12		12	Zone Punches
				11				11				11	11	11		11	11	11	
					0				0		0		0	0	0		0	0	
			9	9	9	9									9	9	9	9	

Card Hole Patterns

①	12-0-9-8-1	⑤	No-Punches	⑨	12-0	⑬	0-1
②	12-11-9-8-1	⑥	12	⑩	11-0	⑭	11-0-9-1
③	11-0-9-8-1	⑦	11	⑪	0-8-2	⑮	12-11
④	12-11-0-9-8-1	⑧	12-11-0	⑫	0		

Control Character Representations

ACK	Acknowledge	EOT	End of Transmission	PF	Punch Off
BEL	Bell	ESC	Escape	PN	Punch On
BS	Backspace	ETB	End of Transmission Block	RES	Restore
BYP	Bypass	ETX	End of Text	RS	Reader Stop
CAN	Cancel	FF	Form Feed	SI	Shift In
CC	Cursar Control	FS	Field Separator	SM	Set Mode
CR	Carriage Return	HT	Horizontal Tab	SMM	Start of Manual Message
CU1	Customer Use 1	IFS	Interchange File Separator	SO	Shift Out
CU2	Customer Use 2	IGS	Interchange Group Separator	SOH	Start of Heading
CU3	Customer Use 3	IL	Idle	SOS	Start of Significance
DC1	Device Control 1	IRS	Interchange Record Separator	SP	Space
DC2	Device Control 2	IUS	Interchange Unit Separator	STX	Start of Text
DC4	Device Control 4	LC	Lower Case	SUB	Substitute
DEL	Delete	LF	Line Feed	SYN	Synchronous Idle
DLE	Data Link Escape	NAK	Negative Acknowledge	TM	Tape Mark
DS	Digit Select	NL	New Line	UC	Upper Case
EM	End of Medium	NUL	Null	VT	Vertical Tab
ENQ	Enquiry				

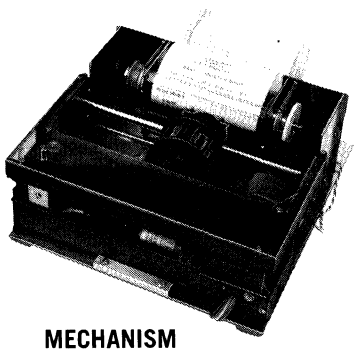
Special Graphic Characters

¢	Cent Sign
.	Period, Decimal Point
<	Less-than Sign
(	Left Parenthesis
+	Plus Sign
|	Logical OR
&	Ampersand
!	Exclamation Point
$	Dollar Sign
*	Asterisk
)	Right Parenthesis
;	Semicolon
¬	Logical NOT
-	Minus Sign, Hyphen
/	Slash
,	Comma
%	Percent
_	Underscore
>	Greater-than Sign
?	Question Mark
:	Colon
#	Number Sign
@	At Sign
'	Prime, Apostrophe
=	Equal Sign
"	Quotation Mark

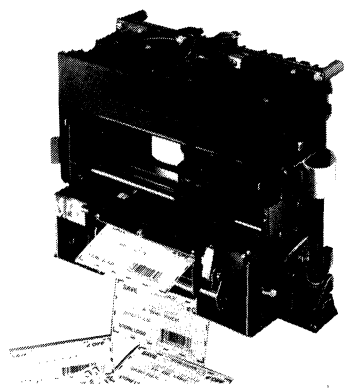
INK-JET AND IMPACT PRINTERS, MECHANISMS AND CONTROLLERS, FOR THE O.E.M

Singer Data Products, Inc., a 100% U.S. Manufacturer, designs & manufactures Printers, Print-Heads, Mechanisms & Controllers for the O.E.M. while specializing in design, development, & manufacture of custom Print-Heads & Printers to customer specifications.

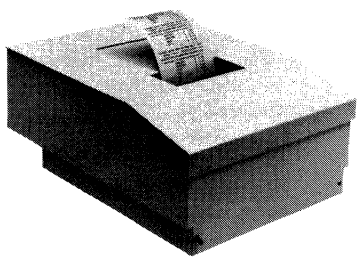
SERIES 240-IMPACT PRINTERS



MECHANISM

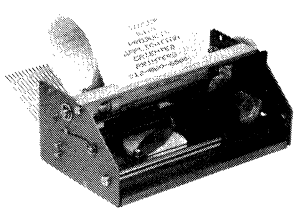


TICKET PRINTER

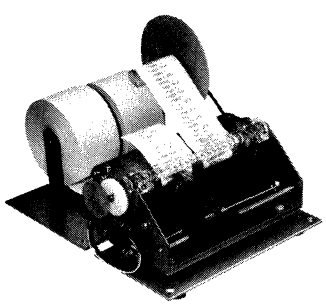


STAND ALONE

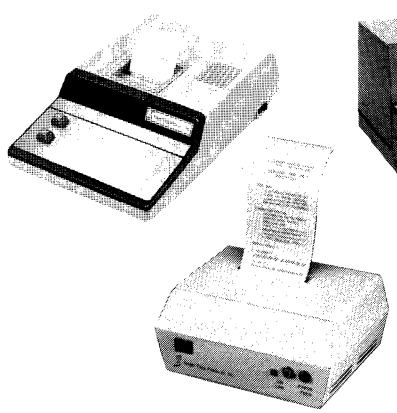
SERIES 340-INK-JET PRINTERS



MECHANISM



SPLIT-PLATEN



STAND ALONE

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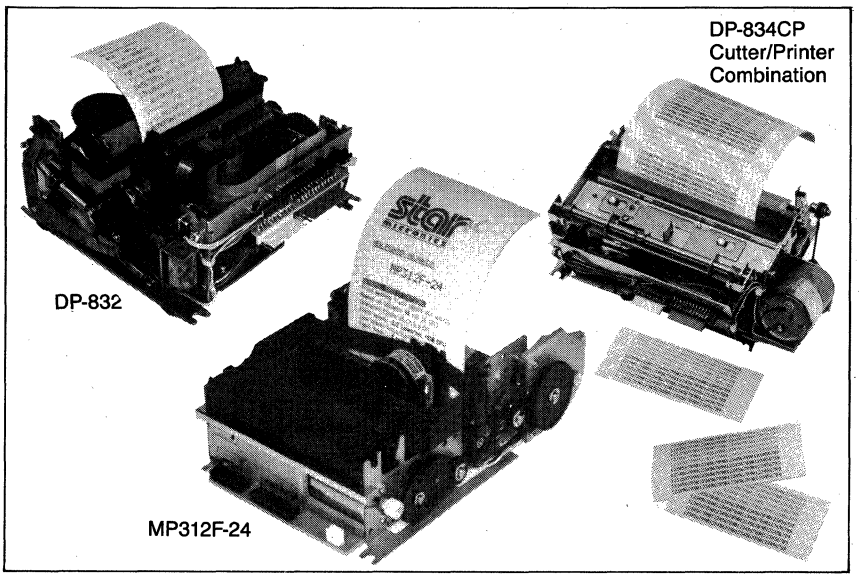
star® COMPLETE LINE OF IMPACT PRINTER MECHANISMS

21, 22 & 40 COLUMNS, IMPACT DOT-MATRIX



Star printer mechanisms are all guaranteed for 100% reliability. They're compact, easy to install and inexpensive to maintain.

The MP300 Series mechanisms offer quiet operation at 3.2 lines/sec. The simple stepping motor paper drive offers full graphics capability, and reliability is in excess of 5 million lines.

822-20 column dot matrix printer mechanism has a 7 wire head that enables it to print 2½ lines every second. It prints on standard 2½" adding machine tapes and provides unusually strong printing impact.

824-40 column dot matrix printer mechanism has a 5 x 7 standard matrix array. It prints 60 cps and can provide a variety of printouts. These include standard 4½" adding machine tapes and double stock carbonless tapes. For fanfold and labels, all that's needed is an optional tractor feed.

832-22 column dot matrix printer mechanism has a 9 wire head to produce characters with true descenders. Its two color bidirectional printing make it ideal for applications requiring print speeds of 3 LPS.

834-40 column dot matrix printer has 5 x 9 or 9 x 9 dot array. It prints on carbonless two copy (1 original plus 1 copy) paper as well as 4½" stock. Models with sprocket feed are also available.

Plus, there's a selection of replacement print heads, control boards, ribbon and paper supplies available. All with the Star name on them and behind them.

SPECIFICATIONS

MP312F-24	
Supply Voltage	24V
Print Method	Serial impact dot matrix
Print Direction	Bi-directional
Character Font	7 x 9 (Half Dot)
Number of Columns	40columns (7 x 9 Font 15CPI)
Dot Pitch	0.33(H) x 0.35(V)mm
Line Spacing	1/6, 1/8, 1/12, n/72, n/144 inch
Character Size	1.29(W) x 2.42(H)mm (15CPI)
Printing Speed	Approx. 3.2 lines/sec (40columns, 15CPI)
Paper Feed Speed	3 inches/sec
Paper: Material	Normal or carbonless paper
Width	(Roll) 3.25, 3.0, 2.25 inches
Diameter	89mm MAX
Thickness	(0.07 ~ 0.10mm (single copy)
Copies	Original + two copies (MAX 0.2mm)
Reliability MCBF	5 million lines (except printhead)
Print Head	100 million characters
Operating Temperature	0°C ~ 50°C
Ink Ribbon	Cassette-Black or Purple
Dimensions	140(D) x 186(W) x 70.5(H)mm
Weight	Approx. 760g (except cassette)

APPLICATIONS

- DP-834 available in a graphics model
- Medical and scientific instruments
- Industrial measurement, process and control systems
- Mini-microcomputers: business professional and hobby
- Point-of-sale (POS) terminals
- Security monitoring systems
- Emergency vehicle data receivers
- Fast-food kitchen printers
- Telecommunications equipment...and many more!

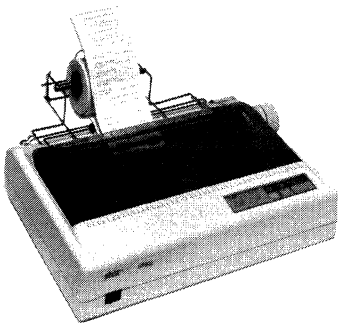
SPECIFICATIONS

	DP-822	DP-824	DP-832	DP-834
Number of characters/ line of print	21 columns standard	40 columns standard at 12 cpi 34 columns standard at 10 cpi	22 (12 cpi)	40 (12 cpi)
Standard matrix array	5 dots wide by 7 dots high	5 dots wide by 7 dots high 7 x 7 and 9 x 7 available with special software	5 x 9	5 x 9
Character height	Up to .114" (2.9mm)	Up to .114" (2.9mm)	1.71mm (Horiz.) x 2.42mm (Vert.)	1.71mm (Horiz.) x 2.42mm (Vert.)
Direction of printing	Left to right	Left to right	Bidirectional	Bidirectional
Speed of printing	2.5 lines/sec. @ 12 VDC	Approximately 1.0 line/sec. @ rated voltage	3 lines/sec.	2 lines/sec.
Printing area	1.77" (45mm) @ 21 col.	3.3" (84.4mm) @ 40 col.	46.16mm @ 22 col.	84.26mm @ 40 col.
Paper advance/line of print	1/6" (4.24mm)	1/6" (4.24mm)		
Paper slew speed	Up to 10 lps during continuous paper advance	Up to 10 lps during continuous paper advance	Up to 12 lps during continuous paper advance	Up to 12 lps during continuous paper advance
Dimensions	Width: 4.173" (106mm) Length: 5.710" (145mm) Height: 2.067" (52.5mm)	Width: 6.221" (158mm) Length: 5.787" (147mm) Height: 2.244" (57mm)	Width: 5.334" (135.5mm) Length: 5.433" (138mm) Height: 2.322" (59mm)	Width: 7.17" (182mm) Length: 5.43" (138mm) Height: 2.32" (59mm)
Weight	1.25 lbs. (570 grams)	1.8 lbs. (820 grams)	1.4 lbs. (680 grams)	1.74 lbs. (790 grams)
Operating temperature	5°C to 45°C (Note: Temperature and relative humidity affect ribbon ink viscosity)	Operating: 5°C to 45°C 80% Storage: −20°C to +75°C 90% (Note: Parameters affect ribbon ink viscosity)	+5°C to +45°C	+5°C to +45°C

star micronics
OEM DIVISION
70-D ETHEL ROAD WEST, PISCATAWAY, N.J. 08854 (908) 572-9512 FAX: (908) 572-5095

COMBINATION REPORT/RECEIPT PRINTER

COST EFFECTIVE ANSWER FOR PC-POS APPLICATIONS



The SP600 printer is the ideal choice for the single printer PC-POS application. It includes complete receipt printing capabilities, but also provides the end of day report capacity. A dual cash drawer driver allows the use of low cost solenoid only cash drawers, thus reducing overall system cost. Roll paper widths are available to allow minimum media cost. Paper width of 2.25 inches, allowing up to 35 columns, and 4.5 inches, allowing up to 66 columns may be used. Three paper widths are available with 40 column operation, and will assure compatibility with software already available for the other Star receipt printers.

FEATURES

- Roll paper handler for friction fed 2.25, 3.0, 3.25, 4.5 inch paper
- Fan folded report width from 4 to 10 inches wide
- Roll mode emulates Star receipt printers
- Report paper parking feature allows easy loading of report paper
- Dual cash drawer driver reduces system cost
- Command set designed for POS applications
- Centronics™ parallel interface

PRINT COLUMNS

		FORMS	ROLL			
Paper Width		10″	4.5″	3.25″	3.0″	2.25″
Pica (10CPI)		80*	33	25	25	17
Elite (12CPI)		96	40*	30	30	21
Condensed Pica	(16CPI)	—	53	40*	40*	28*
	(17CPI)	137	—	—	—	—
Cond. Elite (20CPI)		160	66	50	50	35

*Default condition

SPECIFICATIONS

Printing System	Serial Dot Matrix Impact
Printing Direction	Bi-directional
Number of Pins	9
Print Speed	144 CPS (Elite draft)
Line Spacing	1/6, 1/8, 1/12, n/72
Paper Feed Method	Friction and Sprocket
Paper Feed Speed	2.7 Inches/Second
Interface	Centronics™ parallel
Data Buffer	4 Kilobytes
Cash Drawer Drivers	2
Paper Out Detector	Forms mode only
Dimensions	380mm W. x 375mm D. x 155mm H. including roll paper handler

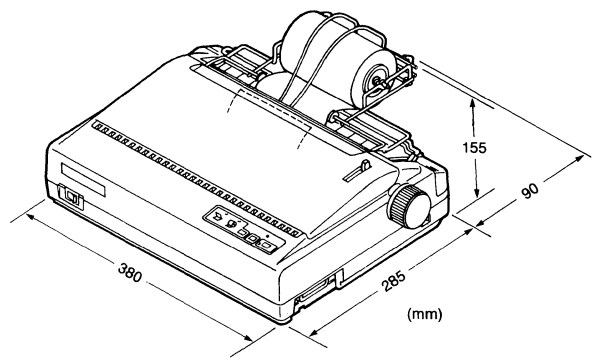
POWER

Line Voltage	120VAC +/– 10%
Line Frequency	60 Hz
Power Consumption	Typ. 30 W., MAX 60 W.

ENVIRONMENTAL

Operating Temperature	5° to 40°C.
Operating Humidity	10% to 80% R.H. (No Condensation)
Storage Temperature	– 30° to 65°C.
Storage Humidity	10% to 95% R.H. (No Condensation)

DIMENSIONS (mm)



USER NOTES

The printer operates in two modes selectable from the front panel. The modes are Roll Mode and Forms Mode.

ROLL MODE:
This mode is intended for operation with cash register roll type paper, and is normally used for printing receipts. The roll paper width is DIP Switch selectable. The printer command set is a super set of the commands used in the Star Micronics receipt printers. This will provide compatibility with existing software.

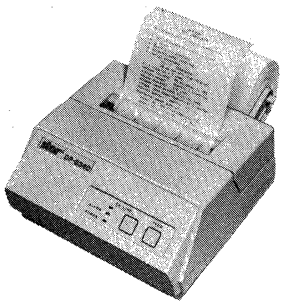
FORMS MODE:
In the forms mode, the printer is usually operated with standard 8½ x 11 fan folded paper, and can be used for the End of Day report printing. The printer command set will be compatible with any software designed to operate with the Star command set used in the 80/136 column printers. Using the Condensed Elite mode, the printer can produce as many as 160 columns.

CASH DRAWER DRIVERS
A dual cash drawer is provided, that will allow the use of simple "solenoid only" cash drawers. This will save the cost of the electronics required to connect the cash drawer directly to the computer communication, or printer port. As the printer and cash drawer both operate from the same parallel port, it will often free up ports for other peripherals such as bar code scanners, and other communications devices.

OEM DIVISION
70-D ETHEL ROAD WEST, PISCATAWAY, N.J. 08854 (908) 572-9512 FAX: (908) 572-5095

FULLY PACKAGED DOT MATRIX PRINTER

DP-8340 SERIES



DP-8340 FM / **DP-8340 SM** — 40 columns
Accommodates 4.5″ paper
Single peripheral cash drawer driver
RS232 multiple handshake
Sprocket (SM) or friction (FM) feed

DP-8340 FC / **DP-8340 SC** — 40 columns
Accommodates 4.5″ paper
Dual cash drawer driver
Parallel Centronics™
Sprocket (SC) or friction (FC) feed

DP-8340 RM / **DP-8340 RC** — 44/29 columns
Accommodates 3.25″ paper
One line validation option available
Available in serial RS232 or
Parallel Centronics™

The DP-8340 is a housed dot matrix printer designed for heavy-duty applications requiring maximum reliability at a competitive price.
The units are packaged as a printer module and separate power supply module so that it will occupy a minimum of counter space.
The included cash drawer driver provides a large reduction in system cost as it allows the use of simple non-intelligent cash drawers.

FEATURES

- Two color printing capability
- Separate power supply and printer modules provide minimum footprint and adaptability to mobile operation
- Features Star Micronics reliability in a small package

SPECIFICATIONS

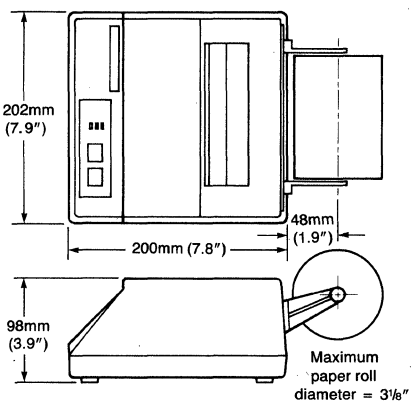
		FM	FC	SM	SC	RM	RC
Printing Method	9 Wires Serial Impact Dot Matrix	*	*	*	*	*	*
Printing Direction	Bi-directional	*	*	*	*	*	*
Printing Speed	2 Lines per Second	*	*	*	*	*	*
Standard Matrix	5 x 9 dots (12 CPI)	*	*	*	*		
	7 x 7 dots (15 CPI), 5 x 7 dots (10 CPI)					*	*
Number of Columns	40 (12 CPI)	*	*	*	*		
	44 (15 CPI), 29 (10 CPI)					*	*
Character Size	1.71mm Horiz. x 2.42mm Vert.	*	*	*	*		
	1.32 x 2.42 @15CPI, 2.00 x 2.42 @10CPI					*	*
Character Spacing	2.12mm @12CPI	*	*	*	*		
	1.70mm, @15CPI, 2.55mm @10CPI					*	*
Line Spacing	4.23mm 1/6inch	*	*	*	*	*	*
Paper Feed Speed	12 Lines per Second	*	*	*	*	*	*
Printing Area	84.3mm @12CPI	*	*	*	*		
	74.46mm @15CPI, 73.03mm @10CPI					*	*
Paper Grade	Standard or Carbonless	*	*	*	*	*	*
Width	114.3 +0.5 −1.0mm (4.5 inches)	*	*	*	*		
	82.55 +/− 0.5mm (3.25 inches)					*	*
Roll	80mm diameter maximum	*	*	*	*	*	*
Copy	Original + 1 Carbonless 0.13mm Max	*	*	*	*	*	*
Ribbon Color	Black/Red, Black, Purple	*	*	*	*	*	*
Type	35mm diameter spool, 13mm width	*	*	*	*	*	*
Peripheral Driver	Two (1A, 12V)		*		*		*
	One (1A, 12V)	*		*		*	
Power w/Power Supply	120V AC +/− 10V	*	*	*	*	*	*
Req. w/o Pwr. Supply	12V DC +10%/− 5%	*	*	*	*	*	*
Operating Temperature	+5C to +40C	*	*	*	*	*	*
Reliability	5 million lines MCBF	*	*	*	*	*	*

Six Models Available to Match Your Application Requirements

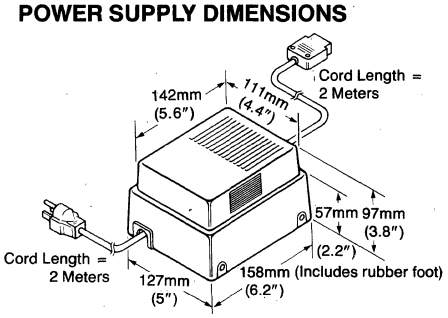
	DP8340FM*	DP8340FC*	DP8340SM*	DP8340SC*	DP8340RM*	DP8340RC*
INTERFACE	Serial	Parallel	Serial	Parallel	Serial	Parallel
PAPER	4.5″ Roll	4.5″ Roll	4.5″ Sprocket	4.5″ Sprocket	3.25″ Roll	3.25″ Roll

* add (− 120) to part number to indicate power supply included

PRINTER DIMENSIONS



POWER SUPPLY DIMENSIONS



INTERFACE

* SERIAL RS-232C: Support a full duplex interface providing complete status information and error checking capability to the driving device. The RS-232C interface provides a 1.5K byte buffer and will allow operation without handshake at low baud rates. Supports Xon/Xoff handshake protocol and DTR level type busy.
* CENTRONICS PARALLEL: Centronics (TM) parallel interface providing data transfer rates of 1000-6000 characters per second.

PAPER

* 4.5″ ROLL: (MODEL FM/FC) Standard ECR type roll paper (up to Original + 1 carbonless copy)
* 3.25″ ROLL: (MODEL RM/RC) Standard ECR type roll paper (up to Original + 1 carbonless copy)
* 4.5″ SPROCKET: (MODEL SM/SC) Fanfold or roll (up to Original + 1 carbonless copy)

CASH DRAWER/PERIPHERAL DRIVERS

All serial interface models have one peripheral drive circuit capable of driving a 12V device with up to 1 Amp. All parallel interface models have two peripheral drive circuits capable of driving a 12V device up to 1 Amp.

OEM DIVISION
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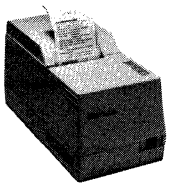
HIGH PERFORMANCE DOT MATRIX PRINTER

SP 300



- **RECEIPT**
- **KITCHEN**
- **REMOTE**

FEATURES

- 3.2 lines per second
- Adjustable paper path
- Dual cash drawer driver
- Flexible graphics capability
- Rewind and cutter option available

SPECIFICATIONS

Printing System	Dot Matrix Impact
Printing Direction	Bi-Directional
Number of Pins	9
Number of Columns	40 (3.0 & 3.25 inch rolls) 28 (2.5 inch rolls)
Character Pitch	15.4, 12.8, 8.5 (CPI)
Print Speed	3.2 LPS (150 CPS)
Line Spacing	1/6", 1/8"
Paper Feed Method	Friction (Stepping Motor)
Paper Feed Speed	3 Inches / Second
Paper Rolls	3.25, 3.0, 2.5 inches wide
Ink Ribbon Type Color	 Cartridge Purple (Standard) 6 million characters Black (Optional) 1.6 million characters
Copies	One original plus 2 copies
Data Buffer	4 KB With Backup
Cash Drawer Drivers	Two, with compulsion support
Paper Out Detector	Standard
Dimensions	6.6"W x 13"D x 6.7"H
Environmental Temperature, Operating Temperature, Storage Humidity, Operating Humidity, Storage	 0 to + 50 Degrees C – 20 to + 70 Degrees C 10% to 95% W/O Condensation 5% to 95% W/O Condensation

INTERFACE

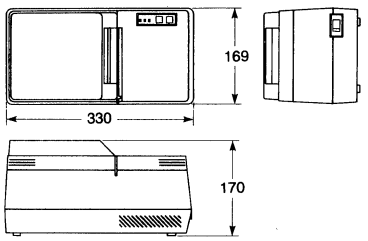
Serial	
Baud Rates	150, 300, 600, 1200, 2400, 4800, 9600
Interface Standards	EIA RS232, (Standard). EIA RS422, (Optional). 20 mA Current Loop, (Optional). Other standards possible via customer installable sub board.
Addressability (With RS422 option)	14 Address Selectable by DIP Switches
Connector	DB 25S on rear of printer
Parallel	
Interface Standards	Centronics parallel (TM)
Connector	Mini-Ribbon 36 Pin Female

PART NUMBERS

SP312FD-120	Serial interface, 120 VAC
SP312FC-120	Parallel interface, 120VAC

The SP300 is a printer designed especially for PC-POS and restaurant systems. It offers very high performance in respect to printing speed and reliability at a very competitive price. The stepping motor paper drive system has several advantages including quiet operation and adjustable line feed increment. This along with the cassette ribbon provides a very simple printer mechanism. The dual cash drawer drivers will support up to two cash drawers. A single line validate function is included.

DIMENSIONS (mm)



USER NOTES

The SP300 is a high performance printer designed for receipt, and remote/kitchen printer applications. Features include:

HIGH PERFORMANCE/PRICE RATIO: Speed of 3.2 lines per second (150 CPS), and features equivalent to printers selling for much higher prices, without any sacrifice of reliability.

STEPPING MOTOR PAPER FEED: Provides rapid, flexible, quiet, simple, and reliable paper transport.

DUAL CASH DRAWER DRIVER: Supports the use of up to two "solenoid only" cash drawers, providing considerable systems cost savings.

SERIAL OR PARALLEL INTERFACE: Models with serial, and parallel interfaces are available to meet system requirements.

ADDRESSABILITY: Fourteen printer multidrop addressability available with the RS422 option. This will save on printer cabling costs, and serial port requirements.

CASSETTE RIBBON: Clean hands, cassette ribbon loading, good for 6 million characters (Purple ink).

NARROW FOOTPRINT: Printer width of 6.6 inches is small enough to fit next to the CRT in a POS system.

TEMPERATURE RANGE: High upper temperature limit of 50 degrees C, is ideal for kitchen applications.

COMPATIBILITY: The command set is compatible with other Star Micronics receipt printers such as DP8340 and SP600.

ADJUSTABLE PAPER WIDTH: The printer can print 40 columns on 3.25 or 3.0 inch paper, and can print 28 columns on 2.5 inch paper.

DATA BUFFER: Standard buffer is 4K bytes with backup to eliminate problems with short power interruptions.

OPTIONS

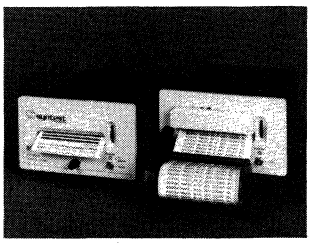
RS422, AND CURRENT LOOP: Customer installable RS422, and Current Loop interface modules are available.

PAPER REWIND OPTION: Customer installable rewinder, along with an autographic table allows use as a journal printer.

AUTOMATIC PAPER CUTTER OPTION: An autocutter option is available for applications where the tear bar is not sufficient.

OEM DIVISION
70-D ETHEL ROAD WEST, PISCATAWAY, N.J. 08854 (908) 572-9512 FAX: (908) 572-5095

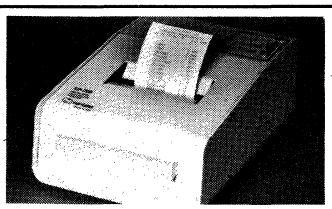
syntest CORPORATION



SP-201/401
Panel Mount Thermal Printers

The SP-201 and SP-401 thermal panel-mount printers are "smart," low-cost solutions to difficult applications, including factory floor, outdoors, and vehicular. Optional non-volatile RAM can store alarms, messages, account numbers, etc. EPROM is programmable to specify functions like font changes or to number crunch input data. Advanced electronic design provides built-in protection for mobile use. With options, the SP-201/401 can both provide reliable hardcopy and can ensure graphic validation of critical manufacturing or other industrial processes. **Available in impact as well.**

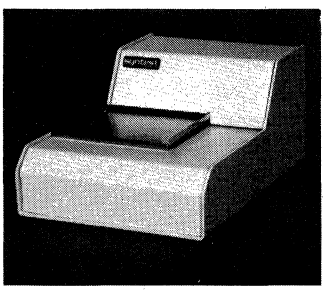
SPECIFICATONS:
- RS-232C, RS-422/485, 20mA interfaces
- Time/date stamp (optional)
- Takeup journal for unattended stations (optional)
- 7K buffer
- Dimensions are 4.5"W x 3.1"H x 5.7"D
- Wide input power...6 to 30VAC/DC
- SP-201
  12 characters/inch 20 columns
  19 characters/second
- SP-401
  16 characters/inch 40 columns
  24 characters/second



SP-700
Two Color Printer

The SP-700 is designed for POS, receipt, and other institutional applications requiring **two-color, cost-effective desktop printing.** It easily interfaces to any existing computer by means of switch-selectable 20mA or RS-232C interfaces at baud rates from 190 to 9600. This 20 (or 40) column 5x7 dot matrix impact printer also provides the standard 103 character ASCII subset and permits data or text mode printing.

SPECIFICATONS:
- 2 color printing
- 60 characters per second
- High MTBF
- RS-232C or 20mA Current Loop interface
- 24 column cutter (optional)
- + 12VDC, 115VAC
- 10.30"L x 7.25"W x 3.90"H



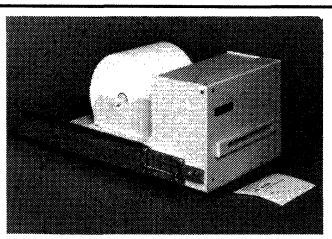
SP-307
42 Column Barcode Scanner/Ticket Printer

The SP-307 is a new industrial grade impact ticket printer with shuttle-style head that prints up to five extremely clear copies (one original, four copies) in a 42 column mode. Housed in a rugged 3/32" aluminum enclosure, this microprocessor-driven unit has a unique combination of compact design, serial or parallel ports and popular options like internal 10-year battery time and date stamp.

The SP-307 can also be configured for bar-code reading. Applications include point of sale, weighing and measurement, inventory and automated manufacturing. The power input is normally 115/230VAC, and 7-22VDC is optional for mobile or battery operation.

SPECIFICATONS:
- Prints at 2.4 lines per second
- Dimensions are 10.08L x 7.00W x 4.5H
- Operating temperature is 0 to 50 degrees Celsius
- Weight is 6lbs DC version, 8lbs AC version

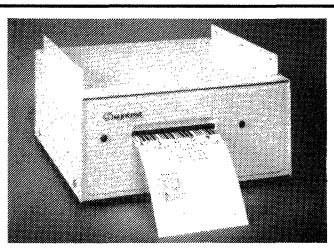
FEATURES:
- Compact design
- Switch selectable baud rates from 50 to 19.2K/second
- Hinged lid for easy mechanism access
- Time/date stamp (optional)
- Inked Ribbon Cartridge
- Date and text modes



SP-318
High Speed Kiosk Thermal Printer

In just under 4 seconds the SYNTEST SP-318 kiosk printer will print and cut a 45 line 80 column 5.5" long slip. It will produce over 2000 of these slips before the paper requires replenishment. This level of performance, well above that of competitive units, translates directly into cost savings by reducing the frequency of routine maintenance calls. This low maintenance, high reliability and high speed printer finds application in kiosk, ATM and other unattended consumer operated systems. Other high-speed thermal units are the SP-315 and SP-324.

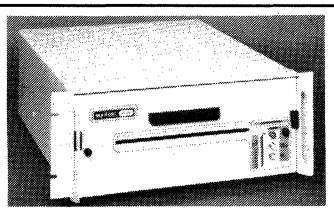
SPECIFICATONS:
- 80 column 8 x 16 dot matrix thermal printing
- 4.5" wide x 1000 ft. paper roll
- Built-in paper cutter
- IBM graphics
- Barcode 39
- Fast 15 lines/sec printing
- Measures 8.75"W x 6.0"H x 12.5"D
- Accepts 115/230 VAC or 24 VDC
- 7K data buffer
- 0-50°C operation
- RS-232C, 20mA, Centronics interfaces



SP-320
12V Mobile Ticket Printer

The SP-320 ticket printer allows reliable dot matrix printing of invoices, pick lists, and other documents while operating from 12V battery power. Utilizing a 9 wire dot matrix printhead the SP-320 provides a 40 column print field and bidirectional printing at a speed of 160 cps on a 4.25" wide by 10" long multi-part form. Ideally suited for use in delivery vehicles the SP-320 features shock and vibration resistant design with operation over a –40°C to +55° temperature range. A 7K internal data buffer is standard. Input interfaces include RS-232C, 20mA, and Centronics parallel.

SPECIFICATONS:
- 40 column 5 x 9 dot matrix printing
- 160 character per second print speed
- Environmentally hardened
- 12 vdc powered
- Accepts 4.25" x 10" multipart forms
- 7K data buffer
- IBM graphics and barcode available
- RS-232C, 20mA, Centronics interfaces
- Measures 10.7"W x 4.9"H x 10.9"D
- Optional Time/Date Stamping



SP-2010A
80 Column Rack Mounted Printer

The Syntest SP-2010A is a ruggedized 80 column impact printer designed for integration into harsh environments. Housed in a heavy aluminum case and featuring a self-cleaning, self-lubricating mechanism, this rackmountable unit can withstand severe temperatures as well as shock and vibration. Standard interfaces to choose from include RS-232C, 20mA Current Loop, and Centronics parallel. RS-422/485 is available as option.

SPECIFICATIONS:
- 168 characters per second
- Max. print rate is 2.1 lines per second
- IBM Hi-Res graphics (optional)
- Operates in 0 to 50 degrees Celsius
- 115/230VAC, 12/24VDC
- Barcode 39 (optional)
- Time/date stamping (optional)
- Non-volatile RAM (optional)
- IBM Proprinter mimic firmware (optional)
- Dimensions are 18.5"L x 16.5"W x 7.00"H

Experienced customizers of printers for tough applications

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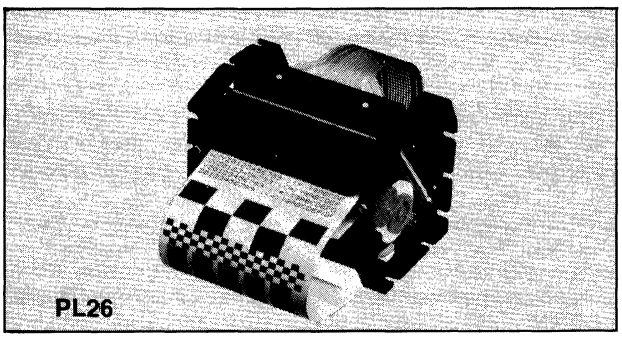
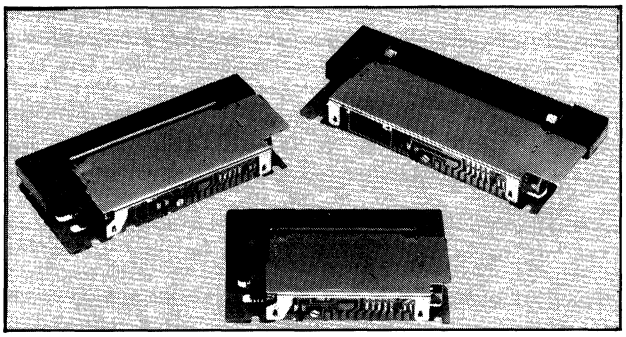
MINI-PRINTERS FOR THE OEM FROM NCR, EPSON®, FUJITSU AND AXIOHM

Telpar is a manufacturer of its own line of thermal printers as well as a distributor of value-added-reseller of mini-printers made by NCR, **EPSON®**, AXIOHM and FUJITSU. Telpar can offer a wide range of features as well as provide custom controllers to meet the needs of the mini-printer marketplace:

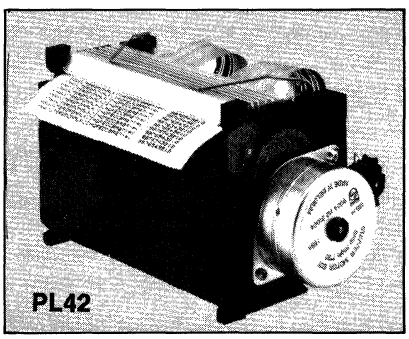
- **MECHANISMS ALONE OR WITH CONTROLLERS**
- **IMPACT OR THERMAL**
- **12 TO 80 COLUMNS**
- **STANDALONE AND RACK MOUNTS**
- **CUSTOM CONTROLLERS**
- **MULTIPLE INTERFACES**
- **GRAPHICS**
- **BAR CODE**
- **REAL TIME CLOCK, KNIFE CUT-OFF OPTIONS**
- **AC OR DC INPUT POWER**
- **PORTABLE, BATTERY POWERED**



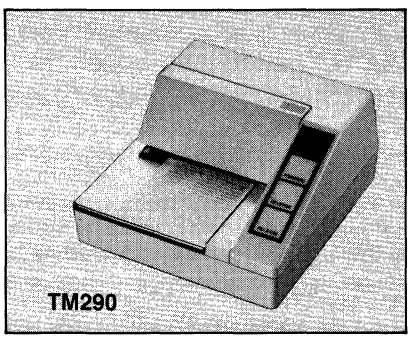
• **Axiohm 26 Column Printer**



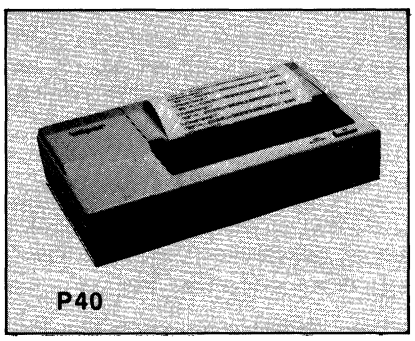
• **EPSON® Mini Impact Mechanisms (Controllers Available)**



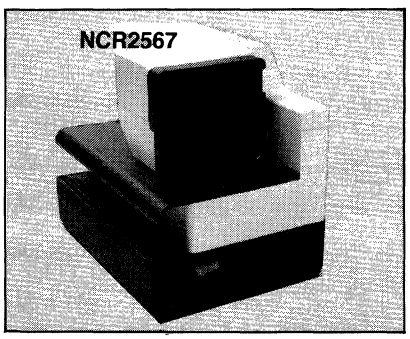
• **Axiohm 42 Column Printer**



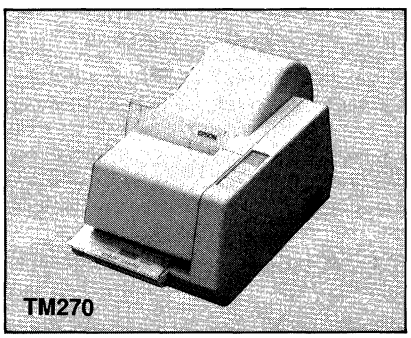
• **EPSON® Slip Printer**



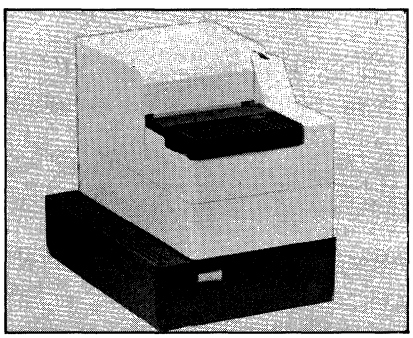
• **Standalone–Desktop and Portable**



• **NCR Slip Printer**



• **Epson Multi-Function Printer (Slip, RJ and Validation)**



• **NCR Receipt Printer**

Telpar is the North American distributor for NCR's line of 40 column point-of-sale printers and cash drawers. Custom designs to meet special customer requirements.

telpar, inc.

For applications assistance or other information contact:
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XICO

MAGNETIC STRIPE CARD PRODUCTS

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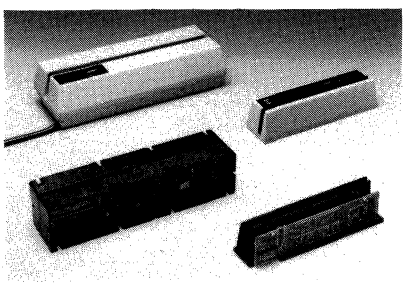
Electronic Features
- Microcomputer accuracy & reliability
- Broad range of speed & acceleration
- Exceeds ANSI/ISO jitter specs
- Digital E/M transient filter
- Reformat to ASCII characters

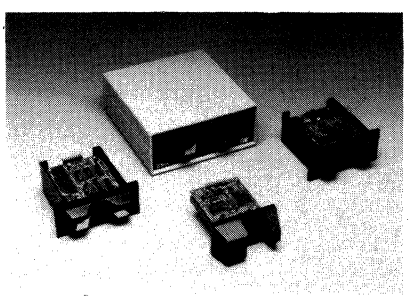
Mechanical Features
- Quality digital card head
- Full gimbal head assembly
- Precision engineering plastic body
- Low card wear, long module life
- Rugged, virtually immune to damage

Output Features
- EIA standard interfaces
- Real-time or buffered
- Serial or 8-bit parallel
- Direct connect to host I/O
- Multidrop addressable



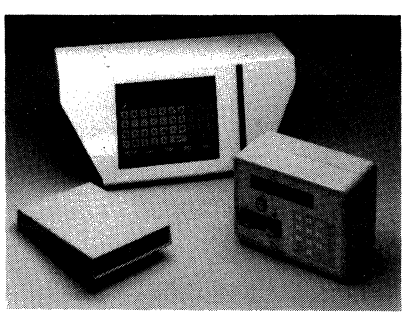
Swipe Readers and Encoders

Hand swipe units for cards, badges, tickets and passbooks, with either high or low coercivity magnetic stripes. Available in all ANSI/ISO track combinations, for both standard and custom encoding densities. Different sizes and configurations to fit any application. Input options include bar code and sense/device circuits. Interface options include Bit & Strobe, TTL-ASCII, RS-232C, RS-422, RS-485, Keyboard Wedge, RS-232 Wedge, and custom. Available as OEM Modules, enclosed Peripherals with power supplied by host, and as intelligent, interactive, self-powered Terminals. Exceptionally rugged and human factors tolerant. Perform reliably for over a million passes. The industry standard for magnetic stripe swipe readers and encoders.



Insert Readers and Encoders

Manual insertion and withdrawal units for cards and badges with single or dual magnetic stripes, either high or low coercivity. Available in all ANSI/ISO track combinations, for both standard and custom encoding densities. Both full-stripe and partial-stripe configurations to fit any application. Removable bezel available in optional color. Input options include bar code and sense/device circuits. Interface options include Bit & Strobe, TTL-ASCII, RS-232C, RS-422, RS-485, Keyboard Wedge, RS-232 Wedge and custom. Available as OEM Modules, enclosed Peripherals with power supplied by host, and as intelligent, interactive, self-powered Terminals. Rugged and reliable for over a million cycles, the industry standard for insert readers, and the only available manual insert encoders.



Reader/Encoder Systems

Stand-alone and special purpose systems combining a magnetic stripe card reader or encoder with keyboard, display and communication electronics in a custom enclosure with power supply. Battery-backed 64K ROM/RAM and custom software for applications such as credit/debit, market promotion, time & attendance, data collection, and machine control. Optional resources include bar code, printer, sense/device circuits and clock/calendar. Standard EIA or custom interfaces.

Communication Controllers

RS-485 multidrop network versions of Xico Readers and Encoders are supported by intelligent Communication Controllers which perform all polling and management of the RS-485 network, with a standard RS-232C or other port for the host.

Designed for OEM, System Integration, and Industrial Applications, including:

CREDIT AND DEBIT CARDS
Point of sale terminals
Credit authorization terminals
Teller terminals

DATA COLLECTION CARDS
Time & attendance systems
Job costing & material control
Hospital information systems

ACCESS CONTROL CARDS
Security gates and doors
Dispensing machines & stations
Computer terminals

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- APTEC/IOC 200; 12.5 Megabytes per second
- HIPPI (High Performance Parallel Interface); 100 or 200 Megabytes per second
- MEMbus; proprietary open bus for custom interface design by you or Zitel

Disk Array - HIPPI ARRAY 32 or ARRAY 64

High Transfer Rate: to 176 Megabytes per second
High Capacity: to 27 Gigabytes in a single RETMA rack

Data Transfer Interface Flexibility:

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Control Interface Flexibility:

- VME or VME64 • HIPPI • RS232 • Ethernet
- High Reliability/Fault Tolerant Features

Custom High Speed Storage - (see Section 4100)

Zitel OEM Products....Top Flight Manufacturing and Engineering, Producing Innovative Solutions for High Performance Data Storage.

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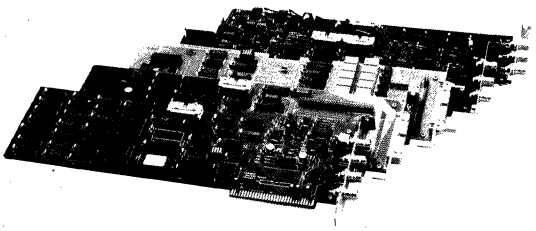
BANCOMM
DIVISION OF DATUM INC.

Bus Level Timing Modules

Bancomm Division specializes in microprocessor based timing products, especially bus level timing modules designed to operate within a user's computer processing system. Relative to conventional rack mount timing products, bus level timing modules save space, simplify system interconnections, and make it possible to fully utilize the speed of bus level data transfers and interrupt driven processing.

PC AT/XT Modules

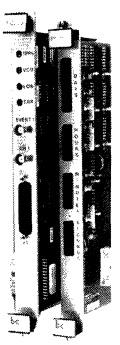
PC03XT Time Code Reader
PC03AT Time Code Processor
PC05XT Time Code Generator
PC09XT SLOCODE Generator
PC11XT Parallel Output Module
RTC-AT Real Time Clock



PC AT/XT Modules

VMEbus Timing Modules

PC03V VMEbus Time Code Processor
PC05V VMEbus Time Code Generator
PC26V Time Display



VMEbus Modules

DEC® Buses

PC03Q Qbus® Time Code Processor
PC03U Unibus Time Code Processor

Macintosh Bus

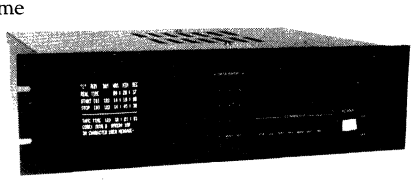
PC03MAC Time Code Processor

Multibus

PC03SBX Time Code Reader Interface

Timing Instruments

Bancomm manufactures a variety of rack mount timing instruments that utilize bus level modules packaged in a dedicated chassis. The **M80T Controller** performs a wide variety of time code translation, generation, and tape recorder control functions using plug-in STD bus modules. It has space for five optional modules and features a front panel CRT alphanumeric display for programming and data display. The **M80XT Controller** is similar; however it uses PC XT bus modules, can accept 12 optional modules, and features a front panel vacuum florescent display. The **M80T Sequencer** is a special configuration of the **M80T Controller** which maintains a countdown clock and initiates 16 external test events with millisecond resolution. The **M48 Controller** is another special configuration of the **M80T Controller** which generates and decodes time data inserted into and recovered from the M48 data block within AMPEX Corp High Density Digital Tape Recorders (HDDR).



M80T Controller

TYMCOR® Time Base Correctors

The TYMCOR® line of digital time base correction products all serve a common objective - to reduce the effect non-constant tape speed has on data recorded and reproduced by instrumentation recorders. Bancomm has supplied a number of custom time base correctors for linear instrumentation recorders, cassette recorders, and rotary head machines. The keystone of the division's standard product line is the **TYMCOR® 1400 Digital Time Base Corrector**. This unit is compatible with any standard wideband linear instrumentation recorder and offers an order of magnitude improvement in time base error performance.

Model 1400

DEC is a registered tradename of Digital Equipment Corporation *Qbus is a registered tradename of Digital Equipment Corporation*

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MAGNUM OPUS CUSTOM ELECTRONIC ENGINEERING

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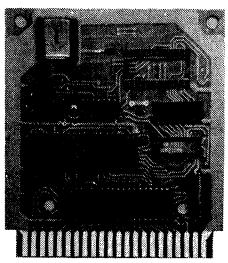
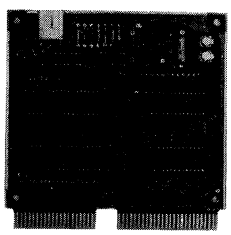
6502LB MICROCOMPUTER



- 6502, 65802 CPU
- Crystal Oscillator
- 1K RAM
- 2K, 4K, 8K ROM, EPROM
- 16 I/O Lines
- Serial Data Port
- Handshake Capability
- Two 16 Bit Timer/Counters
- Size: 4 x 4½ Inches
- Available: NMOS, CMOS; 1 MHz, 2 MHz.

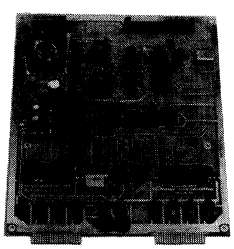
6502LBE MICROCOMPUTER



- 6502, 65802 CPU
- Crystal Oscillator
- 2K, 8K, 16K RAM
- 2K-16K, 64K ROM, EPROM
- 16 I/O Lines
- Serial Data Port
- Handshake Capability
- Two 16 Bit Timer/Counters
- Active Reset Circuit
- Battery Backed RAM and Clock (optional)

Available: NMOS, CMOS; 1, 2, 3, 4 MHz. Expandable • Size: 5.5 x 5.6 Inches.

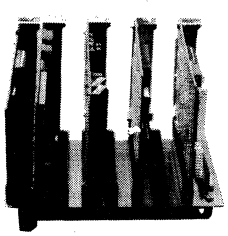
6502GP MICROCOMPUTER



- 6502, 65802 CPU
- Crystal Oscillator
- 1K-3K RAM
- 2K-8K ROM, EPROM
- Serial Port
- Control Signals
- 15 Baud Rates
- 32 Parallel I/O Lines
- Four 16 Bit Timer/Counters
- Two Serial Data Ports
- On Board Power Supply
- Expandable

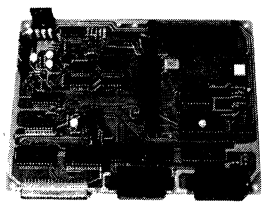
Available: NMOS, CMOS; 1 MHz, 2 MHz.

"XT"™ IBM MODULAR MICROCOMPUTER



- V-20 CPU
- 8087 Coprocessor Socket
- 256K-2 MEG RAM
- 64K BIOS
- Zero Wait State RAM
- 4.77/10 MHz Operation
- Keyboard Port, Speaker Port
- Multilayer PC Board
- Backplane with Power Connectors
- Various Video, Disk and I/O Cards

MOCEE BASIC MICROCOMPUTER-CONTROLLER



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- BCD Floating Point Math
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- 24 I/O Lines • Serial Port
- 8K-32K RAM
- 8K-24K EPROM

Use as Development System, Burn Program into EPROM with On Board EPROM Burner, Then Use As Final System

"BABY MINI"™

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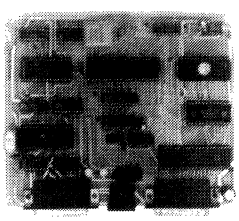
- BCD Floating Point Math
- Serial Port
- 24 I/O Lines
- 8K-32K RAM • 8K-24K EPROM
- Timers • Printer Port
- Auto Reset
- On Board EPROM Burner

PS-1	• 5V 1 Amp μC Power Supply
PS-2B	• Power Supply for Basic μC
DRB-1	• MOCOMM BASIC Communications Software
MB-1	• BASIC Users Manual
OPT-X	• HMOS, CMOS; Battery Backed RAM, Clock

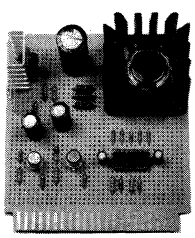
6502KD MICROCOMPUTER



- 6502, 65802 CPU
- 2K-8K RAM
- 2K-16K EPROM
- 16 I/O Lines
- Two 16 Bit Timer/Counters
- 20 Key Keyboard Port
- 6 Digit Seven Segment LED Display Port
- Serial Port
- Control Signals
- 15 BAUD Rates
- Battery Backed RAM (optional)
- Clock (optional)
- 6 Digit Display Board (optional)

Available: NMOS, CMOS; 1 MHz.

CUSTOM CIRCUITS • SYSTEMS • PRODUCTS



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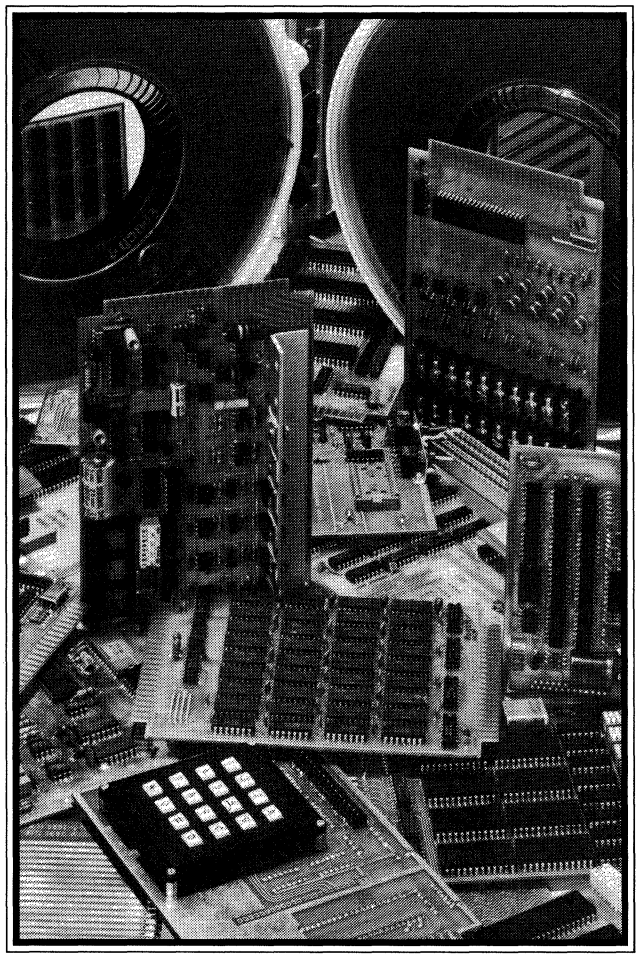

Wintek Corporation is your complete source of microcomputer hardware and software products for the 6800, 6801, 6805, 6809, and 68HC11 microprocessor families.

- Micro Modules for R&D efforts and for the OEM
- Software Development Tools
- Computer-Aided-Design Software

Items listed on this page are just a sample of Wintek's wide product line. Call us toll free to request a complete catalog of Wintek products and services.

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Lafayette, IN 47904-2993
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Micro Modules

All modules are 4.5 by 6.5 inches. Unit prices are listed. Quantity discounts for micro modules are: 10-24, 10%; 25-49, 20%; 50-99, 30%; 100-499, 40%; 500+, 50%. Manuals are available for $5 each.

MCH18	6809 MPU, 2K RAM, 3 ROM Sockets, 2 RS-232 serial ports, 4 parallel ports, watchdog timer, real-time clock	$196
MCH48	6809 MPU, 8K RAM, 3 ROM Sockets, 2 RS-232 serial ports, 4 parallel ports, watchdog timer, real-time clock	$205
MCH78	6809 MPU, 32K RAM, 3 ROM Sockets, 2 RS-232 serial ports, 4 parallel ports, watchdog timer, real-time clock	$238
MCH88	6809 MPU, 64K RAM, 2 ROM Sockets, 2 RS-232 serial ports, 4 parallel ports, watchdog timer, real-time clock	$283
MCV10	6800 MPU, 128 bytes RAM, 1 ROM socket	$95
MCV45	6800 MPU, 512 bytes RAM, 1 ROM socket, 1 TTL serial port, 4 parallel ports	$153
MAI04	16-channel, 12-bit A/D module	$159
MAI20	2-channel, 8-bit D/A module	$89
MCI11	16-button keypad with fifteen 7-segment LED displays	$199
MCT10	Counter/timer module with battery	$129
MDS08	Driver/sensor module with 8 optically-isolated inputs	$102
MDS44	Driver/sensor module with 4 optically-isolated inputs and 8 open-collector drivers (28 VDC, 250 mA)	$102
MDS80	Driver/sensor module with 16 open-collector drivers (28 VDC, 250mA)	$102
MGP00	IEEE-488 Bus Interface Module	$177
MPB00	Breadboard with parallel interface	$49
MPI08	64-line parallel I/O module	$125
MRR29	Memory expansion module with sockets for 56K RAM/ROM, battery backup	$179
MRR49	Memory expansion module with sockets and memory mapping	$189
MRR59	Memory expansion module with sockets and memory mapping, battery backup	$229
MSI08	8-port RS-232 serial interface module	$164
ABP04	4-slot backplane	$40
ABP07	7-slot backplane	$70

PC-Based Development Software for the 6800 Family

Develop 6800-family software on an IBM PC or compatible. C Compilers are complete K&R implementations; Macro Assemblers are Motorola compatible. All prices for software listed below include a linker and terminal emulator. Complete manual sets are available separately for $50.

PAS00	6800 Macro Assembler	$495
PAS01	6801/6301 Macro Assembler	$495
PAS05	6805 Macro Assembler	$495
PAS09	6809 Macro Assembler	$495
PAS11	68HC11 Macro Assembler	$495
PCC00	6800 C Compiler and Macro Assembler	$895
PCC01	6801 C Compiler and Macro Assembler	$895
PCC09	6809 C Compiler and Macro Assembler	$895
PCC11	68HC11 C Compiler and Macro Assembler	$895
UEP02	EPROM Programmer	$495

Sophisticated Schematic and PCB Design Solutions from Wintek Corporation

Solve your most demanding design problems with the power and reliability of HiWIRE® II. HiWIRE II's total integration of schematic capture and PCB artwork allows you to move confidently through all phases of the design process. Whether you use a keyboard, a mouse, or both, you'll find that HiWIRE II's menu-driven interface lets you concentrate on design, instead of on design software.

Superior Schematics: When it comes to drawing schematics, HiWIRE II is a refined and responsive design tool. Design custom components with ease, or call components from extensive libraries with simple, "point-and-shoot" operation.

Outstanding Circuit-Board Design: Support for expanded and extended memory allows HiWIRE II to handle complex designs with ease, including surface-mount, through-hole, microstrip, and ECL applications. An optional gridless rip-up-and-re-route autorouter can route your board to 100%, handling up to 255 layers simultaneously —all with 1-mil resolution. It's the perfect choice for high-density boards.

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- Variable trace width and pad size
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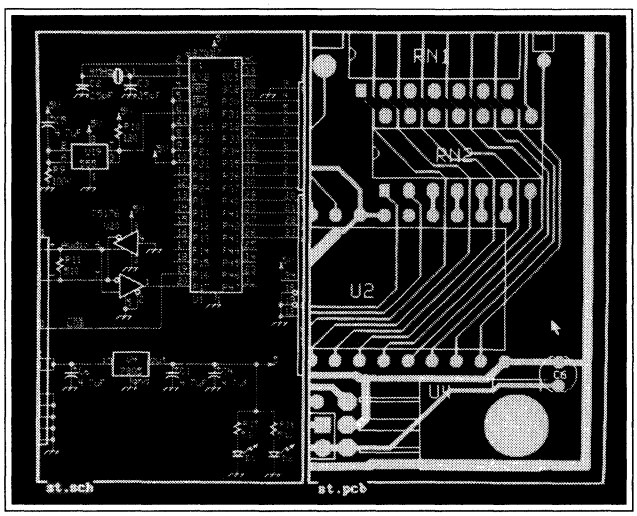
- ASCII file format
- DXF output
- Netlist, bill-of-materials, and drill-tape utilities
- Extensive libraries with "point and shoot" component selection
- Display drivers for CGA, EGA, VGA, and Super VGA
- Keyboard and/or mouse driven
- 800 number for free technical support



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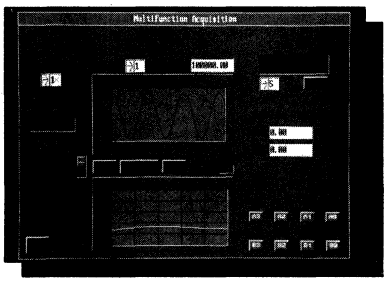
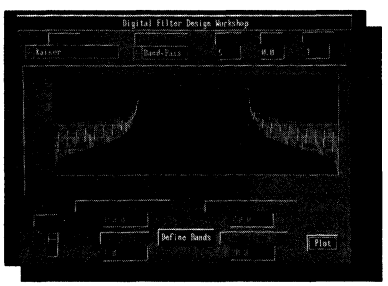


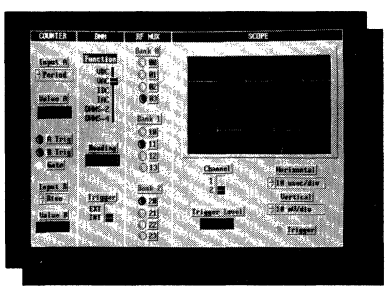
Acquisition

Integrated libraries for GPIB, VXI RS-232, and plug-in A/D, D/A, and DIO boards



Analysis

Extensive libraries for data reduction, digital signal processing, and statistical analysis



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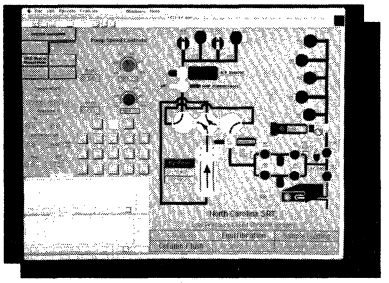
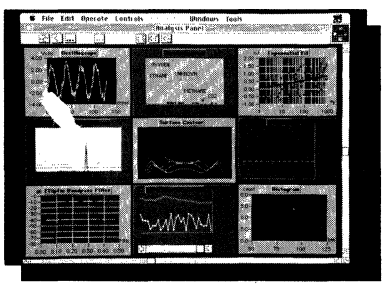
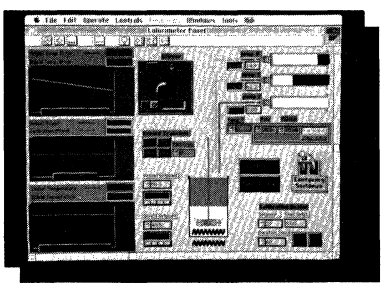
Flexible, interactive, graphic displays and report generation

LabVIEW® 2

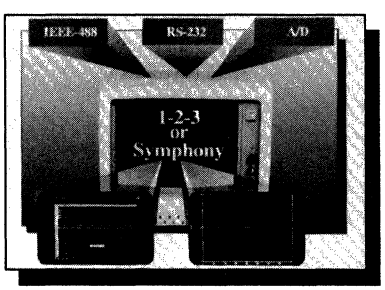
for the Apple Macintosh computers







Measure



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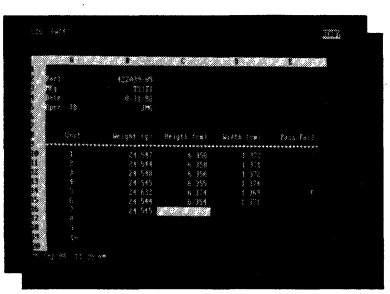

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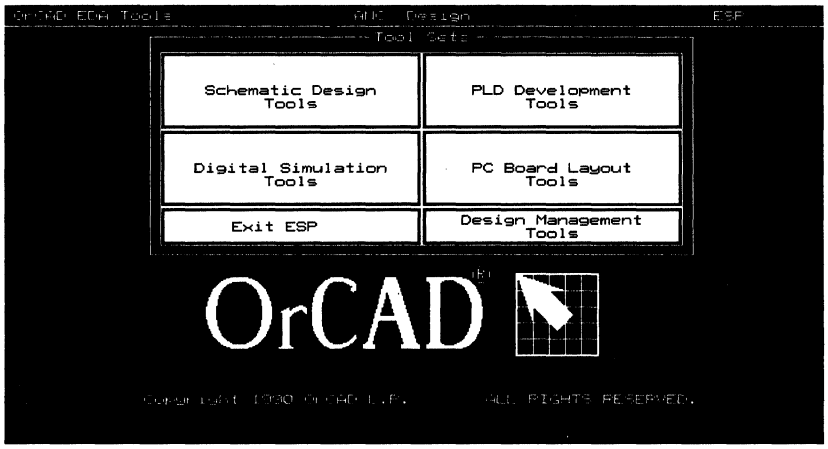
Release IV



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Our schematic design tools are known for being the best price/performance value in the industry. Its one reason why more designers use OrCAD products than any other electronic design automation tools in the world. With the introduction of the Release IV products, OrCAD introduces ESP: a graphical user interface designed with the EDA designer in mind.

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OrCAD offers the best solution for working with programmable logic devices. Programmable Logic Design Tools accept several forms of input including schematic, Boolean equations, truth tables, state machines and several forms of logic synthesis. Output can be JEDEC or hex format.

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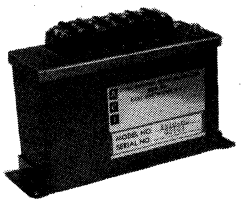


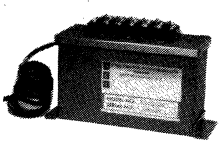
Model 4331: 3ϕ Voltage — 50-400 Hz
Temperature: −20°C to +71°C
Size: 7½" x 1½" x 3"
Output Relay: DPDT 1 Amp

FREQUENCY TRANSDUCER/CONTROLLER

Model 3750: 50 - 60 - 400 Hz
Output 1: 0-1 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Time Delay: Adjustable 0 to 2½ SEC.
Accuracy: 1%
Linearity: .05% center frequency
Temperature: −20°C to +71°C
Size: 6½" x 1½" x 3"

D.C. CURRENT SENSOR/CONTROLLER

Model 4502



Current Ranges: 0-10 MA **Thru** 0-100 Amp
Excitation: 28 VDC ±4 VDC
Output 1: 0-5 VDC
Output 2: Solid State or Relay
Accuracy: 0.5%
Size: 4½" x 1½" x 3"

Undercurrent or Overcurrent

A.C. CURRENT SENSOR/CONTROLLER

Model 4025: 50-400 Hz
Excitation: 115 or 220 VAC
Output 1: 0-1 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Time Delay: Adjustable 0 to 2½ SEC.
Temperature: −20°C to +71°C
Size: 6½" x 1½" x 3"

A.C. CURRENT MONITOR—ECONOMY

CURRENT RANGES: 0-1 Amp **THRU** 0-100 Amp
50-400Hz **ADJUSTABLE**

	OUTPUT	SIZE
MODEL 4101	0-5 VDC	4½" x 1½" x 3"
MODEL 4210	RELAY SPDT	6½" x 1½" x 3"

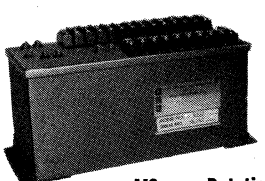
TEMPERATURE: −20°C to +71°C

A.C. VOLTAGE TRANSDUCER/CONTROLLER

Model 9601: 50-400 Hz
Input: 90-140 VAC
Output 1: 0-1 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Accuracy: 1%
Response: Less than 0.25 Hz
Time Delay: Adjustable 0 to 2½ SEC.
Size: 6½" x 1½" x 3"

POWER LINE MONITOR/CONTROLLER

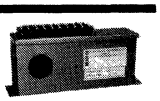
Model 4301: 1ϕ Voltage and Frequency
Model 4302: 2 or 3ϕ Voltage and Frequency
Voltage Band: 95 - 135 VAC
Frequency Band: ±10% center frequency
Hi-Lo Limits: Adjustable to any points within Band
Output Relay: SPDT or 3PDT 10 Amp
Time Delay: Adjustable 0 to 2½ SEC.
Temperature: −20°C to +71°C
Size: 7½" x 3" x 3½"



50-60-400 Hz

M8 — ϕ **Rotation**
MS — mil qual

WATTS/TRUE POWER TRANSDUCER CONTROLLER

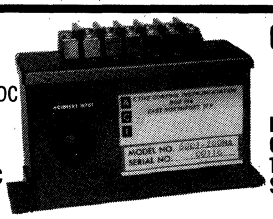


Model 9401 **50-60-400 Hz**
Input: 90-150 & 160-250 VAC — 0-500 W to 0-100 kW
Output 1: 0-1, 0-2 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Size: 6½" x 1½" x 3"
Watts Ranges: 0-500 W, 0-1 kW, 0-2 kW, 0-5 kW, 0-10 kW, 0-20 kW, 0-50 kW, 0-100 kW

D.C. CURRENT SENSORS

Pass-Thru

Model 6001 — Model 6002 Bi-Directional



Thru-Current Ranges:		0-5 Amp
0-10 MA	0-200 MA	0-10 Amp
0-20 MA	0-500 MA	0-20 Amp
0-50 MA	0-1 Amp	0-50 Amp
0-100 MA	0-2 Amp	0-100 Amp

Excitation: 28 VDC ±4 VDC
Output: 0-5 VDC
Accuracy: 0.5%
Response: 1 MSEC
Temp.: −20°C to +71°C
Size: 4½" x 1½" x 3"

CURRENT SENSOR

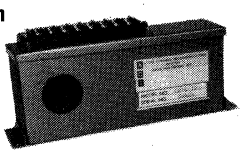
Bi-Directional

	MODEL 7101 GENERAL PURPOSE ±5% D.C. TO 1 KHz	**MODEL 7201** HIGH PERFORMANCE ±1% D.C. TO 10KHz
EXCITATION:	±15VDC	
OUTPUT:	0 to ±5VDC	
TEMP:	−20°C to +71°C	
SIZE:	4½" x 1½" x 3"	
THRU-CURRENT RANGES		
	0-10 Amp	0-100 Amp
	0-20 Amp	0-200 Amp
	0-50 Amp	0-500 Amp

D.C. CURRENT SENSOR

Pass-Thru
50 KV Isolation

Model 6011



Thru-Current Ranges:		0-5 Amp
0-10 MA	0-200 MA	0-10 Amp
0-20 MA	0-500 MA	0-20 Amp
0-50 MA	0-1 Amp	0-50 Amp
0-100 MA	0-2 Amp	0-100 Amp

Excitation: 115 VAC ±10% 50 - 400 Hz
Output: 0-5 VDC
Accuracy: 1%
Response: 0.5 Sec.
Temp.: −20°C to +71°C
Size: 6½" x 1½" x 3"

D.C. CURRENT SENSOR/CONTROLLER

Model 4560

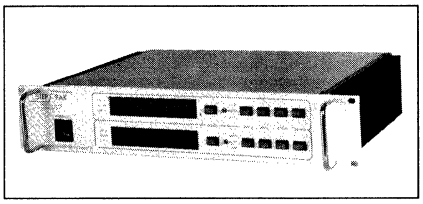
Thru-Current Ranges:		0-5 Amp
0-10 MA	0-200 MA	0-10 Amp
0-20 MA	0-500 MA	0-20 Amp
0-50 MA	0-1 Amp	0-50 Amp
0-100 MA	0-2 Amp	0-100 Amp

Excitation: 115 VAC ± 10% 50-400 Hz
Output 1: 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Accuracy: 1%
Temp.: −20°C to +71°C
Size: 6½" x 1½" x 3"

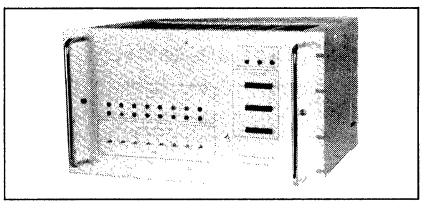
Telephone or write for individual detail sheets, prices and applications assistance: **FAX (305) 451-3232**

ACS

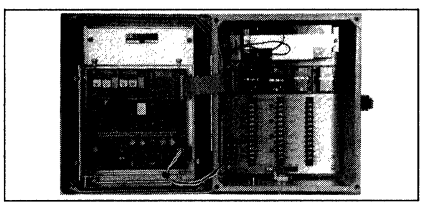
ADVANCED CONTROL SYSTEMS CORPORATION



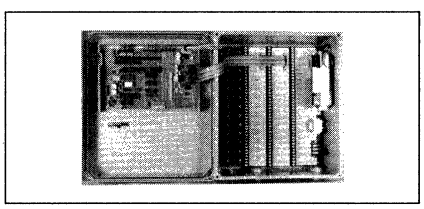
MCU-2 DRIVES TWO STEPPING MOTORS
— High speed, high precision indexing and speed control
— High power drivers, up to 6 Amp per motor phase
— Front panel manual controls and position display
— Host computer control of several units via RS232C port
— 19″ rack mountable, 3.5″ high front panel



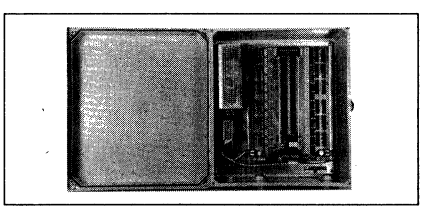
MDU-8 POWER DRIVERS FOR EIGHT STEPPING MOTORS
— Efficient bi-level drivers; up to 6 Amp per motor phase
— Each channel accepts TTL step pulse and direction level
— Adjustable current limiting resistors and fusing
— Forced air cooling for high power operation
— 19″ rack mountable; 10.5″ high front panel



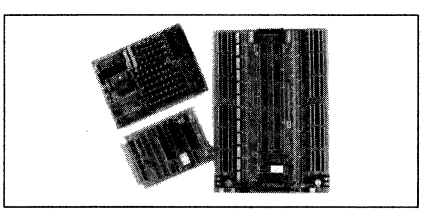
RCU-4 INDUSTRIAL ENVIRONMENT REMOTE CONTROL UNIT
— Four control relay outputs; 250 VAC/30 VDC, 10 Amp
— Four On/Off type inputs; optoisolated
— Four analog inputs; 0-1mA or 0-5 VDC
— NEMA-4 enclosure; dimensions, 13.5″ x 10.0″ x 7.0″ (H x W x D)
— Battery backed-up for uninterrupted operation
— RS232/RS485 communication-control port



RCU-16 INDUSTRIAL TYPE REMOTE CONTROL UNIT
— Thirteen control relay outputs; 250 VAC/30 VDC, 10 Amp
— Sixteen On/Off type inputs; optocoupled
— Sixteen analog inputs; 0-1mA or 0-5 VDC
— NEMA-4 enclosure; dimensions, 17.5″ x 14.0″ x 8.0″ (H x W x D)
— Battery backed-up for uninterrupted operation
— RS232/RS485 communication-control port



RCU-200 INDUSTRIAL I/O CONTROLLER
— Twenty-four input/output control ports (8 lines each)
— Inputs are filtered and diode protected
— Outputs have 50 V/.6 Amp driver; inductive load protected
— Logic and I/O power supply included
— NEMA enclosure; dimensions, 13.5″ x 10.0″ x 7.0″ (H x W x D)
— RS232/RS485 communication-control port



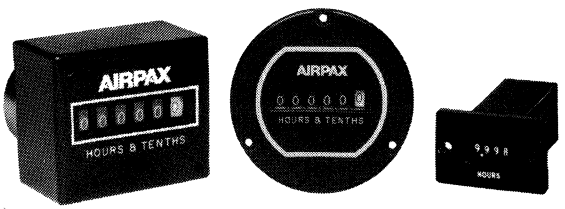
BOARD LEVEL MACHINE CONTROLLERS
— CCB-3; Serial port, 24 TTL I/O lines, 8 opto inputs, 10 opto outputs, firmware.
— CCB-6; Board level of RCU-200, firmware.
— CCB-9; Serial port, 48 opto inputs, 24 opto outputs, firmware

For further information on these or other products, please call our Sales Department.

ACS
ADVANCED CONTROL SYSTEMS
OLD MINE ROCK WAY, HINGHAM, MA 02043, USA
TEL: (617) 740-0223 FAX: (617) 740-4227

INDICATORS AND COUNTERS

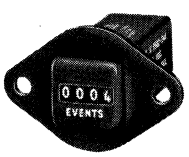
Our versatile product line offers the highest standards to virtually any application. Meet all your elapsed time indicator and events counter requirements from the best source. Contact Airpax, Cheshire Industrial Park, Cheshire, CT 06410. (203)271-6000. FAX (203)271-6100. A North American Philips Company.



Commercial Elapsed Time Indicators

Maintain record of equipment on/off time and provide utilization time information for maintenance, billing, etc. Many different models and mounts. Up to 6-digit readouts.

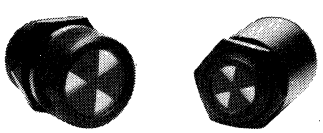
Type	Series No.	Operating VAC	Styles
Standard Commercial	K42220	6-230, 50 or 60 Hz	Round and rectangular
Microminiature Commercial	K49200	115 60	End or side readout



Microminiature Events Counters

Meet MIL-I-8974 environmental requirements. Up to 6-digit display, depending on model. Non-resettable. Many standard mountings.

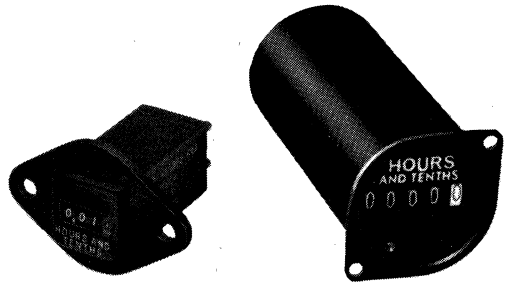
Type	Digits	Series No.		
		28 VDC	115V60 Hz	115V 400 Hz
Non-resettable	4	K19502	K19511	K19501
	5	KI9554	K19513	K 19503
	6	K19506	K19515	K19505



Fault Indicators—B.I.T.E.

Monitor circuits and systems for operation beyond design parameters. Contrasting flag indicates fault condition. Magnetically latched until manually or electrically reset. Units with internal switches for remote signaling.

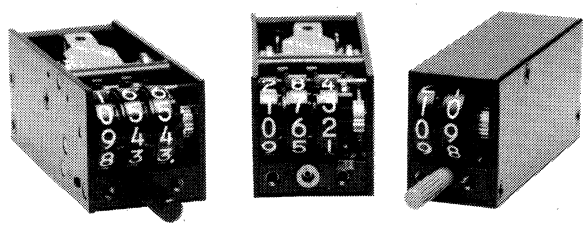
Type	Series	MIL Ref.	VDC	Operating Time
Round-Manual Reset Internal Sw	L21603/05	MIL-I-83287	5-30	50ms
Round Manual Reset	L21603/01	MIL-I-83287/01	3-30	50ms
Round-Electric Reset	L21603/02	MIL-I-83287/02	10-30	50ms



MIL Spec Elapsed Time Indicators

Meet MIL-M-7793 environmental requirements. In either subminiature (5-digit) or microminiature (4 & 5-digit) sizes. "Hours" in white numerals on black, "tenths" digit red on white. Hermetically sealed.

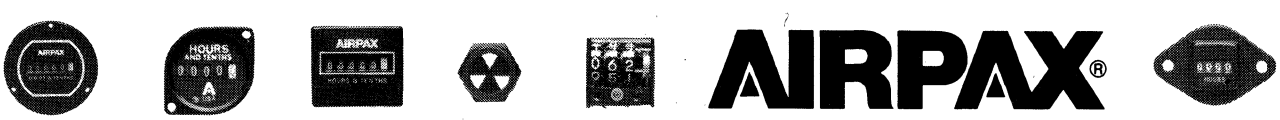
Type	Digits	Series No.	Operating Voltage
Subminiature	5	K4200	28 VDC
	5	K23200	115 VAC, 60 Hz
	5	K252000	115 VAC, 400 Hz
Microminiature	4	K 19200(Square)	24 or 120 VAC
	4	K19220 (Round)	400 Hz
	4	K19600 (Square)	115 V 60 Hz
	4	K19793 (Sqr./Rnd.)	10-34 VDC
	4	K19796 (Sqr./Rnd.)	4.5-6.5 VDC
	5	K19795 (Rect.)	10-34 VDC
	5	K19798 (Rect.)	4.5 - 6.5 VDC



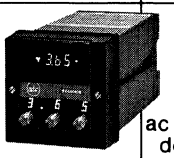
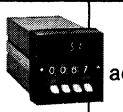
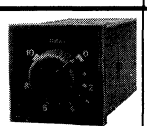
Subtractive and Additive Events Counters

Two- and three-digit military grade counters. Meet MIL-STD-202F tests. Maximum count rate 1000 pulses per minute. Additive (countup) and subtractive (countdown) models. Presettable. Operates on 21-29 VDC pulses.

Type	Digits	Series No.	Operating Voltage
Subtractive	2	K-4702-PI	21-29 VDC
	3	K-4701-PI	
Additive	2	K-4702 P2	
	3	K 4701 P2	



atc® TDRs, TIMERS, COUNTERS

		Input Voltage	Ranges	Operating Mode	Load Relay	Temp. Range	Repeat Accuracy	Cycle Indicator	
								Ind.	Non Ind.
375 MULTI-RANGER Fully Programmable Timer/Counter		ac	Timer: .01 to 999 seconds, minutes or hours, programmed in field. Counter: 1 to 99,900 programmed in field.	Single Preset, Flip-flop or Multiple Presets	Two DPDT's 1 early, 1 delayed. 7 A at 120, 240 or 24V ac 3 A at 24V dc	32° - 140°F	Timer: ±10 ms. Counter: 100%	X	
365 LONG-RANGER Computing Timer		ac or dc	Switch selectable: 0-9.99, 99.9 or 999 seconds, minutes or hours	Interval, Delay or Pulse	DPDT, 1 Instant 1 Delayed 7A at 120, 240 or 24V ac 3A at 240V dc 1½ A at 48V dc ½A at 125V dc	32°-140°F	±0.01 second on all ranges	X	
355 SHAWNEE II Compact IC Digital GP Reset Timer		ac	0.01-99.99 seconds or minutes. 0.1-999.9 seconds or minutes. Field convertible.	Interval, Delay or Pulse	DPDT, 1 Instant 1 Delayed 5 A at 120V ac 2 A at 240V ac 0.1 A at 125V ac	32° -140° F	±0.01 second	X	X
356 SHAWNEE II Compact IC Digital GP Predetermining Counter		ac	1 to 9999 or 10 to 99,990 in 10 count increments.	Interval, Delay or Pulse	DPDT 5 A at 120V ac 2 A at 240V ac 0.1 A at 125V dc	32° -140° F	100% (±0 count)	X	X
366 LONG-RANGER Computing Counter		ac or dc	Switch selectable; 1 to 999 10 to 9990 100 to 99900	Interval, Delay, or Pulse	DPDT, 1 instant 1 Delayed 7 A at 120, 240 or 24V dc 3 A at 240V dc 1½ A at 48V dc ½ A at 125V dc	32° - 140°F	100% (±0 count)	X	
339 Multi-range Octal base TDR DIN size, 36 x 36 mm		ac or dc	Multi-range Six ranges from 1 sec. to 10 hours or 0.3 sec to 3 hours	Interval or On delay	DPDT 10 A @ 120 V ac	32°F-120°F	±0.5% of range	X	
319D Multi-range Octal base TDR		ac or dc	Multi-range. Five ranges from 0.3 sec. to 30 min. Three ranges from 1 sec. to 100 sec.	On Delay	DPDT 5 A at 120V ac, 240V ac, 24V ac, 24V dc	32°F-158°F	Varies with changes in line voltage & ambient temperature but not with reset time — from ±1% to ±6%		X
328 MOS TDR Multi-Range TDR		ac or dc	Multi-range. Six switch-selectable ranges from 1 second to 10 hours.	On Delay, Off Delay, Interval	DPDT 5 A at 120/240V ac 1/10 hp at 120V ac 5 A at 24V dc	0°-150° F	Varies with changes in line voltage & ambient temperature but not with reset time — from ±1% to ±5%		X
322 TDR Motor-Driven Cycle Progress TDR		ac	12 ranges from 5 seconds to 5 hours.	Interval, Delay or Pulse	Two SPDT's 10 A at 120V ac 5 A at 240V ac	32°-120° F	±2% of range	X	

☐ Need more information? ☐ Need latest pricing?
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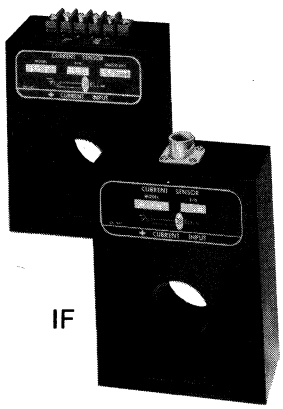
Call: 800-441-8245
(In PA: 215-337-5500)

AUTOMATIC TIMING & CONTROLS COMPANY, INC.
King of Prussia, Pennsylvania 19406
FAX: 215-337-0838

dc & ac Current Sensors (Solid-state Shunts)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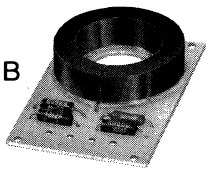
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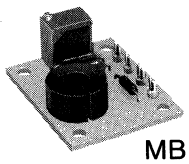
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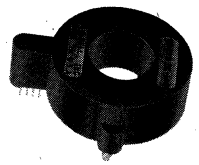
IH/IHA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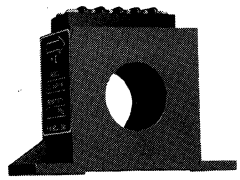
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IA

DESCRIPTION

Bell Current Sensors are small, lightweight, inexpensive devices for non-contact current measurements to 3000 A dc or peak ac up to 200 kHz.

The sensors are non-contact. Hall-effect devices, offering no dc insertion loss, power loss, isolation or heating problems.

The Hall-effect sensor is a four-pole, magneto-sensitive device mounted in the core gap, and reads the magnetic field surrounding the conductor passing through the gap. The field is proportional to the unknown current, and the output voltage of the Hall generator is proportional to this magnetic field, thus proportional to the current.

Various units in the broad line of F.W. Bell current sensors find applications in the automotive, aerospace, industrial and power generation fields.

FEATURES

- **Fast-responding**
- **Non-contact operation**
- **Output voltage isolation from input**
- **Very low insertion impedance**
- **Minimal distortion from adjacent conductors**
- **Amplified and non-amplified models available**
- **Models for mounting directly on PCBs**

TYPICAL APPLICATIONS

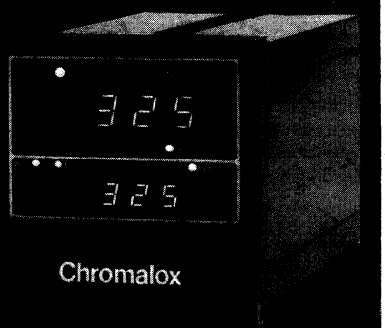
- **Monitoring and control of dc motor circuits**
- **Overload sensor in dc power supplies**
- **Control of dc motor-driven machine tools**
- **Replacements for shunts, particularly in hostile environments, in airborne circuits and when isolation is required**
- **Monitoring and control of battery load and charge circuits**
- **Current sensing element in feedback circuits, on interlocks and on dc circuit breakers**
- **Process control element in dc-operated processes**
- **Power measurement in dc power circuits**

F.W. BELL
6120 Hanging Moss Rd. Orlando, FL 32807
Phone: 407-678-6900 TWX: 810-853-3115 Fax: 407-677-5765

SPECIFICATIONS

MODEL	RATED CURRENT dc & ac	RATED OUTPUT	ACCURACY
IH-25	25 A	0.5 mV/A	±1.0% RO
IHA-25	25 A	1 V	±1.0% RO
IH-100	100 A	0.5 mV/A	±1.0% RO
IHA-100	100 A	5 V	±1.0% RO
IH-150	150 A	0.5 mV/A	±1.0% RO
IHA-150	150 A	5 V	±1.0% RO
ID-5001M	350 A	0.5–1.1 mV/A	±2% RO
ID-5101M	100 A	0.5–1.1 mV/A	±2% RO
ID-5011M	350 A	0.5 mV/A	±2% RO
ID-5111M	100 A	0.5 mV/A	±2% RO
ID-5021M	350 A	0.5 mV/A	±2% RO
ID-5031M	350 A	0.5 mV/A	±2% RO
IB-5001M	350 A	0.5–1.1 mV/A	±2% RO
IB-5101M	100 A	0.5–1.1 mV/A	±2% RO
IB-5011M	350 A	0.5 mV/A	±2% RO
IB-5111M	100 A	0.5 mV/A	±2% RO
IA-5025P	100 A dc	10 V dc	±0.5% RO
IA-5023P	250 A dc	10 V dc	±0.5% RO
IA-5022P	500 A dc	10 V dc	±0.5% RO
IA-5021P	1000 A dc	10 V dc	±0.5% RO
IA-5020P	2000 A dc	10 V dc	±0.5% RO
IA-5024P	3000 A dc	10 V dc	±0.6% RO
IF-5003M	250 A	0.3–0.6 mV/A	±0.5% RO
IF-5002M	500 A	0.15–0.3 mV/A	±0.5% RO
IF-5001M	1000 A	0.15–0.3 mV/A	±0.5% RO
IF-5000M	2000 A	0.05–0.10 mV/A	±0.5% RO
IF-5004M	3000 A	0.05–0.10 mV/A	±0.6% RO
IF-5025P	100 A	10 V dc	±0.5% RO
IF-5023P	250 A	10 V dc	±0.5% RO
IF-5022P	500 A	10 V dc	±0.5% RO
IF-5021P	1000 A	10 V dc	±0.5% RO
IF-5020P	2000 A dc	10 V dc	±0.5% RO
IF-5024P	3000 A	10 V dc	±0.6% RO
PI-100	0–100 A	0.5–1.1 mV/A	±1.5% RO
PI-350	0–350 A	0.5–1.1 mV/A	±1.5% RO
PI-600	0–600 A	0.25–5.5 mV/A	±2% RO
MB-1020	0–20 A	0.5 mV/A	±1% RO
MB-1050	0–50 A	0.5 mV/A	±1% RO
MB-1120	0–20 A	0.5 mV/A	±1% RO
MB-1150	0–50 A	0.5 mV/A	±1% RO
MB-1220	0–20 A	0.5–1.1 mV/A	±1% RO
MB-1250	0–50 A	0.5–1.1 mV/A	±1% RO

Flexibility is a big new plus in temperature control



Chromalox® introduces the enhanced, mPU-based 2001 PLUS! 1/4 DIN Temperature/Process Controller

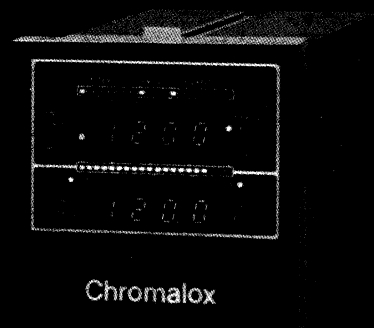
Get all the proven power, menu-driven field programming, precision, and reliability of the popular Sentry 2001 Controller—

- **PLUS convenient, accurate automatic self-tuning!**
- **PLUS 16-interval ramp/soak programming!**
- **PLUS single- and multi-drop digital communications option!**
- **PLUS bumpless, balanceless Auto/Manual control!**

Send for detailed product data sheets on the 2001 PLUS! and other Chromalox controllers

- **2030 Dual Channel Ramp/Soak Controller—128-interval temperature and humidity control ideal for environmental chambers, ovens, furnaces**
- **2020 Ramp/Soak Temperature/Process Controller—4 programs, 8 intervals per program, 8 event outputs per interval—all in a 1/4 DIN package**
- **3910 Temperature Controller—smallest, lowest cost available—perfect for OEMs**

Improve environmental chamber, oven and furnace performance...



with the Chromalox® 1/4 DIN 2030 dual channel controller

- **and humidity control at a reasonable cost**
- **16 ramp/soak programs, 8 intervals per program for a total of 128 intervals; 8 event ouputs per interval**
- **Nested program loop capability**
- **Optional features and software available**

Send for product data sheets on the 2030 and other Chromalox controllers

- **2020 Ramp/Soak Temperature/Process Controller—4 programs, 8 intervals per program, 8 event outputs per interval—all in a 1/4 DIN package**
- **3910 Temperature Controller—smallest, lowest cost available—perfect for OEMs**
- **2001 PLUS! Temperature/Process Controller—16 intervals ramp/soak, self-tuning, mPU-based flexibility in a 1/4 DIN package**

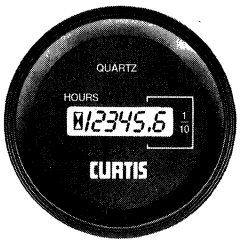
Chromalox®
INSTRUMENTS AND CONTROLS
1382 HEIL-QUAKER BOULEVARD, LAVERGNE, TN 37086
PHONE: (615) 793-3900 **FAX: (615) 793-3563**

EDWIN L. WIEGAND DIVISION
EMERSON ELECTRIC CO.

EMERSON

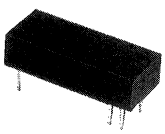
CURTIS

CURTIS 700 SERIES SOLID-STATE HOUR METERS



Designed to outlast the equipment they monitor, 700 Series hour meters cost less than units they replace. Built with customized, dedicated microchip technolgy, they are crystal quartz-driven with totally solid-state circuitry. Housed in a sealed module with LCD readout, they have *no moving parts*. Available for DC or AC, their non-volatile memory holds data *without battery or power* for as long as required. CURTIS 700 Series tolerate extremes of shock, dust, vibration, moisture and temperature (-40°C to 85°C). Shallow-depth housing permits easier installation. Voltages from 6VDC to 220VAC (50, 60Hz).

DIGITAL SOLID-STATE ELAPSED TIME INDICATORS



PC BOARD-MOUNT UNIT

PANEL-MOUNT UNIT

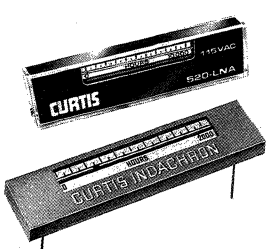
CURTIS SSETIs—the elapsed time indicator that has pioneered *the solid-state* ETI—feature:

- RELIABILITY—outlasts the equipment they monitor
- Impervious to shock
- Highest accuracy
- Non-volatile memory
- Built-in RFI/EMI protection
- Low power use; as low as 2mW
- Records up to 99,999.99 hrs.
- Military: panel-mount unit with handheld reader—form, fit and function interchangeable with electromechanical MIL spec devices
- Commercial (and military): PC board-mount unit for remote readout via data bus, panel test connector, or handheld reader interface
- Priced lower than the unit they replace.

HANDHELD READER

ANALOG ELAPSED TIME INDICATORS

Smallest-size, Lightest-weight, Lowest-cost, AC or DC at any Voltage



LNA & LC (non-resettable) Series: Easily-readable, very low-cost units used by OEM for warranty-by-use and P/M scheduling in office equipment, test instruments, etc. AC and DC with various time scales and electrical ratings. LNAs are adhesive-mounted, LCs via circuit board pins.

120PC (non-resettable) Series: Specially designed with circuit board pins for PC cards, components, and subassemblies, 120PCs are totally encapsulated in epoxy for optimum reliability. Run from DC current with customer-supplied series resistor to achieve desired time scale.

TYPICAL APPLICATIONS FOR CURTIS ETIs

ETI innovation since 1960

Warranty and P/M Scheduling: Provides a low-cost means of monitoring actual use time of equipment.

Reliability Engineering: Provides MTBF data or subsystem replacement-time data without costly, unreliable logging.

Test Equipment Utilization/Calibration: Provides utilization data for savings in capital investment for test instruments, tools, etc., as well as a means for calibration scheduling.

The ETIs that've been to the moon and back

CURTIS

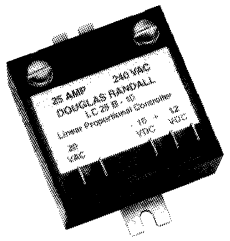
CURTIS INSTRUMENTS, INC.
200 Kisco Avenue • Mount Kisco, NY 10549
(914) 666-2971 • FAX (914) 666-2188

DOUGLAS RANDALL

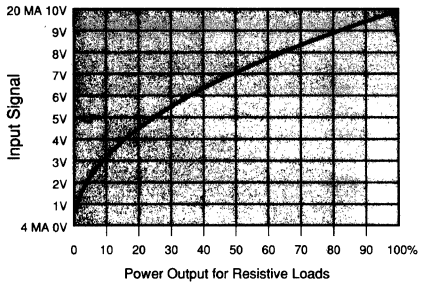
100 Mechanic Street, Bldg. #26, P.O. Box 506, Pawcatuck, CT 06379
(203) 599-2075, FAX (203) 599-1754 Toll Free: 800-447-6799

SOLID STATE COMPONENTS
STOCKED FOR IMMEDIATE DELIVERY

L.C. SERIES POWER CONTROL MODULES—PROPORTIONAL CONTROLS



OPTICALLY COUPOLED PROPORTIONAL CONTROL



The optically coupled Douglas Randall L.C. series power control modules utilize D.C. analog control signals to proportionally control loads up to 100 amps, 300 Vrms. Changes in input signal linearly vary the firing angle of the thyristor load control device, so only the portion of the sine wave between the firing of the thyristor and zero crossing is available to the load. (see graph 1 on reverse). Average power output versus input voltage/current for resistive loads is shown in Figure 2 on reverse side of this sheet.

INPUT DATA

Range	0-5 DC	0-10 V DC	4-20 mA DC
Turn-on Threshold	.25 V	.5 V	4.5 mA
Input impedence	12.7K ohms	25K ohms	460 ohms
Isolation signal to load	4000 V peak	4000 V peak	4000 V peak
Isolation signal to base	4000 V peak	4000 V peak	4000 V peak

OUTPUT DATA

Model Number	LC25	LC40	LC70	LC100
maximum current	25 A	40 A	70 A	100 A
maximum voltage drop at 100% on	1.6 V	1.6 V	1.6 V	1.6 V
max. non-repetitive single cycle surge current	300 A	400 A	1000 A	1500 A
voltage range (RMS)	20-300	20-300	20-300	20-300
minimum holding current	.10 A	.10 A	.15 A	.20 A
off state DV/DT (V/μsec)	200	200	500	500
on state DI/DT(A/μsec)	150	150	150	150
I^2T for fusing (A^2/sec)	800	1000	7000	12000
off state leakage current (mA)	15	20	30	50
isolation output to ground	4000 V	4000 V	4000 V	4000 V
power factor (min)	.5	.5	.5	.5

PROPORTIONAL CONTROLS/40 AMP @ 480 VAC

Douglas Randall Proportional Control vary loads up to 40 Amp @ 480 VAC from 0 to 99%.

Mechanical Specifications on SSR AC output

SERIES R— RESISTOR CONTROLS

These controls operate by connecting a variable resistor to the input terminals. See Figs. 1 & 2.

INPUT*
Variable Resistor (150,000Ω, 1 watt)—For 120VAC
Variable Resistor (1 Megohm, 1/2 watt)—For 240VAC, 277VAC or 480VAC

Output Voltage		CURRENT 5A	10A	15A	25A	40A
90-130 VAC	Models	R05A	R10A	R15A	R25A	R40A
200-240 VAC	Models	R05B	R10B	R15B	R25B	R40B
400-480 VAC	Models*	R05D	R10D	R15D	R25D	R40D

OUTPUT DATA

Maximum Current	5A	10A	15A	25A	40A
One Cycle Surge Current	75A	100A	150A	225A	400A
Overload (1 Sec., RMS)	20A	30A	50A	70A	150A
Minimum Holding Current	.05A	.05A	.07A	.08A	.09A
AC Line: 90/130 VAC, 200/240 VAC, 250/300 VAC or 400/480 VAC					
Typical Leakage: 90/130 VAC—10 mA; 200-240 VAC—7 mA; 250-300 VAC—6mA; 400-480 VAC—3 mA*.					

*Models R05D. R10D. R15D. R25D and R40D have no snubbers.

INPUT MODULES RDA, RDB & RDD

These modules accept 0-10 VDC signals. Their output is connected to the input terminals of Series R—Resistor Modules, which in turn controls loads up to 40 Amp @ 480 VAC. See Fig. 3.

SERIES RD/LOGIC INPUT CONTROL

Series RD provide full control from 0% to 99% when energized by 0-10 VDC or 0-15m ADC signals.

MODEL RD04A AND MODEL RD04B UL Listed File Number E103645

INPUT SIGNAL	0-10 VDC or 0-15 ma DC(2)	
OUTPUT SIGNAL	RD04A	RD04B
Maximum Current	4A	4A
One Cycle Surge Current	100A	100A
One Second Overload Current	40A	40A
Minimum Holding Current	.05A	.05A
AC Line Voltage	90-130 VAC @ 47-63 Hz	200-240 VAC
Off State Leakage	.01A (typical)	.01A (typical)
Response Time	150 m sec @ 10 VDC (typical)	300 m sec @ 10 VDC
Isolation (Input to Output)	500 VRMS	500 VRMS

Notes: 1. All data is measured at 25°C.
2. The input is not polarity sensitive, but must be protected against voltages above 10 VDC.

GENERAL SPECIFICATIONS —ALL UNITS

- Zero crossover switching
- 7500V opto-isolation
- Back-to-back SCR operation
- Timing: 15K ohm/second nominal; 22 megohms maximum.
- Minimum operation with resistor terminal shorted: 300 milliseconds nominal.
- All units have snubbers

NOMINAL PERCENTAGES OUTPUT VS INPUT RESISTANCE @ 25°C

Models R05 to R40A

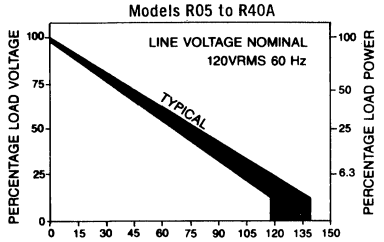


Fig. 1

Models R05 to R40B, R05 to R40D

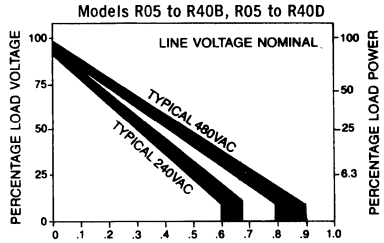


Fig. 2

MODELS RDA, RDB, RDD PERCENT OUTPUT VOLTAGE vs INPUT VOLTAGE

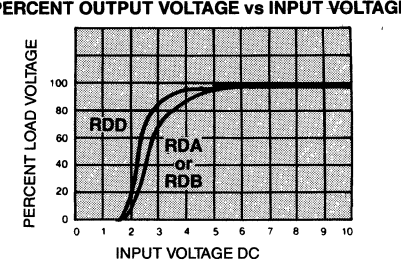


Fig. 3

THE DYNATIME Series

SUBMINIATURE ELAPSED TIME INDICATORS

The NEW INDUSTRY STANDARD in ETI technology . . . with CMOS microelectronics that delivers precisely controlled power to the patented stepper drive module. Summarily, a remarkably efficient system that has proven its versatility. For example, Models D76 and TTL-compatible D46 are proven performers from logic buss or low-voltage DC power. Or take advantage of Model D16's stability between 10 and 34 VDC. It is now qualified to new MIL-M-7793E, as is the down-sized 60 Hz Model D92. All are POWER MISERS, with expanded voltages to match today's tougher equipment specs. And the SHORT CASES will SAVE SPACE, too. That's DYNATIME versatility . . . you can rely on it.

NOW QUALIFIED TO NEW MIL-M-7793E

MODEL D16 (12 & 28 VDC)	MODEL D92 (115V/60 Hz)	MODEL D95 & D25 (400 Hz)
New M7793/1 & /2, Short New MS21341A (Short) & B (Long) New M7793/5, Long (was MS17321)	New M7793/3 & /4, Short	New M7793/6 (was MS17322) D95 to MS27651 (115V) D25 to MS27650 (26V)

BASIC MODEL	DYNATIME FEATURES	INPUT VOLTAGE RANGE	INPUT VOLTAGE NOMINAL	NOMINAL POWER, MW	MAX. CASE LENGTH, IN.	TYPICAL MODEL NO.'S	FIG. NO.	TYPICAL MILITARY NO.'S
D16	The SHORT CASE, EXPANDED VOLTAGE RANGE, VERY LOW POWER, QUARTZ ACCURACY . . . All these proven features are now requirements for the new MS21341A, M7793/1 and /2 meters. And Model D16 is fully qualified!	10/34 VDC	12VDC & 28 VDC	13 (AVG) & 85 (AVG)	1.094 SHORT	D16C8C2 D16C8C*-136 D16C8C*-16 D16D8A	1 2 2 3	M7793/1-001 M7793/1-** MS21341A-** NONE
16	Delivers Model D16 performance, but is qualified in the traditional long case per MS21341B and M7793/5 specs.				2.062	16C8C2 16C8C*-16	1 2	M7793/5-002 (was MS17321-10) MS21341B-**
D46	Proven performance from your TTL buss or other regulated low-voltage DC power, and needs only 3 MW (Avg)!	4.5/6.5 VDC	5 VDC	3 (AVG)	1.094 SHORT	D46C8C2 D46C8C* D46D8A	1 2 3	NONE
D76	Another POWER MISER, keeps accurate time from 12 VDC or other logic buss power down to 6.5 VDC.	6.5/13 VDC	9VDC	8 (AVG)		D76C8C2 D76C8C* D76D8A	1 2 3	NONE
D92	MICROELECTRONICS ACCURACY, EXPANDED VOLTAGE RANGE, VERY LOW POWER—All packed into a SUBMINIATURE CASE, and now qualified to new M7793/3 and /4 specs.	75/150 60 Hz	115	300		D92C8C2 D92C8C*-136 D92D8A	1 2 3	M7793/3-001 M7793/3-** NONE
		NOTE: FOR 50 Hz METER, REPLACE D92 ABOVE WITH D91.						
D95	A new choice, with improved MICROELECTRONICS ACCURACY, EXPANDED VOLTAGE RANGES, and VERY LOW POWER compared to our motor-driven meters—D95 saves 50 percent, while D25 saves 90 percent! Both meters are now qualified to existing MS27650, 27651 and M7793/6 specs, but you can reply on the DYNATIME performance ratings you see here.	75/150 400 Hz	115	300	1.094 SHORT	D95C8C2	1	M7793/6-002 (was MS17322-10)
						D95C8C*-16	2	MS27651-**
D25		15/40	26	40		D25C8C*-16	2	MS27650-**

NOTES: 1. Also available—Other 4 & 5 DIGIT READOUTS, MOUNTS, ROUND CASE per M7793/2, /4, /5, /6.
2. *Denotes "X" Dim.; A = Flush, B thru T in .031" steps, then U thru Z in .062" steps.
3. **Denotes Mount setback & type. See applicable Military Drawings.
4. Code "-136" in Model No. defines tin-plate mount face; "-16" is same plus added testing.

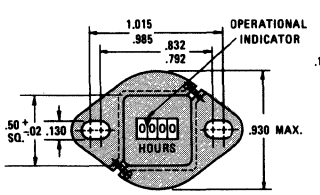


FIG. 1 ADJUSTABLE "C2"

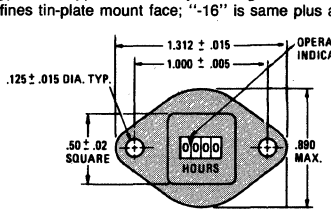


FIG. 2 "C" MOUNT

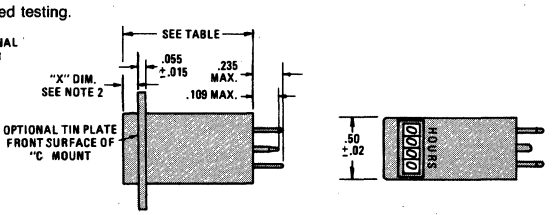


FIG. 3 SIDE-READING

ELECTRO DYNAMICS, INC.

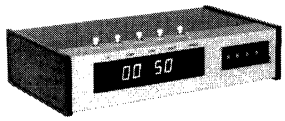
28 VDC EVENTS COUNTERS

REPLACES MS21228 M8974/2-		M8974/1A-	
CASE LENGTH 1.094" MAX.		CASE LENGTH 1.333" MAX.	
CATALOG NO.	DASH NO.	CATALOG NO.	DASH NO.
B16C8A-245	-001	B16C8A-312	-001
B16C8CE-245	-002	B16C8CE-312	-002
B16C8A-232	-003	B16C8A-313	-003
B16C8CE-232	-004	B16C8CE-313	-004

a TALLEY INDUSTRIES Company
1200 T Hicks Road
Rolling Meadows, Illinois 60008
Telephone (708) 259-0740
Telex 28-1070 Fax (708) 255-3827

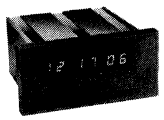
142 SIERRA STREET, EL SEGUNDO, CALIFORNIA 90245 • 213/ 322-2136

CLOCKS and TIMERS



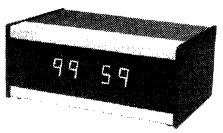
ES 362A Master Up/Down Timer
The **ES 362A** is a four digit, one hundred minute Up/Downtimer with serial output, will drive up to 100 up/down timer serial slaves, such as the **ES-361, ES-366F, ES-369 or ES-372.**

70 SERIES Console-Mount Clocks and Timers



ES 172 Six-Digit, 12 Hour Clock, ES 174 Six-Digit, 24 Hour Clock, **ES 370** Four Digit, One Hundred Minute Up/Down Timer, **ES 371** Up/Down Timer, **ES 570** Four Digit, Sixty or 100 Minute Timer, **ES 572** Six-Digit, 12 Hour Clock or Timer, **ES 574** A 24 Hour version of **ES 572, ES 575** Exactly like **ES 570**, with the addition of a "freeze" button.

80 SERIES One Inch Displays Viewable at 35'

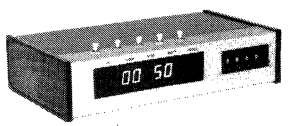


ES 182F Six-Digit, 12 Hour Clock, **ES 184F** Six-Digit, 24 Hour Clock, **ES 380F** Four-Digit, One Hundred Minute Up/Down Timer, **ES 381F** Up/Down Timer, **ES 580F** Four-Digit, Sixty Minute Timer.

90 SERIES Two Inch Displays Viewable at 60'

ES 391AE Presettable Up/Down Timer **ES 590AE** Sixty Minute Timer, Six-Digit Clocks: **ES 992AE** (12 Hr.) and **ES 994AE** (24 Hr.)

100 Minute Up/Down Timers



ES 301AE is a four digit, one-hundred minute timer. With **ES 302AE,** the user can preset times much faster than with the **ES 301AE**, because leverwheel type switches are used for the preset features.

ES 112E (12 hr.) and **ES 124E** (24 hr.) are solid state, CMOS, six-digit clocks.

790 SERIES Microprocessor Based Programmable Timer

The **ES 790** is a 1,000 event, 32 channel, microprocessor-based programmable clock.

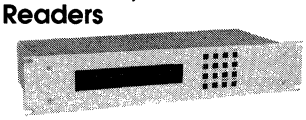
780 SERIES RAM Time Programmers

When programming more than ten events, the **780 Series RAM Time Programmers** are the most cost-effective way of dealing with the problem. They provide 32 events (expandable to 96) in 5 1/4 inches of rack space.

750E SERIES Thumbwheel Programmer/Comparators

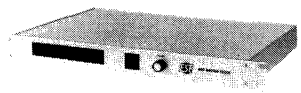
When programming up to four time events, the **750E Series** or expanded versions is recommended. Thumbwheel switches are set to compare the time information from an ESE Clock or Timer.

720 SERIES Programmable Clocks, Timers and Time Code Readers



The **720 SERIES** has been designed to provide microprocessor-based programmability in an economic manner. 10 events occur on 10 isolated output channels, in the form of momentary reed relay contact closures.

MASTER CLOCKS



ES 160 has its own internal timebase, with three second per month accuracy. **ES 160/1** One second per month version of **ES 160. ES 199** has a crystal time base accuracy better than .5 seconds per month. It contains a 10MHz receiver, with audio output, to synchronize with WWV at the push of a button. **ES 180** NIST Master Clock receives and decodes the radio time transmitted by the U.S. NIST. The unit provides an extremely accurate time reference that is available to the user in several forms.

ECONOMY MASTERS

ES 192A (12 Hr.) and **ES 194A** (24 Hr.)
Each Master Clock can drive more than 100 Slave Clocks, including **ES 161E, 161A, 166F, 171, 991AE, 993 AE** and **2559A.**

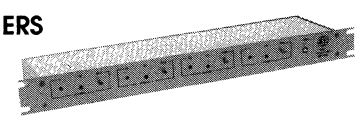
ES 2559 SERIES Master Clock Time For Video

The **ES 2559** is a modified **ES 206A** which receives the serial BCD time code from any ESE Master Clock and displays the time in video.

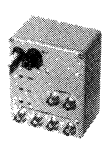
ES 165 Impulse Driver

The **ES 165** Impulse Clock Driver was designed to provide synchronized power to the **ES 168** Analog Impulse Clocks.
ES 168 Analog Impulse Clock operates from the 8 pps output of the **ES 165** Impulse Driver.
When a stepping second hand is desired, specify the **ES 162S** Analog Impulse Clock. **ES 162** Impulse Driver plugs into the **ES 160** chassis, can drive 80 **ES 162S** Analog Impulse Clocks.

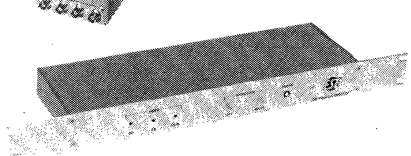
DISTRIBUTION AMPLIFIERS ES 247 Quad 1 x 6 Video Distribution Amplifier



ES207 1 X 4 Video Distribution Amplifier



ES 209 Video/Stereo Distribution Amplifier



The **ES 209** is a 1 x 12 video distribution amplifier combined with a dual 1 x 12 audio distribution amplifier.

ES 217 1 x 4 Audio Distribution Amplifier

ETI SYSTEMS

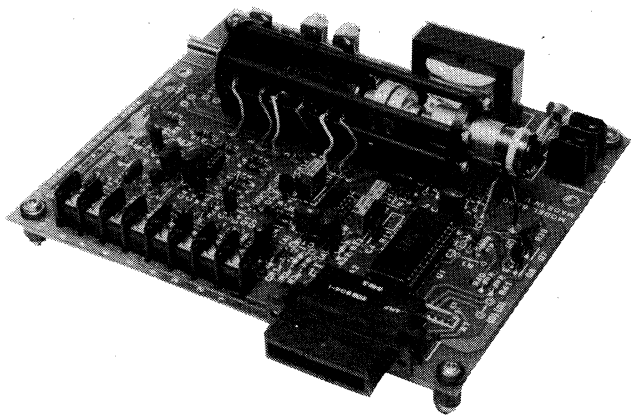
POSITION CONTROLS

MC6500 Series

The MC6500 is an advanced design position control system that is a self-contained servo controlled motorized potentiometer. The dual gang potentiometer affords an isolated variable output for the customer, and a feedback pot to null the servo system at desired position. New Feature: Terminal 21 allows feedback voltage from your process to null the servo system, without feedback potentiometer section.
Motorpot may be mounted on the board or cabled for remote installation. If installed remotely, specify length of cable required. Enclosures are available. OPERATIONS MANUAL SUPPLIED WITH EACH APPLICATION.

● FEATURES:

- Inhibit Circuit for Auto/Manual Switch
- Run Output for Position Confirmation
- End Point Trimmers and Gain Adjustment
- Access Terminal to Operational Amplifier
- 115 VAC Power Supply on Circuit Board



● SPECIFICATIONS

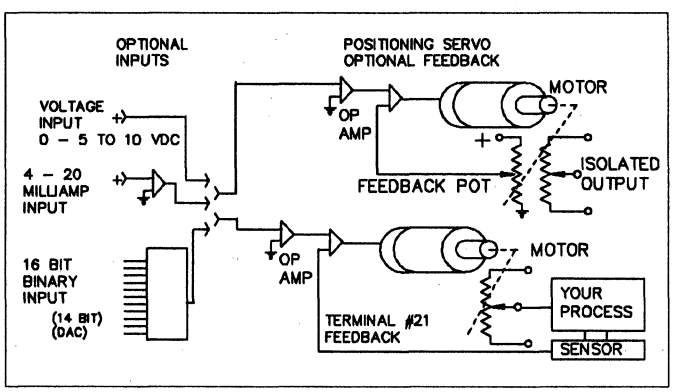
	MODEL 6501 & 6504 VOLTAGE CONTROL	MODEL 6502 & 6505 CURRENT CONTROL	MODEL 6503 & 6506 DIGITAL MODE
CONTROL INPUTS:			
INPUT SIGNAL	0 to 5 or 0 to 10 VDC	4 to 20 mA. See Note 1	16 Bit data w/write strobe inputs
IMPEDANCE	50,000 OHMS	220 OHMS	TTL COMPATIBLE
POWER SUPPY	110/120 VAC	110/120 VAC	110/120 VAC. See Note 3
CONTROL OUTPUT:			
ACCURACY	2% (Nominal combinations average 0.2%)		
MOTORPOT USED	MC20-2, (shown). SERIES 6500 WILL OPERATE ALL ETI SYTEMS D.C. MOTORPOTS.		
WATTAGE (POT)	3 WATTS		
SERVO INHIBIT	Active ground overides input commands and holds pot position. See Note 2		
MOTORPOT RUN			
When Running	0.05 VDC		
When Off	3.00 VDC		

Note 1: Special sensor section will inhibit control below 3 MA.

Note 2: Used with safety switches, back up systems, alarms, feedback to programmable controller or computer.

Note 3: 16 bit capability, 14 bit DAC input.

OPERATIONAL DIAGRAMS



CONNECTOR PIN DESIGNATIONS

11 LSB (Least	12 LOAD MSB
10 significant	13 LOAD LSB
5 bit)	25 WRITE
6	24 LOAD DAC
7	20 GROUND
8	21 POSITION FEEDBACK
9	22 GROUND
4	19 SERVO INHIBIT
3	18 NOT USED
2	17 NOT USED
1	23 RUN OUTPUT
14	
15	
16 MSB (Most significant bit)	

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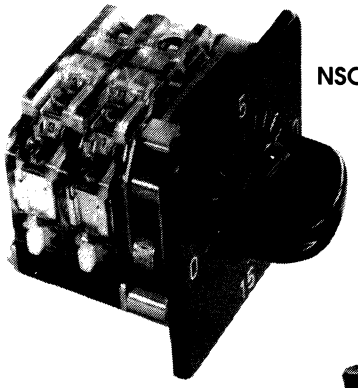
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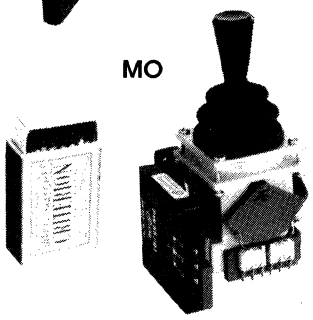
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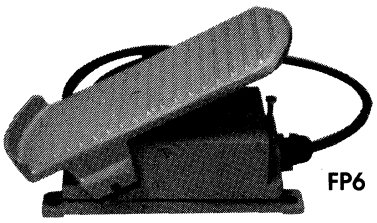
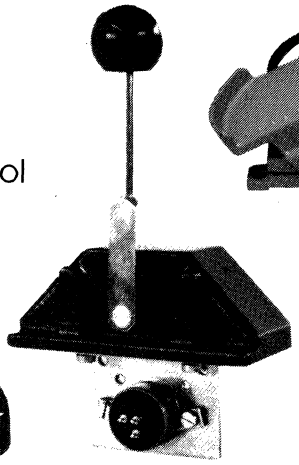

FP6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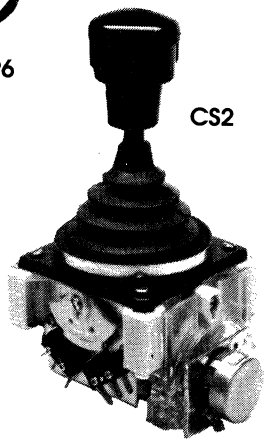
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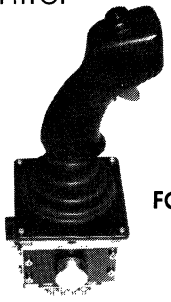
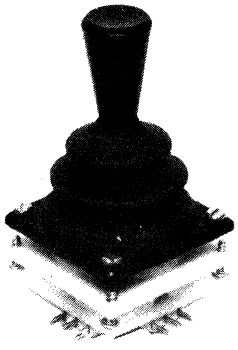

FG1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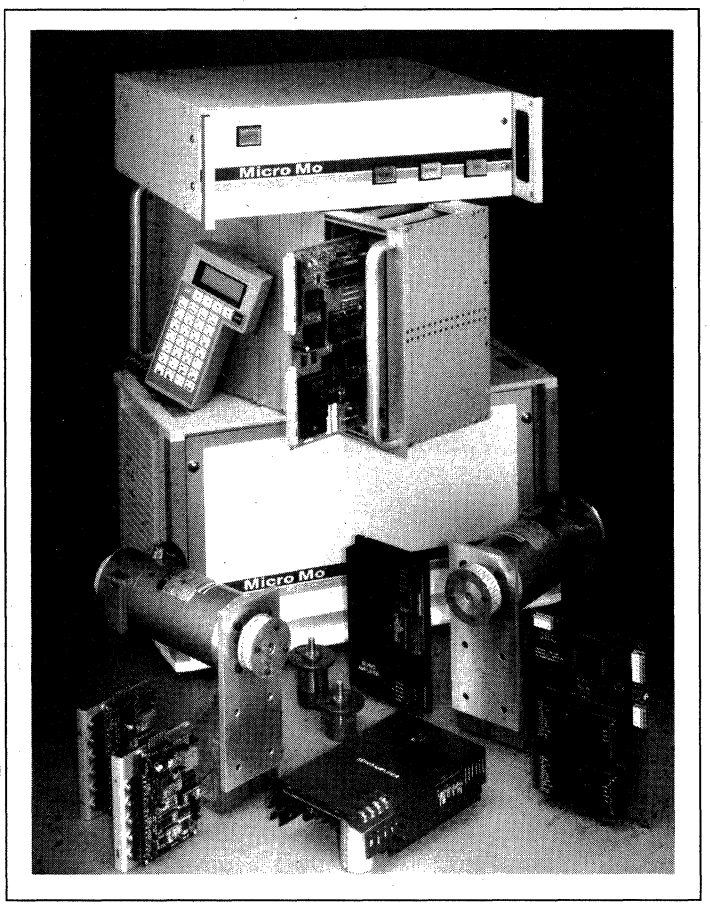

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	MCX-020	Daughter Board	2 axes/board
	MCX-03	Main Controller Board	2 axes for complex functions
	MCX-04	Position Control Board	Low-end dual axis position control
	MCX-05	Speed Control Board	Low-end dual axis speed control
	MCX-100	Control Board	User Specified
Enclosures	MCX-E1	Enclosure	6u Eurocard configuration
	MCX-E2	Enclosure	NEMA 12 box
	MCX-E3	Enclosure	19" Rack Mount Box Series
	MCX-E4	Enclosure	Custom; user defined
Amplifiers	MCX-A1A	Servo (linear) AMP	34V Bus, 6 AMP Cont. (15 AMP Peak)
	MCX-A1B	Servo (linear) AMP	42V Bus, 6 AMP Cont. (15 AMP Peak)
	MCX-A2A	PWM AMP	40V Bus, 5 AMP Cont. (5 AMP Peak)
	MCX-A2B	PWM AMP	120V Bus,10 AMP Cont. (10 AMP Peak)
	MCX-A2C	PWM AMP	120V Bus, 25 AMP Cont. (50 AMP Peak)
	MCX-A3	BLDC AMP	[20-80V Bus, 15 AMP Cont. (30 AMP Peak)]
Interface Modules	MCX-I1	Parallel Interface Buffer	Provides optical isolation
	MCX-I2	A-D Board	12 bit analog to digital converter
	MCX-I3	Memory Expansion Module	Expands 6811 processor memory 2K→64K
	MCX-I31	Memory Expansion Module	Expands Z8 processor memory 128K→196K
	MCX-I32	Memory Expansion Module	Expands Z8 processor memory 128K→256K
	MCX-I33	Memory Expansion Module	Expands Z8 processor memory 128K→320K
Options	MCX-02J	Joystick	Allows manual positioning; includes teach mode
	MCX-02T	Teach Pendant	Hand-held computer input device
	MCX-02P	EPROM Programmer Board	Allows user supplied code to be input to EPROM
	MCX-02S	Custom Software	User defined & applications specific software

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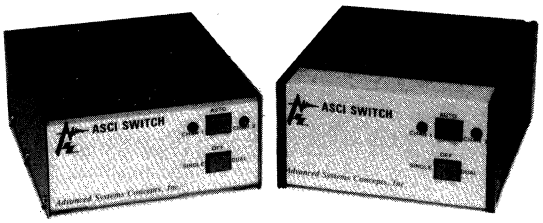
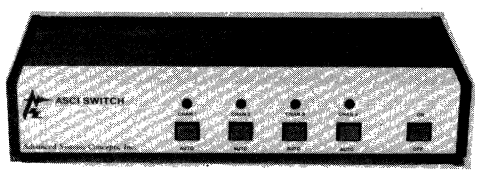


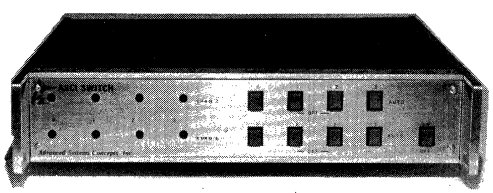
Two Port Switches

ASCI has peripheral switches that allow any two peripherals to communicate with the same input device. Our 20 models are differentiated by the type of transmission desired (serial or parallel), number of lines switched per connector, and the method of control (manual, in-line data, master port, back-up through handshaking or data and remote control).



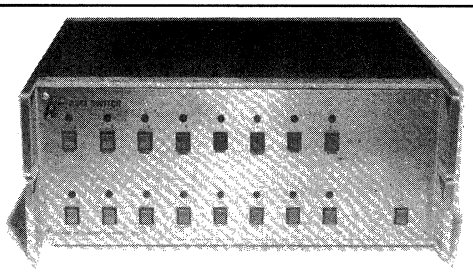
Four Port Switches

ASCI offers a complete line of four port switches for all kinds of peripherals. Current models include four output port expanders and four input sharers for serial or parallel transmission. We have models for intelligent handshaking, software controllable selection, and manual switching of devices.



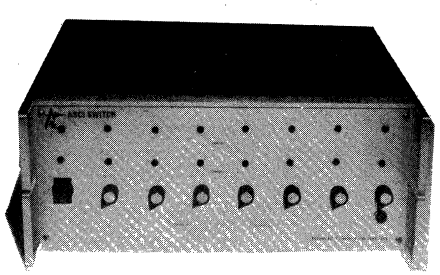
Multiport Switches

ASCI's multiport switches allow anywhere from one to 32 inputs to communicate with one to 32 outputs. Devices supported range from printers and plotters up to mag tape drives. Control can either be using the in-line data stream, manual operation, remote control signals, handshaking or through a master port. Over 32 models are available.



Rack Mounted Switches

Any of our two or four port switches can be placed in rack mountable enclosures. Our standard racks can hold 4 of the four port modules or 8 of our two port modules. In addition, configurations are available that allow bank control of all modules in the same enclosure simultaneously.



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In addition to our standard line ASCI also designs custom units. These units can consist of simply one of our standard products with special connectors or cabling or a complete configuration with special protocol and handshaking requirements. Since our specialty is peripheral interfacing we're sure to be able to provide the unit that will satisfy your needs.

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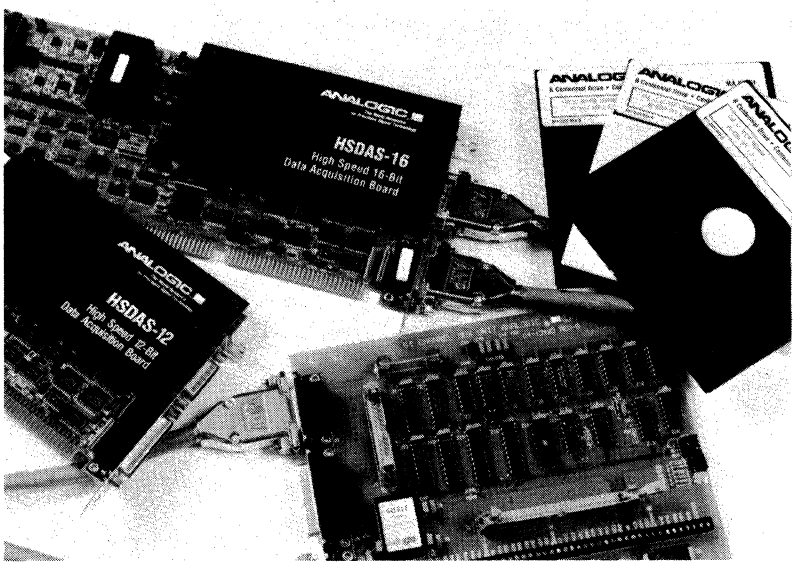

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Model Number	Resolution	On-Board Memory	DMA Modes	Single-Ended Channels	Differential Channels	Simultaneous Sampling Capability	Single-Channel Throughput	Unipolar Input Ranges	Bipolar Input Ranges	Analog Output Channels	Unipolar Output Ranges	Bipolar Output Ranges	Speed	Counter-Timer Channels	I/O Ports	Software Supported
DAS-12-100	12	–	16-bit	16	8	–	100 kHz	156 mV, 312 mV, 625 mV, 1.25V, 2.5V, 5V	156 mV, 312 mV, 625 mV, 1.25V, 2.5V, 5V	2	–	±5V	50 kHz	–	2 x 8 bit	A,D
LS-DAS-12	12	128 samples	16-bit	16	8	–	100 kHz	0 to +2.5V, +5V, +10V	±2.5V, +5V, ±10V	2	0 to +5V 0 to +10V	±5V ±10V	200 kHz	2	2 x 8 bit	A,C,D,E
MS-DAS-12	12	128 samples	16-bit	16	8	2 ch	200 kHz	0 to +2.5V, +5V, +10V	±2.5V, +5V, ±10V	2	0 to +5V 0 to +10V	±5V ±10V	200 kHz	2	2 x 8 bit	A,C,D,E
HS-DAS-12	12	128 samples	16-bit	16	8	4 ch	400 kHz	0 to +2.5V, +5V, +10V	±2.5V, +5V, ±10V	2	0 to +5V 0 to +10V	±5V ±10V	200 kHz	2	2 x 8 bit	A,B,C,D,E
FAST 14-1	14	1M & 2M samples	16-bit	4	4	–	1 MHz	0 to +2.5V, +5V, +10V	±2.5V, +5V, ±10V	–	–	–	–	–	–	A,D
LS-DAS-16	16	128 samples	16-bit	16	8	–	50 kHz	0 to +2.5V, +5V, +10V	±–2.5V, +5V, ±10V	2	0 to +5V 0 to +10V	±5V ±10V	200 kHz	2	2 x 8 bit	A,C,D,E
HS-DAS-16	16	128 samples	16-bit	16	8	–	200 kHz	0 to +2.5V, +5V, +10V	±2.5V, +5V, ±10V	2	0 to +5V 0 to +10V	±5V ±10V	200 kHz	2	2 x 8 bit	A,C,D,E
FAST 16-1	16	1M & 2M samples	16-bit	4	4	–	1 MHz	0 to +2.5V, +5V, +10V	±2.5V, +5V, ±10V	–	–	–	–	–	–	A,D

A = HLL 12
B = Lab Tech
C = HEM
D = DADiSP
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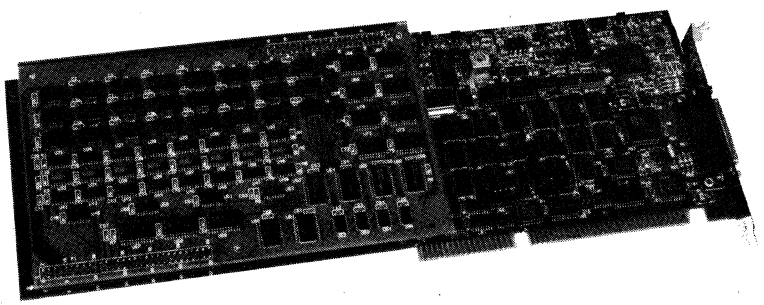
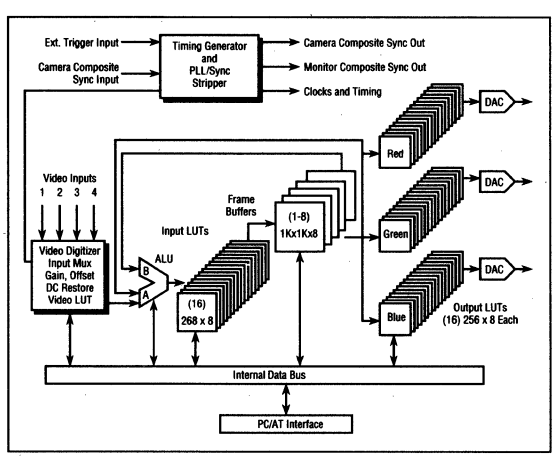


Functional Description

The FG/ALU-8 is a PC/AT-compatible plug-in board that provides the high performance image acquisition and processing capability that is normally possible only with costly multi-board or system solutions. The FG/ALU-8 provides 512 x 512 x 8-bit resolution, on-board 8-bit real-time ALU processor, on-board storage of 2 to 32 image frames, and triple display DAC outputs on a single board — at a cost that makes it the ideal choice for use in applications such as machine vision, automated inspection, and biomedical analysis. Analogic's IMAGINE™ software provides user-friendly menu driven access to all functions of the FG/ALU-8.

The FG/ALU accepts RS-170 (512 x 480 x 8 bits) or CCIR (512 x 512 x 8 bits) video standards, and flexible PLL circuitry provides stable VCR locking. Once acquired, the images are stored to the on-board frame buffers, and may be locally processed in frame time with the ALU. Input LUTs allow pre-processing of images, such as inversion or contrast, while output display LUTs provide pseudo coloring from a palette of 16.7 million colors, multi-image transformations, and non-destructive overlays.

The optionally available IMAGINE™ software provides the user with an easy to use method of controlling and operating all functions of the FG/ALU hardware. Pull down menus provide control of all hardware functions, image acquisition and management, ALU operations, and all library functions. A library of "C" callable functions (V-LIB-8) is also available for custom software development.



Ordering Guide

FG/ALU -8-1-1	512 x 480 x 8-Bit, 2 Image Buffer
FG/ALU -8-1-2	512 x 480 x 8-Bit, 8 Image Buffer
FG/ALU -8-1-3	512 x 480 x 8-Bit, 32 Image Buffer
FG/ALU -8-3-1	512 x 512 x 8-Bit, 2 Image Buffer
FG/ALU -8-3-2	512 x 512 x 8-Bit, 8 Image Buffer
FG/ALU -8-3-3	512 x 512 x 8-Bit, 32 Image Buffer
VCAB-8	Frame Grabber Video Cable
Imagine™	Menu-driven image processing software
VLIB-8	"C" Callable Library

Features

- **512 x 512 x 8-bit resolution**
- **4 input mux**
- **PC/AT compatible**
- **Software programmable gain and offset**
- **Up to 32 Framestores on board**
- **DC restoration circuitry**
- **Anti-aliasing filter**
- **Flexible PLL, locks to VCR**
- **RS-170, RS-330, PAL, and CCIR Compatible**
- **8-bit real-time ALU**
- **8-bit 10 MHz A/D converter**
- **16, 256 x 8-bit input LUT**
- **Nondestructive 4-bit overlay buffer**
- **Real-time pan, scroll, and zoom**
- **4K x 8-bit output LUTs per RGB**
- **8-bit Output RGB DACs**

Applications

- **Video image acquisition**
- **Video image analysis**
- **Biomedical analysis**
- **Machine vision**
- **Pattern recognition**
- **Robotics**
- **Automated inspection**
- **Security systems**
- **Pseudo-color enhancement**

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Analog-to-Digital Converters

Description	Model Number	Bits	Conversion Time	Input Ranges	Differential Nonlinearity	Integral Nonlinearity	Noise	Package
Buffered A/D converter	MP2735A-2	15	5 µs	±5V 0 to +10V	±0.25 LSB	±0.005% FSR	35 µV rms	3" x 4" x 0.44"
Buffered A/D converter	AM30516	16	5 µs	±5V 0 to +10V	±0.25 LSB	±0.003% FSR	30 µV rms	3" x 4" x 0.44"
Triple Slope A/D converter	AH30217	17	3.33 ms	±10V	±0.2 ppm FSR	±12 ppm FSR	10 µV rms	40-pin TDIP
Sub-Ranging A/D converter	ADC5030	18	5 µs	±5V 0 to +10V	±0.5 LSB	±0.002% FSR	30 µV rms	3" x 4" x 0.44"
6 Channel ADC with UART	ADC5041	16-24	1-100 CPS	±5V	±1 LSB	±0.00075% FSR	10 µV rms	1.2" x 2.2" x 0.44"
6 Channel ADC with µP Int	ADC5042	16-24	1-100 CPS	±5V	±1 LSB	±0.00075% FSR	10 µV rms	1.2" x 2.2" x 0.44"

Sample-and-Hold Amplifiers

Description	Model Number	Gain Range	Input Range	Acquisition Time	Aperture Uncertainty	Non-Linearity	Noise	Package
1-Ch. Audio Distortion Suppressor	AH201-1	–1	±10V	N/A	N/A	±0.002%	10 µV rms	24-pin DIP
2-Ch. Audio Distortion Suppressor	AH201-2	–1	±10V	N/A	N/A	±0.002%	10 µV rms	24-pin DIP
2-Ch. Audio S/H & Mux	SHA2400	+1	±5V	3.5 µs	±200 ps	±0.0015%	30 µV rms	2" x 2" x 0.44"
Low Noise S/H	SHA2410	Program-mable	±5V	2.5 µs	±200 ps	±0.0015%	20 µV rms	14-pin DIP
High-Speed, High-Accuracy S/H	AH20016	+1	±10V	500 ns	±5 ps	±0.0015%	20 µV rms	24-pin DIP
High-Speed High-Accuracy S/H	SHA2200	+1	±5V	225 ns	±10 ps	±0.006%	30 µV rms	24-pin DIP

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Sampling Analog-to-Digital Converters

Description	Model Number	Bits	Throughput Rate	Input Ranges	Differential Nonlinearity	Integral Nonlinearity	Noise	SNR	Package
3x Oversampling Audio W/FIR Fil	ADC5120	20	48 kHz	±5V	N/A	N/A	N/A	103 dB	3" x 4" x 0.44"
Industry Standard	ADC4300	16	50 kHz	Pin Pro-grammable	±0.0015% FSR	±0.0015% FSR	200 µV rms	N/A	32-pin DIP
Monolithic Self-Calibrating	ADC4201	16	86 kHz	0V to Vref ±Vref	No Missing Codes	±0.0015% FSR	60 µV rms	87 dB	40-pin DIP
Monolithic Self-Calibrating	ADC4202	16	86 kHz	0V to Vref ±Vref	No Missing Codes	±0.0015% FSR	60 µV rms	90 dB	40-pin DIP
Monolithic Self-Calibrating	ADC4203	16	86 kHz	0V to Vref ±Vref	±0.001% FSR	±0.001% FSR	35 µV rms	92 dB	40-pin DIP
Monolithic Self-Calibrating	ADC3201	14	94 kHz	0V to Vref ±Vref	±0.0015% FSR	±0.0015% FSR	40 µV rms	79 dB	40-pin DIP
Monolithic Self-Calibrating	ADC3202	14	94 kHz	0V to Vref ±Vref	±0.0015% FSR	±0.003% FSR	40 µV rms	84 dB	40-pin DIP
Low Noise, Low Distortion	ADC4355	16	100 kHz	±5V 0 to +10V	±0.25 LSB	±0.003% FSR	35 µV rms	95 dB	3" x 4" x 0.44"
Low Noise, Low Distortion	MP2735A-1	15	125 kHz	±5V 0 to +10V	±0.25 LSB	±0.005% FSR	45 µV rms	90 dB	3" x 4" x 0.44"
Low Noise, Low Distortion	AM40516	16	125 kHz	±5V 0 to +10V	±0.25 LSB	±0.003% FSR	40 µV rms	95 dB	3" x 4" x 0.44"
Low Noise, Low Distortion	ADC5020	18	144 kHz	±5V 0 to +10V	±0.5 LXB	±0.0005% FSR	40 µV rms	103 dB	3" x 4" x 0.44"
Low Noise, Low Distortion	ADC4357	16	200 kHz	±5V 0 to +10V	±0.5 LSB	±0.003% FSR	60 µV rms	90 dB	3" x 4" x 0.44"
High-Speed	ADC4342	16	400 kHz	±5V 0 to +10V	±0.5 LSB	±0.002% FSR	55 µV rms	91 dB	3" x 5" x 0.44"
High-Speed	ADC4346	16	400 kHz	±5V 0 to +10V	±0.5 LSB	±0.002% FSR	55 µV rms	91 dB	3.8" x 4.5" x 0.55"
Very High Speed	AM40016	16	400 kHz	0 to +10V	±0.75 LSB	±0.003% FSR	70 µV rms	N/A	3" x 5" x 0.44"
Very High Speed	AM40116	16	400 kHz	±10V	±0.75 LSB	±0.003% FSR	90 µV rms	N/A	3" x 5" x 0.44"
Very High Speed	AM41016	16	400 kHz	0 to +10V	±0.85 LSB	±0.003% FSR	70 µV rms	83 dB	3" x 5" x 0.44"
Very High Speed	AM41116	16	400 kHz	±10V	±0.85 LSB	±0.003% FSR	90 µV rms	88 dB	3" x 5" x 0.44"
Very High Speed	AM41216	16	400 kHz	±5V	±0.85 LSB	±0.003% FSR	70 µV rms	83 dB	3" x 5" x 0.44"
Very High Speed	ADC3214	14	1 MHz	±1.25V ±2.5V	±0.75 LSB	±0.006% FSR	180 µV rms	76 dB	2" x 3" x 0.44"
Very High Speed	ADC4344	16	1 MHz	(±5V) (±2.5V) 0 to +10V	±0.75 LSB	±0.003% FSR	90 µV rms	90 dB	2.5" x 3.5" x 0.44"
Very High Speed	ADC3110	14	1 MHz	(±5V) (±2.5V) 0 to +5V	±0.75 LSB	±0.006% FSR	180 µV rms	84 dB	3" x 5" x 0.44"

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MINIGLOSSARY TIMERS

Accuracy
The variation of unit performance, i.e., time delay, voltage trip point, etc., over the specified conditions of ambient temperature, input voltage range, and time between operations.

Adjustability
The changing of a unit set point, within the specified range of unit operation, by means of internal or external adjustment mechanism (i.e., changing time delay with potentiometer).

Contact Rating
The electrical power-handling capability of relay contacts under specified environmental conditions and for a prescribed number of operations.

Delayed Interval Timing Function
Input voltage is applied continuously. The timing cycle is started by momentarily actuating the control circuit. The functions of separate Delay-On-Operate and interval type timers are combined in one package providing a single OFF-ON-OFF output cycles

Also called: single shot.

Delay-On-Operate Timing Function
Application of the input voltage starts the time delay. At completion of the time delay, the relay contacts transfer.

Also called: Delay-On-Make, On-Delay, Delay Relay, Delay-On-Pickup.

Delay-On-Release Timing Function
Input voltage must be supplied continuously to timer. Actuation of control circuit causes relay contacts to transfer immediately. Time delay starts when control circuit is released. The relay remains energized for the duration of the time delay—then de-energizes.

Also called: Delay-On-Break, Off-Delay, Delay-On-Dropout, Delay-On-Energization.

Frequency Sensor
A device that monitors a predetermined overfrequency and/or underfrequecy condition, and changes output state when these conditions exist.

Hysteresis
The difference between the response of a unit or system to an increasing and a decreasing signal (example: a voltage sensor).

Interval Timer Timing Function
Application of input voltage causes relay contacts to transfer and time delay to begin. At completion of the time delay, the relay contacts return to de-energized state.

Also called: Delay Interval, One Shot.

Output Control
The switching device, either solid-state or electromechanical, used in the unit to control the load connected to the output terminal(s).

Phase Sensor
A device that monitors for proper phase rotation in 3-phase systems.

Programmability
Ability to modify function, time delay or input voltage of a timer.

Recovery Timer

(Delay-On-Operate/Interval Timer)
The minimum time that input voltage must be interrupted *prior* to time-out to insure a successive timing cycle within the specified limits.

(Delay-On-Release)
The minimum duration of time that control circuit must be re-actuated to insure a new timing cycle when the control circuit is released.

Recycle Time

(Delay-On-Operate or Interval Timer)
The minimum time that input voltage must be interrupted after the timing cycle is completed to assure a successive timing cycle within the repeatability specified.

(Delay-On-Release)
The minimum duration of time that control circuit must be actuated to insure a successive timing cycle within the repeatability specified when the control circuit is released.

Repeat Cycle Timer Timing Function
Application of power automatically initiates continuous off-on cycling of the output relay.
Also called: flasher, intervalometer

Reset Time
The time required for the contacts to return to normal position when power is removed.

Reverse Polarity Protection
Blocking circuitry arrangement within the timer to prevent damage or output actuation if reverse polarity input voltage is applied.

Tolerance
The difference between specified and actual timing or sense point (factory setup tolerance).

Transient Protection
Prevents damage to unit if positive or negative transients are applied to the unit. Insures proper operation of the unit during and after transient occurrence. Max. transients are usually specified as to amplitude and duration, i.e., 1000V for 1 second.

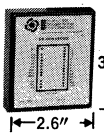
Trip Point
The predetermined point at which a sensing device is set to change the output state.

Voltage Sensor
A device that monitors for a predetermined overvoltage and/or undervoltage condition, and changes output state when these conditions exist.

SYNCHRO CONVERTERS/DISPLAYS/ENCODERS

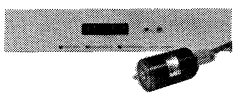
STANDARD LOW COST UNITS TO SATISFY ALMOST ANY SYNCHRO/RESOLVER OR SHAFT INTERFACING REQUIREMENT

SYNCHRO/RESOLVER TO BCD Series SBC



INPUT: 11.8/90V RMS L-L, 60 or 400Hz. Ref: 26/115V RMS **OUTPUT:** 3, 4 or 5 decade BCD-scaleable unipolar or bipolar **ACCURACY:** ±30, ±6, or ±2 minutes of arc ±1 LSB. **PACKAGE:** 2.6″ x 3.1″ x .82″H module. **OPTIONS:** Choice of Scale factors, Zero offset adjustments (±5%).

MULTITURN ABSOLUTE ENCODERS Series MDS90



INPUT: MULTI-TURN Shaft angle position. **OUTPUT:** 4, 5, or 6 Digit LED Display +BCD or Binary Data. **ACCURACY:** Up to ±1 pt. in 100,000. **PACKAGE:** Size 23 Pickoff with full or half rack electronics. **OPTIONS:** Zero Offset, NEMA 12 Housings, Presets, power supplies.

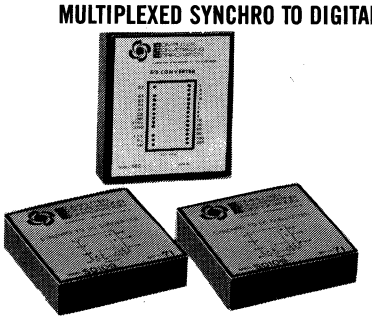
TYPICAL UNITS

Multiturn Encoders	Output Code	Resolution Counts/360°	Revolution for Full Count	Data Range
MDS90-DBC-16	Binary	2^{10}	64	2^{16}
MDS90-DBC-10	BCD	1000	10	10,000
MDS90-DBC-100	BCD	1000	100	100,000

LOW COST ANGLE INDICATOR Series AI540

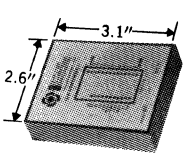
INPUT: 11.8/90V RMS L-L, 60 or 400Hz, Ref: 26/115V RMS +115V 60Hz power. **OUTPUT:** 3, 4 or 5 Digit .5″H LED Display (Unipolar or Bipolar) **ACCURACY:** ±3, ±6 or ±30 minutes of arc, ±1 LSB. **PACKAGE:** (A) 5.5″W x 7.5″L x 2.0″H panel mount (DC supplies included); (B) 9½″W x 1¾″H half rack mounting (DC supplies included). **OPTIONS:** Choice of scale factors, Zero offset adjustment (±5°).

MULTIPLEXED SYNCHRO TO DIGITAL Series MSI



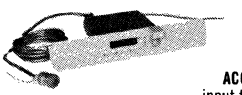
INPUT: 11.8/90V RMS L-L 60 or 400Hz, Ref. 26/115V RMS, up to 128 channels. **OUTPUT:** 14 Bits parallel binary or 4 decade BCD **ACCURACY:** ±4.6 minutes of arc ±.5 LSB. **PACKAGE:** (A) Central Converter 2.6″ x 3.1″ x .43″H module; (B) Four channel input module 2.6″ x 3.1″ x .43″H module. **OPTIONS:** (A) Scale Factor choice on BCD output. (B) Linear DC output. (C) Systems mounted on PC boards or racks

MULTISPEED SYNCHRO TO DIGITAL ONE MODULE Series SDT



INPUT: 11.8/90V RMS L-L, 60 or 400Hz Ref: 26/115V RMS **SPEEDS:** 10, 16, 18, 32, 36, 64. **OUTPUT:** 16 Bits parallel binary and velocity. **ACCURACY:** ±.01 or ±.005 degrees **PACKAGE:** One 2.6″ x 3.1″ x .82″H module. **OPTIONS:** (A) Systems packaged on PC cards or racks; (B) 6 Digit Display

ABSOLUTE ENCODERS Series DS90



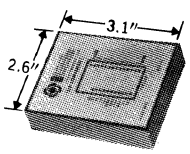
INPUT: Shaft angle position coupled to "DIGI-SHAFT" system; **OUTPUT:** four digit (.5″H) LED display (0 to 9999) +BCD or Parallel binary data (ANY SCALE FACTOR DESIRED); **ACCURACY:** ±1 part in 3600 (single turn) From shaft input to digital output; **PICKOFF:** Resolver (Size 8, 11, or 15); **PACKAGE:** (A) 5.44″W x 7.00″ x 1.75″H; (B) Full or half rack; **OPTIONS:** Multichannels, Zero offset, Presets, DC output, Multiturn units with 5 digit (99999) output, NEMA 12 Housings.

TYPICAL UNITS (single Turn)

Pt. No.	Output	Counts/360°
DS90-DB-12	Binary Data	2^{12}
DSR90-36-BC	0-3599 display +BCD data	3600
DSR90-10	0–999 display	1000
DSR90-25-BC	0 to ±2500 display +BCD data	±2500

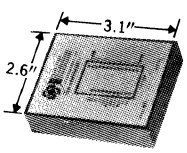
FULL SCALE OUTPUTS OF UP TO 9999 AVAILABLE
MULTITURN UNITS WITH UP TO 999999 FULL SCALE OUTPUTS AVAILABLE

SOLID STATE CONTROL TRANSFORMER Series SCT



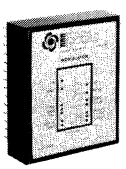
DIGITAL INPUT ANGLE (ϕ): 14, 12, or 10 bits parallel binary. **SYNCHRO RESOLVER INPUT ANGLE (θ):** 11.8/90vrms L-L, 60 or 400Hz. **OUTPUT:** E out=(V ref ±7%) sin (θ-ϕ) Sin wt; **GRADIENT:** .4 or 1vrms/degree. **RANGE:** ±7 or ±12.5 degrees; **ACCURACY:** ±4, ±15, or ±30 minutes of arc. **PACKAGE:** 2.6″ x 3.1″ x .82″H Module.

SOLID STATE CONTROL DIFFERENTIAL TRANSFORMER Series SCDX



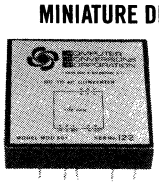
DIGITAL INPUT ANGLE (ϕ): 14, 12, or 10 bits parallel binary. **SYNCHRO/RESOLVER INPUT ANGLE (θ):** 11.8/90vrms L-L, 60 or 400Hz. **OUTPUT:** (1) 9.2K (ϕ) Sin (θ-ϕ) Sin wt. [7vrms.] (2) 9.2K (ϕ) Cos (θ-ϕ) Sin wt. [7vrms.] **ACCURACY:** ±4, ±15 or ±30 minutes of arc. **PACKAGE:** 2.6″ x 3.1″ x .82″H.

MINIATURE MODULATORS Series MOD500



INPUT: 0 to ±10 OR ±100V DC and 26V/115V RMS reference. **OUTPUT:** 0 to 7V RMS (other voltages available). **ACCURACY:** ±.2% **F.S.: NULL:** ±.1% F.S. **PACKAGE:** (A) 2.6″ x 3.1″ x .625″ Module. (B) 1.3″ x 1.3″ x .42″H module. **OPTIONS:** Gain+Zero adjust, external output transformers.

MINIATURE DEMODULATORS Series D400



INPUT: 0 to 5, 10, 25 or 100V RMS, 400 to 5000Hz, 5/26V RMS, reference. **OUTPUT:** 0 to ±5 or ±10V DC. **ACCURACY:** ±.2, .3 or .5% **F.S.: NULL:** ±.1% F.S. **PACKAGE:** (A) 1.3″ x 1.3″ x .42″H module. (B) 1.75″ x 1.75″ x .6″H module

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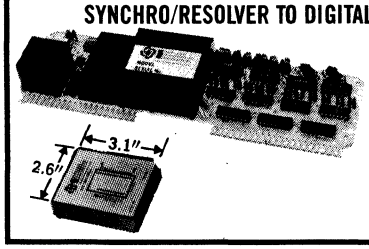
SYNCHRO CONVERTERS/DISPLAYS/ENCODERS

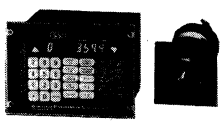
STANDARD LOW COST UNITS TO SATISFY ALMOST ANY SYNCHRO/RESOLVER OR SHAFT INTERFACING REQUIREMENT

SYNCHRO/RESOLVER TO DIGITAL Series SDC40/60



INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** 16, 14, 12, or 10 Bits parallel binary or BCD. **ACCURACY:** ±1, ±4, ±6 or ±30 minutes or arc. **PACKAGE:** (A) 2.6" x 3.1" x .42"h Module (B) 2.6" x 3.1" x .82"h or (C) 4.5" x 6.5" x .75"h repairable PC card.

PROGRAMMABLE LIMIT SWITCH Series PLS1000

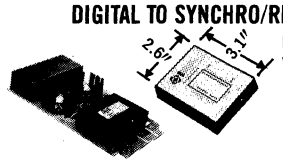


INPUT: Single, Multiturn or Linear Resolver. **RESOLUTION:** Field Scaleable to 1 part in 4096/turn. **OUTPUTS:** 16 & 1 fault, field select TTL or DC to 50V, Solid State and Electro-mechanical relay boards. **DISPLAY:** 8 character electro fluorescent and status LEDs. **SPEED:** 5 us throughput fully loaded, 3000 RPM. **FUNCTIONS:** Hi/Low setpoints, dwells, timers, tach, cycle count RS232 I/O, force outputs, offsets, 5 speed advance. **MEMORY:** Non-volatile EEPROM 10–100 programs, serial buffer. **SIZE:** 7.4" x 6.2" x 4.5" panel mount or 14" x 12" x 10" Nema 13.

SYNCHRO/RESOLVER TO LINEAR DC Series SLD200

INPUT: 11.8/90vrms L-L, 60 or 400 Hz., Ref: 26/115vrms. **OUTPUT:** (A) –10 to +10 vdc linear with angles from –180° to +180° (standard) (B) o to +10V DC linear with angle from 0° to 360° (special) (C) –10 to —10 vdc linear with angles from –90° to +90°. **ACCURACY:** ±6 minutes of arc at input speeds up to 1440°/sec, or ±15, ±30, ±60 minutes of arc. **PACKAGE:** (A) 2.6" x 3.1" x .82" Module; (B) 3.06" x 2.6" x 3.18"H Can; (C) 4.5" x 6.5" x .75"H repairable PC card.

DIGITAL TO SYNCHRO/RESOLVER Series DSC40/60

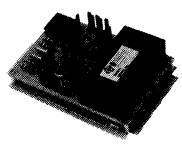


INPUT: 14, 12 or 10 bits parallel binary and 26/115 vrms reference. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving 1VA, 2VA, 5VA (up to 3 TRS) or 25VA loads. **ACCURACY:** ±4, ±15, or ±30 minutes. **PACKAGE:** A) 2.6" x 3.1" x .6"h. B) 2.6" x 3.1" x .82"h module. C) PC card with edge connector (5VA and 25VA units).

SYNCHRO/RESOLVER TO SINE-COSINE DC Series SD100

INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** ±10 sin θ vdc; ±10 cos θ vdc. **ACCURACY:** ±2 or ±4 minutes of arc. **PACKAGE:** 1.75" x 1.75" x .6"h or 3" x 3" x .625"h Module.

DC ANGLE TO SYNCHRO/RESOLVER Series LDS500

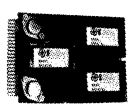


INPUT: ±10V DC or ±100V DC representing ±180° of angle. **OUTPUT:** 11.8/90V RMS L-L, 60 or 400Hz capable of driving up to three size 11 T.R.'s (75 Ohms L-L). **ACCURACY:** ±15 or ±30 minutes of arc. **PACKAGE:** (A) 4.5" x 9.25" x 2.0"H repairable PC board with 22 pin edge connector. (B) 2.6" x 3.1" x 1"H module (1.5VA Output).

INVARIANT SYNCHRO/RESOLVER TO SINE-COSINE Series SD100 I

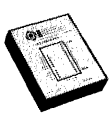
INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** ±10 sin θ vdc, ±10 cos θ vdc. **ACCURACY:** ±4 minutes of arc. **INVARIANCY:** A ±10% change in the input or reference voltage results in a ±.5% change in the individual DC outputs. **PACKAGE:** 3" x 3" x .625"h Module.

DC SIN COS TO SYNCHRO DRIVERS Series DCS400



INPUT: ±10 vdc representing sin θ and cos θ. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving up to three size 11 T.R.'s (75 ohms L-L). **ACCURACY:** ±6, ±15, ±30 minutes of arc. **PACKAGE:** A) 4.5" x 6.5" x .8"h repairable PC Card. B) 4.5" x 9.25" x 1"h PC Card.

DIGITAL TO LVDT Series DLV



INPUT: Two 14 Bit offset binary or two's complement. **OUTPUT:** 0–7V RMS at 3KHz (2000 ohm minimum load). **ACCURACY:** ±.1% of Full Scale. **PACKAGE:** 2.6" x 3.1" x .43"H Module.

DIGITAL to SYNCHRO/RESOLVER Series DSP REFERENCE POWERED

INPUT: 14 or 12 bits parallel binary and 115V **RMS REF:** 60 or 400Hz. **OUTPUT:** 90 V L-L 60 or 400Hz capable of driving 4.5VA. **ACCURACY:** ±4 minutes of arc. **PACKAGE:** 2.6" x 3.1" x .82"H. No external transformer required.

SYNCHRO/RESOLVER POWER AMPLIFIERS Series SPA

INPUT: 7V RMS L-L to 90V RMS L-L, 60 to 400Hz Synchro and 26V RMS to 115V RMS Reference input. **OUTPUT:** 7V RMS L-L to 90V RMS L-L Synchro capable of driving loads up to 125 VA. **ACCURACY:** ±3 or ±10 minutes of arc. **PACKAGE: (A)** 2.6" x 3.1" x .82"H module (1–5VA); **(B)** 4.5" x 9.25" PC card (5 to 25VA); **(C)** 5.2" x 6.0" x .75"H pc card (10 to 25VA); **(D)** 5.1" x 7.4" x 2.6"H max bulkhead mount metal case (25 to 125 VA)

ADDITIONAL PRODUCTS:

- Hi Speed Multiplexed Synchro to Digital
- Multiplexed Encoders
- Multiplexed Synchro to Linear DC
- Digital Sine/Cosine to Synchro
- Modular Encoders
- Standard Bus S/D & D/S
- Two Speed Digital to Synchro
- Synchro Reference Supply
- Selsyn to Digital/DC
- Azimuth Change Pulse Conv.
- BCD to Binary Converters

ALL SYNCHRO INPUT/OUTPUT UNITS

- Available in 0°C to 70°C or –55°C to +85°C temperature range
- TTL compatible output and inputs or CMOS, or LP Shottky
- Operate from ±15 v, or ±15 and +5 vdc
- Transformer isolated inputs/outputs
- Solid State construction — 883 Level B Available
- CAN BE MADE FIELD OR FACTORY REPAIRABLE
- Available hermetically sealed and to MIL SPECS (E-5400)
- Deliver: Stock to 4 weeks (small quantity)

SPECIAL UNITS AND PACKAGES AVAILABLE ON REQUEST

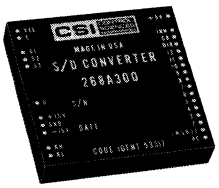
Write or phone for detailed specifications, applications assistance and evaluation units.

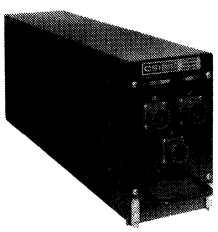
COMPUTER CONVERSIONS CORPORATION

DEPT. EM
6 DUNTON COURT, EAST NORTHPORT, NEW YORK 11731
(516) 261-3300 • TWX (510) 226-0448 • FAX (516) 261-3308

CSI CONTROL SCIENCES, INC.

OVER TWENTY YEARS OF COMMITMENT TO QUALITY





CSI specializes in providing ***real time, tracking,*** converters to digitize or simulate a wide variety of transducers such as . . .

SYNCHROS - RESOLVERS - LVDT's
RVDT's - INDUCTOSYN's™

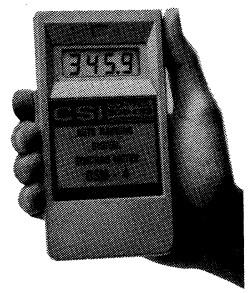
. . . for military, industrial and commercial applications. CSI provides over ***sixty families*** of modules, boards, systems and instruments including:

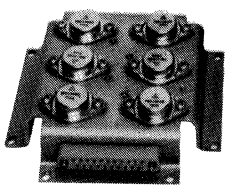
Synchro/Digital	Digital/Synchro
Resolver/Digital	Digital/Resolver
LVDT/Digital	RVDT/Digital
Inductosyn/Digital	Preamplifier
Angle Position Indicators	Testers
Solid State CT's	Solid State CDX's
Binary/BCD-BCD/Binary	Custom Converters

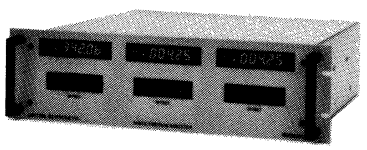
CSI is dedicated to maintaining the industry's ***highest reliability and fastest delivery.*** The actual field MTBF for standard products exceeds 2,000,000 hours and CSI delivers . . .

ON TIME - EVERY TIME!!!

Contact our Applications Hot Line for *immediate* assistance...(818) 709-4705







PIN FOR PIN REPLACEMENT GUIDE FOR ANALOG DEVICES CONVERTERS

Analog Devices Series	Control Sciences Series	Analog Devices Series	Control Sciences Series	Analog Devices Series	Control Sciences Series
AP1750	110A102	RDC1602	168F100	SDC1604	168H100
DSC1605	192B500	RDC1603	168F200	SDC1700	168F300V
DSC1705	192B700	RDC1700	168F300V	SDC1702	168F200V
DSC1706	192B800	RDC1702	168F200V	SDC1704	168F100V
DTM1716	192B203	RDC1704	168F100V	SDC1725	168T350
DTM1717	192B303	RDC1725	168T350	SDC1786	168F200
IPA1751	220A100	RDC1786	168F200	TSDC1608	168C300-8
IRDC1730	168L500	SBCD1756	168E600	TSDC1609	168C300-16
IRDC1731	168L400	SBCD1757	168E600	TSDC1610	168C300-32
RBCD1756	168E600	SDC1602	168F100	TSDC1611	168C300-64
RBCD1757	168E600	SDC1603	168F200	TSL1612	167B100

Contact factory for second source replacements to other manufacturer's conversion products

CSI CONTROL SCIENCES INCORPORATED
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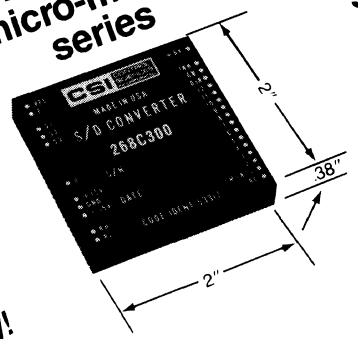
synchro/resolver/Inductosyn™/LVDT converters

CSI

2" x 2" micro-module series



synchro/resolver converters

Digital to synchro/resolver converter, 12-14 bit series 292A700/800

FEATURES
- 4/6 minute accuracy
- Short-circuit protection
- Thermal protection
- 1.5 watt output power
- Integral heat sink

Synchro/resolver to digital converter, 12 bit series 268A300

FEATURES
- 8.5 minute accuracy
- Fast tracking to 100 rps
- 50 - 2600 Hz operation
- Velocity/Inter-LSB outputs
- Direction/ripple clk outputs

NEW!

Synchro/resolver to BCD converter, 4 decade series 268A600

FEATURES
- 100 milliwatts @ ± 5V
- 0.2 degree accuracy
- 50-1200 Hz operation
- Pin programmable for 0° to 360° or ± 180°

Solid-state control transformer, 12-bit series 280A300

FEATURES
- Synchro or resolver input
- 6 minute accuracy
- Demodulated ac output
- Low power, 600 milliwatt
- 50 - 2600 Hz operation

NEW!

Micro-power Synchro/ Resolver to digital converter, 12 bit series 268C300

FEATURES
- 150 milliwatts
- 8.5 minute accuracy
- 50 - 1200 Hz operation
- Velocity/Inter-LSB outputs
- Direction/ripple clk outputs

resolver/inductosyn™ converters

Dual Preamplifier, low noise, inductosyn series 220A100

FEATURES
- Gain 1300
- 2.6 - 10 KHz operation
- Phase match 1 degree
- Stable with 16-bit R/D's
- Load capacity 10,000 pf
- Low power, 150 mw typical

Power Oscillator, 5-watt resolver/inductosyn series 210A100

FEATURES
- 400 Hz - 10 KHz operation
- In-phase/quadrature outputs
- 5-watt continuous output
- Short-ckt/overload protection
- Thermal cutoff protection
- Integral heat sink

Resolver/inductosyn to digital converter, 12 bit series 268B300

FEATURES
- 8.5 minute accuracy
- Fast tracking to 100 rps
- 400 Hz - 10 KHz operation
- Velocity/Inter-LSB outputs
- Direction/Ripple clk output

Inductosyn is a registered trademark of Farrand Industries, Inc.

special function converters

LVDT/RVDT to digital converter, 11 bit series 278A300

FEATURES
- Fast tracking to 400 lsb/ms
- Bandwidth to 250 Hz
- 400 Hz - 10 KHz operation
- Inter-LSB output
- Velocity output
- Over-range output

Binary angle to bcd converter, 4-decade series 269A100

FEATURES
- 0.125 rounding error
- Ultra low power, 30 mw
- 12-bit digital input
- Full scale 359.9 degrees
- 2.5 millisecond conversion

Military LVDT/RVDT converter, 14 bit series 378A100

FEATURES
- Programmable input
- Fast tracking to 320 lsb/ms
- 400 Hz - 5KHz operation
- Inter-LSB output
- Velocity output
- Over-range output

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CSI synchro/resolver/Inductosyn™ to digital converters

SINGLE SPEED TRACKING SYNCHRO/RESOLVER/INDUCTOSYN™ CONVERTERS

GENERAL DATA

CSI tracking converters will operate with either sine or square wave excitation with no degradation in performance. Most units will withstand 1000% overvoltage indefinitely without damage.

By design, units may be supplied to fit non-standard requirements without impacting price or delivery. No cost options include non-standard input voltages, non-standard tracking rates and dynamic responses, plus dc output proportional to velocity. Typical delivery is four to six weeks ARO.

FEATURES

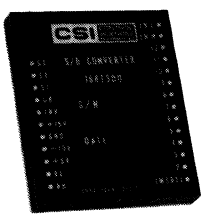
- Low power consumption
- True Type II tracking converter
- Industry standard pin-out
- 1000% overvoltage protection
- Insensitive to amplitude and frequency variations

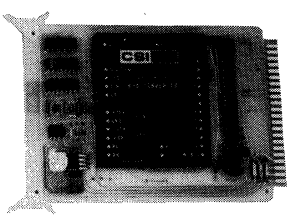
APPLICATIONS

- Radar tracking systems
- Navigation systems
- Industrial control systems
- Collision avoidance systems

GENERAL PURPOSE TRACKING

Series	Resolution	Accuracy	Tracking	Package[1]	Input[2]	Remarks
168F200	10 Bits	±30 Minutes	70 RPS	A	S,R 3-130 Vrms 50-1200 Hz	Industry standard broadband series. 1000% input overvoltage protection. Optional velocity output.
168F300	12 Bits	±8.5 Minutes	30 RPS			
168F100	14 Bits	±5.3 Minutes	10 RPS			
168T300	12 Bits	±8.5 Minutes	50 RPS	A	S,R 3-130 Vrms 50-2600 Hz	Outputs have three-state latches. Single word or two byte read.
168E700	1°	±1°	36 RPS	B	S,R 3-130 Vrms 50-1200 Hz	BCD converter features ultra-low power consumption. 1000% input overvoltage protection.
168E600	0.1°	±0.2°	36 RPS			
900B101S	4¹/₄×6¹/₄ inch card for most above units including sockets.					
SCB-24	4¹/₄×6¹/₄ inch system card accepts most tracking converters. Includes oscillator, optional 3-state latches or encoder (A quad B) output.					



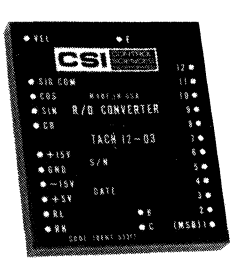


HIGH ACCURACY/FAST TRACKING

Series	Resolution	Accuracy	Tracking	Package[1]	Input[2]	Remarks
168H100	16 Bits	±1.3 Minutes	3 RPS	B	S,R 3-130 Vrms 50-440 Hz	Synthesized reference corrects up to 70° phase shift.
168H200	16 Bits	±3.5 Minutes (±1.8 Minutes Repeatability)	5 RPS	A	S,R 3-130 Vrms 50-2600 Hz	Low cost 16 bit series with high repeatability.
168H600	14 Bits	±2.6 Minutes	30 RPS	A	R 2.5-11.8 Vrms 360-2600 Hz	High accuracy/fast tracking series.
168H700	15 Bits	±1.6 Minutes	17 RPS			
168H800	16 Bits	±1.3 Minutes	8 RPS			
900B115S	4¹/₄×6¹/₄ inch mounting card for above units including sockets.					

INDUCTOSYN™/RESOLVER CONVERTERS

Series	Resolution	Accuracy	Tracking	Package[1]	Input[2]	Remarks
168L400	4000 Counts	±2 Counts	100 RPS	A	R,I 2.5 Vrms 5000 Hz	Serial data plus zero crossing and direction outputs.
168L500	12 Bits	±8.5 Minutes	67, 87, 170 RPS	A	R,I 2.5 Vrms 400-10k Hz	Ripple carry and direction outputs, velocity output.
TACH-12	12 Bits	±8.5 Minutes	50, 75, 100 RPS	A	R 2.5-11.8 Vrms 400-5000 Hz	Features 1% precision velocity to replace tachometers. Flat response to 200 Hz.



1. A = 3.125″ × 2.625″ × 0.42″ maximum module B = 3.125″ × 2.625″ × 0.82″ maximum module
2. S = Synchro, R = Resolver, I = Inductosyn™

Inductosyn is a registered trademark of Farrand Industries Inc.

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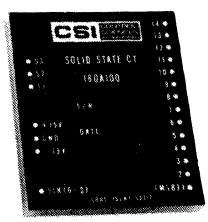
synchro/resolver/Inductosyn™ to digital converters

CSI

SPECIAL FUNCTION DEVICES

	Series	Description	Input[2]	Output	Accuracy	Remarks	Size[1]
NEW!	110A100	5 VA Power Oscillator		6-115 Vrms 400-10K Hz		Adjustable Amplitude	B
	160B100	4 channel Multiplexed S/D, R/D	S, R, I 2.5-130 Vrms 47-5000 Hz	12 bit Binary Angle	± 8.5 Minutes	100 micro-second conversion	3.4x4.0 x .42"
NEW!	175A100	3 VA Ampl.	S, R	S, R	± 3 min.	3 VA power	B
	178A100	LVDT/RVDT converter + pwr. osc.[1]	LVDT, RVDT 2.5 Vrms, 400-5000 Hz	14 bit Binary + Excitation	± 0.03% F.S. @ x 1 Gain	High BW, Prog. gain. Overrange	A
NEW!	185A400	Solid-state CDX	S, R plus 13 bit digital angle	Output Difference Angle	± 6 Minutes	3 VA Output Power	B



SOLID STATE CONTROL TRANSFORMERS

Series	Resolution	Accuracy	Package[1]	Input[2]	Output	Remarks
180A200	10 Bits	±15 Minutes	A	S,R 11.8 V or 90 Vrms	0.4 V/Deg (11.8 V In) 1.0 V/Deg (90 V In)	Output represents difference between input S(R) angle and digital angle. Output range ±7° from null.
180A300	12 Bits	±6 Minutes				
180A100	14 Bits	±4 Minutes				
188A300	12 Bits	N/A	B	Two Digital Angles, AC Ref.	±10V for 1/2 scale	Output represents difference of two digital angles.

TWO SPEED TRACKING CONVERTERS

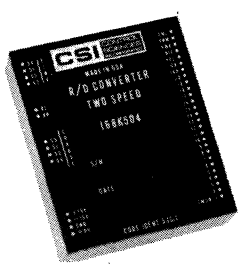
GENERAL DATA

CSI offers a broad line of modular and card mounted two-speed S/D and R/D converters with resolutions to 22-bits and accuracies to ±3-seconds of arc. All are type II tracking converters featuring no velocity error and only minor acceleration errors. Inputs withstand 1000% overvoltage without damage. Models available for multi-pole resolvers with up to 70° phase shifts.

FEATURES
- High accuracy
- Low cost
- 1000% overvoltage protection
- Industry standard pinouts

APPLICATIONS
- Geared two speed
- Multiple pole two speed
- Radar systems
- Robotics

	Series	Resolution	Accuracy	Tracking	Package[1]	Input[2]	Remarks
	168H500	16 Bits	±20 Seconds	To 3 RPS	B	S,R 1:36 1:16, 1:32 3-130 Vrms 50-3000 Hz	Low cost single module version of above unit.
NEW!	168M500				A		Low profile version of above.
NEW!	168T500						Low profile 3-state version of above.
	168K400	16 Bits	±20 Seconds	3 RPS	B	S,R 1:16, 1:32, 1:36. 3-130 Vrms 400-5000 Hz. Designed for multi-pole S,R.	Accurate single module 2-speed converter with **3-state outputs** and auto-correction for phase shifts to ±70°, ambiguity correction and "stick-off" voltage.
	168K500	20 Bits	±7 Seconds	½ RPS			
	168C300	10 Bits	±30 Minutes	30 RPS	B	S, R Binary Ratios 3-130 Vrms 50-1200 Hz	Coarse converter includes combiner for operation with 12 to 16 bit std. fine converter.
	167B100	19 Bits	± ½ LSB	—	B	Input from two std. S/D, R/D	Combiner for 36:1, 18:1, 9:1 speed ratios from two R/D, S/D converters.
	SCB-15	4¼ x 6¼ inch, circuit board accepts 168C300 plus std. 12, 14, 16 bit S/D, R/D to form complete two speed system.					



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(818) 709-5510 FAX (818) 709-8546

CSI digital to synchro/resolver converters

DIGITAL TO SYNCHRO/RESOLVER CONVERTERS

GENERAL DATA

The series 192 is a family of TTL/LSTTL/CMOS compatible digital to synchro/resolver converters with 1.5 VA to 125 VA output power ratings. Natural parallel binary angle data is continuously converted to analog AC form . . . either as 3-wire synchro or 4-wire resolver signals capable of driving most control transformers or torque receivers. All models are short circuit and overload protected.

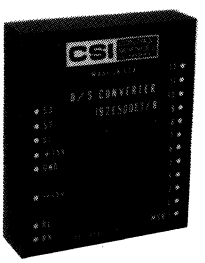
FEATURES

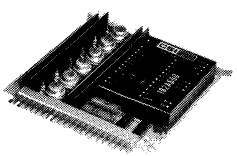
- 12 to 14 bit resolution
- Module or card mounted models
- 1.5 to 125 VA output power
- "Locked rotor" protected (5, 125 VA)
- Thermal overload protected (5, 25, 125 VA)
- Automatic shutdown/recovery (125 VA)

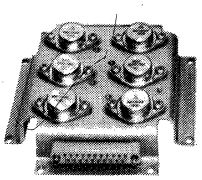
APPLICATIONS

- Trainers
- Simulators
- Remote indicators

Series	Resolution	Output Drive	Output[2] Level	Accuracy	Package[1]	Remarks
192B200	14 Bits	5 ma	R, ±10 V DC-2600 Hz	± 3 Minutes	A	High accuracy vector generator with 0.1% scale factor variation.
192B500	14 Bits	1.5 VA	S,R 11.8 or 90 Vrms 60 or 400 Hz	±4 Minutes	B	Logic voltage +5 to +10 Vdc
192B700	14 Bits	1.5 VA	S,R 11.8 or 90 Vrms 60 or 400 Hz	±4 Minutes	B	Internal +5V logic voltage.
192B800	12 Bits	1.5 VA		±8 Minutes		
192E500	12 Bits	5 VA	S,R 11.8 or 90 Vrms 60 or 400 Hz	±6 Minutes (CT) ±12 Minutes (TR)	B	Built in heat sink with integral overtemperature cutoff, automatic "locked rotor" prevention. Loss of one ±15 Vdc supply will not damage unit.
192E600	14 Bits	5 VA		±4 Minutes (CT) ±12 Minutes (TR)		
SCB-22	4¼×6¼ inch card includes 192B700, 192B800, 192E500 or 192E600, 400 Hz models and features input data latches					
SCB-25	4¼×6¼ inch card includes 192B700, 192B800, 192E500 or 192E600, 60 Hz models with transformers and input data latches.					
192A600	12 Bits	25 VA	S, 11.8 or 90 Vrms 60 or 400 Hz	±10 Minutes (CT) ±21 Minutes (TR)	5¼ x 5⅜ inch card + transformer.	Board mounted unit features input data latches, output disable, overtemperature cutoff, external transformers. Kits available.
192A650	12 Bits	125 VA	S, 11.8 or 90 Vrms 60 or 400 Hz	±6 Minutes No Load ±21 Minutes Full Load	5¼ x 5⅜ inch card + power buffer & transformer.	Board mounted unit as above 192A600 plus automatic "locked rotor" prevention, automatic overload shutdown and recovery. External transformers and power buffer. Kits available.
SCC-10	5¼×5⅜ inch transformer card for 192A600 series, one or two pair per card assy.					







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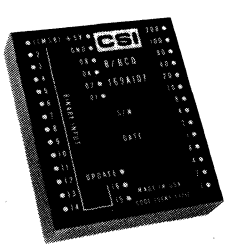
2. S = Synchro, R = Resolver

BINARY/BCD, BCD/BINARY CONVERTERS



NEW!

Series	Input	Output	Accuracy	Package[1]	Conversion Time	Remarks
169A107	16 Bits	359.99°	±01°	B	2.5 us	5 Decade Binary/BCD
169A108	19 Bits	359.999°	±0009°	B	75 ms	6 Decade Binary/BCD
169A200	To 19 Bits	scalable	±0.0003%	B	400 ms	To 6 Decade Binary/BCD
196A100	359.99°	16 Bits	±.003°	B	300 ns	5 Decade BCD/Binary
196A102	359.999°	19 Bits	±.0006°	B	600 ms	6 Decade BCD/Binary

1. B = 3.125" x 2.625" x 0.82" maximum module

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synchro/resolver/encoder systems/related products **CSI**

Now you can measure, align, or checkout synchro systems with a rugged meter that fits in your hand.

The *world's first* handheld Digital Synchro Meter . . .the DSM-4™.

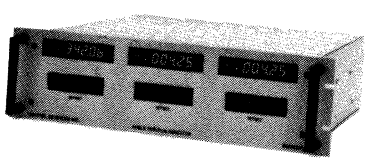
- Auto ranges to accept all standard military synchro signals
- 7-14/54-108 volt stators
- 20-140 volt reference
- 47 to 1200 Hz frequency range
- Large 0.5" four digit LCD display
- 0 to 359.9 degrees range
- ±0.2 degree accuracy
- Rugged, battery powered

And now the world's first handheld Digital Resolver Meter. . .the DRM-4.™

All features of the DSM-4™ except autoranging. The DRM-4™ features two voltage ranges selectable by the power switch. Standard voltage ranges are 3.5 to 7.0 and 7.0 to 14 volts rms. Reference is 3.5 to 30 volts, 47 to 2600 Hz.

ANGLE POSITION INDICATORS

FEATURES
- 1, 2, or 3 Channels
- Synchro/Resolver/Encoder inputs
- 5 or 6 Decade display
- Binary digital outputs
- Full 360° offset Maintenance/Calibration Free

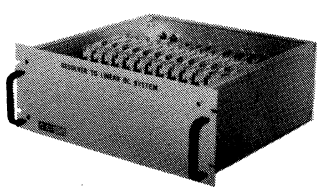


AIRBORNE SYNCHRO AMPLIFIER

FEATURES
- ½ ATR case
- 2 input channels
- Four 5 VA outputs
- Exceeds MIL-STD-704D
- MIL-STD-810, 514.2
- MIL-E-5400, Class 1A

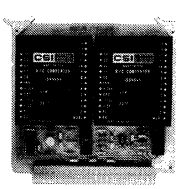
MULTICHANNEL DATA ACQUISITION SYSTEM

FEATURES
- Synchro or resolver input
- Up to 26 channels
- 0-10V analog output
- Integral power supply
- 60 or 400 Hz



DUAL SYNCHRO/RESOLVER TO ANALOG CONVERSION CARDS

FEATURES
- Synchro or resolver input
- ±0.2° or 0.05° accuracy
- 60 or 400 Hz
- 0-10V output



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SAMPLING A/D CONVERTERS

	Model	Resolution (Bits)	Throughput (MHz)	Linearity Error (Max)	Power Watts (Max)	Case
	ADC-HS12B	12	0.066	±3/4 LSB	1.8	32-Pin DIP
	ADS-111	12	0.500	±3/4 LSB	1.8	24-Pin DIP
	ADS-112	12	1.0	±3/4 LSB	1.7	24-Pin DIP
	ADS-193	12	1.0	±3/4 LSB	1.7	40-Pin DIP
	ADS-21PC	12	1.3	±1 LSB	2.5	46-Pin DIP
	ADS-132	12	2.0	±3/4 LSB	3.2	32-Pin DIP
New	**ADS-117**	12	2.0	±3/4 LSB	1.8	24-Pin DIP
New	**ADS-118**	12	5.0	±1 LSB	2.5	24-Pin DIP
	ADS-131	12	5.0	±1 LSB	4.0	40-Pin DIP
	ADS-130	12	10.0	±1 LSB	4.2	40-Pin DIP
Advance	**ADS-120**	12	20.0	±1 LSB	4.2	40-Pin DIP
	ADS-924	14	0.300	±1 LSB	1.8	24-Pin DIP
	ADS-928	14	0.500	±3/4 LSB	3.4	32-Pin DIP
New	**ADS-941**	14	1.0	±3/4 LSB	3.3	32-Pin DIP
New	**ADS-942**	14	2.0	±1 LSB	3.4	32-Pin DIP
Advance	**ADS-944**	14	5.0	±1 LSB	3.4	32-Pin DIP
Advance	**ADS-945**	14	10.0	±1 LSB	4.2	40 Pin DIP
Preliminary	**ADS-976**	16	0.200	±2 LSB	1.8	32-Pin DIP
New	**ADS-930**	16	0.500	±1 1/2 LSB	2.4	40-Pin DIP

A/D CONVERTERS

	Model	Resolution (Bits)	Conversion Time (µsec)	Linearity Error	Power (Watts)	Case
	ADC-207	7	0.050	±1/2 LSB	0.25	18-Pin DIP
	ADC-228	8	0.040	±1/2 LSB	1.25	24-Pin DIP
	ADC-208	8	0.050	±3/4 LSB	0.60	24-Pin DIP
	ADC-304	8	0.050	±1/2 LSB	0.39	28-Pin DIP
New	**ADC-530**	12	0.350	±3/4 LSB	2.10	32-Pin DIP
	ADC-500	12	0.500	±1 LSB	1.70	32-Pin DIP
	ADC-505	12	0.550	±1 LSB	1.70	32-Pin DIP
	ADC-508	12	0.700	±1 LSB	1.70	32-Pin DIP
	ADC-520	12	0.800	±1/2 LSB	1.60	32-Pin DIP
	ADC-521	12	0.800	±1/2 LSB	1.60	32-Pin DIP
	ADC-511	12	1.0	±3/4 LSB	1.25	24-Pin DIP
	ADC-HZ12B	12	8	±1/2 LSB	1.5	32-Pin DIP
	ADC-HX12B	12	20	±1/2 LSB	1.5	32-Pin DIP
	ADC-HC12B	12	300	±1/2 LSB	0.17	32-Pin DIP
	ADC-908	14	1.0	±1/2 LSB	2.70	32-Pin DIP
	ADC-914	14	2.4	±1 LSB	1.20	24-Pin DIP

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D/A CONVERTERS

Model	Resolution (Bits)	Settling Time	Linearity Error	Power (Watts)	Case
DAC-HF8	8	25 ns	±1/2 LSB	0.750	24-Pin DIP
DAC-HF10	10	25 ns	±1/2 LSB	0.900	24-Pin DIP
DAC-HF12	12	50 ns	±1/2 LSB	0.900	24-Pin DIP
DAC-HK12	12	3 µs	±1/2LSB	0.700	24-Pin DIP
DAC-HZ12	12	3 µs	±1/2 LSB	0.390	24-Pin DIP
DAC-HP16	16	15 µs	±0.003% FSR	0.600	24-Pin DIP

HYBRID DATA ACQUISITION SYSTEMS

	Model	Resolution (Bits)	Throughput (KHz)	Linearity Error (Max)	Power (Watts Max)	Channels	Case
	HDAS-16	12	50	±3/4 LSB	1.75	16 SE	62-Pin
	HDAS-8	12	50	±3/4 LSB	1.75	8 DE	62-Pin
	HDAS-75	12	75	±3/4 LSB	0.7	8 SE	40-Pin DIP
	HDAS-76	12	75	±3/4 LSB	0.7	4 DE	40-Pin DIP
	HDAS-534	12	250	±3/4 LSB	3.0	4 DE	40-Pin DIP
	HDAS-538	12	250	±3/4 LSB	3.0	8 SE	40-PIN DIP
	HDAS-524	12	400	±3/4 LSB	3.0	4 DE	40-Pin DIP
	HDAS-528	12	400	±3/4 LSB	3.0	8 SE	40-Pin DIP
Preliminary	**HDAS-950**	16	100	±1/2 LSB @ 14 BITS	1.4	8 SE	40-Pin DIP
Preliminary	**HDAS-951**	16	100	±1/2 LSB @ 14 BITS	1.4	4 DE	40-Pin DIP

SAMPLE HOLD AMPLIFIERS

	Model	Linearity (%)	Acquisition Time	Aperture Delay	Aperture Jitter	Bandwidth (MHz)	Hold Mode Droop	Case
	SHM-HU	0.1	25 ns	6 ns	10 ps	50	50 µv/µs	24-Pin DIP
	SHM-7	0.1	40 ns	3 ns	10 ps	40	100 µV/µs	24-Pin DIP
	SHM 40	0.1	40 ns	3 ns	10 ps	40	100 µV/µs	24-Pin DIP
	SHM-6	0.02	2 µs	20 ns	2 ns	5	10 µv/µs	32-Pin DIP
New	**SHM-43**	0.01	35 ns	5 ns	1 ps	150	5 µV/µs	14-Pin DIP
New	**SHM-49**	0.01	200 ns	6 ns	15 ps	16	1 µV/µs	8-Pin DIP
	SHM-45	0.01	200 ns	6 ns	±50 ps	16	0.5µV/µs	24-Pin DIP
	SHM-4860	0.01	200 ns	6 ns	±50 ps	16	0.5µV/µs	24-Pin DIP
	SHM-30	0.01	500 ns	-25 ns	0.1 ns	4.5	0.01 µV/µs	14-Pin DIP
	SHM-20	0.01	1µs	30 ns	1 ns	2	0.8µV/µs	14-Pin DIP
	SHM-91	0.003	2 µs	15 ns	300 ps	2	5 µV/µs	24-Pin DIP
New	**SHM-945**	0.0004	500 ns	5ns	10 ps	12	0.5 µV/µs	24-Pin DIP
New	**MSH-840***	0.01	750 ns	6 ns	±1 ns	1	1 µV/µs	32-Pin DIP

* QUAD Simultaneous Sample-Hold with 4-Channel Multiplexer

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MULTIPLEXERS

	Model	Channels	Settling Time 20V to 0.01%	Access Time	Input Range	Power (Watts)	Case
	MXD-409	4 D	3 µs	500 ns	±15V	0.105	16-Pin DIP
	MX-808	8 SE	3 µs	500 ns	±15V	0.105	16-Pin DIP
	MXD-807	8 D	3 µs	500 ns	±15V	0.105	28-Pin DIP
	MX-1606	16 SE	3 µs	500 ns	±15V	0.105	28-Pin DIP
	MVD-409	4 D	2.8 µs	350 ns	±15V	0.055	16-Pin DIP
	MV-808	8 SE	2.8 µs	350 ns	±15V	0.055	16-Pin DIP
	MVD-807	8 D	2.4 µs	300 ns	±15V	0.105	28-Pin DIP
	MV-1606	16 SE	2.4 µs	300 ns	±15V	0.105	28-Pin DIP
	MX-818C	8 SE/4D	800 ns	125 ns	±15V	0.540	18-Pin DIP
	MX-1616C	16 SE/8 D	800 ns	150 ns	±15V	0.900	28-Pin DIP
New	**MX-826**	8 SE	200 ns	70 ns	±10.5V	0.395	24-Pin DIP
New	**MX-850**	4 SE	50 ns	20 ns	±10V	0.250	14-Pin DIP

OPERATIONAL AMPLIFIERS

Model	DC Open Loop Gain (V/V)	Settling Time (µsec)	Slew Rate (V/µsec)	Gain Bandwidth (MHz)	Case
AM-500	10^6	200 ns/0.01%	1000	100	14-Pin DIP
AM-1435	10^5	70 ns/0.01%	300	1000	14-Pin DIP

INSTRUMENTATION AMPLIFIERS

Model	Gain Range	Settling Time	Case
AM-551	1 to 1000	2 µs/0.01%	16-Pin DIP

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TUNABLE ACTIVE FILTERS

	Model	Poles	Low Pass	High Pass	Band Pass	Band Reject	Rolloff (dB/Oct)	Frequency Cutoff Range (FC)	Filter Type	Gain	Case
New	***FLT-DL41***	4	♦				30	100 to 400KHz	CA	+1	32 DIP
New	***FLT-DL42***	4	♦				30	250 to 1000 KHz	CA	+1	32 DIP
New	***FLT-DL51***	5	♦				50	120 to 470 KHz	CA	+1	32 DIP
New	***FLT-DL52***	5	♦				50	300 to 1200KHz	CA	+1	32 DIP
New	***FLT-DL41/DL51*** §	7	♦				50	100 to 400KHz	CA	+1	2-32 DIP
New	***FLT-DL42/DL52*** §	7	♦				50	0.25 to 1.0MHz	CA	+1	2-32 DIP
	FLT-C1	7	♦				52	78 Hz-20 KHz	CH	1, 2, 4, 8	32 DIP
	FLJ-DC	2	♦	♦	♦	♦	12	1 Hz-159 KHz	BU,CH,BE	1 ~ 10	40 QDIP
	FLJ-D1	2	♦	♦	♦	♦	12	1 Hz-1.599 KHz	BU	1 ~ 10	40 QDIP
	FLJ-D2	2	♦	♦	♦	♦	12	100 Hz-159.9 KHz	BU	1 ~ 10	40 QDIP
	FLJ-D5LA1	5	♦				60	10 Hz-2 KHz	CA	0 ±0.3 dB max	40 QDIP
	FLJ-D5LA2	5	♦				60	100 Hz-20 KHz	CA	0 ±0.3 dB max	40 QDIP
	FLJ-D6LA1	6	♦				80	10 Hz-2 KHz	CA	0 ±0.3 dB max	40 QDIP
	FLJ-D6LA2	6	♦				80	100 Hz-20 KHz	CA	0 ±0.3 dB max	40 QDIP
	FLJ-VB	2			♦		12	200Hz-20KHz	BU	±1dB	40 QDIP
	FLJ-VH	4		♦			24	20Hz-20KHz	BU	±0.5dB	40 QDIP
	FLJ-VL	4	♦				24	100Hz-100KHz	BU	±0.5dB	40 QDIP
	FLJ-R3BA1	3			♦		—	10Hz-2KHz	CA	0 ±1dB max	40 QDIP
	FLJ-R3BA2	3			♦		—	100Hz-20KHz	CA	0 ±1dB max	40 QDIP
	FLJ-R8LA1	8	♦				135	10Hz-2KHz	CA	0 ±0.1dB max	40 QDIP
	FLJ-R8LA2	8	♦				135	100Hz-20KHz	CA	0 ±0.1dB max	40 QDIP
	FLJ-R8LB1	8	♦				100	10Hz-2KHz	CA	0 ±0.1dB max	40 QDIP
	FLJ-R8LB2	8	♦				100	100Hz-20KHz	CA	0 ±0.1dB max	40 QDIP
	FLJ-UR1BA1	1			♦		—	40Hz-1.6KHz	BU	0 ±1dB	20 SIP
	FLJ-UR2BA1	2			♦		--	40Hz-1.6KHz	BU	0 ±1dB	20 SIP
	FLJ-UR2EA1	2				♦	—	40Hz-1.6KHz	BU	0 ±0.3dB	20 SIP
	FLJ-UR2LH1	2	♦	♦			12	40Hz-1.6KHz	BU	0 ±0.3dB	20 SIP
	FLJ-UR4HA1	4		♦			24	40Hz-1.6KHz	BU	0 ±1dB	20 SIP
	FLJ-UR4HB1	4		♦			42	40Hz-1.6KHz	CH	0 ±1dB	20 SIP
	FLJ-UR4LA1	4	♦				24	40Hz-1.6KHz	BU	0 ±0.3dB	20 SIP
	FLJ-UR4LB1	4	♦				42	40Hz-1.6KHz	CH	0 ±0.3dB	20 SIP
	FLJ-UR1BA2	1			♦		—	400Hz-10KHz	BU	0 ±1dB	20 SIP
	FLJ-UR2BA2	2			♦		--	400Hz-10KHz	BU	0 ±1dB	20 SIP
	FLJ-UR2EA2	2				♦	—	400Hz-10KHz	BU	0 ±0.3dB	20 SIP
	FLJ-UR2LH2	2	♦	♦			12	400Hz-20KHz	BU	0 ±0.3dB	20 SIP
	FLJ-UR4HA2	4		♦			24	400Hz-5KHz	BU	0 ±1dB	20 SIP
	FLJ-UR4HB2	4		♦			42	400Hz-5KHz	CH	0 ±1dB	20 SIP
	FLJ-UR4LA2	4	♦				24	400Hz-20KHz	BU	0 ±0.3dB	20 SIP
	FLJ-UR4LB2	4	♦				42	400Hz-20KHz	CH	0 ±0.3dB	20 SIP
	FLT-U2	2	♦	♦	♦		12	0.001Hz-200KHz	BU,CH,BE,CA	0.1-1000	16 DIP

BU = Butterworth BE = Bessel
CH = Chebyshev CA = Cauer/Elliptical

All Filters operate over the commercial temperature range -20°C to +70°C
Model FLT-U2 also operates at -55°C to +125°C

§ Cascaded Pair

For complete details on DATEL's versatile, high performance Signal Conditioning Filters send for the Components Handbook, Volume 1

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WIDE-RANGING, DC-DC POWER CONVERTERS

NEW 20 WATT, WIDE-RANGING, DC-DC POWER CONVERTERS (2" x 2" x 0.45")

Input (Vdc)	Output	Input Current No Load/Full Load	Output Noise & RIPPLE (TYP)	Efficiency (Min @ F.L.)	Line/Load Regulation	Model
4.6 - 13.2V (5V, Nom)	3.3V,4.25 A	25 mA/3.78 A	50 mV p-p	75%	±0.2% / ±0.5%	**UWR-3.3/4250-D5**
9.0 - 18V (12V, Nom)	3.3V,4.85 A	20 mA/1.77 A	50 mV p-p	76%	±0.2% / ±0.5%	**UWR-3.3/4850-D12**
18 - 72V (48V, Nom)	3.3V,4.85 A	15 mA/0.843 A	50 mV p-p	79%	±0.2% / ±0.5%	**UWR-3.3/4850-D48**
4.6-13.2V (5V, Nom)	5.0V,3.00 A	10 mA/1.875 A	50 mV p-p	80%	±0.2% / ±0.5%	**UWR-5/3000-D5**
9.0 - 18V (12V, Nom)	5.0V,4.0 A	15 mA/2.032 A	50 mV p-p	82%	±0.2% / ±0.5%	**UWR-5/4000-D12**
18 - 72V (48V, Nom)	5.0V,4.0 A	10 mA/0.505 A	50 mV p-p	82%	±0.2% / ±0.5%	**UWR-5/4000-D48**
4.6 - 13.2V (5V, Nom)	12V,1.25 A	75 mA/3.75 A	75 mV p-p	80%	±0.2% / ±0.5%	**UWR-12/1250-D5**
9.0 - 18V (12V, Nom)	12V,1.65 A	45 mA/1.964 A	75 mV p-p	84%	±0.2% / ±0.5%	**UWR-12/1650-D12**
18 - 72V (48V, Nom)	12V,1.65 A	25 mA/0.99 A	75 mV p-p	82%	±0.2% / ±1%	**UWR-12/1650-D48**
4.6 - 13.2V (5V, Nom)	15V,1.00 A	75 mA/3.70 A	75 mV p-p	81%	±0.2% / ±0.5%	**UWR-15/1000-D5**
9.0 - 18V (12V, Nom)	15V,1.30 A	45 mA/1.935 A	75 mV p-p	84%	±0.2% / ±0.5%	**UWR-15/1300-D12**
18 - 72V (48V, Nom)	15V,1.30 A	25 mA/0.96 A	75 mV p-p	83%	±0.2% / ±1%	**UWR-15/1300-D48**
4.6 - 13.2V (5V, Nom)	±5.0V,1.50 A	25 mA/3.80 A	75 mV p-p	79%	±0.2% / ±0.5%	**BWR-5/1500-D5**
9.0 - 18V (12V, Nom)	±5.0V,1.70 A	20 mA/1.685 A	75 mV p-p	80%	±0.2% / ±0.5%	**BWR-5/1700-D12**
18 - 72V (48V, Nom)	±5.0V,1.70 A	20 mA/0.843 A	75 mV p-p	83%	±0.2% / ±1%	**BWR-5-1700-D48**
4.6-13.2V (5V, Nom)	±12V,0.625 A	40 mA/1.829 A	85 mV p-p	82%	±0.2% / ±1%	**BWR-12/625-D5**
9.0 - 18V (12V, Nom)	±12V,0.830 A	40 mA/2.00 A	75 mV p-p	84%	±0.2% / ±1%	**BWR-12/830-D12**
18 - 72V (48V, Nom)	±12V,0.830 A	10 mA/0.508 A	85 mV p-p	82%	±0.2% / ±1%	**BWR-12/830-D48**
4.6 - 13.2V (5V, Nom)	±15V,0.500 A	40 mA/1.829 A	85 mV p-p	82%	±0.2% / ±1%	**BWR-15/500-D5**
9.0 - 18V (12V, Nom)	±15V,0.670 A	30 mA/1.587 A	85 mV p-p	84%	±0.2% / ±1%	**BWR-15/670-D12**
18 - 72V (48V, Nom)	±15V,0.670 A	10 mA/0.508 A	85 mV p-p	82%	±0.2% / ±1%	**BWR-15/670-D48**

NEW, 10 WATT, WIDE RANGING, DC-DC POWER CONVERTERS (2" x 1" x 0.375")

4.7 - 7.0V (5V, Nom)	3.3V,1.8 A	30 mA/1.715 A	50 mV p-p	70%	±0.2% / ±0.5%	**UWR-3.3/1800-D5**
9.0 - 18V (12V, Nom)	3.3V,2.5 A	30 mA/0.915 A	50 mV p-p	75%	±0.2% / ±0.5%	**UWR-3.3/2500-D12**
18 - 72V (48V, Nom)	3.3V,1.80 A	15 mA/0.170 A	50 mV p-p	75%	±0.2% / ±0.5%	**UWR-3.3/1800-D48**
4.7 - 7.0V (5V, Nom)	5.0V,1.60 A	30 mA/2.160 A	50 mV p-p	74%	±0.2% / ±0.5%	**UWR-5/1600-D5**
9.0 - 18V (12V, Nom)	5.0V,2.0 A	15 mA/1.03 A	50 mV p-p	81%	±0.2% / ±0.5%	**UWR-5/2000-D12**
18 - 72V (24/48V)	5.0V,1.80 A	15 mA/0.240 A	50 mV p-p	78%	±0.2% / ±0.5%	**UWR-5/1800-D48**
4.7 - 7.0V (5V, Nom)	12V,0.665 A	40 mA/2.22 A	15 mV p-p	75%	±0.2% / ±0.5%	**UWR-12/655-D5**
9.0 - 18V (12V, Nom)	12V,0.830 A	35 mA/1.00 A	25 mV p-p	81%	±0.2% / ±0.5%	**UWR-12/830-D12**
18 - 72V (24/48V)	12V,0.750 A	10 mA/0.260 A	75 mV p-p	82%	±0.2% / ±0.5%	**UWR-12/750-D48**
4.7 - 7.0V (5V, Nom)	15V,0.530 A	40 mA/2.225 A	15 mV p-p	75%	±0.2% / ±0.5%	**UWR-15/530-D5**
9.0 - 18V (12V, Nom)	15V,0.665 A	35 mA/0.992 A	25 mV p-p	82%	±0.2% / ±0.5%	**UWR-15/665-D12**
18 - 72V (24/48V)	15V,0.600 A	10 mA/0.257 A	75 mV p-p	83%	±0.2% / ±0.5%	**UWR-15/600-D48**
4.7 - 7.0V (5V, Nom)	±5.0V,0.70 A	30 mA/1.842 A	50 mV p-p	76%	±0.2% / ±1%	**BWR-5/700-D5**
9.0 - 18V (12V, Nom)	±5.0V,0.80 A	15mA/0.830 A	50 mV p-p	80%	±0.2% / ±1%	**BWR-5/800-D12**
4.7 - 7.0V (5V, Nom)	±12V,0.335 A	40 mA/2.1 A	15 mV p-p	76%	±0.2% / ±1%	**BWR-12/335-D5**
9.0 - 18 (12V, Nom)	±12V,0.415 A	35 mA/1.00 A	25 mV p-p	83%	±0.2% / ±1%	**BWR-12/415-D12**
18 - 72V (24/48V, Nom)	±5.0V, 0.70 A	10 mA/0.185 A	75 mV p-p	78%	±0.2%/ ±1%	**BWR-5/700-D48**
18 - 72V (24/48V, Nom)	±12V,0.415 A	15 mA/0.260 A	50 mV p-p	80%	±0.2% / ±1%	**BWR-12/415-D48**
4.6 - 13.2V (5V, Nom)	±15V,0.275 A	40 mA/2.142 A	15 mV p-p	77%	±0.2% / ±1%	**BWR-15/275-D5**
9.0 - 18V (12V, Nom)	±15V,0.330 A	35 mA/0.992 A	25 mV p-p	84%	±0.2% / ±1%	**BWR-15/330-D12**
18 - 72V (24/48V, Nom)	±15V,0.330 A	15 mA/0.257 A	50 mV p-p	81%	±0.2% / ±1%	**BWR-15/330-D48**

NEW, 3 WATT, WIDE RANGING, DC-DC POWER CONVERTERS (1.25"x0.8"x0.40")

4.5 - 9.0V (5V, Nom)	5.0V,0.50 A	25 mA/0.714 A	100 mV p-p	70%	±0.2% / ±0.5%	**UWR-5/500-D5**
9.0 - 18V (12V, Nom)	5.0V,0.50 A	15 mA/0.278 A	100 mV p-p	70%	±0.2% / ±0.5%	**UWR-5/500-D12**
18 - 72V (48V, Nom)	5.0V,0.50 A	10 mA/0.069 A	100 mV p-p	75%	±0.2% / ±0.5%	**UWR-5/500-D48**
4.5 - 9.0V (5V, Nom)	±12V,0.105 A	25 mA/0.714 A	75 mV p-p	70%	±0.2% / ±1%	**BWR-12/105-D5**
9.0 - 18V (12V, Nom)	±12V,0.125 A	15 mA/0.333 A	75 mV p-p	75%	±0.2% / ±1%	**BWR-12/125-D12**
18 - 72V (48V, Nom)	±12V,0.125 A	10 mA/0.076 A	75 mV p-p	82%	±0.2% / ±1%	**BWR-12/125-D48**
4.5 - 9.0V (5V, Nom)	±15V,0.085 A	25 mA/0.729 A	75 mV p-p	70%	±0.2% / ±1%	**BWR-15/85-D5**
9.0 - 18V (12V, Nom)	±15V,0.100 A	15 mA/0.333 A	75 mV p-p	75%	±0.2% / ±1%	**BWR-15/100-D12**
18 - 72V (48V, Nom)	±15V,0.100 A	10 mA/0.076 A	75 mV p-p	82%	±0.2% / ±1%	**BWR-15/100-D48**

DATEL, Inc. 11 Cabot Boulevard, Mansfield, MA 02048-1194 • Telephone (508) 339-3000 • TELEX 174388 • FAX (508) 339-6356

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For Immediate Assistance:
1-800-233-2765

eem

MINIGLOSSARY
BASIC ASCII CODE

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Control Character Representations

NUL	Null
SOH	Start of Heading (CC)
STX	Start of Text (CC)
ETX	End of Text (CC)
EOT	End of Transmission (CC)
ENQ	Enquiry (CC)
ACK	Acknowledge (CC)
BEL	Bell
BS	Backspace (FE)
HT	Horizontal Tabulation (FE)
LF	Line Feed (FE)
VT	Vertical Tabulation (FE)
FF	Form Feed (FE)
CR	Carriage Return (FE)
SO	Shift Out
SI	Shift In
DLE	Data Link Escape (CC)
DC1	Device Control 1
DC2	Device Control 2
DC3	Device Control 3
DC4	Device Control 4
NAK	Negative Acknowledge (CC)
SYN	Synchronous Idle (CC)
ETB	End of Transmission Block (CC)
CAN	Cancel
EM	End of Medium
SUB	Substitute
ESC	Escape
FS	File Separator (IS)
GS	Group Separator (IS)
RS	Record Separator (IS)
US	Unit Separator (IS)
DEL	Delete

(CC) Communication Control
(FE) Format Effector
(IS) Information Separator

Special Graphic Characters

SP	Space
!	Exclamation Point
|	Logical OR
"	Quotation Marks
#	Number Sign
$	Dollar Sign
%	Percent
&	Ampersand
'	Apostrophe
(	Opening Parenthesis
)	Closing Parenthesis
*	Asterisk
+	Plus
,	Comma
-	Hyphen (Minus)
.	Period (Decimal Point)
/	Slant
:	Colon
;	Semicolon
<	Less Than
=	Equals
>	Greater Than
?	Question Mark
@	Commercial At
[	Opening Bracket
\	Reverse Slant
]	Closing Bracket
^	Circumflex
¬	Logical NOT
_	Underline
`	Grave Accent
{	Opening Brace
¦	Vertical Line (This graphic is stylized to distinguish it from Logical OR)
}	Closing Brace
~	Tilde

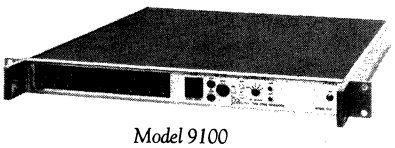
DATUM TIMING

Time Code Generators

Designed for applications requiring low cost, simplicity and high reliability, Datum's time code generators develop time code signals suitable for magnetic tape recording and distribution to remote locations. These units are available in many configurations, and a wide variety of optional features permits the equipment to be tailored to virtually any application.

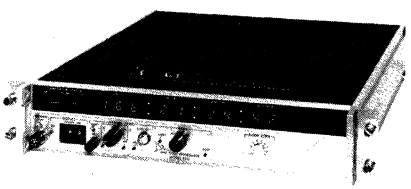
Model 9100/9110 Time Code Generators

The Model 9100 generates a modulated IRIG B time code signal and multiple pulse rate outputs. Front panel controls enable the instrument to be preset, started and halted. Each time digit can be preset individually to facilitate time-of-year or elapsed time operation. A front panel LED display provides a continuous indication of the encoded time value. The generator is contained in a 1-3/4" high chassis designed for mounting in a standard 19" equipment rack.



Model 9100

The Model 9110 includes all the features of the Model 9100, with increased chassis space and added internal power capacity. This unit also generates both modulated and DC-level-shift versions of the IRIG B time code, and a 30-line parallel BCD output reflecting encoded time. Available in 3-1/2" and 5-1/4" high chassis configurations, the Model 9110 accommodates a greater number of optional features than the Model 9100.



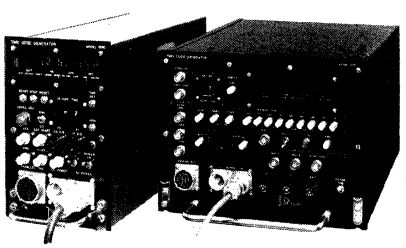
Model 9110

Model 9150 Time Code Generators

This family of time code generators is designed for airborne, shipboard and portable applications, where reliable operation in rugged environmental conditions is essential. Available in many configurations, these units offer the systems engineer a wide choice of optional features, functional capabilities and physical sizes in order to meet the requirements of virtually any mobile application. A few of these configurations are described below.

Model 9150-100 Time Code Generators

This instrument offers the greatest potential for multiple capabilities of any of the 9150 family. The unit is contained in a 1/2- or full-ATR chassis (depending on internal space requirements) conforming to Military Standard MS91403 (ATR type) requirements. Basic circuitry and optional features are mounted on individual circuit cards to facilitate both maintenance and future expansion.



Model 9150-100

The basic unit is driven by a temperature compensated, crystal controlled oscillator and produces 1-, 10- and 1k-pps pulse rate outputs. A nine-digit LED time display is located on the front panel. Input power requirement is +28 Vdc. All electronic components are mounted on plug-in PC boards to facilitate maintenance and future expansion.

Model 9150-406 Time Code Generators

This unit is smaller than the Model 9150-100, but still offers a comprehensive list of capabilities. Basic outputs include modulated IRIG B time code, 1-, 1k- and 1M-pps pulse rates, and 30-bit parallel BCD time data.

Model 9150-406

The generator can be automatically synchronized to an incoming IRIG B signal or manually reset for elapsed time applications. Several functions can also be remotely controlled via dedicated input lines. Input power requirement is +28 Vdc. A rechargeable battery supply is also included. The unit measures 4" high, 5" wide and 8" deep.

Model 9150-300 Time Code Generators

Measuring just 2" high, 5" wide and 4" deep, this light weight, microprocessor controlled instrument is designed for installation in confined spaces. The unit generates a modulated IRIG B time code output and features a nine-digit LED time display. CMOS microcircuits minimize space and power requirements.

Model 9150-300

The unit operates on +12 Vdc power, and is equipped with a Nicad battery supply for continued operation in the event of a power failure.

Model 9150-3000 Time Code Generators

Its miniature size (2-3/4" high, 3" wide, 5-3/4" deep) makes this instrument an ideal candidate for applications involving airframes, remotely piloted vehicles, etc. The unit generates modulated IRIG B time code, and operates on either +12- or +28-Vdc power. An internal battery supply is included.

Model 9150-3000

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Time Code Translators, Readers, Displays

Model 9200/9210 Time Code Translators

This unit is ideally suited to applications requiring precise time code translation, coupled with low cost, high reliability and space for a limited number of optional features. Configured to read the standard IRIG B code format, the basic Model 9200 includes a front panel display and TTL-compatible, multiple-rate pulse train outputs. Wide band input, automatic forward/reverse code translation and digital error filtering make the unit particularly useful for high-speed tape search operations. Measuring just 1-3/4" high, the chassis is designed for mounting in a standard 19" equipment rack.

Model 9200

The Model 9210 includes all the features of the Model 9200, with increased chassis space and added internal power capacity. In its basic configuration, this unit translates multiple IRIG time code formats, and produces multiple-rate pulse trains and a 42-line parallel BCD output reflecting encoded time. Available in 3-1/2" and 5-1/4" high chassis configurations, the Model 9210 accommodates a greater number of optional features than the Model 9200.

Model 9210

Model 9500 Remote Displays

A Model 9500 Remote Display can be used with any Datum Timing instrument, or similar source of parallel BCD input data, to display time and/or event information. Units are available in configurations ranging from six digits (seconds, minutes and hours) to 13 digits (time and event data). LED display elements are employed in sizes ranging from 0.4" to 2.0" and larger. Multiple units can be daisy chained via rear panel connectors. The Model 9500 measures 1-3/4" or 3-1/2" high and is designed for mounting in a standard 19" equipment rack.

Model 9500

Model 9520 Time Display

The Model 9520 reads an IRIG A, B or E modulated time code signal (as optionally defined) in order to display time information in installations involving long distances and/or multiple sites. A modulated code signal transmitted over a single transmission line is much more satisfactory for a widely distributed network.

A 30-bit parallel BCD time output is provided via a rear panel connector. LED display elements are employed in sizes ranging from 0.4" to 2.0" and larger. The unit measures 1-3/4" or 3-1/2" high and is designed for mounting in a standard 19-inch equipment rack.

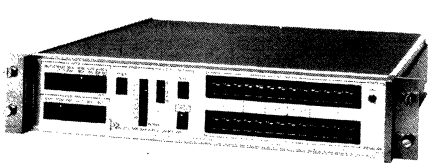
Model 9520

Tape Search and Control Units

Model 9241 Tape Search and Control Units

This unit provides all control functions required by an instrumentation tape transport to locate a segment of tape defined by preselected start and stop times. By comparing its start/stop time switch settings with translated time code from the data tape, the 9241 exercises precise control over the transport to conduct an automatic forward/reverse search operation.

Microprocessor control and modular construction provide high reliability, enhanced field maintenance capability, and future expandability. The unit measures 3-1/2" high, 17" wide and 18" deep, and is designed for mounting in a standard 19-inch equipment rack.



Model 9241

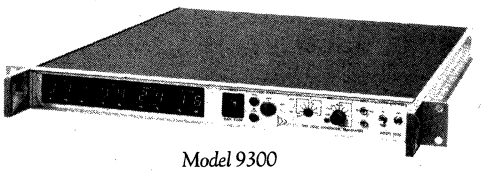
Remote operation via RS-232, IEEE 488 or General Purpose Input/Output interfaces are optionally available.

DATUM TIMING

Multifunction Instruments

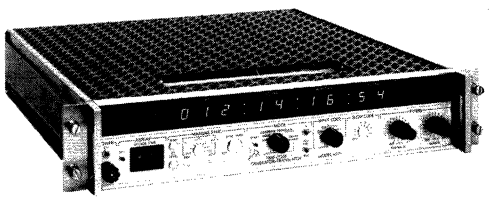
Model 9300/9310 Time Code Generator/ Translators

The Model 9300 combines the primary functions of the 9100 and 9200 to provide generation and translation of the IRIG B time code. Multi-rate pulse trains (1k, 100 10 and 1 pps) are also generated by the basic unit. Designed for mounting in a standard 19" equipment rack, the unit measures just 1-3/4" high. A nine-digit LED display reflects translated or generated time, depending on the selected mode of operation. Each digit can be preset by the operator. All controls and indicators are located on the front panel.



Model 9300

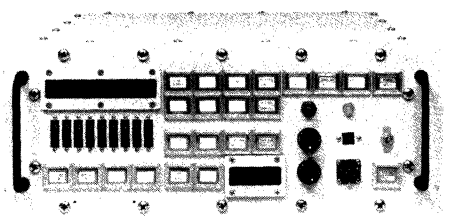
The Model 9310 includes all the features of the 9300, with increased chassis space and added power capacity. In its basic configuration, this unit translates multiple IRIG time code formats, and produces multiple-rate pulse trains and a 42-line parallel BCD output reflecting encoded time. Available in 3-1/2" and 5-1/4" high chassis configurations, the Model 9310 accommodates a greater number of optional features than the Model 9300.



Model 9310

Model 9340 Service Qualified Timing Subsystem

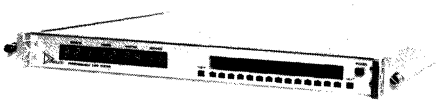
The only equipment of its type to meet MIL-E-16400 requirements, the Model 9340 Timing Subsystem (TD-1307/U) is service qualified for shipboard operation. The unit generates and translates IRIG B time code and conducts automatic tape search operations. Internal circuitry is mounted on a series of plug-in modules. Each module also includes self-test circuitry to check for proper operation and display test status information. The Model 9340 is designed for mounting in a standard 19" equipment rack and measures 7" high.



Model 9340

Model 9700/9710 Programmable Time Systems

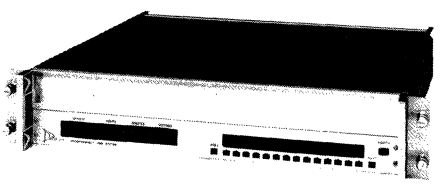
The Model 9700 is available as either a time code generator or generator/translator, suitable for data correlation, magnetic tape recording, etc. Tape search capability can also be included. Microprocessor based design and modular construction provide high reliability, user friendly operation, expandability and compact size. All setup data and status indications are shown on an alphanumeric display, which also prompts the operator through the various programming procedures required for setup and operation. Diagnostic self tests are automatically performed each time power is applied. Time is continuously visible via the LED display.



Model 9700

The Model 9710 includes all the features of the Model 9700, with increased chassis space and added internal power capacity.

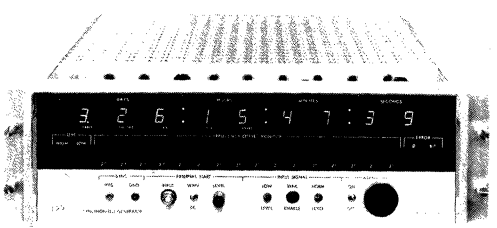
The basic generator function produces IRIG B code. Seven variations of the IRIG code can be processed by the translator. Both units are designed for mounting in a standard 19" equipment rack. The 9700 measures 1-3/4" high and the 9710 is 3.5" high.



Model 9710

Synchronized Time Code Generators

Synchronized Time Code Generators are designed to generate IRIG time code either in the normal fashion or in synchronism with an incoming IRIG time code signal. In the synchronized generator mode, the internal clocking oscillator is servo controlled to maintain phase coherency with the input time code. This produces IRIG time codes and multiple pulse rate outputs in synchronism with the input code. Generation will continue even if the input code is interrupted.



Model 9390 Sync Generator

Units are available either as dedicated instruments (the Model 9390 Synchronized Time Code Generator), or as derivatives of other equipment such as the Model 9100, 9300 or 9700. Designed for mounting in a standard 19" equipment rack, chassis range in height from 1-3/4" to 5-1/4".

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Special Application Instruments

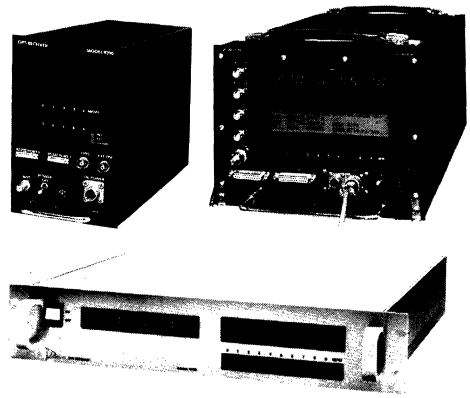
Current Datum GPS Users are invited to call our Hotline Information Center at (714) 533-4956

Model 9390 GPS Time/Frequency System

By monitoring code transmissions from Navstar satellites in the GPS constellation, Datum's 9390 family of GPS receivers offers convenient, on-site access to time and frequency data of unparalleled precision, anywhere on earth. These instruments have enjoyed wide acceptance in the time and frequency community and have opened a host of new possibilities to instrumentation professionals.

Dual channel design enables the 9390 to function as a time and frequency measurement device equally well in dynamic (vehicle speeds up to 600 knots) and fixed-platform installations. Retention of time and almanac data enables the unit to perform visible satellite acquisition in less than two minutes. Geographical position in latitude, longitude and altitude (WGS 84) is determined automatically via an internal position locator algorithm.

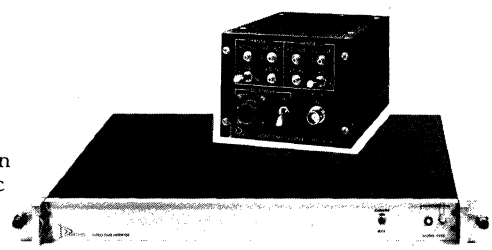
Two types of packaging are available – a 19" rack mounting or tabletop unit, and ruggedized versions for portable or mobil applications. In either case, the receivers are completely self contained except for their antenna/preamp assemblies. The antenna/preamp assemblies are very compact (1.5" high, 4.75" wide, and 4.0" deep, including base) and weather proof, and can be installed in any location providing line-of-sight reception.



Model 9390 GPS Receivers

Video Time/Data Inserters

Video Time Inserters insert translated IRIG B time information into a composite video signal, thereby enabling time to be displayed on a video monitor or television screen. With a time tag in every frame, the video data can also be correlated with various system elements, such as strip chart recorders, printers, magnetic tape units and computers. Units are available in a variety of configurations, ranging from plug-in PC boards to miniaturized airborne units. Optionally, a line of up to 16 alphanumeric characters can be inserted immediately below the time word.



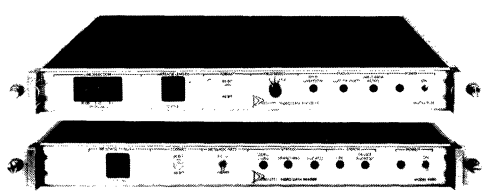
Video Time/Data Inserters

Video Data Encoders and Readers

These units permit digital information to be transmitted within a composite video signal in a manner that is completely transparent to the viewer. The basic characteristics of the video signal remain unaffected.

The Video Data Encoder converts parallel input data into a Datum serial NRZ format. The data, representing up to eight consecutive lines of information, is inserted into the vertical blanking interval of the composite video signal for transmission to a video recorder or remote receiver. The Video Data Reader extracts the encoded information from a received video signal and converts it to an eight-bit parallel format meeting the requirements of most computer interface specifications.

Both the Encoder and Reader are contained in a 1-3/4 inch high chassis designed for mounting in a standard 19" equipment rack.



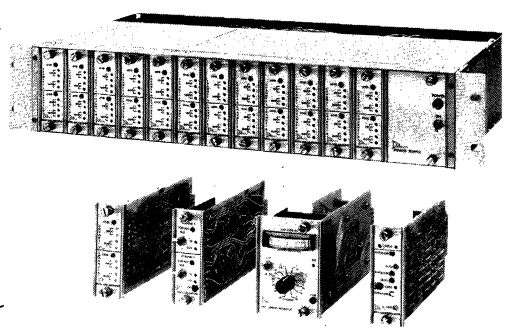
Video Encoders/Readers

Model 9610 Timing Terminal Unit System

The Model 9610 Timing Terminal Unit System comprises a highly versatile group of components (housing, power supply and functional modules) that can be configured to meet a wide variety of signal conditioning and distribution requirements. Each housing may contain a power supply and slots for up to 12 functional modules.

Typical applications include signal conditioning and distribution in central timing systems, repeater amplifier distribution at remote locations, or special processing for terminal equipment.

Compact size, convenient access to components, rack mounting or portable housing chassis, and a large selection of functional modules make the 9610 an attractive solution for the systems designer. Functional modules include line drivers, demodulators, amplifiers, pulse generators, oscillators, decoders and many others.



Model 9610

MINIGLOSSARY
BASIC
EBCDIC CODE

Bit Positions 4, 5, 6, 7	Second Hexadecimal Digit	Digit Punches	00				01				10				11				
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 0, 1
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 2, 3
			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	First Hexadecimal Digit
			12				12	12		12	12	12		12	12				Zone Punches
				11				11	11	11		11	11	11		11			
					0		0		0	0	0		0	0			0		
			9	9	9	9	9	9	9	9									Digit Punches
			①	②	③	④	⑤	⑥	⑦	⑧					⑨	⑩	⑪	⑫	
0000	0	8-1	NUL	DLE	DS		SP	&	-									0	8-1
0001	1	1	SOH	DC1	SOS				⑬		a	j			A	J	⑭	1	1
0010	2	2	STX	DC2	FS	SYN					b	k	s		B	K	S	2	2
0011	3	3	ETX	TM							c	l	t		C	L	T	3	3
0100	4	4	PF	RES	BYP	PN					d	m	u		D	M	U	4	4
0101	5	5	HT	NL	LF	RS					e	n	v		E	N	V	5	5
0110	6	6	LC	BS	ETB	UC					f	o	w		F	O	W	6	6
0111	7	7	DEL	IL	ESC	EOT					g	p	x		G	P	X	7	7
1000	8	8		CAN							h	q	y		H	Q	Y	8	8
1001	9	8-1		EM							;	r	z	`	I	R	Z	9	9
1010	A	8-2	SMM	CC	SM		¢	!	⑮	:									8-2
1011	B	8-3	VT	CU1	CU2	CU3	.	$	,	#									8-3
1100	C	8-4	FF	IFS		DC4	<	*	%	@									8-4
1101	D	8-5	CR	IGS	ENQ	NAK	(	)	_	'									8-5
1110	E	8-6	SO	IRS	ACK		+	;	>	=									8-6
1111	F	8-7	SI	IUS	BEL	SUB	I	¬	?	"									8-7
			12				12				12	12		12	12	12		12	Zone Punches
				11				11				11	11	11		11	11	11	
					0				0		0		0	0	0		0	0	
			9	9	9	9									9	9	9	9	

Card Hole Patterns

①	12-0-9-8-1	⑤	No-Punches	⑨	12-0
②	12-11-9-8-1	⑥	12	⑩	11-0
③	11-0-9-8-1	⑦	11	⑪	0-8-2
④	12-11-0-9-8-1	⑧	12-11-0	⑫	0
				⑬	0-1
				⑭	11-0-9-1
				⑮	12-11

Control Character Representations

ACK	Acknowledge	EOT	End of Transmission	PF	Punch Off
BEL	Bell	ESC	Escape	PN	Punch On
BS	Backspace	ETB	End of Transmission Block	RES	Restore
BYP	Bypass	ETX	End of Text	RS	Reader Stop
CAN	Cancel	FF	Form Feed	SI	Shift In
CC	Cursar Control	FS	Field Separator	SM	Set Mode
CR	Carriage Return	HT	Horizontal Tab	SMM	Start of Manual Message
CU1	Customer Use 1	IFS	Interchange File Separator	SO	Shift Out
CU2	Customer Use 2	IGS	Interchange Group Separator	SOH	Start of Heading
CU3	Customer Use 3	IL	Idle	SOS	Start of Significance
DC1	Device Control 1	IRS	Interchange Record Separator	SP	Space
DC2	Device Control 2	IUS	Interchange Unit Separator	STX	Start of Text
DC4	Device Control 4	LC	Lower Case	SUB	Substitute
DEL	Delete	LF	Line Feed	SYN	Synchronous Idle
DLE	Data Link Escape	NAK	Negative Acknowledge	TM	Tape Mark
DS	Digit Select	NL	New Line	UC	Upper Case
EM	End of Medium	NUL	Null	VT	Vertical Tab
ENQ	Enquiry				

Special Graphic Characters

¢	Cent Sign
.	Period, Decimal Point
<	Less-than Sign
(	Left Parenthesis
+	Plus Sign
|	Logical OR
&	Ampersand
!	Exclamation Point
$	Dollar Sign
*	Asterisk
)	Right Parenthesis
;	Semicolon
¬	Logical NOT
-	Minus Sign, Hyphen
/	Slash
,	Comma
%	Percent
_	Underscore
>	Greater-than Sign
?	Question Mark
:	Colon
#	Number Sign
@	At Sign
'	Prime, Apostrophe
=	Equal Sign
"	Quotation Mark

5 Channel Hand-Held Printing Datalogger with Memory

Model 50 Series

Portable, Multi-Programmable 5-Channel Logger

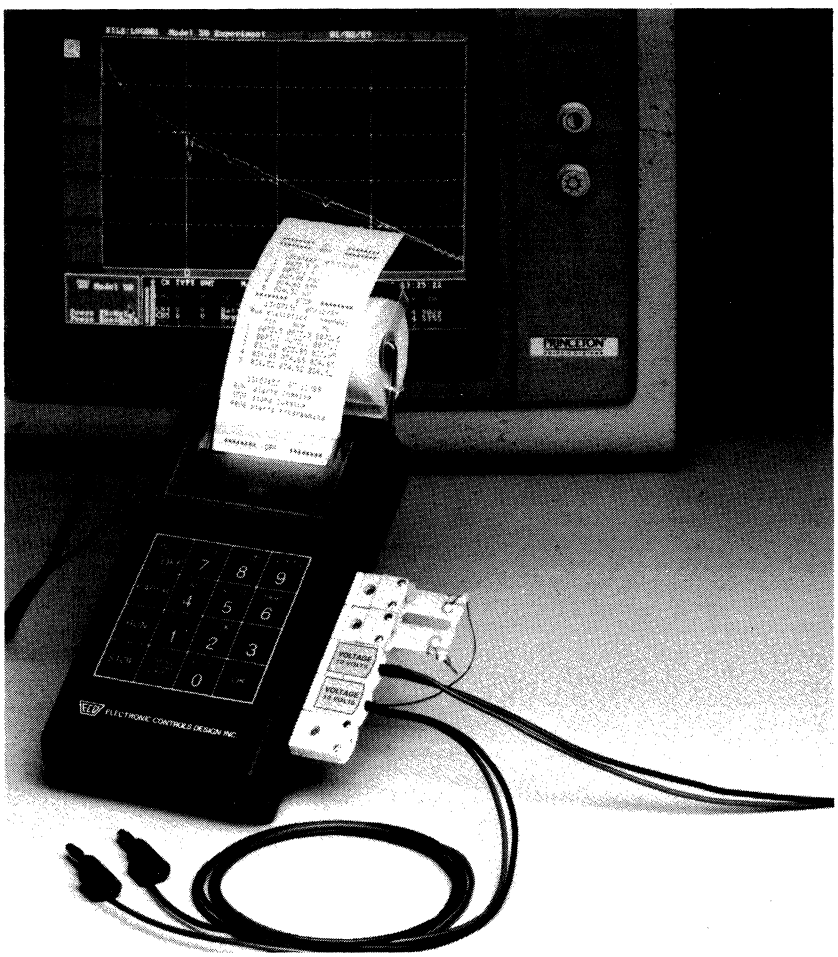
Automatically Logs and Prints Temperature and Voltage Data

RS-232 Communications

Interchannel Math

28K Internal Memory

Graphic Analysis Software



Small enough to hold and operate in one hand, ECD's Model 50 Series programmable datalogger has the power to handle five voltage or temperature (thermocouple) data channels and print out the results. The Model 50 also features a real-time clock and electrically isolated inputs. Unmatched operator prompting makes the unit unusually simple and easy to program and run. Graphic Analysis software is included for mouse or keyboard controlled, full-color graphics analysis on any IBM or compatible PC.

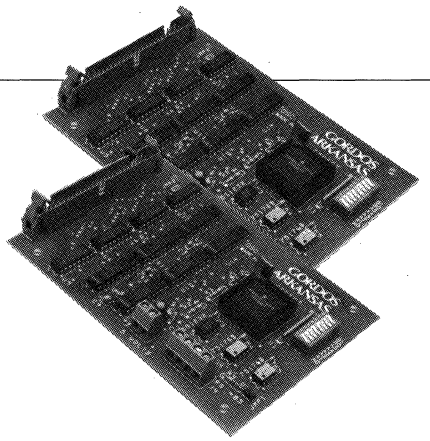
ECD®
SINCE 1964

Electronic Controls Design, Inc.
4287-A S.E. International Way
Milwaukie, Oregon 97222-8825
(503) 659-6100 (800) 323-4548
FAX: 503-659-4422

GORDOS SERIAL COMMUNICATION DEVICES

GSC SERIAL CONTROLLERS

- RS422/485 Multi-Drop Communication up to 5000 Feet Without Repeaters
- 300, 1200, 2400, 9600-baud Data-rates
- Friendly ASCII Instruction Set
- Low Power CMOS Design
- Companion Analog and Digital I/O Module Mounting Boards Available
- Software Drivers for Quick BASIC, Interpretive Basic, C, and Turbo PASCAL

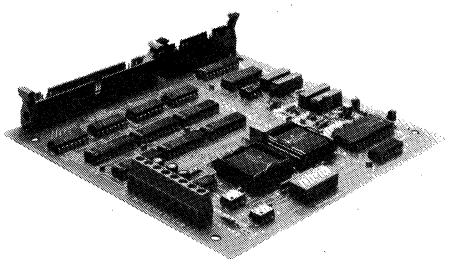


MODEL GSC-24D DIGITAL CONTROLLER

- Controls Any Combination of 24 Digital Input and Output Modules
- Expandable to 512 Digital I/O Modules with GORDOS PAM Boards
- Programmable Input Filters Prevent Contact Bounce Effects
- 16-bit Input Counters Capable of Storing 65535 Events
- 500 mA Open-collector Outputs Drive a Variety of Loads
- Requires Inexpensive 5VDC Power Supply

MODEL GSC-64A CONTROLLER

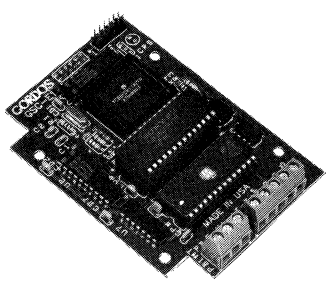
- Controls Any Combination of 64 Analog Input and Output Modules
- 12-bit Analog to Digital Converter plus Sign Bit
- 12-bit Digital to Analog Converter
- Requires 5VDC, 7 to 15VDC, –7 to –15VDC Supplies
- 390-microseconds-per-point Scan Time



MODEL GSC-64A24D ANALOG AND DIGITAL CONTROLLER

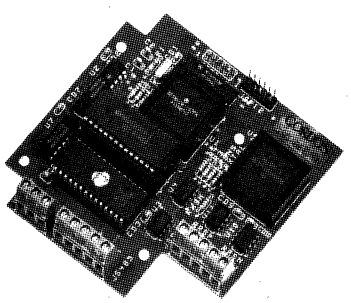
- All the Features of a GSC-64A and GSC-24D in One-Third Less Space
- Controls Any Combination of 64 Analog Input and Output Modules and 24 Digital Input and Output Modules
- Expandable to 512 Digital I/O Modules with GORDOS PAM Boards
- Dual Micro-Controllers Assure Uncompromised Performance

MODEL GSC-BE3 BASIC ENGINE



- Miniature, Single-board Computer for Local Process Control
- Permits Simple and Inexpensive Formation of Distributed Control Systems
- Communicates with Other Basic Engines, GSC Controllers, Host Computers and Peripherals
- Piggy-backs on GSC Series Serial Controllers
- Programmable in BASIC Language
- Software-configurable Master or Slave Operation
- 32K Battery-backed RAM with Real-time Clock
- 32K EPROM with BASIC and Blank Space for User Programs
- Emulating Network Protocols Permit Operation with Existing Software

GSC-BE1,2,3S/N SUB-NET BASIC ENGINE



- Two Programmable RS-422/485 Ports for Communication with Peripheral Equipment
- Piggybacks on GSC Series Serial Controllers
- High Speed SPI Port for Communication between GSC Controllers
- Programmable in BASIC for Readily-Generated Efficient Programs
- Battery-Backed Clock and RAM Permit Program and Data Retention after Power Loss

See Relays Section for additional GORDOS products.

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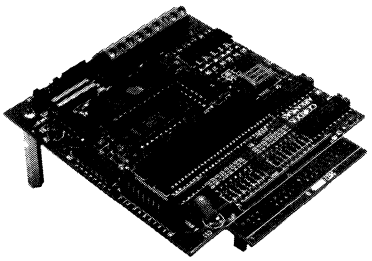
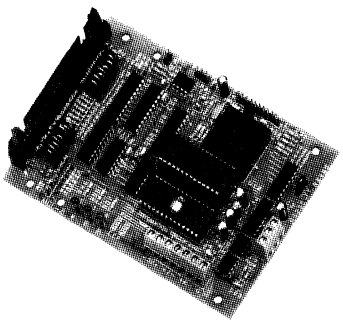
GORDOS SERIAL COMMUNICATION DEVICES



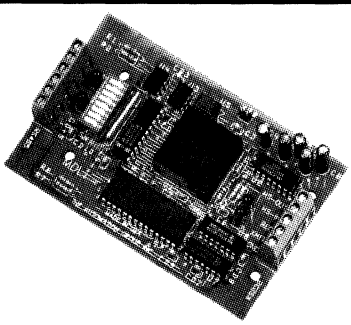
MODEL G1 SERIAL CONTROLLER

- Controls Any Combination of 16 Input and Output Modules
- 300, 1200, 9600, and 19200-baud Data-rates
- ASCII Commands
- Programmable Input Filters Prevent Contact Bounce Effects
- Low-power CMOS Design, +5VDC Operation
- 5,000-foot Range Without Repeaters
- Plug-compatible with GORDOS "H" Series PB Boards



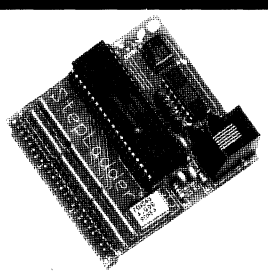
GSC-8 MICRO-ENGINE

- Stand-Alone Microcomputer with Digital and Analog I/O Connections
- On-Board BASIC Language Interpreter for Quick Program Creation
- Motorola® "C" Compiler and Assembler Options Available
- Over-Voltage Protection on Analog and Digital Inputs Prevents Accidental Damage
- 32K Bytes of Battery-Backed RAM Retain Data and/or Programs for Years
- 32K EPROM Used for BASIC Language Interpreter and Custom Programs



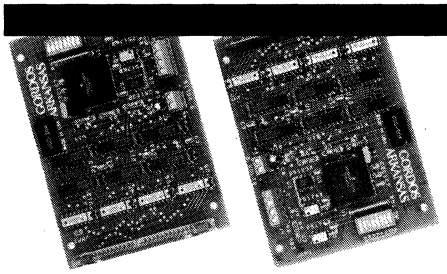
GSC-1 INTELLIGENT CONVERTER

- Intelligent RS-232 to RS-485 Converter
- 2500 Byte Buffer Queues Data for Later Transmission
- Baud Rate Conversion Allows Use with Slow Serial Devices
- Supports XON/XOFF Protocol of Serial Instruments
- DIP Switch Addressing Permits Multiple-Unit RS-485 Networks
- Programmable Character Substitution and String Length Simplify RS-232 Communication



STEPLADDER

- Combines with up to 24 I/O Modules to Form a PLC
- Traditional Ladder Logic Programming Understood by Engineers and Electricians
- Piggybacks on H-series Module Mounting Board to Conserve Space
- Mix Inputs and Outputs in any Combination for Versatile, Cost-Effective Solutions
- Two Timers with 10-millisecond Accuracy Assure Precise Control
- Serial Interface Permits Linking two STEPLADDERS to Create Larger Systems
- Direct Host Operation of I/O points, Counters and Timers Simplifies Programming



MODEL GSC-IOX INPUT-OUTPUT EXTENDER

- Reduces Material and Installation Costs by Eliminating Heavy Gauge Wire and Conduit
- Employs Two Light-gauge, Twisted-wire Pairs
- 5,000-foot Range
- Communicates Between Two Locations in a Uni- or Bi-directional Mode
- Outputs Reflect Status of Corresponding Inputs
- No Programming Required

See Relays Section for additional GORDOS products.

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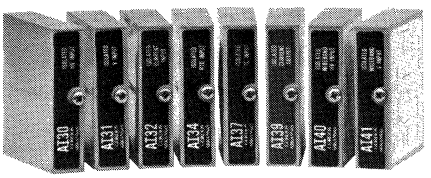
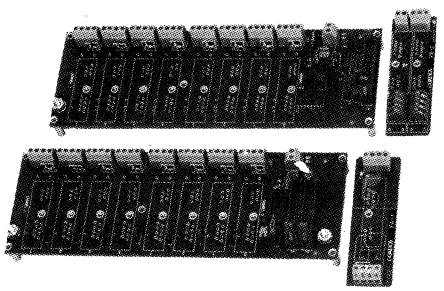
GORDOS I/O PRODUCTS



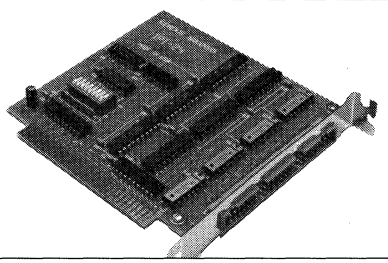
ANALOG I/O MODULES

- Wide Variety of mV, V, mA, RTD, TC, Strain Gauge, Wideband mV, Wideband V and Linearized TC Input Models
- 4-20mA and 0-20mA Output Models
- Fully Isolated
- High Accuracy (±0.05%), Low Drift
- IEEE STD-472 Transient Protection
- 240VRMS Field Wiring Protection
- –25°C to 85°C Operating Range
- Mounting Boards Available in 1,2,8, or 16-Module Versions



PA SERIES ANALOG MODULE MOUNTING BOARDS

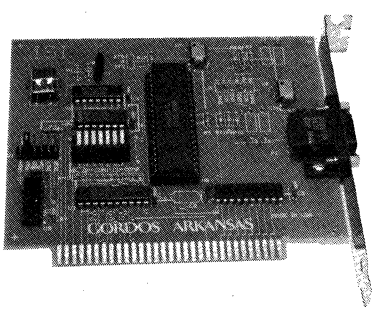
- 1, 2, 8 or 16-module Versions
- Multiplexed and Non-multiplexed Versions available in 8 and 16-module Configurations
- Thermocouple-wire Junction Temperature Compensation
- Each Module Location Configurable as an Input or an Output for System Flexibility
- Resident Sockets for Current-conversion Resistors



PC/XT/AT COMPATIBLE INTERFACES

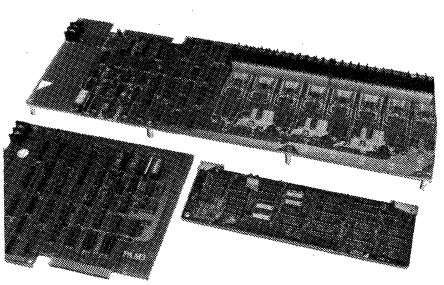
MODEL IPI-24 24-CHANNEL PARALLEL INTERFACE

- 300-foot Range
- Drives PAM Bus, I/O Modules or "G" Series SSRs Directly
- 500 mA Open-collector Drivers Compatible with EMR's
- Any Configuration of Inputs and Outputs



MODEL ISI RS422/485 SERIAL INTERFACE

- Multi-drop Capability
- 5,000-foot Range Without Repeater
- Serial Input and Output Transorbs® Eliminate Transients
- 8250 UART uses Standard DOS® Initialization Routines
- Jumper-selectable COM1 or COM2 for Fast Installation
- Switch-selectable Addressing of First 1024 I/O



PAM SERIES PARALLEL ADDRESSABLE MULTIPLEXERS

- PAM2 Includes both Parallel Control Logic and Mounting Space for 8 Quad-Packs
- PAM3 is a Stand-alone Multiplexer for Interconnection with any GORDOS 8, 16, 24 or 32-point Digital I/O Module Mounting Board
- PAM4 in Conjunction with PB32HQ Board and 8 Quad-Packs Forms a Multiplexer Requiring 50% Less Space
- PAM2, PAM3 and PAM4 can be Used Together on the Same PAM Bus
- Each PAM Controls up to 32 I/O Channels
- Multiple PAM's Control up to 512 I/O Channels
- Programmable Watchdog and Reset Functions

See Relays Section for additional GORDOS products.

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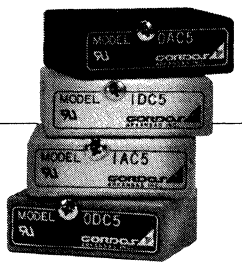
GORDOS I/O PRODUCTS

SINGLE POINT, QUAD-PACK & 8-CHANNEL DIGITAL I/O MODULES & MOUNTING BOARDS

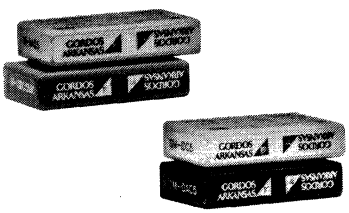


- High Current Thyristor for 100A surge Capability
- 4KV Optical Isolation
- UL Recognized, CSA Certified
- Zero Voltage AC or Random Turn-on Single-Point Output Modules
- Industry Standard Packaging
- Plug into Digital I/O Module Mounting Boards

0.6 INCH SINGLE POINT I/O MODULES

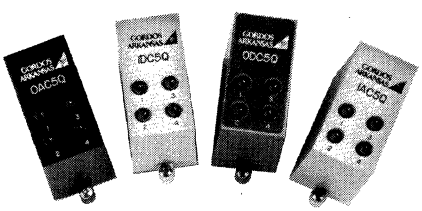
- 5V, 15V, 24V Logic Versions
- Retaining Screw
- Fast-switching DC Versions
- Form A Operation, Form B AC Output Available
- Companion 4 to 32-position Module Mounting Boards

M AND SM SERIES MINIATURE SINGLE POINT I/O MODULES



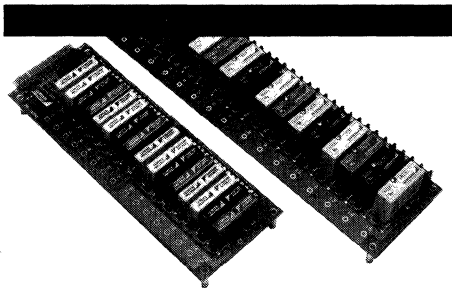
- 33% Thinner than 0.6 inch Modules
- SM Series are Direct Replacements for Larger 0.6 Inch Modules
- M Series may be Plugged-In or Soldered
- 5V, 15V, or 24V Logic Versions
- Companion 8 to 32-position Module Mounting Boards

QUAD-PACK MODULES



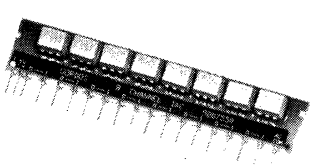
- Four Circuits per Module
- 5, 15, 24 Volt Logic Versions
- Individual LED Status Indication
- AC Input, AC Output, DC Input and DC Output Configurations
- Companion 16, 24 and 32-channel Mounting Boards

PB SERIES DIGITAL I/O MODULE MOUNTING BOARDS



- Models Available for 0.6 Inch, M and SM Series Single-Point Modules and Quad-Packs
- 4, 8, 16, 24 and 32-point Versions
- UL Recognized, CSA Certified Models Available
- LED Indicators, Replaceable Fuses and Logic Pull-up Resistors
- Barrier Strips for Field Termination
- Logic Termination via Card Edge or Optional Cable Connectors
- Barrier Strip Jumpers and Interconnection Cables Available

MINI-8 I/O MODULE



- Eight distinct I/O channels
- OEM cost savings up to 50%
- Up to 80% less board space
- Thick Film Hybrid Construction, Vapor Phase Soldering Provide Superior Reliability
- Computerized Laser Trimming of Resistors Optimizes Performance
- Ceramic Substrate for Proper Thermal Management
- Solder or Plug into PC Boards
- AC & DC Output Modules Rated at 2.0 Amp per Channel, 10 Amp per Module
- AC Input Modules for 120V, 240V
- DC Input Modules for 3.3 to 32V, to 10 to 60V
- UL/CSA Approvals Pending

See Relays Section for additional GORDOS products.

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MINIGLOSSARY
BASIC
EBCDIC CODE

Bit Positions 4, 5, 6, 7	Second Hexadecimal Digit	Digit Punches	00				01				10				11				
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 0, 1
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 2, 3
			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	First Hexadecimal Digit
			12				12	12		12	12	12		12	12				Zone Punches
				11				11	11	11		11	11	11		11			
					0		0		0	0	0		0	0			0		
			9	9	9	9	9	9	9	9									Digit Punches
			①	②	③	④	⑤	⑥	⑦	⑧					⑨	⑩	⑪	⑫	
0000	0	8-1	NUL	DLE	DS		SP	&	-									0	8-1
0001	1	1	SOH	DC1	SOS				⑬		a	j			A	J	⑭	1	1
0010	2	2	STX	DC2	FS	SYN					b	k	s		B	K	S	2	2
0011	3	3	ETX	TM							c	l	t		C	L	T	3	3
0100	4	4	PF	RES	BYP	PN					d	m	u		D	M	U	4	4
0101	5	5	HT	NL	LF	RS					e	n	v		E	N	V	5	5
0110	6	6	LC	BS	ETB	UC					f	o	w		F	O	W	6	6
0111	7	7	DEL	IL	ESC	EOT					g	p	x		G	P	X	7	7
1000	8	8		CAN							h	q	y		H	Q	Y	8	8
1001	9	8-1		EM							;	r	z		I	R	Z	9	9
1010	A	8-2	SMM	CC	SM		¢	!	⑮	:									8-2
1011	B	8-3	VT	CU1	CU2	CU3	.	$	,	#									8-3
1100	C	8-4	FF	IFS		DC4	<	*	%	@									8-4
1101	D	8-5	CR	IGS	ENQ	NAK	(	)	_	'									8-5
1110	E	8-6	SO	IRS	ACK		+	;	>	=									8-6
1111	F	8-7	SI	IUS	BEL	SUB	I	¬	?	"									8-7
			12				12				12	12		12	12	12		12	Zone Punches
				11				11				11	11	11		11	11	11	
					0				0		0		0	0	0		0	0	
			9	9	9	9									9	9	9	9	

Card Hole Patterns

①	12-0-9-8-1	⑤	No-Punches	⑨	12-0	⑬	0-1
②	12-11-9-8-1	⑥	12	⑩	11-0	⑭	11-0-9-1
③	11-0-9-8-1	⑦	11	⑪	0-8-2	⑮	12-11
④	12-11-0-9-8-1	⑧	12-11-0	⑫	0		

Control Character Representations

ACK	Acknowledge	EOT	End of Transmission	PF	Punch Off
BEL	Bell	ESC	Escape	PN	Punch On
BS	Backspace	ETB	End of Transmission Block	RES	Restore
BYP	Bypass	ETX	End of Text	RS	Reader Stop
CAN	Cancel	FF	Form Feed	SI	Shift In
CC	Cursar Control	FS	Field Separator	SM	Set Mode
CR	Carriage Return	HT	Horizontal Tab	SMM	Start of Manual Message
CU1	Customer Use 1	IFS	Interchange File Separator	SO	Shift Out
CU2	Customer Use 2	IGS	Interchange Group Separator	SOH	Start of Heading
CU3	Customer Use 3	IL	Idle	SOS	Start of Significance
DC1	Device Control 1	IRS	Interchange Record Separator	SP	Space
DC2	Device Control 2	IUS	Interchange Unit Separator	STX	Start of Text
DC4	Device Control 4	LC	Lower Case	SUB	Substitute
DEL	Delete	LF	Line Feed	SYN	Synchronous Idle
DLE	Data Link Escape	NAK	Negative Acknowledge	TM	Tape Mark
DS	Digit Select	NL	New Line	UC	Upper Case
EM	End of Medium	NUL	Null	VT	Vertical Tab
ENQ	Enquiry				

Special Graphic Characters

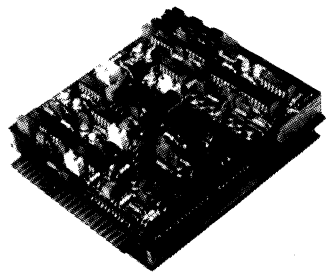
¢	Cent Sign
.	Period, Decimal Point
<	Less-than Sign
(	Left Parenthesis
+	Plus Sign
I	Logical OR
&	Ampersand
!	Exclamation Point
$	Dollar Sign
*	Asterisk
)	Right Parenthesis
;	Semicolon
¬	Logical NOT
-	Minus Sign, Hyphen
/	Slash
,	Comma
%	Percent
_	Underscore
>	Greater-than Sign
?	Question Mark
:	Colon
#	Number Sign
@	At Sign
'	Prime, Apostrophe
=	Equal Sign
"	Quotation Mark

HOPPER ELECTRONICS COMPANY

1943 West North Lane, Suite 9, Phoenix, AZ 85021-1932 • (602)870-3093 800-657-0374

MOD ADC 16M1

16 BIT 1MHZ ANALOG TO DIGITAL CONVERTER, WITH SAMPLE & HOLD



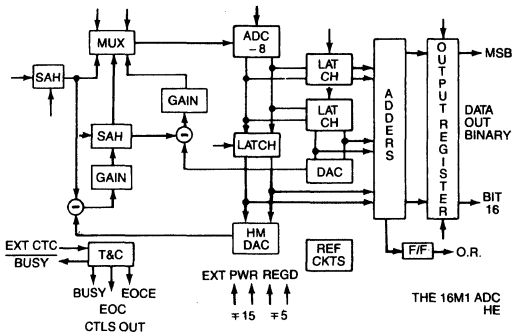
FEATURES:

- High Speed
- 1 Microsecond
- High Accuracy
- ±0.002% FSR
- High Stability
- Up to 2 PPM/°C
- Repairable
- Plug Together Boards

APPLICATIONS:

- Front End for Digital Signal Processors
  - Sonar
  - Radar
  - Loran
- Multi-Channel
- Data Acquisition Systems
- Test Systems
- Medical Scan Systems
- Seismic & Magnetotelluric Systems

SIMPLIFIED BLOCK DIAGRAM



THE 16M1 ADC HE

GENERAL DESCRIPTION

This design by Hopper Electronics provides a high speed, high accuracy, high stability plug-in module, consisting of three P.C. boards plugged together to provide a complete ADC function, including the integral sample and hold circuitry.

The design employs a three step fold-back conversion technique with a transparent partical pipe line to achieve this advance performance.

The high input impedance circuitry consists of two independent complete sample and hold circuits, with a "ping-pong" switch and buffer amplifier.

Temperature compensating circuits and bulk metal film, low temperature coefficient precision resistors provide the high stability.

SPEC SHEET (1)

SPECIFICATIONS	COMM	IND	MIL
Encoding (Digital Resolution)			
Resolution (Binary Bits)	16	16	16
Conversion Time (US)			
Single (CTC to Data Good, EOC)	1.2	1.2	1.2
Single (CTC to CTC/EOCE)	1.0	1.0	1.0
Continuous (MHZ)	1	1	1
Min Conversion Rate			
TYP (25°C HZ)	666	666	666
Min (Full) (KHZ)	66.6	75.0	400
ANALOG INPUT-SINGLE ENDED			
Voltage Range	±10.24V	±10.24V	±10.24V
Input Impedance (MΩ)	10	10	10
Max (Full) (MΩ)	2.5	2	1
Capacitance (TYP) (pf)	6	6	6
Bias Current (TYP 25°C) (na)	±20	±20	±20
Bias Current (Max Full)	±300	±400	±500
Aperture Time (TYP) (ns)	20	20	20
Aperture Uncertainty (ns)	0.1	0.1	0.1
Hold Mode Feed Thru (TYP) (db)	−94	−94	−94
Hold Mode Feed Thru (Full) (db)	−88	−88	−88
Full Power Band Width (MHZ)	1.6	1.6	1.6
DIGITAL INPUTS			
CTC (Command to Convert) TTL Levels and One Load			
Starts on Leading (Rising) Edge			
Min High Duration (ns)	20	20	20
Min Low Duration (ns)	20	20	20
Tri-State Output Control	($\overline{OC1}$ & $\overline{OC2}$)		
Two Eight Bit Bytes Low State-Data Available After EOC High-State-High IMP (No Data)			

DIGITAL DATA OUTPUTS	COMM	IND	MIL
Overrange TTL (OR)			
High Level Output Current (MA)	−2	−2	−2
Lo Level Output Current (MA)	20	20	20
Most Sig Bit (Bit 1) and All to Bit 16			
Tri-State (Can Be In Two 8 Bit Bytes)			
High Level Output Current (MA)	−2.6	−2.6	−2.6
Low Level Output Current (MA)	24	24	24
The Entire 16 Bit Data Word Can Be Output, by Tying $\overline{OC1}$ & $\overline{OC2}$ Low (To Ground)			

DIGITAL DATA CONTROL TTL

Busy—Comes True (High) at Acceptance of $\overline{CTC}$—Goes False (Low) at End of Conversion and Data Ready Busy the Opposite of Busy.

EOCE: End of Conversion Early
—A New CTC Can Be Initiated on Rising Edge of EOCE But Data Not Quite Ready

EOC: End of Conversion
—Data Ready and New CTC Should Be Initiated Now or Soon.

OR: Overrange
—This Signal Will Go True at EOC If the Analog Input Is Positive (+) Overrange, Where Data Output Is Probably False.

ANALOG INPUT TO DIGITAL OUTPUT TRANSFER CHARACTERISTICS

ACCURACY:

Inherent Quantization Error	± ½ LBS
Linerity Error (TYP 25°C)	±0.002% FSR
Gain Error (TYP 25°C)	±0.002% FSR
Zero Error (TYP 25°C)	±0.0015% FSR
Differential LInearity Error	+0.0015% FSR
NOISE: (TYP 25°C)	225 Microvolts
POWER SUPPLY REJECTION:	86DB

DDC A/D, D/A, SYNCHRO,

1553 DATA BUS PRODUCTS

MODEL	TYPE	PACKAGE	DESCRIPTION/FEATURES
BUS-63100 II SERIES	Universal Transceiver and 1553 Transceivers	1.26 x 1.26 x 0.17" Hybrid or 36 Pin DDIP Hybrid	Universal transceiver conforms to MIL-STD-1553 A/B and McDonnell Douglas A-3818, A-5232, A-4905, and A-5690. Dual redundant monolithic low power transceivers. Listed on MIL. DWG. No. 5962-87579. Conforms to MIL-STD-1553 A/B. High S/N ratio, internal filtering. Drives Harris 15530 directly. Complete isolation, including separate power and signal connections. SEAFAC tested. Eliminates non-standard part approval when specified by the Military Drawing number.
BUS-63147 BUS-63148	Dual 5V Transceiver	36 Pin DDIP Hybrid 1.9 x 0.8 x 0.21"	Complete transmitter and receiver pair conforming fully to MIL-STD-1553 A/B. Features +5V power supply. Dual Redundant packaging and Harris I/O compatibility. DESC P/N MIL-DWG No. 5962-89522-01XC.
BUS-65153	Dual Redundant RTU	70 Pin DDIP, Ceramic Package 1.9 x 1.0 x 0.2"	Complete dual redundant MIL-STD-1553A/B Notices 1 & 2/1760A Small Terminal Integrated Circuit (STIC) Remote Terminal. Includes CMOS Protocol and BiPolar low power MK II transceivers, timing control logic, and latchable RT address
BUS-65142 BUS-65144	Dual Redundant RTU	1.9 x 2.1 x 0.25" (DDIP) 1.6 x 2.2 x 0.17" (Flatpack)	Complete dual redundant RTU package in either DDIP or Flatpack hybrid packages. Includes CMOS-SOS Monolithic RTU protocol/ BiPolar and low power Mark II transceivers, data buffers, timing control logic, supports 13 mode codes, 16MHz decoders that offer improved noise rejection and zero crossing detection, and has SEAFAC tested components.
BUS-65522/23 II BUS-65524	VME/VXI Bus Controller, Remote Terminal or Bus Monitor	9.2 x 6.3 x 0.4" VME Eurocard	Dual redundant Bus Controller, Remote Terminal Unit, or Bus Monitor with VME/VXI interface. Supports all MIL-STD-1553 message formats mode codes and provides Built-In-Test capability. Its 8K x 16 dual access RAM and four types of interrupts minimize CPU overhead. BUS-65524 Ruggedized VME bus for high reliability applications. Free BUS-69053 "C" run time library routines.
BUS-65515	IBM® PC RT/BC/MT	13.125 x 4.6" IBM® PC Card	Dual redundant Bus Controller, Remote Terminal Unit, or Bus Monitor with IBM® PC interface. Supports all MIL-STD-1553 message formats, 13 mode codes, and provides Built-In-Test capability. Its 4K x 16 bit dual access RAM and command registers minimize CPU overhead. Free BUS-69052 "C" run time library routines.
BUS-65517II BUS-65519	IBM® PC XT/AT Test and Simulation Cards	13.125 x 4.6" IBM® PC Card	Simultaneously simulates a Bus Controller, an Active Monitor, and up to 31 Remote Terminals. Provides comprehensive error injection/detection. Fully dual redundant 1553A/B. Includes user friendly menu driven software. Optional "C", "Pascal" run time libraries and menu driven PTP production test and simulations card.
BUS-61559 SERIES	Advanced Integrated MUX Hybrid with enhanced features.	2.1 x 1.9 x 0.25" (DDIP) 2.2 x 1.6 x 0.17" (Flatpack)	The AIM-HY'er is a complete MIL-STD-1553B Notice 2 RT/BC/MT terminal. Contains dual low power MKII transceivers, protocol with enhanced RT features, and an 8K x 16 shared RAM host interface. Included are three-state address/Data buffers, command illegalization, on/off-line self test, and passed SEAFAC. Free BUS-69051 "C" run time library routines.
BUS-65149	Universal RT Terminal	2.375 x 1.9 x 0.25" 90 Pin DDIP	A complete Dual Redundant Universal Multiprotocol Remote Terminal device that supports MIL-STD-1553A/B Notices 1 & 2, McAir, Grumman and GD protocol. Programmable features include 8/16 bit DMA, 12/16 MHz clock selection, external/internal bit word and external status bit access.
BUS-65529	IBM® AT RT/BC/MT	6.5 x 4.9" IBM® AT half slot card	Dual Redundant MIL-STD-1553B Notice 2 RT/BC/MT IBM® AT half slot card. Supports all 1553 message formats mode codes and provides built-in test. Its 8K x 16 dual access RAM and enhanced RT features (see AIM-HY'er minimize CPU overhead). Free BUS-69054 "C" run time library routines.
BUS-68005	Data Bus Exerciser	17 x 14.5 x 3.5" Instrument	Provides full function simulation of RTU and BC operation; implements protocol tests of SAE AE-9 proposed production test plan; has 1553 A/B System Tests; Real Time Monitor Output; programmable output level and channel A/B; 2 together can do superceding command test; error generation/detection; Variable Transmitter. (RS 232 and IEEE 488 I/O)
BUS-68015	Noise Tester	8.25 x 14.5 x 3.5"	Programmable bit error rate tester; self-contained noise source correlates with SEAFAC; auto self test and diagnostics. Programmable via IEEE 488; pass/fail or continuous run.

ANALOG TO DIGITAL (A/D) CONVERTERS

MODEL	RESOL.	CONVERSION TIME	LINEARITY ERROR	PACKAGE	OPERATING TEMP. RANGE	POWER DISSIPATION	DESCRIPTION/FEATURES
ADC-00110	12 Bit	100 nsec	±0.025% FSR	46 Pin TDIP Hybrid	−55°C to +125°C	5.5W	10 MHz word rate; includes T/H and all timing circuits.
ADC-00300†	12 Bit	500 nsec	±0.025% FSR	40 Pin TDIP Hybrid	−55°C to +125°C	3.0W	2 MHz word rate; includes T/H and all timing circuits.
ADC-00305	12 Bit	500 nsec	±0.012% FSR	40 Pin TDIP Hybrid	0°C to +70°C	2.6W	2 MHz word rate; containing T/H, A/D converter, Tri-State output registers, and timing circuits. Low cost.
ADC-00310	12 Bit	200 nsec	+0.12% FSR	40 Pin TDIP Hybrid	0°C to 70°C	3.1W	5 MHz word rate, ADC-00305 pin out.

DIGITAL TO ANALOG (D/A) CONVERTERS

MODEL	RESOL.	F.S. SETTLING TIME VOLTAGE	F.S. SETTLING TIME CURRENT	LINEARITY ERROR	PACKAGE	OPERATING TEMP. RANGE	POWER DISSIPATION	DESCRIPTION/FEATURES
DAC-02320	12 Bit	200 nsec	—	±½LSB	24 Pin DDIP Hybrid	−55°C to +125°C	2.2W	Deglitching D/A with 15 MHz update.
DAC-02306 DAC-02307	14 Bit	— 350 nsec	50 nsec —	±0.006% FSR	24 Pin DDIP Hybrid	−55°C to +125°C	1.8W	Latched voltage DAC. Settles to 0.006% in 350 nsec. High accuracy with low impedance voltage output
DAC-02310†	14 Bit	1.5 μsec	—	±0.01% FSR	32 Pin TDIP	−55°C to +125°C	1.7W	14 bit deglitched D/A converter with 10MHz update rate, and 50m V · nsec differential glitch energy.
DAC-02315 & DGL-02316	12 Bit	35 nsec	—	±0.01% FSR	24 Pin DDIP Hybrid	−55°C to +125°C	3.3W	Deglitching D/A converter with 35 MHz update, 14mV P-P glitched, and 38ns glitch duration.

SAMPLE/HOLD and TRACK/HOLD AMPLIFIERS

MODEL	ACQUISITION TIME (F.S. CHANGE)	LINEARITY ERROR	PACKAGE	APERTURE JITTER	DROOP RATE	OPERATING TEMP. RANGE	DESCRIPTION/FEATURES
TH-8530	10 nsec	±0.012% FSR	24 Pin DDIP Hybrid	20 psec	1.0mV/μs	−55°C to +85°C	Buffer ampl. 50MHz sample rate. −60 dB feedthrough.
THA-05203	150 nsec	±0.005% FSR	24 Pin DDIP Hybrid	100 psec	1.0mV/μs	−55°C to +125°C	−74 dB feedthrough.

SYNCHRO INSTRUMENTS

MODEL	FUNCTION	RESOLUTION	ACCURACY	PACKAGE	DESCRIPTION/FEATURES
SR-103/203	Synchro indicator	to 0.001°	to ±0.005°	1.7" High (103) 3.5" High (203) ½ Rack	Wideband 47-1000 Hz, automatic gain ranging, bit fault monitor, synthesized reference, programmable 0-360° or ±180°, IEEE-488 option.
API-30602	Synchro indicator	0.01°	to ±0.03°	3.8 x 2 x 7.5" Panel Meter	Low cost, pin programmable for all common inputs, bright .43" display, tristate output, offset adjust for system zeroing. 47-1200 Hz.
SIM-31200	Angle Simulator	to 0.001°	±0.003°	14.5 x 8.12 x 3.47" Instrument	Synchro or resolver angle simulator with high accuracy, wide band operation (47 Hz to 11 kHz). Front panel keyboard or remote I/O. Rate, auto stepping option.
SBA-SERIES Amplifier	Synchro Booster Amplifier	—	±3'	7.4 x 5.1 x 1.8" Chassis	25VA drive (6 Ω active load). Kick circuit prevents 180° hang-up. Powered from reference. Short circuit, transient, and overload protected.

POWER, 1553 BUS PRODUCTS

SYNCHRO TO DIGITAL (S/D)

MODEL	RESOLUTION	ACCURACY	PACKAGE	TRACKING RATE	DESCRIPTION/FEATURES
RDC-19200 SERIES	10 thru 16 Bit	to ±1 min, +1 LSB	40 Pin TDIP	3.2 to 800 rps	Pin programmable for 10, 12, 14, or 16 bits resolution. Features include velocity output to 0.25% linearity, BIT, LOS, and Major Carry signals.
RDC-19220	10, 12, 14 or 16 Bit	to ±2.3′	28 Pin DDIP 1.4 x 0.6 x 0.2″ 40 Pin DDIP 2.0 x 0.6 x 0.2″	to 1152 rps	Low cost, monolithic programmable Resolver and LVDT to Digital converter with tach grade velocity output. Available in military and industrial models.
SDC-14531	14 or 16 Bit	to ±1.3′	36 Pin DDIP Hybrid	0.61 to 10 rps	Low cost, high reliability synchro or resolver to digital converter. Built-In-Test (BIT), Internal Synthesized Reference, and Single 5V power supply.
SDC-14560 SERIES	10 thru 16 Bit	to ±1 min,	36 Pin DDIP	0.61 to 160 rps	Pin programmable for 10, 12, 14, or 16 bits resolution. Features include velocity output to 0.25% linearity, BIT output, synthesized reference, and CT operation. Models for synchro or resolver inputs.
DTC-19300	12 Bit 14 Bit	0.05% of F.S.	36 Pin DDIP	1 full range per sec., min.	LVDT/RVDT to digital converter; built-in reference oscillator; programmable resolution.
SDC-14570	14 Bit	±5.3′	1.0 x 0.8 x 0.2″	10 rps	Low cost S/D converters with tachometer quality velocity output. Also available in 2 & 3 channel.
SDC-634	14 Bit	to ±2.6′	2.6 x 3.1 x 0.4″ Module	10 rps	Low profile (0.4) industry standard. All common inputs. Transformer isolated.
SDC-36015	10 thru 16 bit	to ±1.3′	4.5 x 13.5 x 0.44″	Full Size IBM® PC Card	Synchro/Resolver Interface for IBM® PC/XT/AT. Provides up to 6 channels of synchro and/or resolver and a high quality velocity output voltage. Also available as *Instrument grade*, angle position indicator, API-36005.

Also available, VME/VXI component and instrument grade cards, dual and triple channel S/Ds, multi-speed, multiplexed, and BCD coded converters.

DIGITAL TO SYNCHRO (D/S) CONVERTERS

MODEL	RESOLUTION	ACCURACY	PACKAGE	OUTPUT DRIVE	DESCRIPTION/FEATURES
DSC-10510	16 Bit	±1′	40 Pin TDIP	5VA	High power hybrid D/S with μP compatible latched input. Can be used for driving CT, CDX, and TR loads.
DRC-10520	16 Bit	±4′	32 Pin TDIP Hybrid	1.5VA	High power hybrid D/R with μP compatible latched input. AC or DC power amps. Protected output. BIT output.
DRC-11520	16 Bit	±4′	36 Pin DDIP Hybrid	5mA	Pin programmable synchro or resolver. Direct coupled for DC SIN/COS or rotating PPI applications, low ±2% scale factor variation.
DSC-36020	Digital/Synchro Resolver Interface	16 Bit	13.125 x 4.6″	IBM® PC Card	Provides up to 6 channels of synchro and/or resolver outputs. Also available as *Instrument* grade synchro/resolver simulator, SIM-36010.
DSC-644	14 Bit	±4′	2.6 x 3.1 x 0.5″ Module	1.5VA	Low profile industry standard pin-out. Metal heat sink, current limited and transient protected. Internal 400 Hz transformers. Low scale factor variation.
DSC-544	14 Bit	±4′	2.6 x 3.1 x 0.8″ Module	4.5VA	Powered from ref, metal heat sink, all internal transformers. Short circuit proof & transient protected. Thermal cutoff.
TD-100	12 Bit	±10′	5.4 x 5.3 x 0.7″ PC Card	25VA	High power torque receiver synchro driver. Options to 115VA with external booster amp. Short circuit protected, thermal cutoff, sequenced turn on, input registers.

Also available: High-powered D/S card assemblies, "S2 grounded" D/S references oscillators.

POWER, H-BRIDGES AND MOTOR DRIVERS

MODEL	TYPE	DRAIN-SOURCE BREAKDOWN VOLTAGE	DRAIN CURRENT	ON RESISTANCE/ Vce Sat.	PACKAGE	DESCRIPTION
PWR-82320	N-Channel	50V-500V	30A-10A	0.04-0.95 ohms	1.37 x 1.80 x 0.375	Designed for Single Power Supply Motor Drive.
PWR-82324	P-Channel	110V-200V	12A-7A	.2-.6 ohms	1.37 x 1.80 x 0.375	Designed for Split Power Supply Motor Drive.
PWR-82331	N-Channel	200V	30A	0.11 ohms	3.0 x 2.1 x 0.390″ copper flat pack	3 phase smart power current bridge with internal drive circuitry and power supply.
PWR-82340	N-Channel	200V	30A	0.11 ohms	3.0 x 2.1 x 0.390″ copper flat pack	2 phase smart power current bridge with internal drive circuitry.

MODEL	TYPE	BREAKDOWN VOLTAGE	OUTPUT CURRENT	ON RESISTANCE/ Vce Sat.	PACKAGE	DESCRIPTION
PWR-82333	IGBT	600V	30A	3.0V	3.0 x 2.1 x 0.390″ copper flat pack	3 phase high voltage current bridge with internal drive circuitry and power supply.
PWR-82342	IGBT	600V	30A	3.0V	3.0 x 2.1 x 0.390″ copper flat pack	2 phase high voltage current bridge with internal drive circuitry and power supply.

DC-DC CONVERTERS

MODEL	PACKAGE	DESCRIPTION/FEATURES
PWR-82400	3.2 x 2.45 x 0.595″	±15V & +5V, ±12V & +5V 60W DC-DC converters.

Unibus and Q-Bus are trademarks of Digital Equipment Corporation.
NOTE: Most hybrid products are available with military screening.
†Some products available to military drawings. Call for details.
**Multibus is a registered trademark of Intel Corporation.
*0.2 V/μs optional.
***Inductosyn is a trademark of Farrand Controls Corporation.
IBM PC is a registered trademark of IBM Corporation.

DDC
ILC DATA DEVICE CORPORATION®

HEADQUARTERS: 105 Wilbur Place, Bohemia, NY 11716-2482
TEL: 516-567-5600 • TOLL FREE 800-DDC-1772
OFFICES: **Northern CA:** San Jose 408-236-3260
Southern CA: Woodland Hills 818-992-1772
Garden Grove 714-895-9777
Washington D.C. Area: Sterling 703-236-3260
Northern N.J.: Totowa 201-785-1734

MINIGLOSSARY
BASIC
EBCDIC CODE

Bit Positions 4, 5, 6, 7	Second Hexadecimal Digit	Digit Punches	00				01				10				11				
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 0, 1
			00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	Bit Positions 2, 3
			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	First Hexadecimal Digit
			12				12	12		12	12	12		12	12				Zone Punches
				11				11	11	11		11	11	11		11			
					0		0		0	0	0		0	0			0		
			9	9	9	9	9	9	9	9									Digit Punches
			①	②	③	④	⑤	⑥	⑦	⑧					⑨	⑩	⑪	⑫	
0000	0	8-1	NUL	DLE	DS		SP	&	-									0	8-1
0001	1	1	SOH	DC1	SOS				⑬		a	j			A	J	⑭	1	1
0010	2	2	STX	DC2	FS	SYN					b	k	s		B	K	S	2	2
0011	3	3	ETX	TM							c	l	t		C	L	T	3	3
0100	4	4	PF	RES	BYP	PN					d	m	u		D	M	U	4	4
0101	5	5	HT	NL	LF	RS					e	n	v		E	N	V	5	5
0110	6	6	LC	BS	ETB	UC					f	o	w		F	O	W	6	6
0111	7	7	DEL	IL	ESC	EOT					g	p	x		G	P	X	7	7
1000	8	8		CAN							h	q	y		H	Q	Y	8	8
1001	9	8-1		EM							;	r	z		I	R	Z	9	9
1010	A	8-2	SMM	CC	SM		¢	!	⑮	:									8-2
1011	B	8-3	VT	CU1	CU2	CU3	.	$	,	#									8-3
1100	C	8-4	FF	IFS		DC4	<	*	%	@									8-4
1101	D	8-5	CR	IGS	ENQ	NAK	(	)	_	'									8-5
1110	E	8-6	SO	IRS	ACK		+	;	>	=									8-6
1111	F	8-7	SI	IUS	BEL	SUB	I	¬	?	"									8-7
			12				12				12	12		12	12	12		12	Zone Punches
				11				11				11	11	11		11	11	11	
					0				0		0		0	0	0		0	0	
			9	9	9	9									9	9	9	9	

Card Hole Patterns

①	12-0-9-8-1	⑤	No-Punches	⑨	12-0
②	12-11-9-8-1	⑥	12	⑩	11-0
③	11-0-9-8-1	⑦	11	⑪	0-8-2
④	12-11-0-9-8-1	⑧	12-11-0	⑫	0
				⑬	0-1
				⑭	11-0-9-1
				⑮	12-11

Control Character Representations

ACK	Acknowledge	EOT	End of Transmission	PF	Punch Off
BEL	Bell	ESC	Escape	PN	Punch On
BS	Backspace	ETB	End of Transmission Block	RES	Restore
BYP	Bypass	ETX	End of Text	RS	Reader Stop
CAN	Cancel	FF	Form Feed	SI	Shift In
CC	Cursar Control	FS	Field Separator	SM	Set Mode
CR	Carriage Return	HT	Horizontal Tab	SMM	Start of Manual Message
CU1	Customer Use 1	IFS	Interchange File Separator	SO	Shift Out
CU2	Customer Use 2	IGS	Interchange Group Separator	SOH	Start of Heading
CU3	Customer Use 3	IL	Idle	SOS	Start of Significance
DC1	Device Control 1	IRS	Interchange Record Separator	SP	Space
DC2	Device Control 2	IUS	Interchange Unit Separator	STX	Start of Text
DC4	Device Control 4	LC	Lower Case	SUB	Substitute
DEL	Delete	LF	Line Feed	SYN	Synchronous Idle
DLE	Data Link Escape	NAK	Negative Acknowledge	TM	Tape Mark
DS	Digit Select	NL	New Line	UC	Upper Case
EM	End of Medium	NUL	Null	VT	Vertical Tab
ENQ	Enquiry				

Special Graphic Characters

¢	Cent Sign
.	Period, Decimal Point
<	Less-than Sign
(	Left Parenthesis
+	Plus Sign
I	Logical OR
&	Ampersand
!	Exclamation Point
$	Dollar Sign
*	Asterisk
)	Right Parenthesis
;	Semicolon
¬	Logical NOT
-	Minus Sign, Hyphen
/	Slash
,	Comma
%	Percent
_	Underscore
>	Greater-than Sign
?	Question Mark
:	Colon
#	Number Sign
@	At Sign
'	Prime, Apostrophe
=	Equal Sign
"	Quotation Mark

DATA ACQUISITION AND CONTROL

Real-World™ IBM-PC/XT/AT, PS/2 INTERFACE PRODUCTS

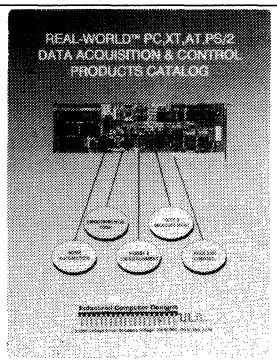
Industrial Computer Designs, Inc. manufactures IBM-PC/XT/AT, PS/2 ***data acquisition and control*** products, plus remote ***sensors and controllers*** offering lowest cost-per-channel pricing. ICD is commited to solving problems through innovative thinking by combining high density, multi-function I/O capabilites with increased flexibity and simplicity. ***OEM and custom versions*** are also availible. These products are used in process control, lighting, energy management, security, test and measurement, and many other Real-World™ situations. ICD has been providing comprehensive solutions for a broad spectrum of industrial, commercial and residential applications for more than 10 years.

MODEL #	FUNCTIONS	Programmable TTL I/O	Input/Output Only TTL I/O	Output Current (mA Max)	Resolution (Bits)	Accuracy (LSBs)	Voltage Range (VDC)	Conversion Speed (KHz)	Single Ended/# Channels	Differential	Programmable Gain	Sample & Hold	RS-232-C Serial Channels	Max Speed Per Channel (KHz)	Interrupts Generated	Required Voltage (+VDC)	Heat Sensitivity (mv/C)	Operating Temp Range (C)	Humidity Range (R.H.)	Distance Range (in)	Available Valve Diameters
1018-PC	PI/O,RS-232(3W),POM	96	32-1	4			TTL							2		NO	ABC		0-70		
1019-PC	PI/O,PS-232-C	144		4			TTL							2		YES	ABC		0-70		
1021-PC	PI/O,PS-232-C	216		4			TTL							2		YES	ABC		0-70		
1048-PC	PI/O,PS-232-C,PTA	48		4			TTL							2		YES	ABC		0-70		
A/D64-PC	A/D,PI/O	24		4	8	+/-1	+5	10	64		NO	NO				NO	AB		0-70		
D/A64-PC	D/A,PI/O	24		4/10	8	+/-1	+5	.1	64		NO	NO				NO	ABC		0-70		
ADA128-PC	A/D,D/A,COMMON NODE		7-1	10	8	+/-1	+5	10	126		NO	NO					ABC		0-70	Bed of Nails Tests	
A/D12B32-PC	A/D,D/A,PI/O,PTA,POM	48		4/10	12+S	+/-1	+/-10	28.5	32	16	YES	YES				YES	ABC		0-70		
ADA1216-PC	A/D,D/A,PI/O,I/O	48	16-O	4/10	12	+/-1	+5	28.5	16/16		NO	YES				YES	ABC		0-70		
PRC4-PC	PROM/RAM MEMORY	4 sockets and programming jumpers allow any size EPROM or RAM from 2k to 64k to be used																			
1524-PC	COUNTER/TIMER,PI/O	24		4	16											7MHz	YES	A		0-70		
CSX8-PC	CO-PROCESSOR RS-232-C														8	19.2	YES	ABC		0-70		
QDB4-PC	QUADRATURE DECODER				24		TTL		4							500	YES	A		0-70	2 Presets/Channel	
1018-PS2	PI/O	96		4			TTL										NO	A		0-70		
1019-PS2	PI/O	144		4			TTL										NO	A		0-70		
1021-PS2	PI/O	216		4			TTL										NO	A		0-70		
1048-PS2	PI/O,PTA	48		4			TTL										NO	A		0-70		
AD12B32-PS2	A/D,PTA			10	12+S	+/-1	+/-10	28.5	32	16	YES	YES					YES	ABC		0-70		
ADA1216-PS2	A/D,D/A			10	12	+/-1	+5	28.5	16/16		NO	YES					YES	ABC		0-70		
1524-PS2	COUNTER/TIMER,PI/O	24		4	16											7MHz	YES	A		0-70		
CSX8-PS2	CO-PROCESSOR RS-232-C														8	19.2	YES	ABC		0-70		
QDB4-PS2	QUADRATURE DECODER				24		TTL		4							500	YES	A		0-70	2 Preset/channels	
RTS-1	REMOTE TEMPERATURE	SENSORS		10		1%	0-5	1Hz						NO				8-12	.04	-6/48		
RLS-1	REMOTE LIGHT SENSOR	•		10		REL	0-5	100Hz						NO				8-12		0/70		
RHS-18	REMOTE HUMIDITY	•		10		5%	0-5	.01Hz						NO				8-12		0/70	20/90	
RMS-18	REMOTE MOISTURE	•		10		REL	0-5	1Hz						NO				8-12		0/70		
RCS-1	REMOTE CURRENT	•		10		2%	0-5	60Hz						NO				8-12		0/70		
URM-1	ULTRA-SONIC RANGING	•		10		1%	0-5	2Hz						YES				8-12		0/70		10/255
HVAC-1	ENVIRONMENTAL CONTROL	CONTROL		1A/24			0-5											8-12		0/70		
ADV-XX	AIR DUCT VALVES	•				O/C	TTL									45S						7-14

ABBREV: PI/O=Programmable Input/Output - A/D=Analog to Digital - D/A=Digital to Analog - PTA=Proto-Typing Area - POM=Plug On Interface Module Support
A= +5VDC - B= +12VDC - C= -12VDC - 3W=3 Wire Only - REL=Relative Measurements - S=Seconds - O/C=Open/Closed

PI/O channels are in programmable groups of eight (Intel 8255 format). All I/O Boards are provided with a complete Owners Operation/Service Manual, Application Demo Diskette, and DOS Drivers. ICD offers a wide range of Add-on and Plug-on modules for Opto-Isolation, Solid State or Mechanical Relay Control, A/D, D/A, Current Loop, and general interfacing applications. Contact ICD or your Local ICD Products Dealer for information additional ICD Products or Application Assistance.

Technical Assistance or Application Questions are welcomed by ICD. Call or write for your own designers choice engineering catalog of high-density, multifunction A/D, D/A and digital TTL I/O interface cards, plus environmental sensors and controller products.



Industrial Computer Designs

31355 Agoura Road
Westlake Village, CA 91361
Phone: (818)889-3179 FAX: (818)889-1490

Information Transfer, Inc.

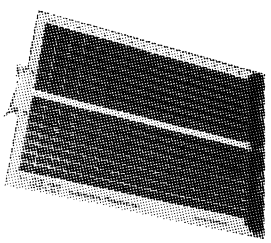
"The Switching Company"

5 YEAR WARRANTY 1971 1991

9000 SERIES

MATRIX SWITCHING SYSTEMS

ITI's 9000 Series matrix system incorporates the HIGHEST CROSSPOINT DENSITY of all ITI's matrix switching systems. It was specifically designed to meet the growing demand for large scale (up to 3000 inputs x 3000 outputs) but affordable matrix switching.



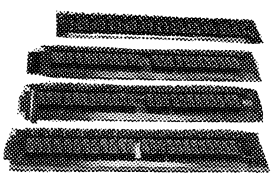
Has features of 8500 series and:

- Sizes up to 3000 inputs x 3000 outputs
- Choice of 16 x 16 or 20 x 20 relays per circuit card
- Models from DC to 1 MHz
- Transmission Characteristics
  - Isolation > 95 dB at 1 kHz
  - Insertion Loss < .1 dB at 100 kHz

HIGH FREQUENCY

MATRIX SWITCHING SYSTEMS

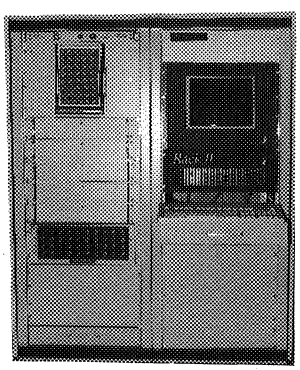
The New ITI High Frequency switching system was developed to handle wide bandwidth switching of general purpose analog and digital voltage signals from DC to 100 MHz. The system is suitable for VHF-UHF Band, wideband IF, antenna and airborne switching.
The switching function can be divided into multiple sections under common control; i.e., one section can provide high frequency switching, and the second section can provide audio switching.



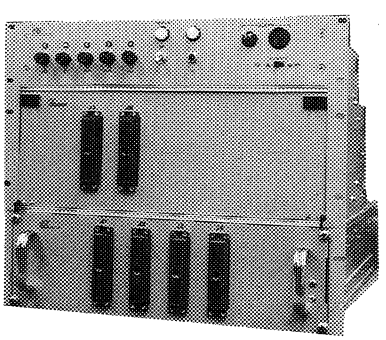
- Frequency Range: DC - 100 MHz
- Crosstalk Isolation: >55 dB at 100 MHz
- Insertion Loss: <1.0 dB at 100 MHz
- Impedance: 75 ohms

ATE SWITCHING SYSTEMS

Custom ATE Switching Systems from Standard "OFF-THE-SHELF" ITI Products



- Switch contacts rated for microvolts to kilovolts and milliamps to 20 amps
- Latching and non-latching crosspoints
- IEEE-488 (GPIB), RS-232-C, Parallel BCD Interfaces
- Manual controls available
- Fast connect and disconnect through use of ZIF connectors
- Multiple switching
- Forms A, B, and C switches
- Front and/or rear panel access for fixtures and instruments



INFORMATION TRANSFER, INC.

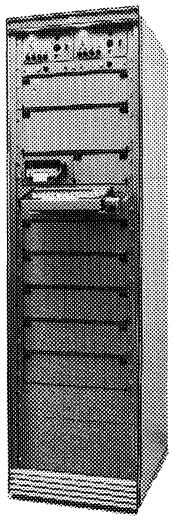
"The Switching Company"

P.O. Box 357 • Bloomfield, New York 14469 • (716) 657-7074 • FAX: (716) 657-7432

Information Transfer, Inc.

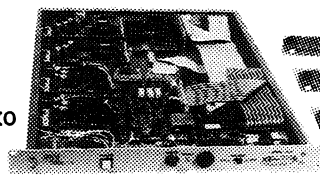
"The Switching Company"

8500 &8800 SERIES AUTOPATCH MATRIX SWITCHING SYSTEMS



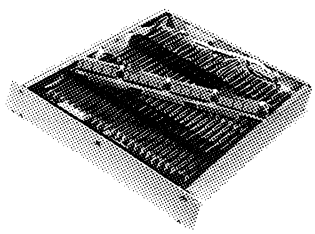
THEY ARE AVAILABLE IN:

- Sizes from 8 inputs x 8 outputs to 1000 inputs x 1000 outputs
- Models from DC to 25 MHz
- IEEE-488 (GPIB), RS-232-C and Parallel BCD interfaces
- Models with built-in maintenance terminals
- Models with redundant power supplies
- Magnetically latched crosspoints
- Models that switch from 1 to 16 poles per crosspoint
- Models with custom designed I/O panels



ITI 8800 MATRIX CONTROLLER

ITI 8800 RELAY CARDS



ITI 8800 MATRIX MODULE

7100 SERIES SCANNER/MULTIPLEXERS

MODEL 7102 & 7103

- Interfaces available - See general information
- Manual backup with front panel controls
- Expandable to 10,000 channels
- Seven-inch, rack-mounting enclosure

MODEL 7102 MODEL 7103

GENERAL INFORMATION

- Available for 1,2,3 and 4 wire switching
- Number of poles can be program selectable (option)
- Expandable in 10-channel increments with plug-in cards
- Variety of switch contacts available: low-level signal to high-current requirements
- Switch contacts intermixed in same scanner
- Interfaces for IEEE-488 (GPIB) bus, RS-232-C port and parallel BCD address
- IEEE-488 and RS-232-C interfaces control multiple scanners
- Programmable scan rate and first to last channel selection
- Custom I/O panels available

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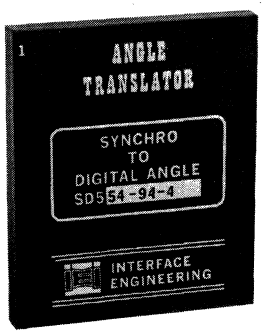
ANGLE TRANSLATORS (617) 986-2600

MODULES



UNITS CONVERSION

CODE CONVERSION

ANGLE COMBINERS COMPARATORS

TRIG FUNCTIONS

DIGITAL SERVOS

SYNCHRO TO DIGITAL

SYNCHRO TO DC

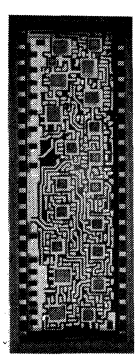
DIGITAL TO SYNCHRO

COORDINATE CONVERSION

SERIAL-OPTICAL DATA LINKS

FAST MATH OPERATORS

ANGLE DISPLAYS



HYBRIDS

ANGLE CODE CONVERTERS

Function	Model	Input	Output	FS/Rate	Accuracy	Size	Bulletin
Binary Angle to BCD Degrees	DD107-4 to -7	12,16,20,21 bits	4 to 7 digits	359.9° to 359.9995°	±0.6 LSD	C A	570115 370226
Binary Angle to BCD Radar Mils	DD124-4 to -7	12,16,20,21 bits	4 to 7 digits	6399 to 6399.997	±0.6 LSD	A	370630
BCD Degree to Arcmin. + Sec.	DD132	.999° BCD	4 digit BCD	59′57″	±1 arcsec	A	371204
Binary Angle to Bipolar Angle	DD117-16-21	17 or 21 bits	±17 or 21 bits	±180° — .3 μs	±0	C	370607
Binary Angle Combiner	DD118	16 bit θ & 16 bit ϕ	16 bit $\theta + \phi$ or $\theta - \phi$	.35 μs	±0	C	470221
Binary Angle Comparator	DD119	16 bit θ & 16 bit $\theta \pm \phi$	±16 bit ϕ shortest path	.4 μs	±0	A	370815
BCD Degrees to Binary Angle	DD127-4, 5	4, 5 digit BCD	13, 16 bits	359.9° to 359.99°	±.6 LSD	A	370915
BCD Degrees to Binary Angle	DD227-6	6 digit BCD	20 bit angle	359.999°	±.7 LSD	B X	180314
Dual Speed Combiner	DD115A	X1 — 7 bits X36 — 14 bits	19 bit angle	0.25 μs	±.0013°	E	471120
Dual Speed Expanders	DD113B	17-21 bits	X36-12/16 bits	0.2 μs	±1 LSB—X36	D	471215
TRIG FUNCTIONS							
Binary Angle to Sin and Cos	DD108/109	12, 15, 18 bits	±16 bit sine and cosine	360°, .9 to 1.5 μs	±.005° to .001°	A BX	270928 570812
Binary Angle to Sin and Cos	DD175	12 bits	±12 bit sine and cosine	360°, .1 μs	.007°	A	870317
Binary Tan to Angle	DD130A, B	10 or 13 bits	16 bit angle	45°, 1.2 μs	±.0025°	A BX	371105 371105
Arcsin or Arccos	DD108/137	16 bits S or C	16 bit angle	90°, 20 μs	±.001°	A/BX	670915
Binary Angle to Tan.	DD130/137	16 bit angle	16 bit tan.	45°, 20 μs	±.0025°	A/BX	670915
DC Angle to S & C	SA840A,B,C	+10 v = 360°	10 sinθ, 10 cosθ	500/sec	±.3° to ±.1°	A	371214
DC S & C to Angle	SA880A,B,C	10 sinθ, 10 cosθ	+10 v = 360°	500/sec	±.3° to ±.1°	A	770320
SYNCHRO-DIGITAL							
Synchro to Digital	SD552/566	synchro	10 bit angle	4800 RPM	±22′	F1	770522
Synchro to Digital	SD553/567	synchro	12 bit angle	1800 RPM	±8″	F1	870317
Synchro to Digital	SD554/568	synchro	14 bit angle	480/720 RPM	±4′	F1	770415
Synchro to Digital	SD555	synchro	16 bit angle	75 RPM	±1′	F	980522
S-D Multichannel	SD532	to 64 channels	13 bit angle	100 μs min.	±5′	D-A	770318
S-D 4 Channel	SD528	4 ch. synchro	13 bit angle	0.2 μs access	±4′	D/BX	671120
S-D Dual Speed	SD556/560	X1, X36 synchro	16-19 bit angle	X1 — 20 RPM	±.01 to .002°	F1	770715
Synchro to BCD	SD570	synchro	3 or 4 digit	ext. scaling	to ±0.1° ±1 LSD	F	970815
Synchro to BCD	SD575/576	synchro	3 or 4 digit	359,359.9	1° and .1°	FX/F	870220
Synchro to BCD and Binary	SD580/581	synchro	3 or 4 digit & 10/14 bit binary	359,359.9 to 80/10	.1° and ±4′	FX/F	871018
DIGITAL-SYNCHRO							
Digital to Synchro	DS340/341	14 bit angle	1-2 vA	360°	±4′	F	761215
Digital to Synchro	DS350	14 bit angle	4 or 10 VA	360°	6′ to 10′	F/H	770212
Digital to Resolver	DR320-A to E	10 to 20 bits	7 v resolver	360°	10′ to 10″	C	670815
Digital to TR	TD355/356	12 bit angle	250 VA pk.	360°	6′ to 20′	—	970730
Solid State CT	DS360/361	synchro vs 14 bit angle	null/error .4 to 1 vac/°	±7 vac	±4′	F/F1	770324
Solid State CDX	DS370	14 bit angle	resolver	±7 vac	±4′	F	970515
SYNCHRO-ANALOG							
Synchro to Linear DC	SA810A,B,C	synchro	+10 or ±10 vdc	0-360°, ±180°	±.25° to ±.1°	A	370612
Synchro to DC Sin & Cos Abs	SA820A,B,C SA822	synchro	10 sin θ 10 cos θ	60 or 400/sec	±.35° to ±.15°	B/F	371114
Synchro to DC Sin & Cos-Ref. scaled	SA830	synchro	10 sin θ 10 cos θ	60 or 400/sec	±.1°	C	371123

INTERFACE ENGINEERING

FAX (617) 986-8932

Function	Model	Input	Output	FS/Rate	Accuracy	Size	Bulletin
Binary Add/Subtract	DD129	16 bit A & B	16 bit A ±B	.4 μs	±0	C	370726
Binary Multiply	DD123/DP	16 bit A & B	18/32 bit AB	10 μs	±0	A	470515
Binary Divide	DD163/DP	16/32A & 16B	18/32 bit A/B	10 μs	±0	A	570719
Square Root	DD123/137	16 bit A	16 bit √A	160 μs	±0	A/A	670915
Floating Point	DD154	16A + 4 bit X	8 modes	.3 μs/shift	±0	A	570622
Complements	DD112	12-20 bit A	ones, two's, direct-thru	.25 μs	±0	C	370918
Inverse Function	DD137	16 bit X	16 bit f (X)	16 X slave	tol. of slave	A	470303
Inverse Function	DD141-20-28	20 or 28 bit X	16 or 24 bit f (X)	.3 μs/count	tol. of slave	C	570210
COORDINATE CONVERTERS							
DC Polar to Rectangular	SA850A,B,C	.1 to 10 v R 0 to 10 v θ	Rsin θ Rcos θ	500/sec	.125 to .5° .1 to .4%	A	371222
DC Rectangular to Polar	SA860A,B,C	.1 to 10 Rsin θ & Rcos θ	+10 v = 360° abs. .1 to 10 R	500/sec	.125 to .5° .1 to .4%	A	371224
Polar to Analog Rectangular	DR320-A to E	10 to 20 bits θ ±10 v R	Rsin θ Rcos θ	2 μs	10′ to 10″ .1 and .3%	C	571022
Optically Isolated Serial Data Link	DD128T & DD128R	Accepts and delivers 24 bit parallel data at up to 20K words/sec. Serial transmission via low cost twisted pair up to 1 mile.				C C	371115 371115
Panel Display Kits	DD120-4 to -6	4 to 6 digit .55″ numerals, complete with bezels, decoders, etc.				PI	371019

Notes: 1) Synchro translators Interface 90 v/60 Hz (-96), 2) Cases: 90 v/400 Hz (-94), and 11.8 v/400 Hz (-114) synchros. Contact IEI for resolver interfaces.

A) 3″x4″x.4″ B) 3″x4″x.8″ Bx) 3″x4″x.675″ C) 2″x4″x.4″ D) 2″x3″x.4″ E) 2″x4″x.8″ F) 2.625″x3.125″x.8″ Fx) 2.625″x3.125″x1.0″ F1) 2.625″x3.125″x.4″

FAST 16 BIT MATH

- Add
- Subtract
- Multiply
- Divide
- Square Root
- Sine
- Arc Sine
- Cosine
- Arc Cosine
- Tangent
- Arctan
- Inverse Functions
- Floating Point
- Complements

COORDINATE CONVERSION

SERIAL DATA LINKS

PANEL DISPLAYS

MAINFRAME SUBSYSTEMS

MAINFRAMES are integrated modular subsystems optimized by the selection of functions, resolutions, and speeds for the specifics of each application. Typical groups are outlined below. Serial, parallel, bidirectional, IEC, and IEEE-488 interface options available. Contact IEI for additional information.

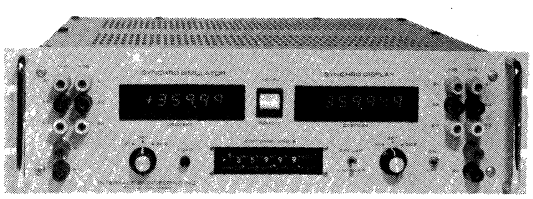
ANGLE DISPLAYS: The DD135 series accepts, converts, displays, and delivers angles in a variety of forms including binary, BCD, synchro, resolver, dual speed, mils, degrees, arc-minutes and seconds and distance in any unit of linear measure at resolutions to 21 bits and accuracies to ±.0003°. Options include bipolar operation and programmable offsets and scaling factors.

CONTROLLERS: Integrated Interface-Controllers complete with motor drive providing manual or computer control of rate and position.

STABILIZATION COMPUTERS: Satellite microcomputer controllers converting Space to Ship and Ship to Space Coordinates. Feature 16 bit floating point precision, computing speed, and dynamic accuracy.

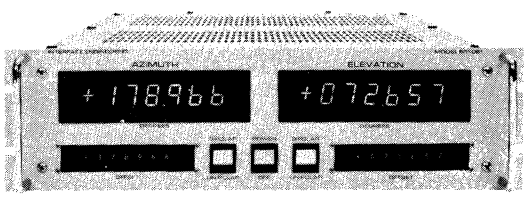
RADAR REMOTERS: Up-link control of Remote radar. Down link reporting of radar trigger, video, Az, El, rate, and status.

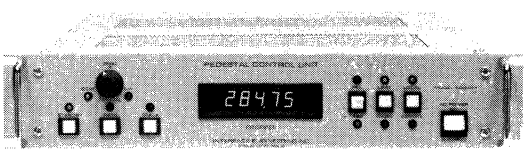
SYNCHRO-RESOLVER: Instruments, displays, simulators.



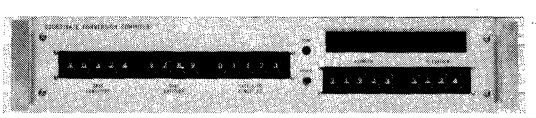
SYNCHRO SIMULATOR/DISPLAYS

ANGLE DISPLAY - INTERFACES

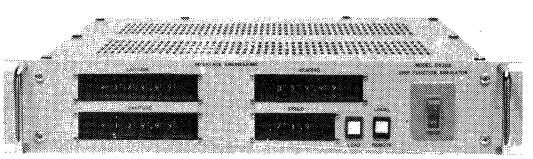




SERVO CONTROLLERS



STABILIZATION COMPUTERS



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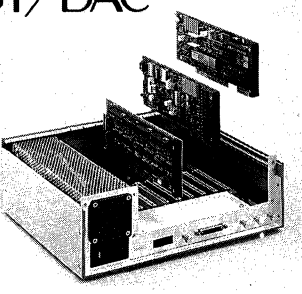
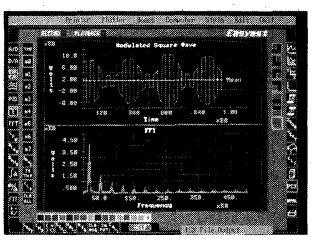
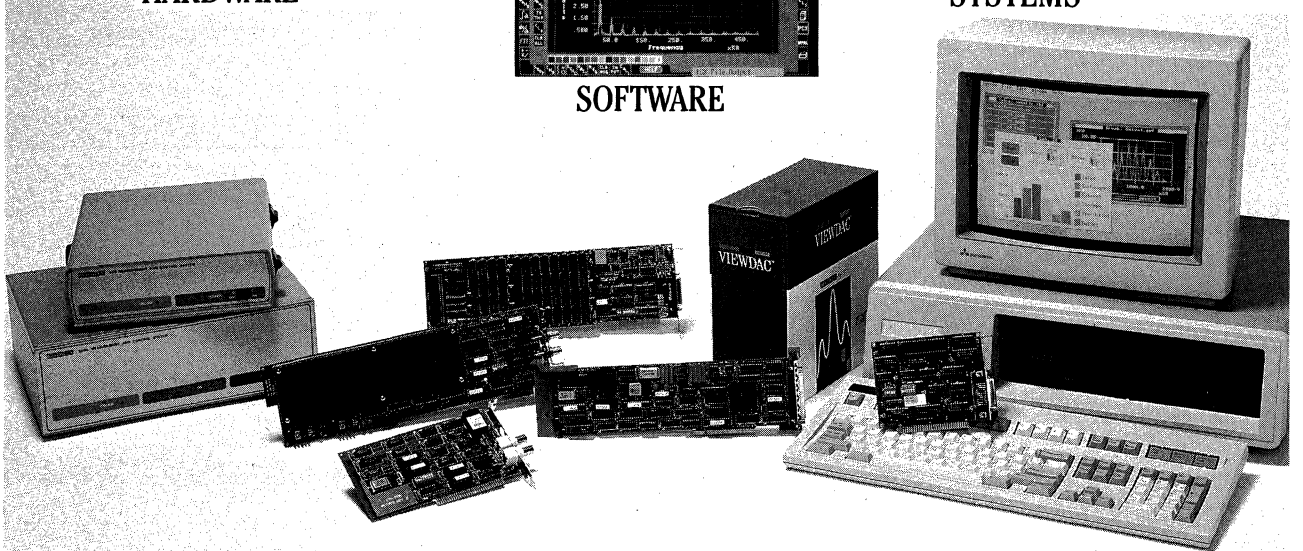


SYSTEMS



SOFTWARE



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MODEL 1701 SCANNER

Random access: Channels selected by manual front panel switch, remotely by parallel BCD, IEEE-488 or RS-232C.

GENERAL: Scan voltages from microvolts to 300 volts. Microprocessor based interface provides two-way communications with a computer via IEEE-488, RS-232C or parallel BCD.

COMPUTER INTERFACE: parallel BCD std., optional IEEE-488 or RS-232C

CAPACITY: 10 to 999 channels - master 10 to 100 channels, slave units add 10 to 200 channels each. Master and slave require 3½″ std. rack space.

NUMBER of POLES: 3 to 100 per channel.

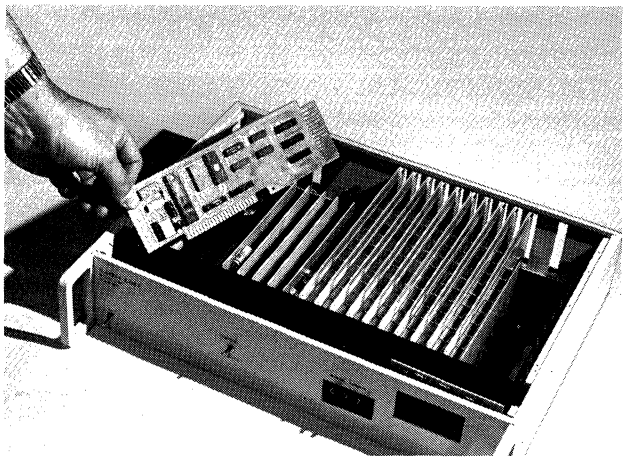
SWITCHING RATE: to 200 channels per second

CONTACT RATINGS: Microvolts to 300 volts

DISPLAY: 7 segment LED - 3 digits for channel, 4½ digits for data

DIMENSIONS: 3½″ high × 17″ wide × 10″ deep

USES: Reading tranducers, thermocouples, RTD's, switch positions, BCD and binary data lines

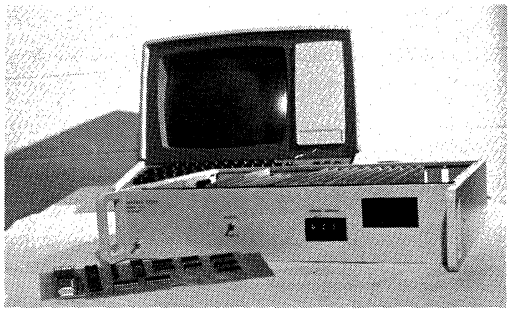


Shown with the Model 1701 Scanner is the Computer Interface Board.

OPERATION FROM A COMPUTER: Commands such as SELECT CHANNEL and SEND DATA are accomplished by two-way communications between a terminal or controller and the Model 1701 using ASCII. Send "25C" to select channel 25. Send "I" to have the scanner respond with 4½ digits of data, sign and decimal point.

LITERATURE: Write for Bulletin 1701-MIB

COMPUTER CONTROLLED DATA ACQUISITION SYSTEM



When connected to the Matrix Model 1701 analog scanner, a personal computer becomes a DAS which can read 100 analog inputs such as thermocouples, RTD's, strain gauge transducers, or any other device with output levels from microvolts to hundreds of volts. Connection is made via the RS-232 or parallel BCD.

Simple commands are accomplished by two-way communication between a computer and the Model 1701.

A 100 channel scanning system, complete with computer, A/D converter, color video monitor and software control module costs less than $42 per channel.

ACCESSORIES: Typical temperature sensors are priced at $15 each. Pressure transducers (ranges up to 750 psi) are priced at $35 each.

MATRIX CORPORATION
Dept. EM, 2260 Distributors Drive, Indianapolis, Indiana 46241
Telephone: (317) 248-2036

NATEL

SYNCHRO/RESOLVER-TO-DIGITAL CONVERTERS

MODEL NO.	DESCRIPTION	REMARKS
HSRD1006	**Synchro/Resolver-to-Digital Converter Microprocessor Compatible 16-bit Hybrid**	Industry's first 16-bit hybrid converter; currently qualified on over 12 major programs world-wide ■ Uses single 5V power at only 20 mA ■ 1.3 arc-minute accuracy ■ Pin-programmable Synchro/Resolver modes and resolution ■ BIT ■ Reference Synthesizer ■ AGC.
HSRD1056 *RADIATION HARDENED MODEL 1056RH ALSO AVAILABLE*	**Improved 2nd Generation, Pin Programmable Synchro/Resolver-to-Digital Converter Microprocessor Compatible 16-bit Hybrid**	The Second Generation "encore" to the popular **Model 1006** including all the 1006 features plus ■ High Quality Velocity ■ Anti-180° lock-up circuit ■ High frequency option (higher tracking and wider bandwidth) ■ Very low (50 mW) power consumption.
HRD1346 *NEW*	**3-Channel, Single Package 16-Bit Resolver-to-Digital Converter Microprocessor Compatible, 5 V-dc Only**	3 Channels in one 40-pin TDIP Hybrid ■ 1.3 arc-minute accuracy ■ True single supply...5V power at only 3.3 mA per channel ■ High speed HCT type 3-state enable ■ High output drive of 10 LSTTL ■ Reference synthesizer ■ High frequency option ■ 3 Independent tracking loops ■ 3 Independent BIT outputs ■ 3 Independent analog velocity outputs.
HRD1416 *NEW*	**One-Inch Square, Single 5 Volt Powered R/D Converter with Reference Oscillator Microprocessor Compatible, 16-bit Hybrid**	Industry's only R/D converter with Built-in Reference Oscillator ■ 1.3 arc-minute accuracy ■ True single supply...5V power at only 15 mA per channel (including power required for reference oscillator) ■ BIT output ■ Reference synthesizer ■ Anti-180° lock-up circuit ■ High frequency/High tracking option ■ DIR (direction) and CO (carry output) for revolution counting.
H2SD1626 **H2RD1626**	**2-Speed, Single Package, 22-Bit 0.0004° Accuracy, 5V-dc Only Synchro (Resolver)-to-Digital Converter Programmable Speed Ratio, μP Compatible**	Industry's only 2-speed, single 40-pin TDIP Hybrid ■ Accuracy to 0.0004° (1.5 arc-seconds) ■ Programmable speed ratios ■ Uses single 5V power at only 20 mA ■ Velocity Output ■ Reference Synthesizer ■ μP Compatible.

DIGITAL-TO-SYNCHRO/RESOLVER CONVERTERS

MODEL NO.	DESCRIPTION	REMARKS
HDSR2006	**Digital-to-Synchro/Resolver Converter Microprocessor Compatible 16-bit Hybrid**	Industry's first 16-bit hybrid converter ■ 1 arc-minute accuracy ■ Pin programmable Synchro/Resolver format, Reference voltage input, and set-up/test modes ■ 0.05% scale factor conformance (radius accuracy) ■ Does not require 5V supply.
HDSC2036	**Two-Channel, Double-Buffered Four-Quadrant Multiplying SIN/COS DAC Microprocessor Compatible 16-bit Hybrid**	Two complete Digital-to-SIN/COS converters with excellent features ■ Single 36-pin hybrid DDIP package ■ Ideal for applications where PC board space is at a premium.
HDR2116 *5VA OUTPUT, 40-PIN HYBRID 2616 ALSO AVAILABLE*	**2VA Output, 32-pin Hybrid 16-bit Digital-to-Resolver Converter Microprocessor Compatible**	■ Fully protected output including current limiting, short circuit and voltage feedback transients. ■ 1 arc-minute accuracy ■ Does not require +5V power supply.
DSC/DRC5001 **DSC/DRC5002** *3VA OUTPUT MODEL 5101 ALSO AVAILABLE*	**16-bit Digital-to-Synchro (Resolver) Converter Low Profile (0.42") μP Compatible**	Industry's only 0.42" high unit with 1.3VA fully protected output including current limiting, short circuit protection, and thermal cut-off. Other features include: ■ Transformer isolated reference input and analog outputs ■ 1% load regulation ■ Pin programmable set-up and test modes ■ No 5-V supply required.

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NATEL L200

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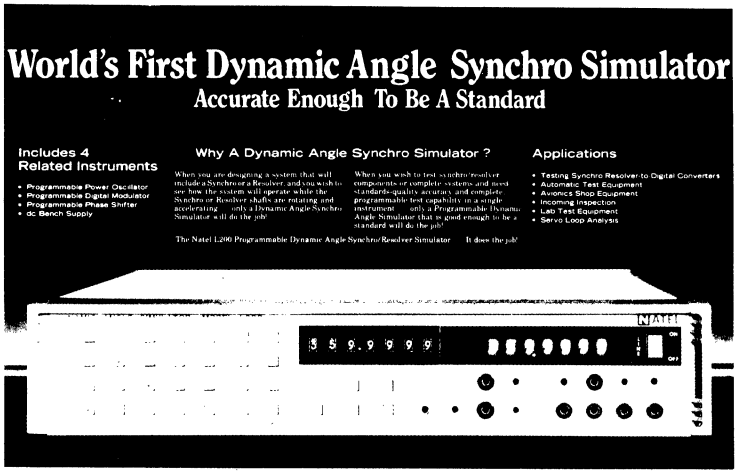

- 3 arc-second accuracy
- Fully IEEE-488 programmable
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  - Phase Shifter
  - dc Bench Supply
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MODEL NO.	DESCRIPTION	REMARKS
SD570/RD570	**6 Arc-second accuracy, 20-bit Synchro(Resolver)-to-Digital Converter**	■ Instrument grade accuracy in 4.5" x 3.0" x 0.8" size ■ Transformer isolated inputs ■ 1.24 arc-second resolution ■ Reference synthesizer ■ Anti-180° lock-up circuit ■ Analog velocity output ■ High tracking rate ■ BIT output.
DSC6206 *12.5 VA OUTPUT MODEL 5206 ALSO AVAILABLE*	**Reference Powered, 25 VA Output 16-bit, 4 Arc-minute Accuracy Digital-to-Synchro Converter**	Fully isolated, microprocessor compatible, virtually indestructible output, high efficiency, high accuracy converter. ■ Does not require any dc power supply. ■ Capable of driving torque Receiver and Synchro loads. Other features include ■ Remote sensing ■ BIT ■ Built-in kick circuit ■ Output disable control.
DSC5031 DSC5032 *5VA MODEL 5131 ALSO AVAILABLE*	**Reference Powered, Low Profile (0.42") 1.3 Arc-minute Accuracy, 1.5 VA Ouptut 16-bit Digital-to-Synchro Converter**	Does not require any dc power supply, since internal power is derived from the reference input ■ Fully protected output including current limiting, short circuit protection, and thermal cut-off ■ Excellent (0.1%) load regulation.
HCDX3106	**Solid State Control Differential Transmitter Microprocessor Compatible 16-bit Hybrid**	Only Control Differential Transmitter available in a single 36-pin hybrid DDIP. Other features include ■ Double-buffered inputs ■ 2 arc-minute accuracy.

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- Two 12-bit analog output channels
- 8 DIO lines, 3 counter/timers

PC/XT Multifunction Board – Lab-PC
- Eight 12-bit analog input channels
- 62.5 ksamples/sec, 8-bit DMA interface
- Two 12-bit analog output channels
- 24 DIO lines
- 3 independent 16-bit counter/timers

Low-Cost PC/XT Multifunction Board – PC-LPM-16
- Sixteen 12-bit analog input channels
- Low power, suitable for laptop applications
- 8 digital input, 8 digital output channels
- 2 independent 16-bit counter/timers
- Includes source code driver software

High-Speed PC AT 32-Bit DIO Board – AT-DIO-32F
- 32 TTL DIO lines
- Dual sets of handshaking lines; each can control an 8-, 16-, or 32-bit transfer
- Dual DMA, 330 kwords/sec (16-bit)
- Interrupt handling capability

LabWindows® and Measure – Application software that combines data acquisition, analysis, and presentation capabilities.
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Register-Level Programming – All boards are shipped with documentation that describes how to directly program the registers on the boards.

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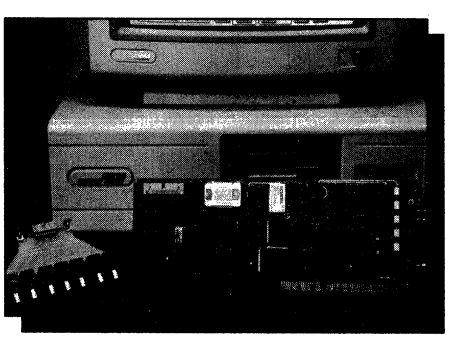

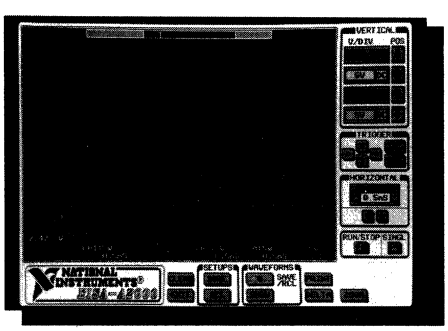

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- Programmable trigger sources and levels
- Software-controlled calibration

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- no programming required
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Multifunction Board – NB-MIO-16 †
- Sixteen 12-bit analog input channels
- 100 ksamples/sec
- Two 12-bit analog output channels
- 8 DIO lines, sink up to 24 mA current
- 3 independent 16-bit counter/timers

Extended Resolution Multifunction Board – NB-MIO-16X †
- Sixteen 16-bit analog input channels
- 55 ksamples/sec
- 2 double-buffered multiplying 12-bit DACs
- 8 DIO lines sink up to 24 mA current
- 3 independent 16-bit counter/timers

Low-Cost Multifunction Board – Lab-NB
- Eight 12-bit analog input channels
- 62.5 ksamples/sec
- 2 double-buffered 12-bit DACs
- 24 DIO lines
- 3 independent 16-bit counter/timers

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- High-speed, 4-channel analog input with simultaneous sampling
  - 1 Msamples/sec throughput to memory
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- Software-controlled self-calibration
- Programmable trigger sources and levels
- High-speed NuBus interface

Analog Output Board – NB-AO-6 †
- Six 12-bit analog output channels
- Unipolar and bipolar outputs available from each converter
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24-Bit Parallel Digital I/O Board – NB-DIO-24
- 24 DIO lines, uni- and bidirectional
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- 150 kbytes/sec
- Interrupt handling capability

High Speed 32-Bit Parallel Digital I/O Board – NB-DIO-32F †
- 32 DIO lines, uni-and bidirectional
- Dual sets of handshaking lines; each can control an 8-, 16-, or 32-bit transfer
- 300 kwords/sec (32-bit)

Digital Signal Processing Board – NB-DSP2300 †
- TMS320C30 single-chip DSP processor
- 33 MFLOPS computational power
- 2 DMA controllers, full NuBus master

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- Full anti-aliasing, linear-phase filters
- 22.05, 24.0, 32.0, 44.1, and 48.0 kHz sampling rates
- ± 0.015 dB amplitude flatness
- Two 16-bit output channels
- Trigger input for controlling data acquisition or waveform generation

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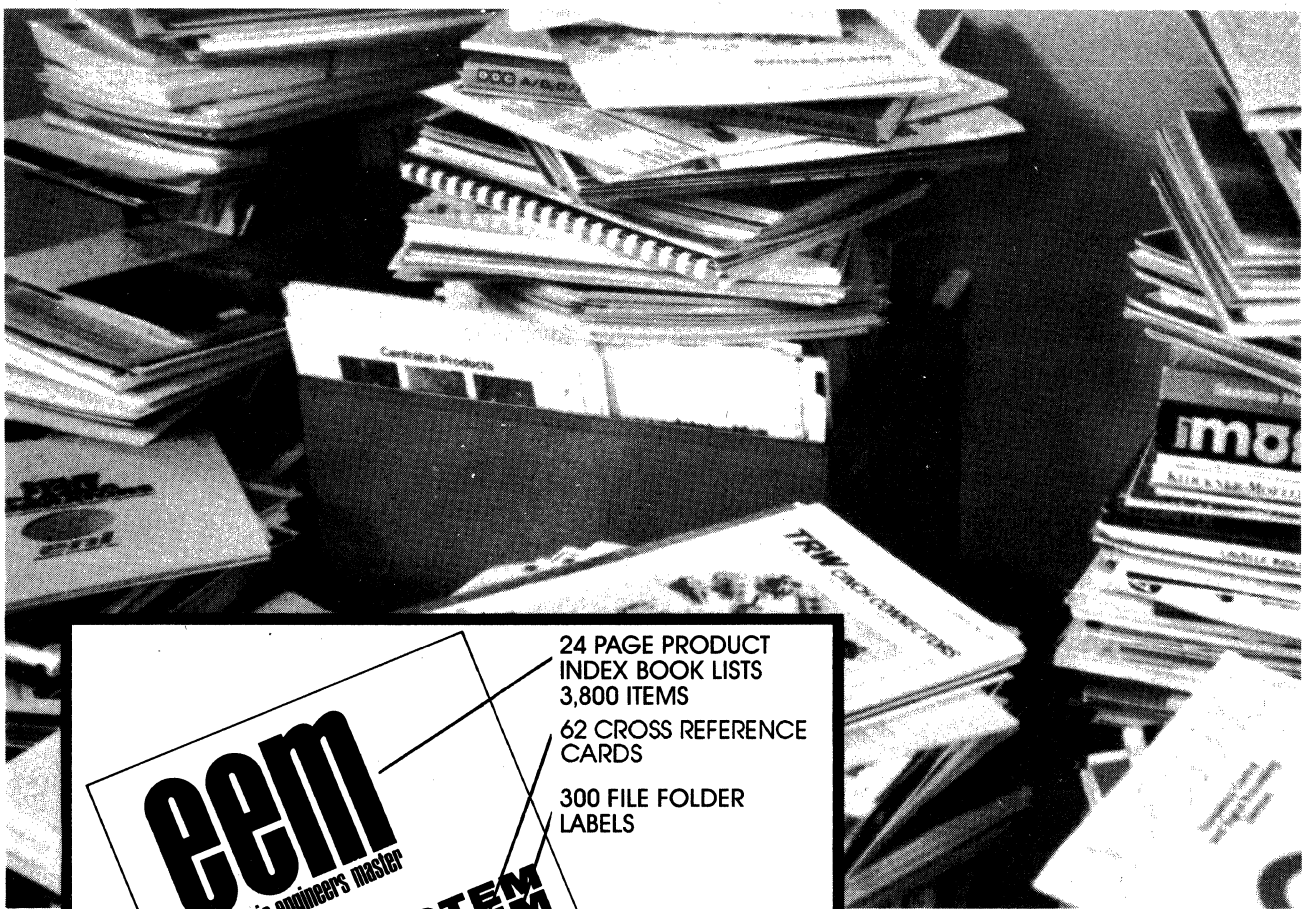

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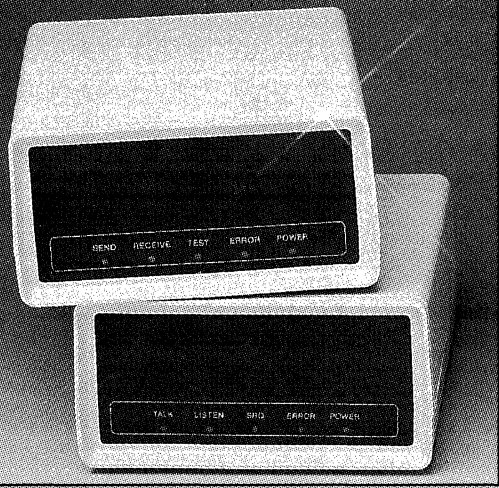

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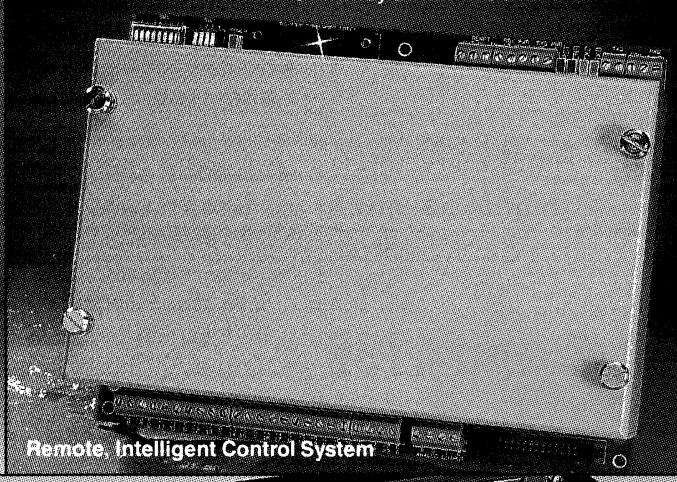

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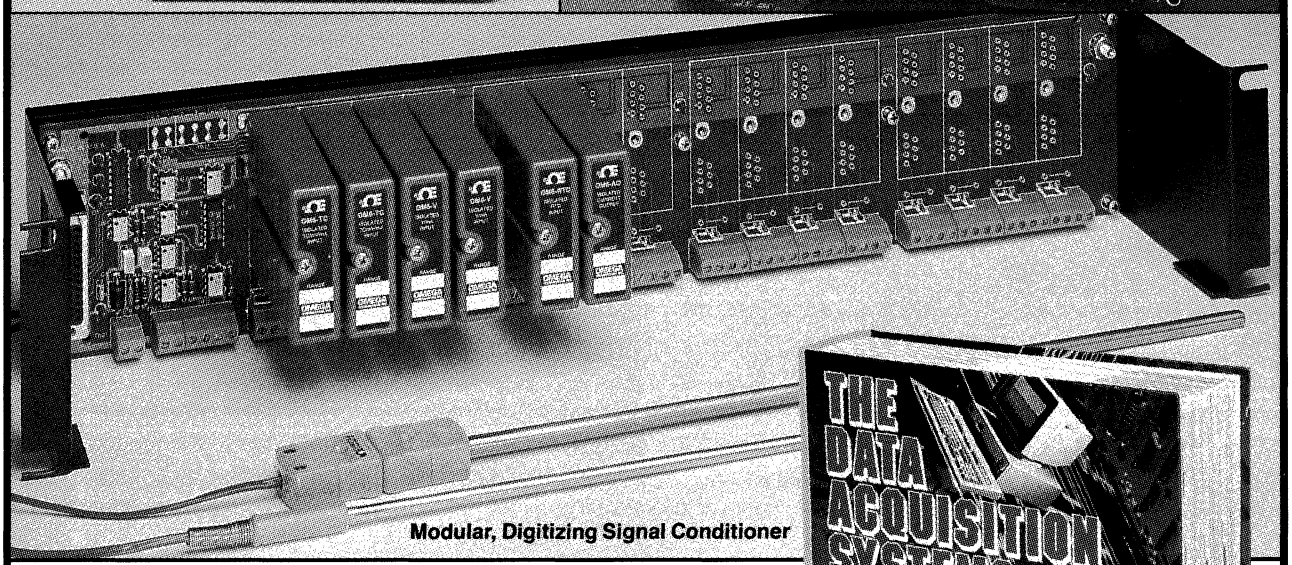

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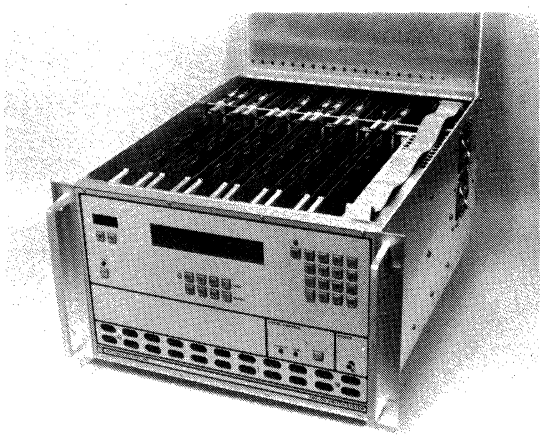

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Programmable

- Enter or review setup at front panel.
- Program from a host computer via GPIB, RS-232C, RS-422, parallel.
- Change setup in seconds.

Flexible

- Choice of I/O connectors: coax BNC, twinax BNC, multipin mass terminated coax, Mil-Spec.
- Custom systems, standard hardware.
- Incorporate a bank switch as a concentrator before the matrix, or at the output of the matrix.

Calibration

- Built in test equipment (BITE).
- Exhaustive test of all connections.
- Test of current setup.

A/D Converters

12-bit, 14-bit, or 15-bit, High throughput, Self test.

Precision 5000

High Data Throughput

A new high in throughput that puts the Precision 5000 ahead of all other analog-to-digital conversion systems. 6.7 MW/second throughput. Up to 64 simultaneously sampled channels per mainframe. 1024 with multiple mainframes.

Multiple Sampling Rates

Up to four different sampling rates can run concurrently. Integrate high and low bandwidth channels in one mainframe.

Calibration

Internal end-to-end, go/no-go diagnostic fault detection allows a confidence check of the systems before taking data.

Flexible

Sample and hold input boards and ADC boards with per channel sample rates ranging from 10 Hz to 210 kHz and resolution from 12 to 15 bits. Programmable input range. Differential or single-ended inputs. Drive latest technology. Serial links to DSP chips. Parallel interfaces for array processors, VME, VXIbus, or DMA to memory.

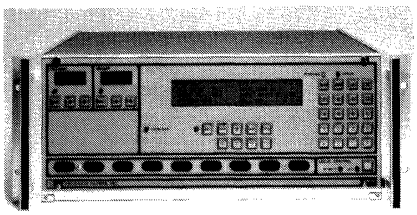
Features include:

- Up to 6.7 MW/second throughput
- 2 to 64 channels per mainframe
- 12-bit to 15-bit resolution
- End-to-end, go/no-go cal
- Differential or single-ended input
- Fixed or programmable input ranges
- Setup and control via RS-232C, GPIB, RS-422, or Ethernet.

- See Precision Filter/Amp systems in Section 2750.
- See Precision Amplifier systems in Section 1100.

PRECISION FILTERS, INC.
240 Cherry Street, Ithaca, New York 14850
607-277-3550 Fax: 607-277-4466 Telex: 646846

Filters, Amps, Band-translators, Switches, 128 Channels, 2 MHz.



System 6000

System Friendly

The Precision 6000 lets you incorporate all these signal conditioners and more, in one mainframe. Setup is easy, using front panel controls, or from a host computer. Expand the system as your needs change.

Precision Filters

Up to 128 filter/amps in mainframe. High-pass, low-pass, time-delay, notch, band-pass, and 1/3 octave filters. Up to 130 dB/octave attenuation slope. Cutoff frequencies to 2 MHz. 1° phase match. Gain, diff input, calibration and monitor options. See Section 2750 for more information.

Programmable Amplifiers

AC and DC preamps for low-level signals. Post-amps for wide band DC signals. Auto gain ranging amps for wide dynamic range acoustic signals. See Section 1100 for more information.

Frequency-band Translators

Translate a band of frequencies centered at an origination frequency to a band centered at a destination frequency. Bandwidth to 51 kHz. Center frequency 10 Hz to 409.5 kHz.

Calibration Subsystem

This optional one-card system lets you generate calibration signals, measure performance of system components, and make go/no-go decisions.

Switch Matrices

Incorporate a programmable patch panel at nominal cost. 4x4 to 32x32. Up to 1024 crosspoints. Bi-directional relay switches. DC to 1 MHz.

Prototype Cards

Use the 6000-2-PROTO card to develop your custom circuits. The mainframe provides power and I/O, as well as front panel and computer control.

Data Acquisition Systems

128 Filter/Amps.
16-Bit Data.
Expand to 1024 Channels.

System 128

The Precision Solution

A single mainframe provides power, interconnection, and I/O connections for 128 filter/amps and an analog-to-digital converter.

System control of filter amps, and the cal and monitor subsystem. Digital interface to VXIbus or VME bus for high speed digital signal processing.

Octal Filter/Amps

- Fixed or programmable cutoff freq.
- Fixed input gain, pre-gain, post gain.
- Differential input; AC or DC coupling.
- Simultaneous sample and hold.
- Calibration and Monitor options.

A/D Converter Subsystem

- Plugs onto the back of mainframe in place of the output connectors.
- Digitizes the outputs from 16 octal filter/amp cards—128 channels.
- The output of each A/D is serialized with a clock and ported to the VXI mainframe.

Total Data Acquisition System

Incorporate the System 128 as part of a complete data acquisition system.

- 1024 channels of data
- Digital cassette recorder
- 386-based VXIbus system controller
- Calibration routines
- Programmable amplifier/filters
- Programmable sample rates
- Time code

Data Recorded (Ampex DCRSi)

- 1024 data channels
- Time code
- System state
- Calibration data

Other VXIbus and VME Cards

- Array processors
- Signal generators

- See Precision Filter/Amp systems in Section 2750.
- See Precision Amplifier systems in Section 1100.

PRECISION FILTERS, INC.
240 Cherry Street, Ithaca, New York 14850
607-277-3550 Fax: 607-277-4466 Telex: 646846

TRAK SYSTEMS

DIVISION OF TRAK MICROWAVE CORP.

TIMING INSTRUMENTS

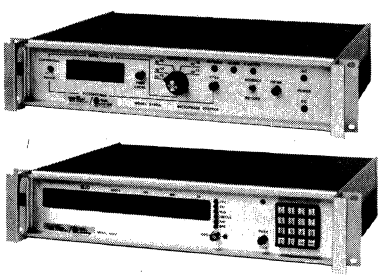
TRAK Systems has been supplying precision timing instruments to government and industry for over 30 years. The company offers a broad line of standard products meeting most needs for highly reliable timekeeping, precision synchronization, code generation, code distribution, and frequency distribution. Product designs are continually updated to incorporate proven state-of-the-art enhancements.

TRAK Systems is well equipped to comply with military specifications and with all types of data requirements. Representative of our capability are triple redundant timing systems being supplied to both NASA and DOD, worldwide. These systems produce multiple time code outputs coherent to within 50 ns of each other and synchronized to within 100 ns of GPS time.

Precision Timing Instruments

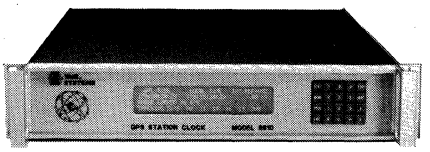
- **Time Code Processors**
- **Computer Controlled Tape Search**
- **Satellite Synchronized Time Code Generators**
- **Time Code Generators**
- **Time Code Readers**
- **Time Code Translators**

TST Instruments



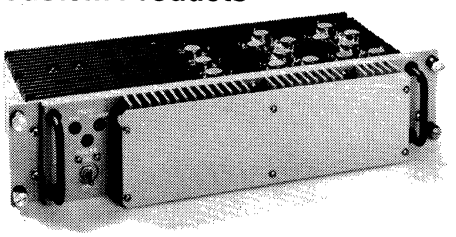
- **Micro Phase Stepper**
- **High Performance Clocks**
- **Precise Rate Distribution**

GPS Station Clock

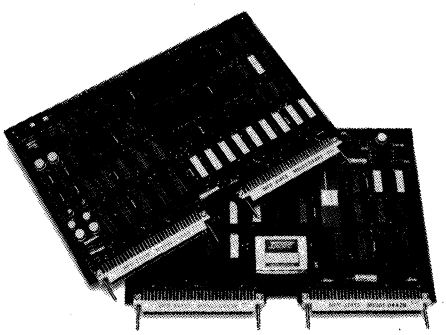


- **100 nanosecond accuracy worldwide**
- **Automatically determines position**
- **Six continuous channels (not commutated) give 8 dB better tracking sensitivity**
- **Full accuracy at 1000 mph platform speed**
- **RS-232 & IEEE-488 control & output ports**
- **Multiple time code and rate outputs**

Custom Products

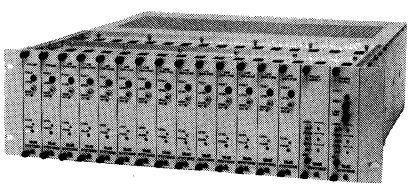


- **MIL-SPEC Units**

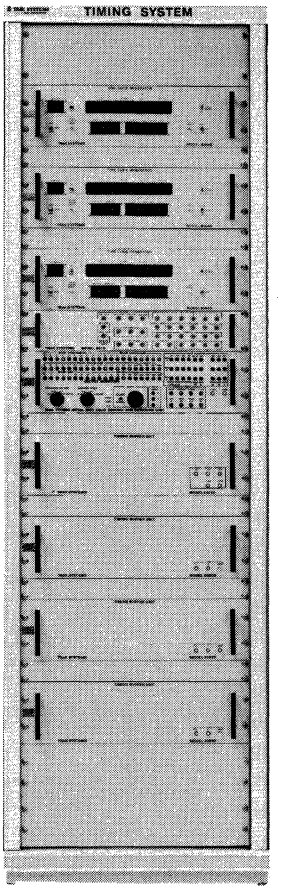


- **Multi-layer Card Subsystems**

Signal Distribution

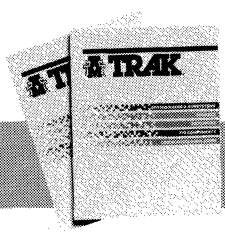


Timing Systems



TRAK Systems' 8421 Series Master Timing Systems provide the superior accuracy, reliability, and maintainability demanded for modern primary timing stations. These systems feature a GPS Station Clock for time and frequency traceability to UTC; atomic frequency standards; triple-redundant time signal generation; centralized fault location and status monitoring; and multiple time and frequency distribution.

Available built-in test features in the 8421 Series include phase, amplitude, and frequency monitoring of the frequency standards; 100% fault sensing and isolation of time code generator outputs; and 100% fault sensing of distributed outputs.



Call or write today for our catalog of high quality mil-spec microwave components and subsystems.

Specifications subject to change without notice.

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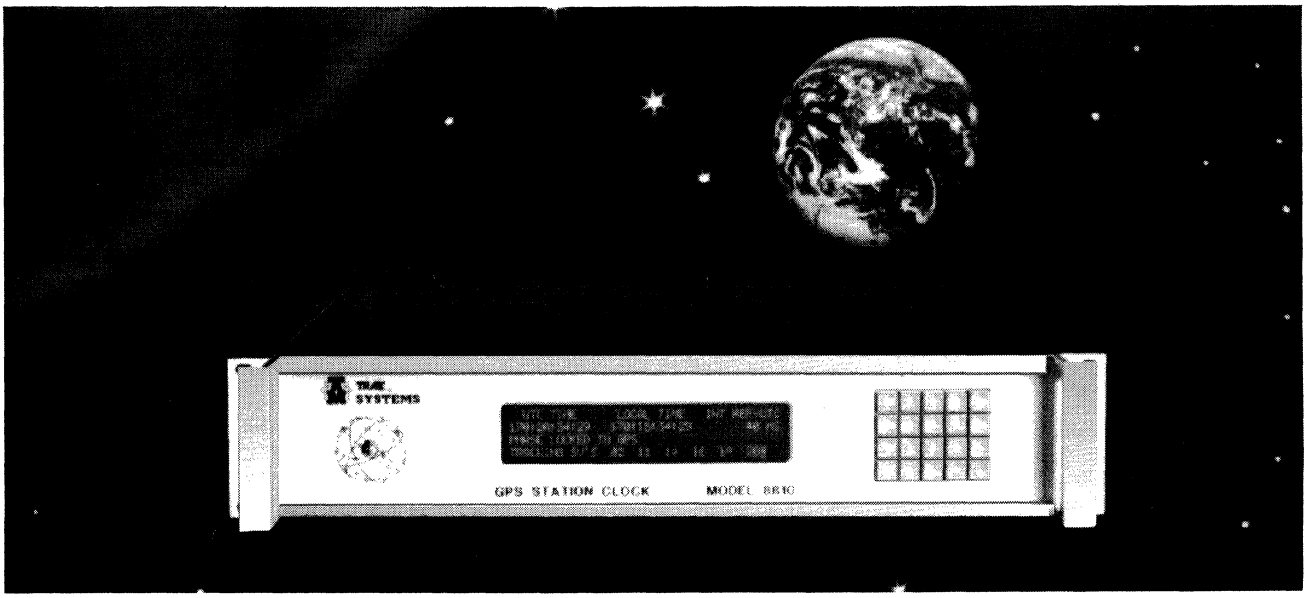

At last: A complete GPS station clock under $10,000

Everything you want in a GPS station clock, in one neat box:

- **GPS receiver**
- **Disciplined standard**
- **Multiple output timing signal generator, and much, much more.**

What do you expect from a company with more than 30 years of production and field experience in the timing business? You'd expect a one-unit master timing station, capable of tracking six satellites simultaneously — even while moving at 1,000 miles per hour — all inside a 3½ inch rack-mount chassis.

That's the **Model 8810 —** a mature product, value-engineered and time-tested, just like the ones we've been providing to NASA and DoD for decades. And there's so much built into this unit, it's hard to describe. Just review the features listed below:

- Automatically determines geographical coordinates — no need to enter position anywhere on earth
- Automatic multi-satellite acquisition
- Time accuracy maintained with platform velocities to over 1,000 mph
- Outputs position data whether stationary or moving
- Multiple time code and rate output options
- User friendly, menu-prompted setup
- 20-key keypad and 4-line, 40 character display allows complete operation, checkout, and status acquisition without ancillary equipment
- Nonvolatile memory stores setup and data indefinitely
- Accurate to within 100 ns worldwide, 24 hours a day
- RS-232 remote control and time output (optional IEEE-488 output)
- RS-232 printer port
- Displays time, position, and REF-UTC/GPS
- Time display is keypad-selectable to UTC, GPS, or local time
- 115/230 VAC with optional 24 VDC backup
- Antenna with 50′ coax cable included
- Built-in test routines
- Fully modularized
- GPS receiver is drop-in replaceable
- Workmanship standards to MIL-STD-454
- Three-year limited warranty
- Plus, a host of desirable options

That's the **Model 8810,** from TRAK Systems. And at this price, there's nothing else like it on the market. So why pay more, and install boxes of equipment, when you can have it all in one neat unit?

For free literature, or more information, contact us at:

TRAK SYSTEMS DIVISION
4726 Eisenhower Blvd.
Tampa, Florida 33634-6391
Phone: (813) 884-1411, extension 248
TLX: 52-827
FAX: (813) 886-2794

TRAK SYSTEMS
DIVISION OF TRAK MICROWAVE CORP.

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SYNCHRO AND RESOLVER CONVERTER MODULES

HI-REL TO 883B, MIL-M-38510, WS6536

DESCRIPTION	Input Availability	Output	Static Accuracy	Size
TRACKING SYNCHRO/RESOLVER TO DIGITAL: Full tranformer isolated units with jitter free output. NO -15VDC required. Valid data immediately available at trailing edge of CB.	Freq.: 50Hz to 2045Hz L-L V_{RMS}: 5 to 90 Ref. V_{RMS}: 10 to 115	Model 1663: 18 bits Model 1651: 16 bits Model 1651: 14 bits Model 1651B: 12 bits Model 1652: 10 bits	±.005° ±.01° ±4.0' ±8.5' ±21'	3.1" x 5.1" x 1.0" 3.1" x 2.6" x 0.82" 3.1" x 2.6" x 0.82" 3.1" x 2.6" x 0.42" 3.1" x 2.6" x 0.42"
AUTORANGING TRACKING S/D. Model 1653: Transformer isolated. Reference and L-L voltages may vary independently of each other.	Freq.: 44Hz to 1000Hz L-L V_{RMS}: 5 to 115 Ref. V_{RMS}: 5 to 125	12 bits	±1 LSB	3.1" x 2.6" x 0.82"
TRACKING S/D WITH BCD OUTPUT. Model 1662: Transformer isolated with jitter free output. 0 - 359.9°	Freq.: 50Hz to 2045Hz L-L V_{RMS}: 5 to 90 Ref. V_{RMS}: 10 to 115	4 Decade BCD	±0.1°	3.1" x 2.6" x 0.82"
TWO SPEED SYNCHRO/RESOLVER TO DIGITAL. Series 1512: Single speed module combines gear ratios from a two-speed system. Velocity output. Integral true self test. Ratios: 9:1, 10:1, 16:1, 18:1, 32:1, 36:1, 45:1, 50:1, 64:1, 100:1, etc.	Freq.: 50Hz to 2045Hz L-L V_{RMS}: 1.3 to 90 Ref. V_{RMS}: 5 to 115	16 bits binary parallel	±0.005°	3.125" x 6.0" x .82" or 3.625" x 3.625" x .82"
MULTIPLEXED SYNCHRO/RESOLVER TO DIGITAL. Series 5200: Simple, noise immune, small and inexpensive. Modular system, up to 128 channels	Any combination of Synchros and Resolvers	14 bits binary parallel to 75 µs conversion.	±5'	3.125" x 2.65" x 0.82" + 1.85" x 0.85" x 0.82" per channel
SYNCHRO OR SIN/COS TO LINEAR DC. Series K678-1637: Converts synchro/resolver inputs to a linear infinite resolution DC output. Connector termination available. Output voltage may be offset.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90 Ref V_{RMS}: 10 to 115	±10VDC for angles -180° to +180°	6', 15', 30' or 1°	**K678:** 3.1 x 2.6 x .42 **K6678:** 3.1 x 2.6 x .42 **1637:** 3.2 x 2.6 x .78
SYNCHRO/RESOLVER TO SINE/COSINE DC. Series 655/697: Generates sine and cosine DC outputs proportional to the angle	Freq.: 60Hz or 400Hz L-L V_{RMS}: 11.8 or 90 Ref V_{RMS}: 26 or 115	-10VDC to +10VDC representing the sine and cosine of the input angle.	±6'	**400Hz:** 1.85" x .85" x 0.82"
SYNCHRO TO SINE/COSINE DC (non-variant). Series 655NV: Generates sine and cosine DC outputs proportional to the input angle. Insensitive to synchro reference and line voltage. Ideal for displays.	Freq.: 60Hz or 400Hz L-L V_{RMS}: 11.8 or 90 Ref V_{RMS}: 26 or 115	-10VDC to +10VDC representing the sine and cosine of the input angle.	±6'	3.44" x 3.19" x 0.82" or 3.1" x 2.6" x .82"
DIGITAL TO SYNCHRO/RESOLVER. Series 1667: High accuracy	16 bits, TTL levels binary coded angle.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90	±1'	3.125" x 3.625" x 1.0"
DIGITAL TO SYNCHRO/RESOLVER. Series 1673: Miniaturized, 1.5 VA, short circuit proof. 0.1% Max. amplitude variation.	14 bits, TTL levels binary coded angle.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90	±4' ±8'	3.125" x 2.625" x 0.82"
DIGITAL TO SYNCHRO 50/400Hz. Series 1690: Integral transformer isolation in small size.	14 bits, TTL levels binary coded angle.	Freq.: 50Hz to 400Hz L-L V_{RMS}: 90	±4'	3.125" x 2.625" x 0.82"
DIGITAL TO SYNCHRO/RESOLVER. Series 1680: Low cost, medium resolution version of our popular Series 1673.	10 bits, TTL levels binary coded angle	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90	±21'	3.125" x 2.625" x 0.82"
DIGITAL TO SYNCHRO/RESOLVER. Series B1670: Drives 3 TR's High power, solid state device converts a 14 bit input into a 3 wire synchro or 4 wire resolver output. Overload and short circuit protected.	14 bits	Freq.: 60Hz or 400Hz L-L V_{RMS}: 11.8 or 90 Ref V_{RMS}: 26 or 115	±4'	**PC:** 4.5" x 8" x .68" for 1" slot spacing
BCD TO SYNCHRO/RESOLVER. Series F1673:	4 Decade BCD	50Hz-10KHz 5-90V_{L-L}	±.1°	3.1" x 3.6" x .82"
DC TO SYNCHRO/RESOLVER. Series D1673:	±10VDC; ±180°	400Hz 26 - 90V_{L-L}	±12'	3.12" x 3.635" x 0.82"
SYNCHRO AMPLIFIERS. 15VA, 25VA, 100VA. Series 5179M, etc. For either passive loads or torque receivers.	As Required	11.8/90 V_{L-L} Synchro	±6'	7.4" x 4.4" x 1.45"
DIGITAL TO SINE/COSINE DIGITAL. Series 1500: Model 1500-1 has tristate outputs and MUX sine and cosine over 12 lines.	14 bits angles 0° to 360°	12 bits sine and cosine also quadrant signs.	±2'	3.0" x 4" x 0.4"
DIGITAL TO SINE/COSINE DC (non-variant). Series 1501: 0.05% max. amplitude variation.	14 bits	±10VDC, as the sine and cosine.	±4' or ±15'	3.125" x 2.625" x 0.42"
DIGITAL VECTOR GENERATOR. Model 1504: High speed multiplying trigonometric D/A. Converts 14 bits of digital input and analog R into R sin θ and R cos θ.	14 bits	±10V max. Reference will accept any wave form	±4'	3.125" x 2.625" x 0.42"
DIGITAL TO RESOLVER. Series 1503: 0.035% max. amplitude variation.	14 bits	2 AC voltages, 20V P-P as the sine and cosine.	±4'	3.125" x 2.65" x 0.42"
CONTROL TRANSFORMER, SOLID STATE. Series 1682: Fully transformer isolated unit. 1.0% max. amplitude variation.	Synchro and 16 bits Natural parallel binary	±5V_{RMS} representing ±12.5°	±1'	3.125" x 2.625" x 0.42"
CONTROL DIFFERENTIAL TRANSMITTER, SOLID STATE. Series 1681: Model 1685 offers Synchro or Resolver output.	Synchro and 14 bits Natural parallel binary	6.5V_{RMS}, sine/cosine or synchro/resolver	±4'	3.125" x 2.625" x 0.82"
SINE/COSINE TO SYNCHRO DRIVERS. Series B676: Solid state device designed to handle large current surges of TR's. Will drive three 11TR4s to a low null. Overload and short circuit protected.	±10VDC, representing the sine and cosine of the required angle.	Freq.: 60Hz to 400Hz L-L V_{RMS}: 11.8 or 90 Ref. V_{RMS}: 26 or 115	±10'	**PC:** 4.5" x 8.0" x .82" for 1" slot spacing
LINEAR DC TO SINE/COSINE DC. Series C670: Converts a DC voltage, representing an angle, into two output voltages that are proportional to the sine and cosine of that angle.	±10VDC, representing angles from -180° to +180°	K sin θ and K cos θ K = 10VDC	±10'	3.19" x 3.44" x 0.82"
COORDINATE ROTATOR. Series A689: Rotates (X-Y) coordinates proportional to a linear DC input.	Y = R cos θ Y = R sin θ R = ±10VDC	R sin (θ + β) Rcos (θ + β)	±10'	3.19" x 3.44" x 0.82"
POLAR TO RECTANGULAR. Series A1618: Converts polar coordinates (R, θ) into rectrangular (X, Y).	R: ±10VDC θ: ±10VDC	X = R cos θ, Y = R sine θ R = ±20MV to ±10VDC	±10'	3.19" x 3.44" x 0.82"
RECTANGULAR TO POLAR. Series 695: Converts rectangular coordinates (X, Y) into polar (R, θ).	X = R cos θ Y = R sin θ	R = $(X^2 + Y^2)^{1/2}$ θ = $\tan^{-1}$ Y/X	±10'	3.19" x 3.22" x 1.78"
DEMODULATORS: AVAILABLE TO 38510 RELIABILITY Phase Sensitive Transformer isolated, single or dual channel.	840: 0 to 5 V_{RMS} 9318: To cust. spec	0 to ±4.3VDC As requested	±0.1% FS ±0.1% FS	1.63" x 1" x 1" 3.1" x 1.9" x 0.5"
TWO-SPEED COMBINER. Series 1510: 9:1, 18:1, 36:1 in single module	Fine: to 14 bits Coarse: to 7 bits	19 or 21 bits	.0013°	3.125" x 2.625" x .42"
BINARY TO BCD ANGLE. Series 1505:	12, 16, 20, 21 bits	4 to 7 digits	±0.6LSB	3" x 4" x .4"
BCD TO BINARY ANGLE. Series 1619:	4, 5, 6 digits	13 to 19 bits	±1LSB	3" x 4" x .4"

Other frequencies and voltages available. Units available for either 0 to +70°C or -55°C to +105°C operation. Most units available in hermetically sealed enclosures.

TRANSMAGNETICS, INC. DEPT. EM, 210 ADAMS BOULEVARD, FARMINGDALE, NEW YORK 11735
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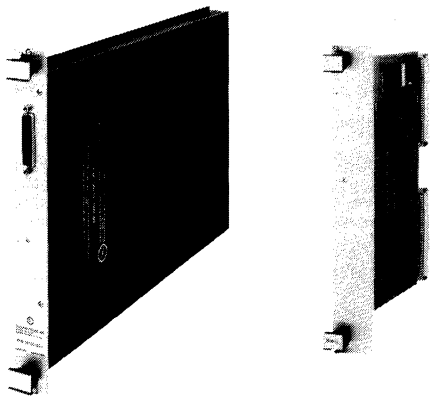
VMEbus, VXIbus, MULTIBUS, PC, STDbus, ARINC 429



Interfaces With:

Synchros, Resolvers
D/A, A/D, LVDT, RVDT
Demods
AC Power Controllers

VMEbus: Series 5410: We supply customized boards to meet specific customer requirements. Ruggedized MIL versions are available.

5410C-8-*: 3 S/D or R/D to 16 bits
5410C-9-*: 2 Two-speed channels, any speed ratio
5410C-14-*: 2 16 bit D/S with 1 arc minute accuracy
5410C-15-*: 3 14 bit D/S
5410C-16-*: 2 16 bit S/D (.013° accuracy) and 5 VA reference supply
5410C-21-*: 8 MUX S/D with self-test
5410C-22-*: 16 channel MUX LVDT/RVDT measurement
5410C-40-1: 3 Two-speed with self-test
5410M-44-1: 8 A/D and 6 D/A with self-test
5410C-61-*: 6 S/D with self-test
5410C-61-1: 10 LVDT Stimulus

MULTIBUS I & II: Series 5401 and 5402: We supply customized boards where the customer specifies up to three different modules, either single or multi speed with resolution to 16 bits. Ruggedized MIL versions are available.

PC series: Our 5647C card plugs into the PC and is populated with up to 6 S/D or LVDT input channels.

STD bus: Series 5405: We supply boards with a single synchro/resolver to digital converter with an accuracy to 40 arc seconds.

ARINC 429: We supply stand alone ADF, DME and other interfaces qualified to RTCA/DO-160.

VXIbus Instruments on a "C" size card. Message based (MATE/CIIL) designs. All units include full wraparound self- test and error codes.

5410C-30: One 0.001° Synchro Measurement and two independent 0.01° Synchro Stimulus
5410C-31: Wideband Phase Angle Volmeter
5410C-42: Programmable Simulator (7 Single or 1 Single with 3 16:1 Multispeed)
5410C-43: Programmable five channel Synchro Measurement (Single or 16:1 Multispeed)
5410C-45: Phase Angle Generator (High Accuracy)
5410C-49: Narrowband Phase Angle Voltmeter (High Accuracy)
5410C-51: 3 Channel Synchro Torque Driver
5410C-55: 12 Channel 16 bit D/A
5410C-59: 10 Channel LVDT Simulators
5410C-60: Power Supply Controller: Programmable Voltage & Frequency (1Φ & 3Φ Driver)

Transmagnetics, Inc. not only leads the field with high accuracy, high resolution Converters, Synchro/Resolver Simulators and Angle Measuring Instruments, but also supplies complete sub systems for Flight Simulators and Weapons Control Systems that range from 48 channel D/S to 68 channel high-power synchro distribution systems. Our capabilities extend to PWM Servo Amplifiers, Hi-Rel Airborne Reference Supplies and complete Actuator Control Systems. We invite your inquiries.
Transmagnetics QC available to MIL-I-45208A or MIL-Q-9858A. Our soldering spec to WS6536 or MIL-STD-2000.

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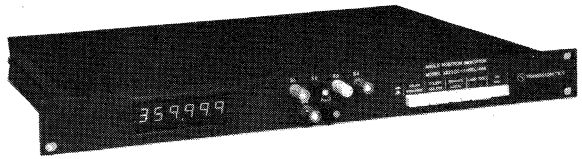
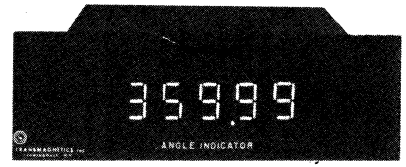
SYNCHRO/RESOLVER INDICATORS, SIMULATORS & TEST EQUIPMENT

INTERFACE WITH IEEE 488, MATE CIIL, RS232C





ANGLE INDICATORS

MODEL NUMBER	RESOLUTION	ACCURACY	RANGE	FREQUENCY (Hz)	INPUT (V_{L-L})	DISPLAY	IEEE-488	RS232	MATE CIIL	SIZE (inches)	CONNECTORS
2623CC-43/488 Dual Channel, Autoranging	0.001°	0.004°	0 - 359.999	47/10K	10 - 100 or 2 - 26	6 DECADE	YES	AVAILABLE	YES	1.75 x 19 x 13	Rear Panel
2623CC-44/488 Single Channel, Autoranging	0.001°	0.004°	0 - 359.999 ±179.999	47/10K	10 - 100 or 2 - 26	6 DECADE	YES	AVAILABLE	YES	1.75 x 19 x 13	Front Panel banana jacks
2623CC-41/488 Dual Channel, Autoranging	0.01°	0.017°	0 - 359.99 ±179.99	47/2045	10 - 100 or 2 - 26	5 DECADE	YES	AVAILABLE	YES	1.75 x 19 x 13	Rear Panel
2623CC-65/488 Includes 359.9° Offset	0.01°	0.017°	0 - 359.99	47/2045	10 - 100	5 DECADE	YES	NO	NO	1.75 x 19 x 13	Rear Panel
A2623CC-28H Dual Channel, Autoranging	0.01°	0.017°	0 - 359.99 ±179.99	47/2045	10 - 100 or 2 - 26	5 DECADE	NO	NO	NO	1.75 x 19 x 13	Rear Panel
A2623CC-28HX 4 Channel, Autoranging	0.01°	0.02°	0 - 359.99 ±179.99	47/2045	10 - 100 or 2 - 26	5 DECADE	NO	NO	NO	1.75 x 19 x 13	Rear Panel
2623CC-39/488 Two Separate Channels	0.01°	0.017°	0 - 359.99 ±179.99	47/2045	10 - 100 or 2 - 26	5 DECADE	YES	NO	NO	5.25 x 19 x 13	Rear Panel Front Panel
2623CC-40/488 With Internal Reference	0.01°	0.017°	0 - 359.99 ±179.99	47/2045	10 - 100 or 2 - 26	5 DECADE	YES	AVAILABLE	YES	3.5 x 19 x 13	Rear Panel
2623-57 Tristate Outputs	0.1°	0.15°	0 - 359.9 ±179.9	47/2045	As Required	4 DECADE	NO	NO	NO	1.75 x 5.5 x 11	Rear Panel
2623DC With Internal Reference	0.1°	0.15°	0 - 359.9 ±179.9	47/2045	As Required	4 DECADE	YES	NO	NO	1.75 x 5.5 x 11	Rear Pane
2623CC-27/488 Multispeed 9:1, 18:1, 36:1, etc.	0.01°	0.01°	0 - 359.99	47/2045	As Required	5 DECADE	YES	NO	YES	1.75 x 19 x 13	Rear Panel
2623CC-46/488 Multispeed 9:1, 18:1, 36:1, etc.	0.001°	0.001°	0 - 359.999	47/2045	As Required	6 DECADE	YES	NO	NO	3.5 x 19 x 13	Rear Panel
5008 with Preset Solid State Selsyn Indicator	50 Counts per turn	±1 Count	0 - 99,000	50/60	48 - 90	5 DECADE	NO	OPTIONAL	NO	1.75 x 19 x 13	Rear Panel
2623CC-50 Offset and DC Outputs	0.01°	0.017°	0 - 359.99 ±179.99	47/2045	10 - 100 or 2 - 26	5 DECADE	NO	NO	NO	1.75 x 19 x 13	Rear Panel
2723 Three axis Two Speed	0.001°	0.001°	0 - 359.999	400	90	6 DECADE	NO	Special Serial	NO	5.5 x 19 x 13	Rear Panel

ANGLE SIMULATORS

MODEL NUMBER	RESOLUTION	ACCURACY	CHANNELS	IEEE-488	RS232C	MATE CIIL	OUTPUT (V_{L-L})	REF (V_{RMS})	FREQ (Hz)	LOCAL ANGLE INPUT	REMOTE ANGLE INPUT	ANGLE DISPLAY	DYNAMIC MODE	SIZE
3800C-1	0.01°	0.01°	Dual	NO	NO	NO	As Required	As Required	As Required	YES	NO	NO	NO	A
3800C-2	0.01°	0.01°	Dual	NO	NO	NO	11.8/26/90	26/115	As Required	YES	NO	NO	NO	B
3800C-3	0.01°	0.01°	Single	NO	NO	NO	11.8/26/90	26/115	As Required	YES	YES	YES	NO	A
3800C-5	0.01°	0.01°	Single	YES	NO	NO	As Required	As Required	As Required	NO	YES	YES	YES	C
3800C-6	0.01°	0.01°	Single	YES	YES	NO	11.8/26/90	26/115	400/2045	YES	YES	YES	NO	A
3800C-6A	0.01°	0.01°	Single	YES	YES	NO	11.8/26/90	26/115	50/1000	YES	YES	YES	NO	A
3800C-6V	0.01°	0.01°	Single	YES	YES	YES	11.8/26/90	26/115	400/2045	YES	YES	YES	YES	B
3800C-6VA	0.01°	0.01°	Single	YES	YES	YES	11.8/26/90	26/115	50/400	YES	YES	YES	YES	B
3800C-8	0.01°	0.01°	Single	YES	NO	NO	As Required	As Required	As Required	NO	YES	YES	YES	C
3800C-10	0.01°	0.01°	Two Speed 18:1/36:1	YES	YES	YES	90	115	400/2045	YES	YES	YES	YES	B
3800C-10A	0.01°	0.01°	Two Speed 18:1/36:1	YES	YES	YES	90	115	50/1000	YES	YES	YES	YES	B
3800C-17	**SMART DIGITAL DIRECTOR**		Incorporates two multi-speed Synchro/Resolver output channels whose gear ratio can be programmed from 1:1 to 99:1, and an auto-ranging angle measuring instrument. Further, sine motion, ramp motion, rotation and step functions are separately programmable for each channel either via front panel switches or via IEEE-488 bus. 60/400 Hz. Customized velocity outputs.											E

IEEE-488 MATE/CIIL RACK AND STACK INSTRUMENTS

3800C-37/488	0.01° resolution synchro/resolver simulator and autoranging angle meter within same enclosure. Full wraparound self test with error messages.	D
3800C-47/488	Four channel LVDT simulator, each with programmable reference supplies and programmable phase shift. Full wraparound self test with error messages.	D
3800C-48/488	Twelve AC and 18 DC stimulus, each with isolated return and programmable reference. Full wraparound self test with error messages.	F

RS232C TEST INSTRUMENTS

5643C	20 channels of 16 bit S/D 60/400 Hz or 20 channels A/D with internal power	B
5671C	22 two-speed channels with internal reference and DC power	B

REFERENCE SUPPLIES 5 VA & 14 VA - High Stability - 1% Reference and Voltage Tolerance.

5410C-16REF	5 VA with 1% Frequency stability and 2% Voltage tolerance	G
5601M-1/38510	14 VA, 1% Reference, 1% Voltage tolerance, .05% Regulation	H

PWM SERVO AMPLIFIERS MILITARY Grade with EMI & RFI Filtering for Actuators and Antenna Drivers.

5516M	350W Brushless DC Motor Driver in package 5" x 5" x 4"	
5517M	160W Brushless DC Motor Driver in package 5" x 5" x 2.5"	

SIZE A: 19" x 3½" x 14"
SIZE B: 19" x 5¼" x 14"
SIZE C: 19" x 1¾" x 14"
SIZE D: 19" x 3½" x 20"
SIZE E: 19" x 7" x 16"
SIZE F: 19" x 10¼" x 16"
SIZE G: 3.125" x 2.625" x .5"
SIZE H: 3.625" x 3.625" x 1.03"

TMI TRANSMAGNETICS, INC.
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TEMPERATURE PLATES

FAST, EFFICIENT ENVIRONMENTAL COMPONENT TESTING

MIL-STD 883, ENVIRONMENTAL STRESS SCREENING, MISSION SIMULATION, BURN IN

FEATURES

*extremely rapid ramp rates
*very small footprint
*microprocessor based controllers
*programmable ramp & soak profiles
*RS232/422 & GPIB IEEE-488 interfaces
*clamping, fixturing & enclosure options
*handles high power components

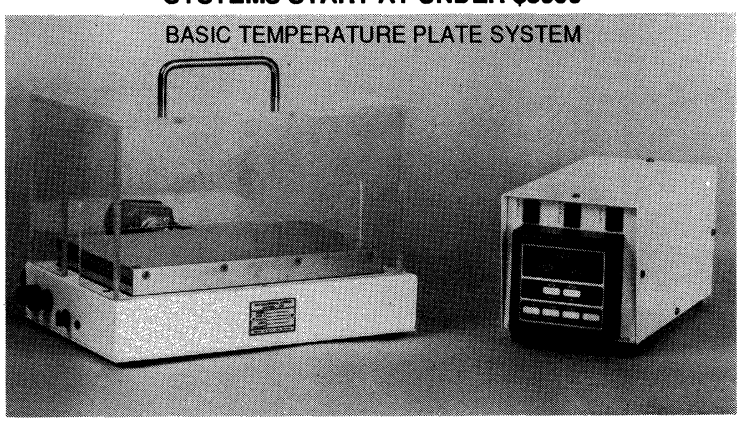
IEEE-488

ADVANCED CASCADE CONTROL

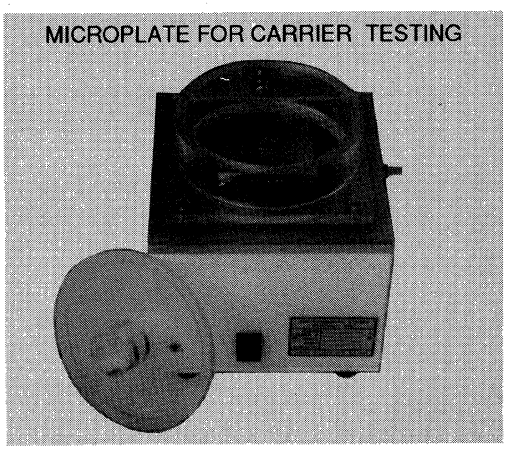
*desiccator for non-sealed devices
*easily accessible for cabling & probing
*ability to tune devices at temperature
*liquid carbon dioxide or nitrogen cooling
*optional device probe
*9 standard sizes with customs available
*dry nitrogen purge system

SYSTEMS START AT UNDER $3000

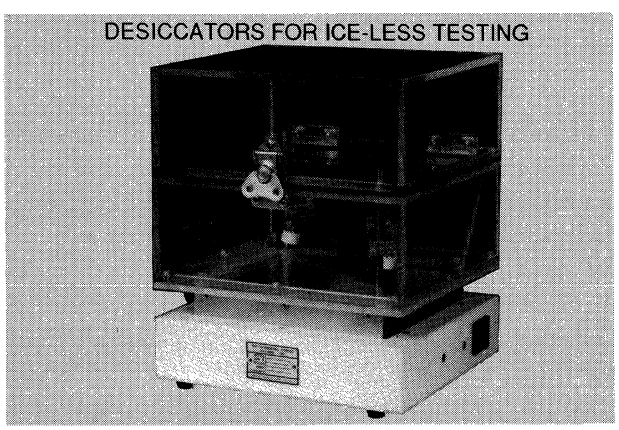
BASIC TEMPERATURE PLATE SYSTEM



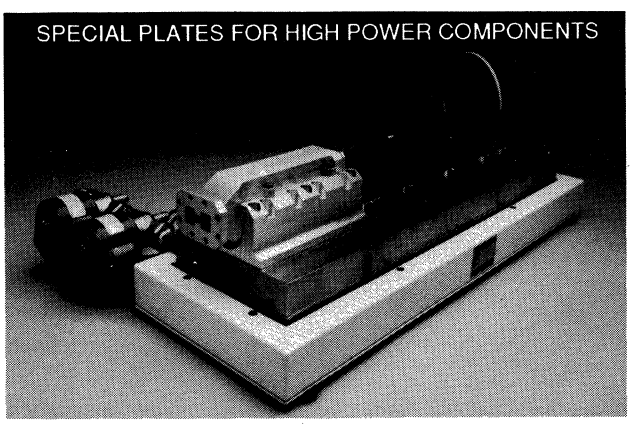
MICROPLATE FOR CARRIER TESTING



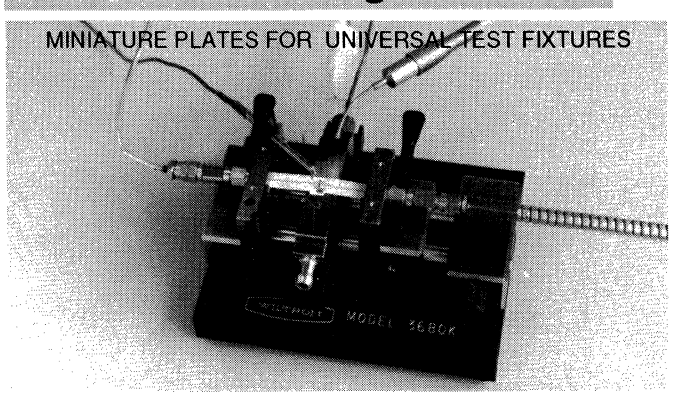
DESICCATORS FOR ICE-LESS TESTING



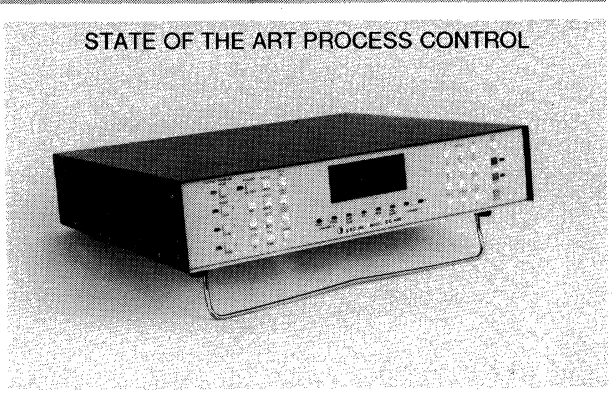
SPECIAL PLATES FOR HIGH POWER COMPONENTS



MINIATURE PLATES FOR UNIVERSAL TEST FIXTURES



STATE OF THE ART PROCESS CONTROL



ENVIRONMENTAL STRESS SYSTEMS, INC

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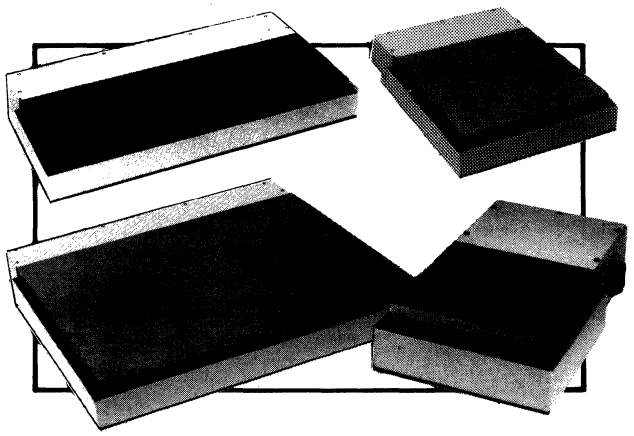
Environmental Test Equipment

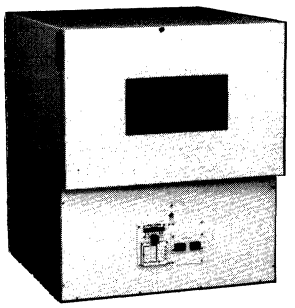
Quality, Ingenuity, Integrity — Since 1955

Cold Plates (Thermal Platforms)



- Efficient, accessible, thermally conductive surfaces
- Ramp rates to 100°C per minute!
- Stable within hundredths of a degree
- Seven standard sizes available.
- Enclosure and fixturing options
- Mil-883 and 510 compatible

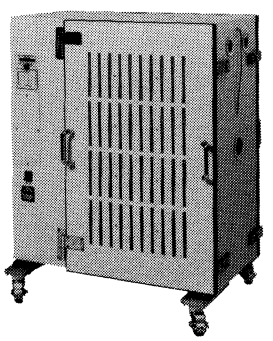
Cycling Chambers



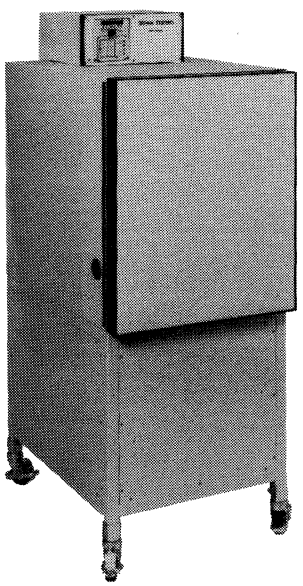
- Fast, Dependable, Economical, Wide range, Programmable control

Burn-In-Ovens

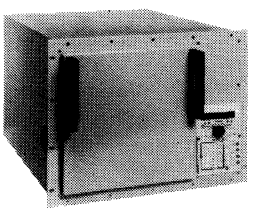
- Conventional and *Dual Access* (Entire rear wall removable for fixturing)



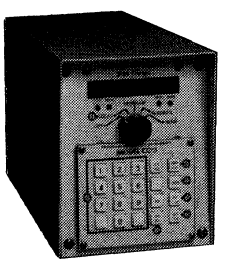
Temperature Chambers



- Portable, rack mount, bench and floor models
- Single stage, cascade, LN_2, CO_2, and air cooled
- Custom chambers a specialty



Controllers (Digital & Analog)



- Programmable
- Dual probe capability responds to both process and product temperature
- Both IEEE-488 and RS-232 interfaces built in
- Platinum RTD's traceable to National Bureau of Standards
- Permanent storage of stand alone programs and setup parameters
- Direct plug-in compatibility for all Sigma thermal products
- Superlative accuracy and stability
- Self instructing manual operation — easy programming

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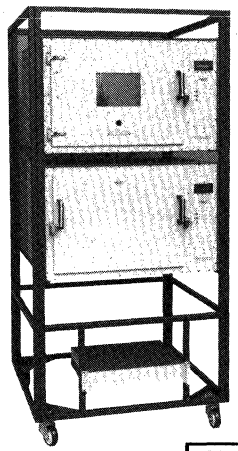
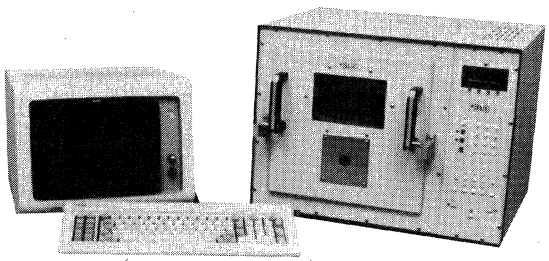
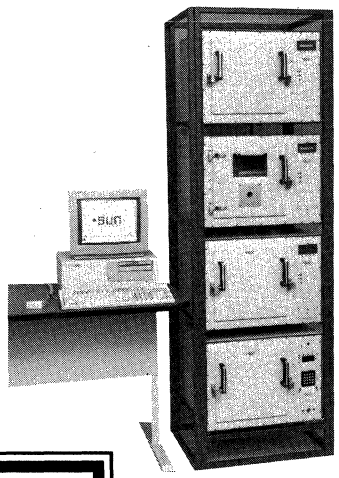


POWERFUL

enough for the most demanding automated test systems

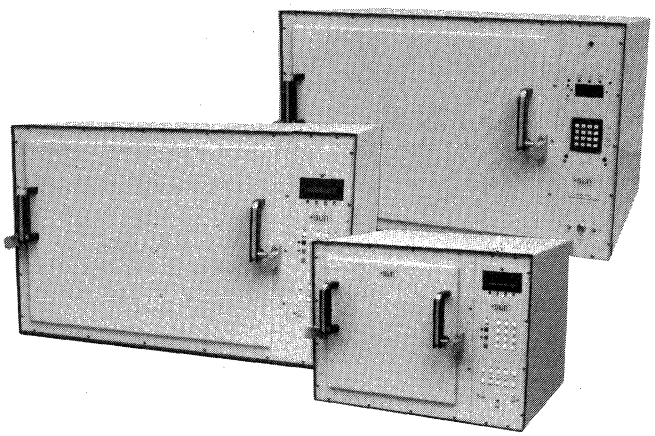




QUIET

Zero voltage Switching

ENVIRONMENTAL TEST CHAMBERS

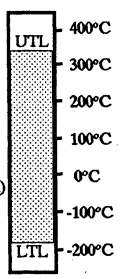


FAST

enough for **MIL STD 883** upto 1°C/sec

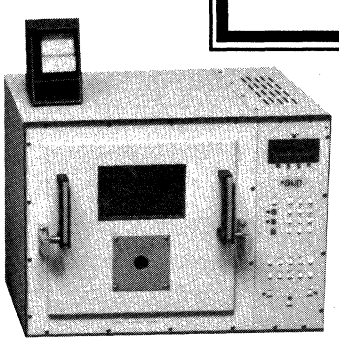
Broad Operating Range

(°C,°F,or °K)



OPTIONS:

- 3 Tank LCO_2 manifold
- Air cooled Chambers
- N_2 Gas Purge
- PC-based ATE Systems
- Carts, Racks, Fixturing
- LN_2 Auto Purge
- Switching Matrix



Features

- IEEE-488 & RS232
- Local Programming
- PID Algorithms
- 2 Year Warranty
- Engineering Support
- Competitive Pricing
- Fast Delivery
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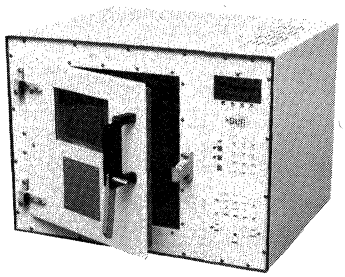
- Ramping
- User Probe
- Chart Outputs
- Menu Setups
- Digital User Port
- RS422
- Serial User Port
- Analog I/O

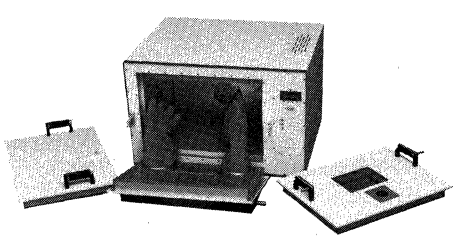


Retrofit ...

your existing temperature or temp/humidity chamber with:

IEEE-488

RS232, Programmability, and more.



30 Day Free Trial

Other SUN SYSTEMS Products

Sun Systems also designs and manufactures PROCESS CONTROLS which offer state-of-the-art control of processes such as temperature, humidity and pressure with a wealth of user-friendly features.

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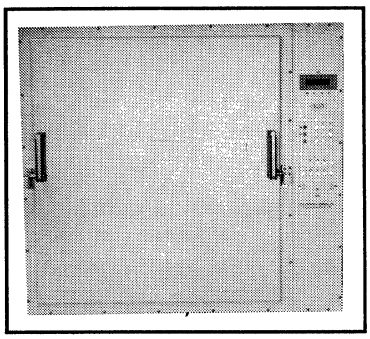
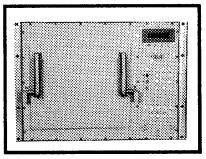
ENVIRONMENTAL TEST CHAMBERS

SUN SYSTEMS

Chamber Specifications

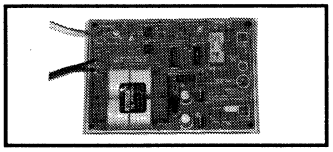
The chambers are constructed of 302 Stainless Steel with sealed interior. Chamber Volumes from .37 ft^3 to 6.16 ft^3. Temperature Ranges from -184°C to 315°C. Heat/Cool Rate of Change up to 1°C/sec Prices from $3150. Local Programming, RS232 and IEEE-488.





Over/Under Temperature Protection Module

This electronic control device monitors the upper and lower temperature. When the temperature exceeds the upper or falls below the lower temperature limit set point, the overtemperature protection module will interrupt power and disable the cooling and heating processes. This device can be redundant to the primary controllers standard safety features.



LN_2 Line Purge

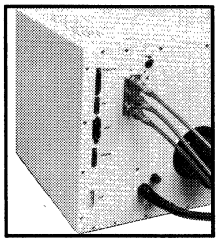
This option lets Liquid Nitrogen flow through the line automatically thus cooling down the line quickly and decreasing testing time. This option is provided for use with long LN_2 lines.

N_2 Gas Purge

N_2 gas enters the chamber forcing the air out and provides a Nitrogen atmosphere.

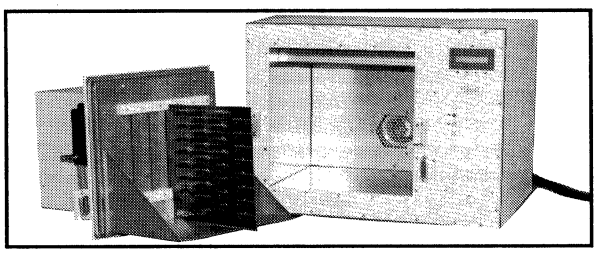
3-Tank Auto Switch Manifold

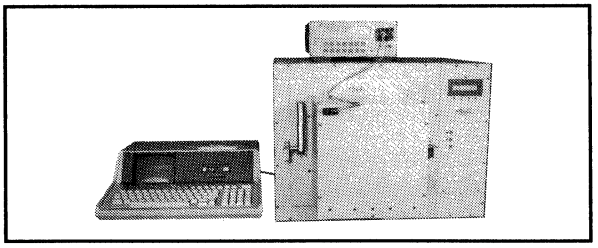
Sun Systems offers a 3-tank manifold with auto-switching for extended testing with LCO_2 @ 850 psi.



Switching Matrix

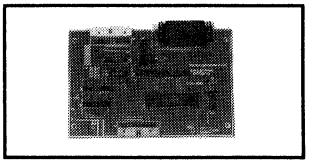
A Kelvin measurement path is provided for up to 160 2 leaded devices or 80 3,4 lead devices. Control of the chamber and selection of a device for measurement are locally controllable via the front panel or remotely controllable via the chamber's RS232/422 or IEEE-488 busses.





Printer Port

An optional IBM/PC Parallel Printer Port is offered to provide automatic data logging and charting of chamber parameters. This board also provides additional Bit I/O to control on/off processes. It consists of eight 100mA open collector drivers capable of driving solid state relays and eight contact inputs with internal pull up resistors to 5 Volts. The I/O on the printer expansion board is accessible from the front panel and via RS232 and IEEE-488.

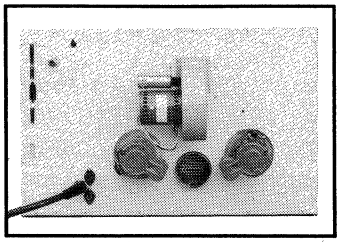


Remote Control Programs

The demo disk provides a user-friendly menu driven program capable of full chamber control along with example programs for RS-232/422 and GPIB. Sun Systems demo disk is provided free of charge.

Air-Cooled Option

An air-cooling option is available on the larger chambers for pull down from hi-temp to ambient temperature to conserve on expectorant use.



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SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

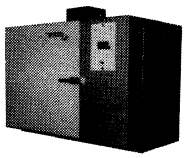
Tenney ENGINEERING, INC.

ENVIRONMENTAL TEST EQUIPMENT

The Most Experienced Manufacturer of High Technology Environmental Test Equipment

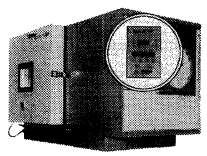
109 Springfield Rd., Union, New Jersey 07083 • (908) 686-7870 • FAX: (908) 686-7971

BENCHTOP TEMPERATURE CHAMBERS
Workspace:
1¼ and 5 cubic feet.
Temperature range:
−80°C to +200°C



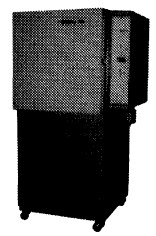
Bulletins 108 and 152

BENCHTOP TEMPERATURE-HUMIDITY CHAMBERS
Workspace:
3 and 5 cubic feet
Temperature range:
−73°C to +200°C
Humidity capabilities:
20%RH to 98%RH



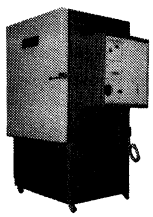
Bulletins 101 and 153

TENNEY SERIES HIGH-LOW TEMPERATURE AND TEMPERATURE HUMIDITY TEST CHAMBERS
Workspace:
6 cubic feet to
64 cubic feet
Temperature range:
−73°C to +200°C
Humidity: Optional



Bulletins 154, 155, 156 and 157

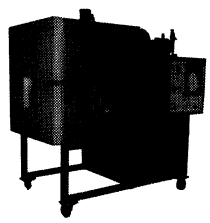
TH & T SERIES MODERATE RANGE TEMPERATURE-HUMIDITY CHAMBERS
Workspace:
27 cubic feet and
65 cubic feet
Temperature range:
Low to −18°C
High to +93°C
Humidity: Optional



Bulletins 158 and 159

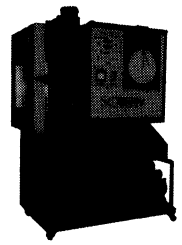
TEMPERATURE-VIBRATION CHAMBERS
For AGREE and ESS programs. Temperature rate of change to 25°C/minute. Mating to electrodynamic or mechanical shakers and sliptables.

VersaTenn® Standard



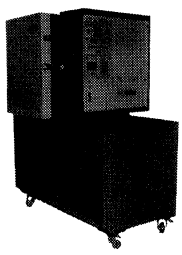
Bulletin 105

TENNEYSTRAT ALTITUDE-TEMPERATURE CHAMBERS
Workspace:
5 cubic feet thru
64 cubic feet
Temperature range:
−73°C to +177°C
Altitude: to 200,000 feet
Humidity: Optional



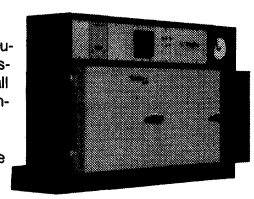
Bulletin 141

LOW TEMPERATURE PROCESS EQUIPMENT
Packaged
Refrigeration Systems
Temperature range:
Low to −73°C
High to +121°C



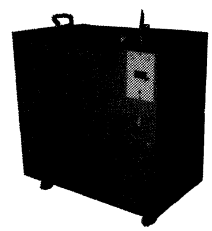
Bulletin 114

T-SHOCK JR.
Benchtop thermal shock system with automatic product transfer. Designed for small lot production screening to MIL-STD-883 and MIL-STD-202. Cold zone is full range *Tenney Jr.*



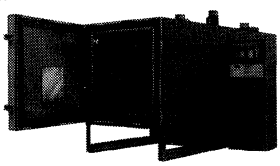
Bulletin 164

MULTI-RANGE PRECISION TEMPERATURE BATHS
Workspace:
One gallon and
nine gallon
Temperature range:
−73°C to +120°C



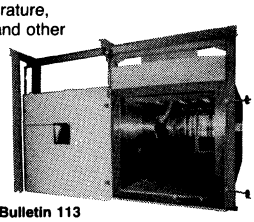
Bulletin 146

CERT SYSTEMS
Combined Environment Reliability Testing Systems provide temperature, humidity, altitude, random vibration and cooling air simulation. Permits simulation of mission profile environments.



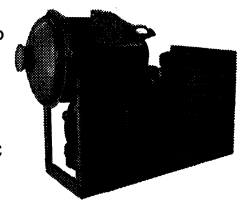
Bulletin 134

WALK-IN ROOMS
For burn-in, temperature, humidity, altitude and other controlled environment testing. Custom-engineered in unitized or semi-unitized packages, as well as modular panels.



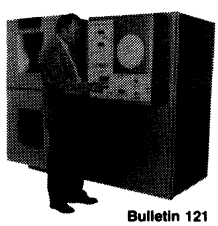
Bulletin 113

THERMAL VACUUM SPACE SIMULATORS
Workspace:
Standard 1½ feet to
6 feet diameters
Vacuum capability:
to 2 $\times 10^{-8}$ Torr.
Temperature
range: From
−196°C to +177°C



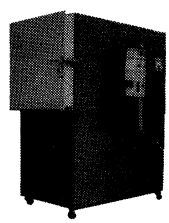
Bulletin 120

THERMAL SHOCK CHAMBERS
Two zone, three zone and dual loading capabilities. Vertical or horizontal configurations. Designed for MIL-STD 883/202 shock testing. Workspace: 2, 8 and 10 cubic feet. Microprocessor controls standard.



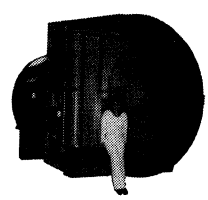
Bulletin 121

VACUUM CHAMBERS AND VACUUM OVENS
Workspace:
4 cubic feet thru
27 cubic feet
Temperature range:
to +150°C
Vacuum capability:
to 169 microns
(200,000 feet)



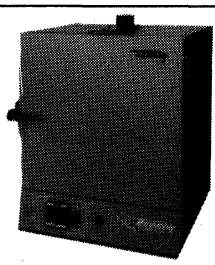
Bulletin 110

AUTOCLAVE SYSTEMS
Sizes:
Small laboratory
models to large
production units
Temperature range:
+400°C
Pressure to 800 psig.
Vacuum: Optional



Bulletin 122

CONSTANT TEMPERATURE OVENS
Sizes from 1 to 32 cubic feet. Temperature controlled from 5°C above ambient to 300°C by RFI-free electronic controllers having sensitivity of ±0.1°C.

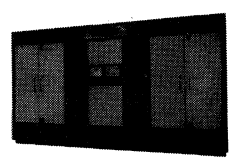


Bulletin 163

VACUUM OVENS
Workspace: 0.56 and 1.7 cubic feet. Temperature range 300°C, with a capability of achieving vacuums to 10 microns or better. Each have digital setpoint and display and full-view observation window.

Bulletin 163

BURN-IN CHAMBERS
Size and number of doors may be specified to meet any burn-in requirement.
Typical
temperature range:
0°C to +60°C



Bulletin 133

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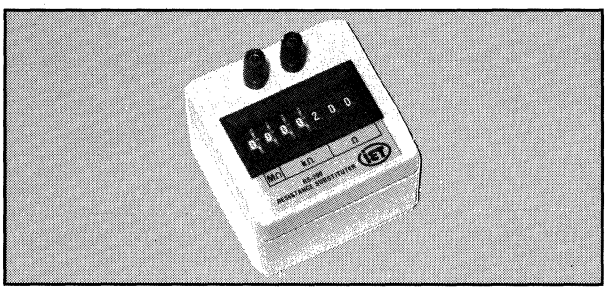
IET LABS, INC.

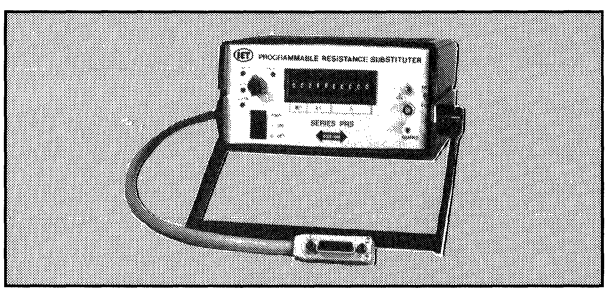
DEPT. EM, 534 MAIN STREET WESTBURY, NY 11590, (516) 334-5959 FAX: (516) 334-5988

CALIBRATION • TEST • MEASUREMENT



Decade Substituters

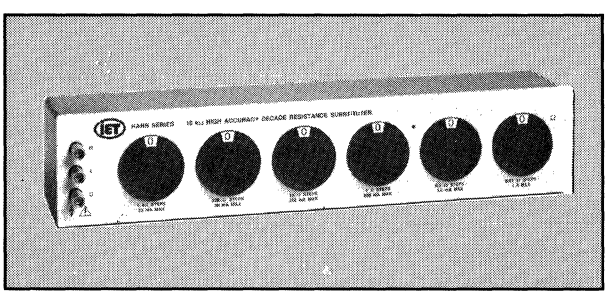
- Resistance
- Capacitance
- Inductance
- RTD



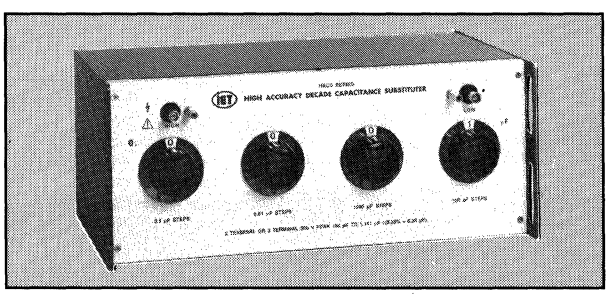
Programmable

- IEEE-488
- BCD

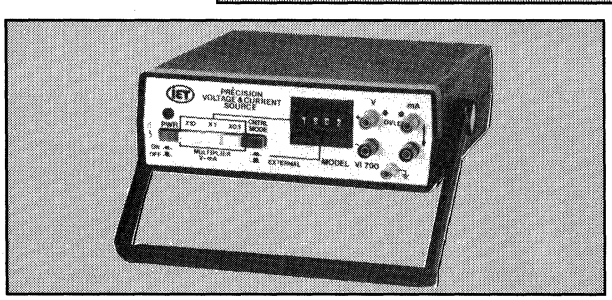
IEEE-488



High Accuracy Resistance
High Resistance
Kelvin Varley Voltage Dividers
Transfer Standards



High Accuracy Capacitance
High Accuracy Inductance
High Power Resistance



Precision Sources

- Voltage
- Current

Impedance Meters
Component Testers

See our catalog on pages D•1258-1265

CALIBRATORS, REFERENCES, STANDARDS, SOURCES

Manufacturer	Starting EEM Page No.	Model/ Series	Device Type: Calibrator	Reference, DC	Standard	Source	Parameters: Current, AC	Current, DC	Frequency	Phase Angle	Power	Resistance	Voltage: AC	AC(RMS)	DC	Parameter Range From-To Units	Readout Features
Advantest America Inc.	D•1214	TQ8345/8346			√				√								Programmable, IEEE-488 Compat.
American Automation	D•1217																Microprocessor Development Support Programs for IBM PC-XT/AT/PS/2
Anritsu	D•1218	MG3633A MG9001A/ MG9002A				√										Carrier: 10KHz - 2.7GHz Modulation: AM 0%-100% FM 0-3.2MHz 0.85µM/1.3µM/1.55µM	Signal, Test
Clarke - Hess Comm. Res.	D•1236	5000, 5500, 6000			√				√	√			√	√			Digital, IEEE-488 Compat.
		255, 256, 258, 259, 263, 828			√		√	√			√		√	√	√		Digital, IEEE-488 Compat.
Electronic Development Corp.	D•1242	Various	√	√	√		√	√		√	√	√	√	√	√		Digital, Programmable, IEEE-488 Compat.
Empro Mfg. Co.	D•1246	DC Ammeter Shunts															
Energy Systems	D•1247	AC & DC Loads			√						√	√					Digital, Programmable, IEEE-488 Compat.
General Resistance	D•1252		√	√	√	√		√				√			√		Analog, Digital, Programmable, IEEE-488 Compat.
Hipotronics	D•1254	KVM Series			√								√		√		Analog, Digital
IET Labs Inc.	D•1258	HARS-X/-Q/-L	√		√							√				.001 - 10M	Digital
		HRRS	√		√							√				.01M - 1,110M	Digital
		PRS	√		√							√				0.01 - 100M RTD Simulator	Digital, Programmable, IEEE-488 Compat.
		PRTD	√		√							√				0.001 - 1K RTD Simulator	Digital, Programmable, IEEE-488 Compat.
		HATS-LR	√		√							√				1 - 100K	Digital, Transfer Std.
		HATS-Y	√		√							√				10K - 100M	Digital, Transfer Std.
		SR	√		√							√				1 - 10M	Std. Resistor
		KVD-600/700	√		√							√			√	Voltage Divider	
		HACS	√		√											100pF - 1µF	Digital, Capacitance
		HACS-Z	√		√											1pF - 1000µF	Digital, Capacitance
		PCS	√		√											100pF - 100µF	Digital, Capacitance Programmable, IEEE-488 Compat.
		SC-900	√		√											0.02pF - 1100pF	Analog, Prec. Air Cap.
		SC	√		√											100pF - 10µF	Standard Capacitor
		LS	√		√											1µH - 100H	Digital, Inductance
		PLS	√		√											1µH - 100H	Digital, Inductance Programmable, IEEE-488 Compat.
		SL	√		√											100µH - 10H	Std. Inductor
		V1-700	√	√		√									√	100µV - 200V;	Digital, Programmable, IEEE-488 Compat.
		HSVR		√											√	1V - 19V	
Integrated Technologies Solutions	D•1267	IPDS014				√	√	√	√	√	√	√		√	√		Digital, Analog Programmable, IEEE-488 Compat.
Japan Elctrns.	D•1268	Sensors														1%-25%-Gas	

CALIBRATORS, REFERENCES, STANDARDS, SOURCES (cont'd)

Manufacturer	Starting EEM Page No.	Model/ Series	Device Type: Calibrator	Reference, DC	Standard	Source	Parameters: Current, AC	Current, DC	Frequency	Phase Angle	Power	Resistance	Voltage: AC	AC(RMS)	DC	Parameter Range From-To Units	Readout Features
Julie Research Labs	D•1270	RD, PRS		√								√					Programmable, IEEE-488 Compat.
		Locost 106	√		√		√	√				√	√		√	6 1/2 Digit Readout	Digital Programmable, IEEE-488 Compat.
		VDR, HV, DV, KV, MVD													√	0-100KV	
		SCO-106		√											√	1.01770V 1PPM Acc.	Analog
		GTX, DVS, ZVR	√	√	√										√	0-1200V	Analog
		DCS-105, QCS-106			√		√									0-120A	
		ACS-106, ACV-106			√		√									0-12A	Programmable, IEEE-488 Compat.
		TNB-102			√											0.5-1000V, 50KHz	
		AVS 106, RVD 10G															Digital, Programmable
		RVD 126, AVC 106		√		√									√	0 to 200V	IEEE-488 Compatible
		NB, DMR, PRO, MRS			√							√				0 to 10 Megohm	
		BMR, DR														1 PPM accuracy	
		AC-129, AC104, AC50CAL	√			√							√			10nV to 1211.11V, 10Hz to 1.1MHz	Programmable, IEEE-488 Compat.
		AC50, AC153				√					√					0 to 250 VA	
Jennings	D•1274								√				√	√	√	AC/DC-50KV	
Krohn-Hite	D•1279	All															
Magnetic Instrumentation	D•1290		√													Magnetics	Fluxmeters, Gaussmeters
Magnos	D•1291		√													Fluxmeter	
MDF Products	D•1293	MDF-400 thru 9000	√	√	√	√					√		√	√		Noise, DC to 110GHz	Analog, Digital, Programmable, IEEE-488 Compat. Signal, Audio, Signal, Test
Mint Systems	D•1295																Digital, Programmable IEEE-488 Compat.

CALIBRATORS, REFERENCES, STANDARDS, SOURCES (cont'd)

Manufacturer	Starting EEM Page No.	Model/ Series	Device Type: Calibrator	Reference, DC	Standard	Source	Parameters: Current, AC	Current, DC	Frequency	Phase Angle	Power	Resistance	Voltage: AC	Voltage: AC(RMS)	Voltage: DC	Parameter Range From-To Units	Readout Features
National Instrmnt.	D•1296	Workstation Interfaces		√		√										DMA rates	Analog, Digital, Programmable, IEEE-488 Compat.
		Comp. Source Interfaces	√	√	√	√	√	√	√	√	√	√	√	√	√	Var.	Analog, Digital, Programmable, IEEE-488 Compat.
Nohau Corp.	D•1300	Microcontroller Emulator		√		√										8 bit	
North Atlantic Ind.	D•1306	213C	√		√					√				√		500VAC	Digital, Programmable, IEEE-488 Compat.
Omega Engrg..	D•1307	All	√		√	√	√	√				√	√				Digital
PPM Inc.	D•1311											√					
Programmed Test Sources	D•1312	PTS 040–x10				√			√								
Quantum Data	D•1315	801C-CE														1.6-200MHz	Analog, Digital, Programmable, IEEE-488 Compat.
Ross Engrg.	D•1319	VMD			√								√	√	√	0–900KV	Digital, IEEE-488 Compatible
Sensitive Research	D•1322			√	√		√	√			√	√	√	√	√		Analog
Shalltronix Corp.	D•1325	6800 & 800														1500V, 2000V	
Signum Systems	D•1326	Emulators			√	√	√	√	√	√	√	√	√	√	√		Analog
Sunrise Elctrncs.	D•1329			√	√	√										Programmable Logic Testing	Digital, Programmable
Transistor Devices	D•1331	All		√			√	√				√	√	√	√		Analog, Programmable, IEEE-488 Compat.
Valhalla Scientific	D•1332	2701C	√	√	√	√		√							√	200mV-1200V, 25mA; 120mA opt.	Digital, Programmable, IEEE-488 Compat.
		2703	√		√	√			√	√			√			1.2mV-120V, 10Hz-100KHz	Digital, IEEE-488 Compat.
		2705			√	√			√	√			√			1.2mV-1200V; 10Hz-100KHz	
		2724A	√		√	√						√				0-11G; 5pA-120mA	Digital, IEEE-488 Compat.
		2500	√				√	√								1μA-1A	
		2500EP	√				√	√								100μA-10A	Programmable, IEEE-488 Compat.
		2575A	√			√	√	√								100A-1mA; .001 -100	
Vishay Resistive Systems Group	D•1335	Precision Current Sensors														0.005 to K range values	
Walker Scientific	D•1337		√	√	√	√										Gauss-flux hysterisis	Analog, digital
Weston	D•1338	432			√						√					7.5W - 15KW	Analog
		904 & 433											√	√		15MA - 200A, 10V - 750V	Analog
		931 & 901			√			√							√	50MV - 750V, 30μA - 50A	Analog

INSULATION RESISTANCE TESTERS

Manufacturer	Starting EEM Page No.	Model/ Series	No. of Digits	Maximum Readings: Voltage (V) AC	Maximum Readings: Voltage (V) DC	Maximum Readings: Current (A) AC	Maximum Readings: Current (A) DC	Resistance M	Accuracy (% Reading)	Remote Control	Type Display
Cabletest, Int'l	D•1230	388-HD		850	1000	20	20	10M	0.5		LCD
Hipotronics, Inc.	D•1254	H 301B H 303B H 306B HD 106		1000 2500 5000 5000	1500 3000 6000 6000	5 5 5 5	5 5 5 5	@500VDC,100,000 @500VDC,100,000 100,000	±2% F.S. 3/32 ±2% ±2% F.S. ±2% F.S.		analog analoig analog analog
Omega Engineering	D•1307	All	3 1/2		√			2M	various		LCD
Qualitec Technologies	D•1313	ACDC 560E ACDC 260E	3 1/2 3 1/2	5000 1,500	0–1000 0–1000	10 25		100,000 100,000	0.3 0.3	√ √	LCD LCD
ROD-L Electronics	D•1316	M300 RT			2			.15Ω	±.03	√	analog, digital
Rosemont Analytical	D•1318	L-10A			10-1000			$5x10^4$ to $5x10^{13}$	@ 1-2%		analog

MEGOHMMETERS

Manufacturer	Starting EEM Page No.	Model/ Series	No. of Digits	Maximum Readings: Voltage (V) AC	Maximum Readings: Voltage (V) DC	Maximum Readings: Current (A) AC	Maximum Readings: Current (A) DC	Resistance M	Accuracy (% Reading)	Remote Control	Type Display
Hipotronics	D•1254	HM3A			1000			20,000,000	3/32"<1,000,000 1/8">1,000,000		analog
		HM6B			500			10,000,000	3/32"<1,000,000		analog
		HD103		2500	3000	5	5	N/A	±2%		analog
		HD115		12,500	15000	5	5		±2% FS		analog
		HD140		15,500	40,000	5	5		±2% FS		analog
		HA3ATC		3000		5			±2% FS	√	analog
		HDB4AT			4000		5		±2% FS		analog
		HDB4ATCT			4000		5		±2% FS	√	analog
Industrial Test Equip.	D•1266	1620	4		2500		1mA	200,000,000	5	√	analog
Qualitec Technologies	D•1313	IR400P IR350E	3 1/2 3 1/2		0–1000 0–1000			100,000 100,000	0.3 0.3	√ √	LCD LCD
ROD-L Electronics	D•1316	M300RT			√			.15Ω	±0.3	√	analog, digital
Rosemont Analytical	D•1318	L-12			10-1000			$.5x10^6$ to $.5x10^{16}$	@ 1-2%	Foot switch	analog

TEST SYSTEMS, COMPUTER CONTROLLED (ATEs)

Manufacturer	Starting EEM Page No.	Model/ Series	Applications (passive/active components, EMI/RFI, power, ICs, etc.)	Modular, Standalone	Compatibility (MS Dos, VXI, GPIB, etc.)	Programmable	Compliance/ Approvals
Cabletest Int'l	D•1230						
Integrated Technologies Solutions	D•1267	1PDS-100	Power	√	RS 232, GPIB	√	
Cytec	D•1240		Switching systems		IEEE-488, Vx1, RS232		
General Microwave	D•1251	490	Pulse power meter	Standalone, Rackmount	GPIB	√	
Mint Systems	D•1295	3100	Passive components	Standalone	GPIB	√	
Penny & Giles Data Systems	D•1310		Tape recorders (playback up to 42 tracks)		RS 232		
Transistor Devices	D•1331	All	Power	Rackmount		√	MIL
Voltech	D•1336	PM 3000 TF 2000	Power Transfer funtion	√ √	GPIB/RS232 RS 252/Centronics	√ √	

FUNCTION GENERATORS

Manufacturer	Starting EEM Page No.	Model/Series	Frequency Range From	Frequency Range To	Functions	Sweep
B & K Precision	D•1223	3010	0.1Hz	1.0MHz	sine, square, triangle	
		3011	0.2Hz	2.0MHz	sine, square, triangle	√
		3017	0.2Hz	2.0MHz	sine, square, triangle	√
		3025	0.005Hz	5.0MHz	sine, square, triangle, haversine	√
		3030	0.001Hz	5.0MHz	sine, square, triangle, pos. and neg. square, pos. and neg. ramp waveforms	√
Elgenco	D•1244	602A, 603A, 610A, 624A	5Hz	5MHz	Gaussian noise	
		632A	DC	35KHz	Gaussian noise	
		602A-20-200, 602A-1390	5Hz	5MHz	Gaussian noise	
Integrated Technologies Solutions	D•1267	1PDS-810	DC	1MHz	Wave form generator	√
Kikusui	D•1278	4500A	0.001Hz	10MHz	sine, triangle, pulse	
Krohn-Hite Corp.	D•1279	1000A Series	0.2Hz	3MHz	cont, gate, trig, pulse, burst (9 combinations)	Lin/Log
		2000A Series	0.003Hz	31MHz	cont, gate, trig, pulse, burst, VC	Lin/Log
		5400C	0.002Hz	5MHz	cont, VC	
		5600/5700	0.2Hz	3MHz	cont, (portable, battery op.)	
		5920	0.0001Hz	5MHz	arb, cont, gate, trig, burst	Lin/Log
		All	0.025dB	0.1dB	Arbitrary waveforms	
Leader Instruments Corp.	D•1286	LFG-1310	0.01Hz	10MHz	sine, square, triangle, ramp & pulse	√
Marconi Instruments	D•1292	2382	10Hz	400MHz	analyzers, spectrum	
		2383	100Hz	4.2GHz	auto, GPIB, 3Hz resolution	
		2386	100Hz	26.5GHz	bandwidth tracking generator	
Noise Com, Inc.	D•1304	NC 7100 SCR	DC	110 GHz	White gaussian noise, IEEE-488 compatible	
North Atlantic Industries Inc.	D•1306	5310	47Hz	5KHz	synchro resolver	
		530	50Hz	11KHz	resolver synchro bridge	

DIGITAL MULTIMETERS, NOT HANDHELD

Manufacturer	Starting EEM Page No.	Series/ Model	No. of Digits	Maximum Readings Voltage (V) AC	Voltage (V) DC	Current (A) AC	Current (A) DC	Resistance M	DC Accuracy %Reading	True RMS	Type of Display	Battery Operated	Plug-In
B & K Precision	D•1223	2832	3 1/2	1000	1000	200mA	2000mA	20	0.5%	√	LCD	√	√
		2905	3 1/2	750	1000			20	0.5%	√	LCD	√	√
		2940	4 1/2	760	1000		10A	20	0.3%		LCD	√	
		2945	4 1/2	760	1000		10A	20	0.05%DCV 0.03% DCA	√	LCD	√	
		2907	3 1/2	760	1000	10A	10A	20	0.1%DCV 0.75% DCA	√	LCD		
		2906	3 1/2	750	1000	10A	10A	20	0.25 DCV		LCD	√	
		2833	4 1/2	1000	1000	20A	20A	20	0.05%	√	LCD	√	√
		2830-31	3 1/2	750	1000	10A	10A	10	0.5 or 0.1 VDC		LCD	√	
John Fluke Mfg. Co. Inc.	D•1248	8840 Series	5 1/2	700	1000	2	2	20	0.005	√	VF		
		45	5	750	1000	10	10	300	0.02	√	VF	√	√
		37	3 1/2	1000	1000	10	10	32	0.1		LCD	√	
IET Labs Inc.	D•1258	IMF-600	3 1/2	750	1000	2	2	1000	0.1	√	LED	√	√
Keithley Instruments	D•1275	179A	4 1/2	1000	1200	20	20	20M Ω	0.04%	√	LED	√	√
		177	4 1/2	1000	1200	2	2	20M Ω	0.03%	√	LED	√	√
		197	5 1/2	750	1000	10	10	220M Ω	0.011%	√	LCD	√	√
		196	6 1/2	300	300	3	3	300M Ω	0.003%	√	LED		√
		199	5 1/2	300	300	3	3	300M Ω	0.006%	√	LED		√
		193A	6 1/2	700	1000	2	2	220M Ω	0.003%	√	LED		√
		195A	5 1/2	700	1000	2	2	20M Ω	0.025%	√	LED		√
		169	3 1/2	1000	1000	2	2	20M Ω	0.25%		LCD	√	√
		175	4 1/2	750	1000	10	10	200M Ω	0.03%	√	LCD	√	√
		614	4 1/2		20		2mA	200GΩ	0.08%		LED	√	√
		617	4 1/2		200		20mA	10TΩ	0.05%		LED		√
		619	5 1/2		200		2	2TΩ	0.01%		LED		√
		642	4 1/2		11		100nA		0.05%		LED		√
		236	5 1/2		110		100nA	10TΩ	0.025%		LED		√
		237	5 1/2		1100		100nA	100TΩ	0.025%		LED		√
		238	5 1/2		110		1	10TΩ	0.025%		LED		√
Kikusui International	D•1278	DME1400	4 1/2	√	√	√	√	0-20M	±0.03%		LCD		
North Atlantic Industries	D•1306	2250	5 1/2	500						√	LED		
Ross Engineering Corp.	D•1319	VMD-2	4 1/2	900KV	900KV				0.1, 0.01%		LCD	√	
Voltech	D•1336	PM1000	4 /2	1000	1000	20	20	N/A	0.25	√	LCD		√
		PM3000	5 1/2	2000	2000	200	200	9.999	0.1	√	Dot Matrix		√

multimeters-2900

HANDHELD DIGITAL MULTIMETERS

Manufacturer	Starting EEM Page No.	Model/ Series	No. of Digits	Maximum Readings					DC Accuracy (% Reading)	True RMS	Type Display
				Voltage (V)		Current (A)					
				AC	DC	AC	DC	Resistance M			
B & K Precision	D•1223	388-HD	4	850	1000	20	20	10M Ω	0.5	√	LCD
F. W. Bell Inc.	D•1226	UM-790O CG-100D	3 1/2 3 1/2	90-660		1-1000 1-200	1-1400 1-200		±1.5 ±0.75	√	LCD LCD
John Fluke Mfg. Co.	D•1248	79/29 Series 8060/62A 80 Series 37 45 8840 Series	3 1/2 4 1/2 3 3/4 3 1/2 5 5 1/2	750 750 1000 1000 750 700	1000 1000 1000 1000 1000 1000	10 2000 10 10 10 2	10 2000 10 10 10 2	32 300 40 32 300 20	0.3 0.05 0.1 0.1 0.02 0.005	 √ √ √ √	LCD LCD LCD LCD VF* VF
LEM USA	D•1289	LEM 600	3 1/2	750	1000	200/600	200/600	2000Ω	±0.1	√	LCD
Omega Engineering	D•1307	Many	3 1/2	√	√	10A	10A	20; Temp.°C,°F	0.1	√	LCD
Ross Engineering	D•1319	VMDP	4 1/2	400KV	400KV				0.1	0.5	LCD

ANALOG MULTIMETERS, NOT HANDHELD

Manufacturer	Starting EEM Page No.	Model/ Series	Maximum Readings					DC Accuracy (% Reading)	Battery Operated	Plug-in
			Voltage-AC	Voltage-DC	Current-AC	Current-DC	Resistance M			
Dymec	D•1241	Links	10KHz-1MHz							√
Keithley Instruments	D•1275	602 610C		10 100		300mA 300mA	10TΩ 100TΩ	1% 1%	√	 √
Millivac Instruments	D•1294	MV-973A	300V	1000V	10mA	10mA	5000	1%	√	
NH Research	D•1299	L4000		1.5-400VAC		960A	0.1-4K	0.2%		
Orion Industries	D•1308	Unilab	(Call mfr.)							

SIGNAL GENERATORS

Manufacturer	Starting EEM Page No.	Model/ Series	Frequency Range (Hz)		Modulation (Hz)		Features	
			From	To	From	To	IEEE-488 Compatible	Programmable
Advantest America Inc.	D•1214	TQ8111 D3173/3273	0.8µm 50MHz	1.6µm 3.0GHz			√	√
Anritsu America	D•1218	MP 1608A MP 1701A	50MHz 50MHz	5GHz 10GHz		512 kbt 512 kbt		√ √
Elgenco	D•1244	602A, 603A, 610A 624A	5Hz 5Hz	5MHz 500KHz				
Integrated Technologies Solutions	D•1267	IPDS-3000	DC	25KHz	DC	25KHz	√	√
Julie Research Labs	D•1270	RCD AC	1 Hz 0.1 Hz	1 MHz 99 KHz				
Leader Instruments Corp.	D•1286	3215 3216 3220	100KHz 100KHz 100KHz	140MHz 140MHz 1.3GHz	0 0 0	99.9KHz 99.9KHz 99.9KHz		
Marconi Instruments	D•1292	2030/2031	10KHz	2.7GHz	DC	10MHz	√	√
Programmed Test Sources	D•1312	040 120 160 250 300 500 PTSX10	0.1 90 0.1 1 0.1 1 .1	40MHz 120MHz 160MHz 250MHz 300MHz 500MHz 100MHz			√	√

PULSE GENERATORS

Manufacturer	Starting EEM Page No.	Model/ Series	Frequency Range (Hz) From	Frequency Range (Hz) To	Optical Peak Power µW Pulse Amplitutde (V)	Electronic	Optical
Avtech Electrosystems Ltd.	D•1222	AVO	1KHz	250 MHz	100MA-200 AMPS	√	
		AVP	0	1 MHz	2V-40V	√	
		AVM	0	25 MHz	5V-40V	√	
		AVR	0	100 KHz	700V	√	
		AVI	0	20 KHz	50V-100V	√	
		AVL	0	5 KHz	350V	√	
B & K Precision	D•1223	3300	5MHz	1Hz			
Berkeley Nucleonics Corp.	D•1229	6040	.01Hz	100 MHz	5V/ECL	√	
		6040/201E	.01Hz	500 MHz	±5V	√	
		6040/203E	.01Hz	50 MHz	±25V	√	
		6040/202H	.01Hz	1 MHz	±300V	√	
		6040/085	.01Hz	CW	2mW		√
		6040/106H	.01Hz	2 KHz	50mW		√
		6040/130	.01Hz	CW	1mW		√
		6040/155	.01Hz	CW	1mW		√
Krohn Hite	D•1279	2100A	.01Hz	31.16 MHz			
Schaffner EMC	D•1321	NSG 200		200 MHz	4000	√	
		NSG 600		200 MHz	4000	√	
		NSG 500C			300V	√	
		NSG 587			10000V	√	
		NSG 432		1 GHz	25000V	√	
		NSG 1025		200 MHz	4400	√	
		NSG 500 B/11			300	√	
		NSG 650			6600	√	
		NSG 433		1 GHz	1800	√	

HIPOT TESTERS (INSULATION, RESISTANCE & DIELECTRIC STRENGTH)

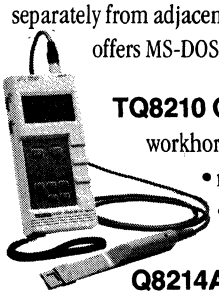
Manufacturer	Starting EEM Page No.	Indicators: Audible	Indicators: Visual Digital	Indicators: Visual Analog	Current Meter	Power Source
Associated Research	D•1220	√	√	√	√	115/230 VAC, 50/60 Hz
Cabletest International	D•1230		√	√		0-3.5 KVAC Test Voltage
Chatsworth Data Corp.	D•1234		√	√	√	115 VAC
Cirrus Systems	D•1235	√	√		√	AC
Criterion Instruments	D•1238	√		√	√	120V, 208V, or 240V
Hipotronics Inc.	D•1254	√	√	√	√	Line 50/60Hz
Integrated Technologies Solutions	D•1267			√		AC/DC Amplifier, 50W–5KW
Kikusui International Corp.	D•1278	√		√	√	AC & DC
L-Com	D•1281		√	√		
Qualitec Technologies Inc.	D•1313	√	√		√	AC & DC
ROD - L Electronics Inc.	D•1316	√	√	√	√	AC & DC
Ross Engineering	D•1319	√	√	√		115 VAC
Schaffner EMC/Instrument Div.	D•1321	√	√	√	√	115VAC, 50/60 Hz
Slaughter Co.	D•1327	√		√	√	3000 VAC
Torotron Corp.	D•1330	√		√		115 VAC

MAGNETIC TEST EQUIPMENT

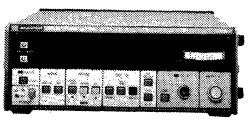
Manufacturer	Starting EEM Page No.	Type of Equipment	Range (Gauss)	Input: Voltage (V) AC	Input: Voltage (V) DC	Output: Current (A) AC	Output: Current (A) DC	Noise (Hz)	Accuracy (% Reading)	Readout Analog/ Digital	Type Display
EMDS	D•1245	Fluxgate Magnetometer					±10 VDC	0.1 Int. P-P	.03%	Analog	
Walker Scientific	D•1337	Gaussmeters Fluxmeters									

OPTICAL MEASUREMENT PRODUCTS

Q8460A OPTICAL TIME DOMAIN REFLECTOMETER (OTDR) Complete with an optical return loss function, the Q8460A OTDR provides high resolution fault location detection in fiber lines used for optical subscriber systems, LANs, and CATV. Benefits include: • minimum reading resolution of 5cm for accurate fault detection at distances of 15, 50, and 100km • spatial resolution of 5m or less allows the OTDR to accurately measure the target connection point separately from adjacent points • portability enables easy remote site testing • optional floppy disk function offers MS-DOS compatibility and storage of up to 100 pages of waveforms.



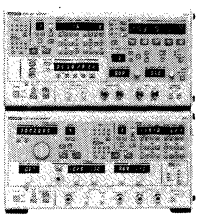
TQ8210 OPTICAL POWER METER An all-purpose portable optical power meter that will serve as the workhorse of your operations: • spectral response compensation function • a wide dynamic range (4½ digits) • multi-functional, including smoothing, maximum value hold, and relative-value (dBr) measurement • backlighted liquid crystal display • analog output function.



Q8214A OPTICAL POWER METER A low-cost, two-input channel power meter for general purpose as well as high sensitivity applications: • covers 0.8 to 1.65μm with single sensor • built-in spectral response compensation for each sensor • high accuracy measurements • D/A converted output and analog output • brightness control • affordably priced.

Q8215 OPTICAL MULTIMETER The contemporary general-purpose optical power multimeter with all the extras you'll need: • peak power measurement, modulation/demodulation functions, analog monitor function, and direct measurement to 50mW • sampling up to 10 times per second • backlighted display • built-in temperature measurement • measures DC, AC, resistance.

D3173/D3273 ERROR RATE MEASURING SYSTEM reliable systems you'll find for accurately evaluating digital communica- high-speed logic devices: • wide frequency range of 50MHz to3.0GHz can be 9 types of pseudorandom patterns • synthesizers clock generator for stable outputs have fast rise/fall times rated at 90ps • built-in timer, 10 pre-settable patterns from 1 bit to 64 Kbits.

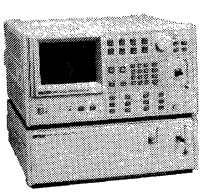


These are some of the most tions systems and other set in 1kHz steps to deliver clock frequency • data/clock frequencies • settable word

TQ8325 OPTICAL WAVELENGTH METER Sophisticated high-accuracy, high resolution measurements for laser diodes used in communications and LEDs follows interference method of He-Ne laser as wavelength standard: • high-accuracy — 5ppm — with great stability to extend periods between calibration • high resolution — 0.001nm • high speed—5 samples/s — enables measurement of changes in wavelength with changing temperature • built-in auto-resolution and GPID provided as standard • wide bandwidth measurements over 0.6 to 1.0μm and 1.0 to 1.6μm wavelength bands.

Q8344A OPTICAL SPECTRUM ANALYZER The easy-to-use Q8344A optical spectrum analyzer uses the Michelson interferometer technique to obtain maximum wavelength resolution of .05nm at 850nm and 0.1nm at 1300nm. Other benefits include: • wavelength range of 350 to 1750nm with 0.1nm center wavelength accuracy • internal He-Ne wavelength reference allows repeatable measurements without the need for calibration • zoom-hold capability to allow stored raw data to be reanalyzed under different setup conditions. • direct measurement of coherence length.

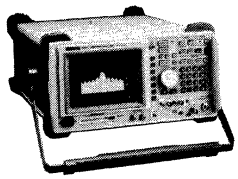
Q8381/8382 OPTICAL SPECTRUM



ANALYZER Advanced measuring devices to cover the spectrum and side-mode measurements of DFB laser diodes that deliver consistent efficiency and performance: • dynamic range of 50dB at 5nm and 40dB at 1nm *offset* (Q8382's range is 60dB at 1nm and 50dB at 0.5nm offset) • measure- ment range of 0.6 to 1.75μm with 0.1nm resolution • accuracy of 0.5nm at 25°C • easy to operate • built-in extras, including wide range of marker, cursor, and automatic half-value width measurement functions • 3-dimensional waterfall and dual display • GPIB capability for connection to plotter and full remote control capability.

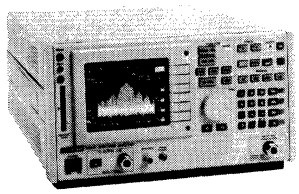
SPECTRUM ANALYZERS

R3271 SPECTRUM ANALYZER With a frequency range of 100Hz to 26.5GHz, the portable R3271 Spectrum Analyzer offers performance, versatility, and efficiency. Other benefits include: • internally preselected microwave frequency to provide more than 100dB of true dynamic range • compatibility with mobile radio equipment, microwave component testing, and radar • built-in counter to detect individual signals in complex waveforms • precise measurements of modulated and complex signals • standard GPIB for use in automated measurement systems • portability for field applications. • 50μs sweep in zero span accessible from GPIB.



R3265 SPECTRUM ANALYZER Advantest's new R3265 Spectrum Analyzer features synthesized local oscillator and advanced high frequency measurement techniques to deliver high stability microwave spectrum analysis capabilities at a highly affordable price. Features include: • frequency range of 100Hz to 8GHz • maximum resolution of 10Hz.

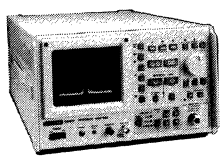
R3261/3361 SERIES SPECTRUM ANALYZERS



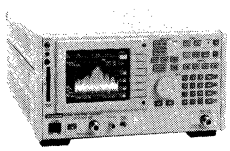
Compact and convenient, the R3261/3361 Series Spectrum Analyzers are fully synthesized for extremely accurate measurement and feature internal tracking generators for automatic frequency sweeping. Additional features include: • simplified operation with user-defined functions and measuring windows • frequency ranges of 9kHz to 2.6GHz (R3261A/3361A) and 9kHz to 3.6GHz (R3261B/3361B) • 120dB display range • 1Hz resolution setting and measurements with synthesis technique • built-in tracking generator, IC memory card, and GPIB • prices start at $12,900.

R3762 SERIES NETWORK ANALYZERS The R3762 quasi-microwave band vector network analyzer allows simplified, high speed measurement of amplitude, phase, group delay, and impedance for greatly improved throughput. Additional features include: • 300kHz to 3.6GHz with 1Hz resolution • high-speed measurement: 0.5 ms/point • powerful analytic and marker functions • BASIC controller function.

R4131D SPECTRUM ANALYZER For just $5,995, the R4131D portable spectrum analyzer is designed to monitor mobile radio equipment, satellite broadcasts, and CATV systems. Covering a frequency range of 10kHz to 3.5GHz in a single sweep, the R4131D features a maximum input sensitivity of −116dBm, a dynamic range of 70dB, and skirt characteristics of −80dBc or better. Additional features include: • standard GPIB for use in automated systems • advanced signal track • built-in quasi-peak measurement for EMI testing • automatic occupied bandwidth measurement • tracking generators available to 3.5GHz • positive/negative peak detect.



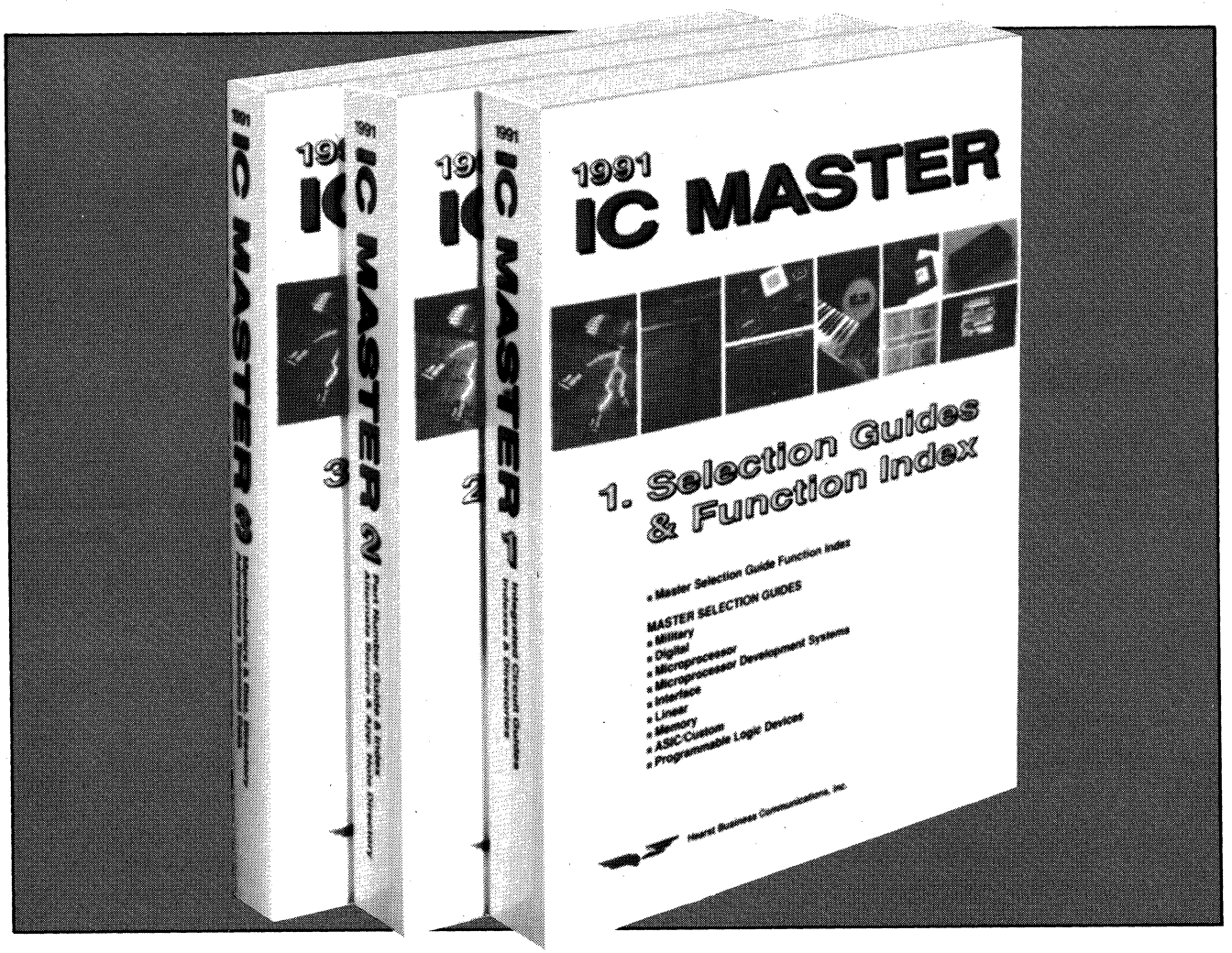
EMC SYSTEMS/PREQUALIFICATION TESTING WITH SOFTWARE With its compatibility with new EMC software for IBM PCs, Advantest's R3361A Spectrum Analyzer (see paragraph above for more information) is ideal for EMC prequalification testing. This new software package, which runs under Microsoft® Windows, is designed for the detection of radiated emissions as well as conducted and radiated susceptibility testing, covering Military Standard 461. Advantest also offers IC memory card software that simplifies prequalification testing and reduces the time required for routine measurements.



ADVANTEST®
Advantest America, Inc.

300 Knightsbridge Parkway, Lincolnshire, IL 60069 (708) 634-2552

SUPER TIME SAVER!



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We're American Arium, and we've created a winning combination: EZ-PRO® development software and emulators from American Automation and high-performance logic analyzers from Arium.

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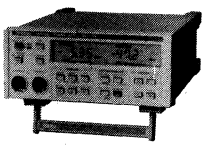
ELECTRONIC MEASURING INSTRUMENTS

for telecommunications equipment and systems

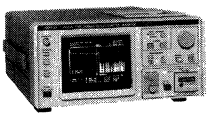
FIBER OPTICS MEASURING INSTRUMENTS

OPTICAL POWER METER ML910B
0.38 to 1.8 μm



Features
- Dual input at same time with feedthrough sensor
- Difference (DIFF) display in two power input levels with resolution of 0.001 dB; relative value (REL) display at this resolution
- Adjustment unnecessary for all sensors
- Broad wavelength range of 0.38 to 1.8 μm
- Wide dynamic range (−90 to +10 dBm)
- Wavelength sensitivity data incorporated in sensor
- Display-calibrating circuit
- Data storage
- REL recall function

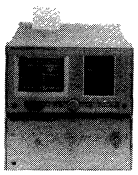
OPTICAL TIME DOMAIN REFLECTOMETER MW9010A



Features
- AUTO FAULT LOCATION for easy use
- NEAR mode for short dead zone
- Full-range aggregate averaging for quick measurement
- Advanced function for multi-functions (Memory save/recall, labelling, IOR setting, meter/feet selection, etc.)
- Direct plotting function requiring no controller
- Compact and light weight (132.5H × 284W × 350D mm and 9 kg)
- DC operable (with MZ146A DC-AC Inverter)

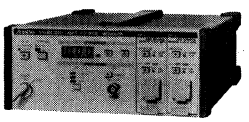
Specifications
Distance range: 10, 40, and 80 km*1
Horizontal scale: 50 m/div. to 8 km/div.*1
Vertical scale: 0.5, 1, 2.5, and 4 dB/div.

OPTICAL SPECTRUM ANALYZERS MV02 Series



Features
- **Broad bandwidth, 0.35 to 1.75 μm**
- **High sensitivity, −80 dBm**
- **Low polarization dependency, < 1.0 dB**
- **Built-in power monitor, 1.5 dB**
- **Automatic chromatic analysis**
- **Color display**
- **Touch EL panel**
- **Selection of optical units, up to three can be connected to a single display unit.**
- **MS9030A** Display unit
- **MS9701B** High accuracy 0.35 to 1.75 μm optical unit
- **MS9703B** Wide dynamic range 0.6 to 1.75 μm double monochrometer

STABILIZED LIGHT SOURCES MG9001A/MG9002A
0.85 μm/1.3 μm/1.55 μm



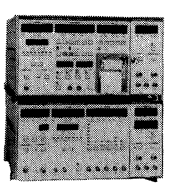
Features
- **Plug-in light source units**
  These models provide economical stabilized light sources for many different uses with easy to change light source units.
- **Many plug-in units to choose from**
  LED light sources: 7 kinds
  LD light sources: 4 kinds
- **Variable output level**
  The light output can be adjusted up to 6 dB in 0.01 dB steps.
- **Versatile modulation**
  Analog/digital modulation functions enable use as E/O converters for measuring LAN systems or baseband characteristics. A separate unit is available for digital or internal modulation (270 Hz, 1 kHz, 2 kHz) with the MG9002A.

OPTICAL LOSS TEST SET MS9020A
0.75 to 1.8 μm

- **Loss measurement over 64 km**
  The high-sensitivity light receptor means a wide dynamic range of 32 dB. With this single set, it is possible to measure loss over up to 64 km of single-mode fiber (with a loss of 0.5 dB/km).
- **Fast measurement in 1.3/1.55 μm bands**
  The new 1.3/1.55 μm switchable light source enables quicker loss measurements in these two common wavelengths.

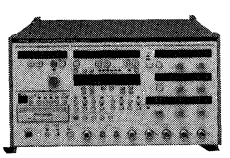
PCM MEASURING EQUIPMENT

ERROR-RATE MEASURING EQUIPMENT ME522A
1 MHz to 1.4 GHz



Features
- Built-in synthesizer
- Many measuring patterns:
  Pseudorandom patterns: 2^7-1, 2^{10}-1, 2^{15}-1, and 2^{23}-1
  Programmable patterns: Max. 3 patterns,
  Mark ratio variable patterns: 1/8, 1/4, 1/2, 3/4, 7/8
  Alternate patterns: 8-bit programmable
  Isolated patterns: 1/1 to 1/64
- Flexible input/output interface level: 1 to 3V amplitude, in 0.05V steps
  Waveform: NRZ, RZ, $\overline{RZ}$, CMI, AMI
  Impedance: 50Ω and 75Ω switchable
- Powerful error measuring functions
  Measuring items: error rate, number of error pulse, error interval, error-free interval frequency
  Error analysis: Threshold EI, threshold EFI, error performance data
- Built-in printer
- Built-in clock with calendar
- GP-IB, RS232C (option)

PATTERN GENERATORS/ ERROR DETECTORS
MP1650A/MP1651A
50 MHz to 3 GHz
MP1701A/MP1702A
50 MHz to 10 GHz



Features
- **Generates Clock With Low FM/PM Noise Clock generation by full adoption of frequency synthesizer circuitry**
- **Up to 512-kbit Long Programmable Pattern Enables STM-16 pattern generation in one frame**
- **PRBS Pattern of Variable Length from 2^7-1 to 2^{31} -1**
  Considering narrower spectral span and achieved 4.7 Hz at 10 GHz bit rate
- **Variable Mark Ratio PRBS Pattern**
  A new generation system enables putting more severe test to devices
- **Independent or Ganged Setting of DATA/$\overline{DATA}$ Amplitude/Offset values**
- **Complimentary Clock Output**
  Total three output available: CLOCK 1/$\overline{CLOCK\ 1}$ with variable amplitude/offset, and CLOCK 2 with fixed amplitude/offset
- **Four Channel Rear Panel Output with Variable Amplitude/Offset**
  The values can be set on front panel or via GP-IB.
- **MUX Function**
  Works as a byte to bit serial converter that converts eight separate input into one serial pattern output

Anritsu

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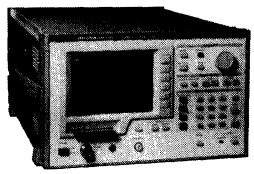
ELECTRONIC MEASURING INSTRUMENTS

for telecommunications equipment and systems

SPECTRUM ANALYZERS

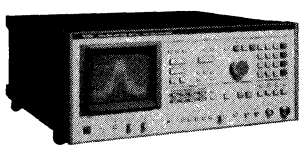
SPECTRUM ANALYZER
MS2601A
10 kHz to 2.2 GHz



Specifications
Frequency range: 10 kHz to 2.2 GHz
Frequency span: 1 kHz to 2000 MHz, 1-2-5 sequence, zero, 2200 MHz
Amplitude range: −130 to +20 dBm
Average noise level:
Second or third harmonic distortion: ≦ −75 dB (at −30 dBm input)
Residual response:
Automatic calibration: Level and frequency
Marker indication: NORMAL and Δ (0.05 dB resolution)
DC operation: DC operation is possible

PTA (option 01) Personal test language (PTL): a high-level measurement language
Software: supplied with ROM
Keyboard: one keyboard attached
Plug-in memory card (PMC): 32k bytes SRAM
Dimensions and weight: 177H × 284W × 450D mm, ≦ 18.5 kg

SPECTRUM ANALYZER
MS2802A
100 Hz to 32 GHz
(18 GHz to 325 GHz with external mixers)

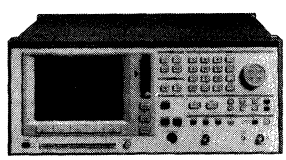


10 Hz resolution bandwidth
Average noise level,
< −135 dBm @ 1 GHz
< −110 dBm @ 32 GHz
Built-in frequency counter, 1 Hz resolution
Four display modes, including time/frequency domain
Variable width zone marker

PTA standard and PMC for mass storage
Two GPIB interfaces
Burst signal analysis
Dimensions and weight:
177H x 426W x 451D mm, < 26 kg

NETWORK ANALYZERS

NETWORK ANALYZER
MS3606B
10 kHz to 1 GHz

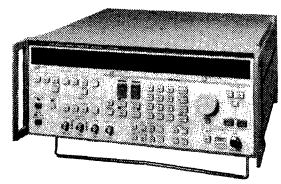


Wide dynamic range, 120 dB
Fast measurement speed, 400 μs/point
Resolution, 0.01 dB and 0.01 degrees
High resolution delay time measurement
PTA for customized program applications
Scalar analysis function with RF sensor

allows easy frequency conversion measurements
Dimensions and weight: < 27 kg

SIGNAL SOURCES

SYNTHESIZED SIGNAL GENERATOR
MG3633A
10 kHz to 2.7 GHz



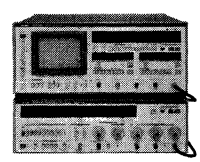
Abbreviated Specifications:

Carrier Frequency	**10 kHz to 2.7 Ghz**
Resolution	**0.01 Hz**
Switching Speed	**10 ms to within 500 Hz.**
Output level range	**-143 to +23 dBm**
Resolution	**0.1 dB**
Signal Purity	**Up to -140 dBc/Hz**
Harmonics	**-30 dBc**
Res FM	**0.8 Hz rms**
Res AM	**0.02% rms**

AM Modulation	**0% to 100%**
Resolution	**0.1%**
Accuracy	**+-5%**
FM Modulation	**0 up to 3.2 MHz (range dependent)**
Resolution	**10 Hz to 10 kHz (range dependent)**
Accuracy	**+-5%**

MICROWAVE MEASURING EQUIPMENT

MICROWAVE SYSTEM ANALYZER
ME453K/L/M, ME538K/L/M
70 MHz band ME453K/L/M
70/140 MHz bands ME538K/L/M

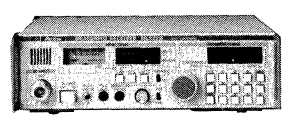


Measurements possible
Group delay
Modulator linearity and sensitivity
Demodulator linearity and sensitivity
Differential gain and phase
IF/BB amplitude response
IF/BB return loss

Frequency spectrum and deviation
Power, gain, and attenuation
AM to PM conversion coefficient
DC characteristics
IF band frequency

RADIO COMMUNICATION TEST EQUIPMENT

MEASURING RECEIVERS
ML521A/B, ML522A/B/C
ML521A/B . . . . . 25 to 300 MHz
ML522A/B/C . . . . . 300 to 1000 MHz
ML524A/B/C . . . . . 25 to 1000 MHz



Specifications
Frequency:
Range: 25,000 to 999.9875 MHz
Resolution: 15 kHz BW, 12.5 kHz
Memory: Up to 100 frequencies can be stored and recalled
Voltage measurement (e.m.f.):
Minimum value: 2 dBμV
Maximum value: 100 dBμV
Accuracy (digital display): ±2 dB

Field strength measurement:
Minimum value: −5 to 29 dBμV/m
Maximum value: 90 to 120 dBμV/m
Selectivity: 6 dB bandwidth: 15 ± 2 kHz
Image ratio: ≧ 90 dB (25,000 to 300,000 MHz)
Dimensions and weight: 60H × 210W × 255D mm, ≦ 4 kg

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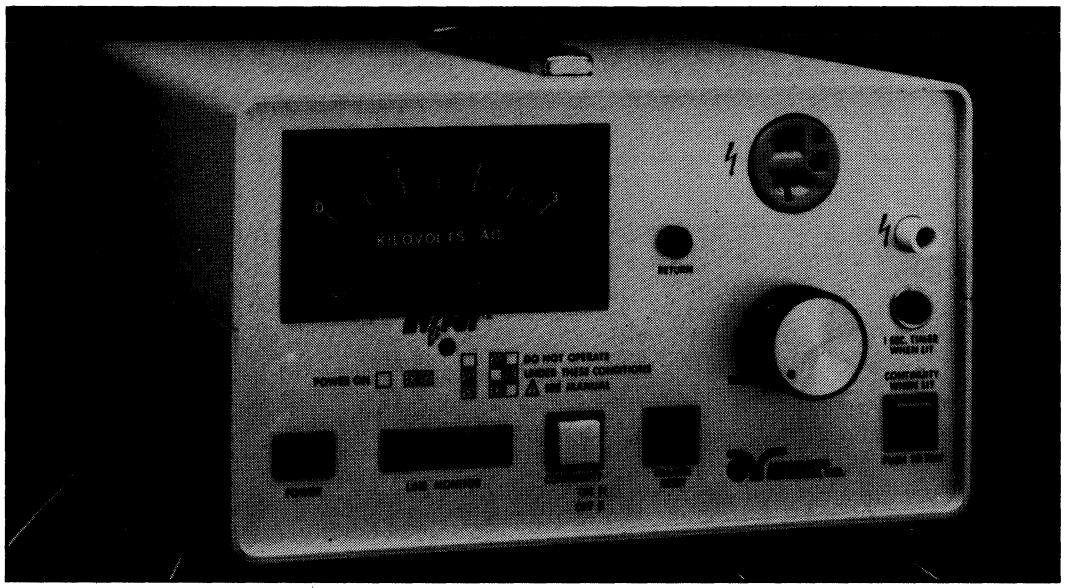
Associated Research's Broad Line of Hypot® Test Equipment



Assures that we have the dielectric withstand tester you need to meet your specific application.

A hipot (high potential) test checks for current leakage or electrical breakdown that can cause electric shock. Underwriter's Laboratory requires specific hipot test procedures for different product groups. Associated Research's full line of Hypot® testers meet UL and other agency requirements.

All Hypots from Associated Research feature:

- Operator Safety. Every Hypot has several built-in safety features, such as safety line monitor and test cables rated at 30KV, to protect your employees from electrical shock during hipot testing. Also available is our optional Safe-T-Probe™ Model No. SP02.
- Easy to set-up and operate. Heavy-duty color coded switches for readability and durability.
- Clear indication of product failure. Your personnel will know when a product has failed to pass the required hipot test.
- Easy to read meters accurately monitor high voltage output during hipot testing.

Depending upon the product you manufacture, you may require one or more of the following features in your hipot tester. Check the table below to select the Hypot model that meets your needs.

- Visual Failure Indicator: Warning light that comes on whenever a product fails the hipot test.
- Audible Failure Indicator: Loud, distinctive alarm that automatically sounds when a product fails the hipot test.
- Manual Reset: When the visual and audible warnings are triggered, the Hypot must be manually reset to continue product testing.
- Built-in Current Meter: Measures the current leakage during testing.
- One Second Timer: Built-in timer circuit automatically maintains high voltage output for one second for consistent testing. One second output is required for some UL test procedures.
- 120K Ohm Resistance: Provides minimum sensitivity adjustment as required for some UL test procedures.

Additional test procedures may require a Hypot accessory such as timers to maintain output voltage for 1 to 99 seconds or "ramp and dwell" which gradually raises voltage output to the test level and then maintains this voltage for 1 to 99 seconds.

Auxiliary relay contacts on some Hypots can be used to trigger an automatic reject mechanism to remove defective products from the production line.

Request our catalog for complete information on our Hypot testers and accessories.

Questions On Hipot Testing? Want Fast Order Service? Call our toll free service and sales number: 1-800-858-TEST.

HYPOT® QUICK SELECTION GUIDE

Model	Output	Visual Ind.	Audible Ind.	Manual Reset	Current Meter	Built In 1 Second Timer	Continuity	Dimensions (inches)	Dimensions (cm)	Weight (lb.)	Weight (Kg)	For UL Tests	For 120KΩ Test
403AI	0-3000 VAC	■	■	■				11 x 11 x 6½	27.94 x 27.94 x 16.51	13.50	6.12	■	
411AI	0-2500 VAC	■	■					11 x 11 x 6½	27.94 x 27.94 x 16.51	13.00	5.90		
414AI	0-6000 VAC	■	■					11 x 11 x 6½	27.94 x 27.94 x 16.51	14.75	6.70		
422AI	0-10,000 VAC	■	■					11 x 11 x 6½	27.94 x 27.94 x 16.51	20.50	9.30		
4030A	0-4000 VAC				■			13½ x 13½ x 8½	34.30 x 34.30 x 21.59	23.00	10.45		
4040AT	0-3000 VAC	■	■	■		■	■	11 x 11 x 6½	27.94 x 27.94 x 16.51	14.50	6.58	■	■
4045AI	0-5000 VAC/DC	■	■					11 x 11 x 6½	27.94 x 27.94 x 16.51	13.00	5.90		
4050AT	0-5000 VAC	■	■	■		■	■	11 x 11 x 6½	27.94 x 27.94 x 16.51	14.50	6.58	■	■
4450DT	0-4 KVAC/0-5 KVDC	■	■	■	■	■	■	12 x 12 x 7	30.48 x 30.48 x 17.78	14.25	6.46	■	■
5060AT	0-6 KVDC	■	■	■		■	■	11 x 11 x 6½	27.94 x 27.94 x 16.51	14.50	6.58	■	
115 VAC INPUT (230V AVAILABLE) AC ACCURACY 3% OF FULL SCALE, DC ACCURACY, 2% OF FULL SCALE.													

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Taking Quality and Value to the Highest Potential

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High Quality PLUS High Value HypotPLUS® Dielectric Withstand Testers

A revolution in digital testing technology-- Top quality equipment at an affordable price.

Now you can quickly, easily and safely perform any hipot test required by UL, CSA, VDE, IEC and other agencies. Sophisticated yet simple, the HypotPLUS is designed to test the electronic products of today. . . and tomorrow.

- **Solid State Electronic Voltage Control** performs smoothly without the use of typical variable transformers which induce noise and spikes into output test voltage.
- **Electronic Ramping with Acceleramp™ Circuit** electronically generates a linear voltage rate of rise while maintaining stable sinewave output.
- **Electronic Line and Load Regulation** maintains steady output voltage even when input voltage or load varies.
- **Posi-Test Current Sensing Circuits** ensure the test item is properly connected, eliminating the possibility of a false pass indication.
- **Complete Remote Input/Output** allows easy connection into any type of automated test system.
- **Monitor Panel** provides visual indication of test status and specific test item failure.
- **Built-In Dwell Timer Circuit** assures accurate compliance for timed tests.
- **Sophisticated Arc Detection Circuit** monitors even low level arcing.
- **10 Turn Leakage Adjust Controls** ensure precise current trip level setting.
- **Heavy Duty Color Coded Controls** are easy to use and designed to withstand years of production line use.
- **Rack Mountable** cabinet for easy installation into test systems. Tilt-up front feet for bench top use.
- **High voltage Indicator Light** alerts operator that high voltage has been activated.

Available in AC (5400DT) and AC/DC (5450DT) Models.
Units can be customized to your needs.

FUNCTIONAL SPECIFICATIONS

MODEL	5400DT	5450DT
DESCRIPTION	AC Hypot and Ground Continuity Test Set	AC/DC Hypot and Ground Continuity Test Set
INPUT	100-130VAC, 50/60Hz, Single phase, 4A 200-260VAC, 50/60Hz, Single phase, 2A Switch selectable	
FUSE	5A 250V 5 x 20 mm. Slow-Blow	
OUTPUT VOLTAGE	0-4KVAC, Continuously adjustable. No transients exceeding 120% of peak value. 1% output regulation over line input range and 120K to 2M load.	0-4KVAC/5KVDC, Continuously adjustable. No transients exceeding 120% of peak value. 1% output regulation over line input range and 120K to 2M load.
OUTPUT CURRENT	0-15 mA	(0-15 mA AC) (0-5 mA DC)
HIGH TRIP CURRENT RANGE	.25-15 mA adjustable with multiturn pot. Factory set for 5 mA	(.25-15 mA AC) (.25-5 mA DC) adjustable with multiturn pot. Factory set for 5 mA AC and 1 mA DC
LOW TRIP CURRENT RANGE	.1-10 mA adjustable with multiturn pot. Factory set for .5 mA	(.1-10 mA AC) (.1-5 mA DC) adjustable with multiturn pot. Factory set for .5 mA AC and DC.
CONTINUITY TRIP	.1 ohm maximum at .1A (25 amp test instrument also available)	
FAILURE DETECTOR	Audible and visual	
RAMP TIMER	0-99 Seconds in 1 second increments	
DWELL TIMER	0-99 Seconds in 1 second increments	
METERING		
Kilovolt	0-19.99 digital. Accuracy and Tracking ±1% of full scale ±1 Least Significant Digit	
Milliamps	0-19.99 digital. Accuracy and Tracking ±1% of full scale ± Least Significant Digit	
REMOTE I/O	Inputs: Test, Reset Outputs: Test in Process, Pass, High Fail, Low Fail, Arc Fail, Continuity Fail	
LINE CORD	Detachable 7½ foot (2.29m) input power cable terminated in a three prong grounding plug.	
HIGH VOLTAGE & RETURN/ CONTINUITY TERMINATIONS	High voltage three prong isolated grounding type receptacle allows device under test to be plugged directly into the dielectric withstand tester. Also equipped with removable five foot (1.52m) high voltage return/continuity leads.	
SIZE (WxHxD)	17 x 7.5 x 14.5 inches (431.8 x 190.5 x 368.3mm)	
WEIGHT	25 pounds (11.34 Kg)	

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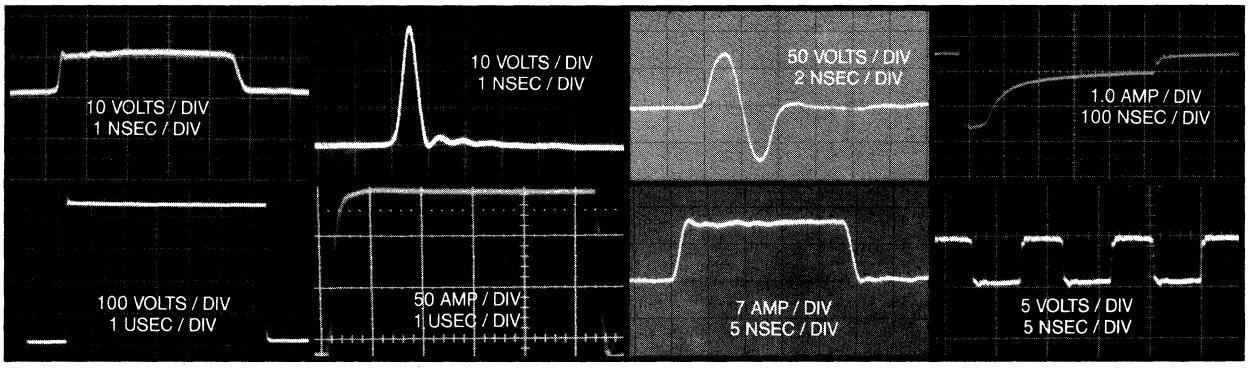
AVTECH

HIGH SPEED PULSE GENERATORS & ACCESSORIES



HIGH SPEED PULSE GENERATORS

MODEL	t_r (nsec)	V_{OUT}	PW (nsec)	PRF (MHz)	PRICE (US)
AVP-2S-C	0.04	2	0.2-4.0	0-1	3327
AVP-AV-1-C	0.1	10	0.2-4.0	0-1	2318
AVP-AV-HV3-C	0.15	40	0.4-2.0	0-1	2837
AVM-2-C	0.1	15	0.2-2.0	0-25	3089
AVMM-2-C	0.3-2.0	5	0.5-10	0-25	3642
AVMP-2-C	0.1	10	5-100	0-1	3089
AVPP-1-C	0.1	10	0.2-100	0-1	4449
AVN-3-C	0.15	15	0.2-1.0	50-250	3816
AVNN-1-C	0.1	5	1-30	25-250	3440
AVMR-2-C	0.3	20	20-200	0-10	2812
AVR-E1-W-C	0.3	20	0.1-5.0 usec	0-20 KHz	2998
AVI-V-C	0.3	50	2-100	0-20 KHz	2048
AVI-V-HV3-C	0.2	100	5-100	0-5 KHz	3445
AVL-3-C	0.5	350	5-100	0-5 KHz	3839

HIGH POWER PULSE GENERATORS

MODEL	t_r (nsec)	V_{OUT}	PW	PRF (KHz)	PRICE (US)
AVI-V-HV3-C	0.2	100	5-100 nsec	0-5	3445
AVR-E3-W-C	0.5	100	0.1-5.0 usec	0-5	3445
AVR-E2-C	0.5	50	20-200 nsec	0-20	3252
AVR-1-PW-C	10	200	0.1-5.0 usec	0-1	2349
AVR-3-PW-C	10	200	0.1-100 usec	0-1	3048
AVR-4-PW-C	20	400	0.1-5 usec	0-1	3869
AVR-5-PW-C	30	500	0.1-100 usec	0-1	4269
AVR-7-PW-C	50	700	0.1-100 usec	0-1	5269
AVR-E4-C	0.4	100	1.0-5.0 nsec	0-100	3869
AVR-D2-C	1.0	30	0.2-20 usec	0-5	4148
AVR-A-1-PW-C	10	200	50-1000 nsec	0-100	2473
AVL-3-C	0.5	350	5-100 nsec	0-5	3839
AVL-3A-C	0.5	170	5-400 nsec	0-5	3439
AVL-2-C	2	350	5-100 nsec	0-5	3039

HIGH-SPEED LASER DIODE DRIVERS

MODEL	I_{OUT} (mA)	t_r (nsec)	PW (nsec)	PRF (MHz)	PRICE (US)
AVO-9A-C	200	0.2	0.4-4.0	0-1	2818
AVO-9B-C	200	0.2	5-100	0-1	3589
AVO-9C-C	100	0.2	0.4-6.0	0-25	3589
AVO-9D-C	400	0.3	20-200	0-5	4011
AVO-9E-C	100	0.2	3-30	25-250	3940
AVO-9F-C	1000	0.5	20-200	0-50 KHz	3752
AVO-2W-C	10 Amp	2.0	2-50	0-20 KHz	2615
AVO-3A-C	70 Amp	1	2	0-20 KHz	2750

HIGH-POWER LASER DIODE DRIVERS

MODEL	I_{OUT} Amps	t_r (nsec)	PW	PRF (KHz)	PRICE (US)
AVO-5-C	28	3	5-100 nsec	5	3523
AVO-5B-C	48	10	25-500 nsec	1	3523
AVO-1	100	8	25 nsec	1	1365
AVO-7A-C	40	100	0.5-200 nsec	1	3869
AVO-6A-C	5	10	0.1-5 nsec	1	2849
AVO-8A-C	40	0.5 usec	1usec-1msec	1	4200
AVO-8B-C	100	1.0 usec	1usec-1msec	1	4690
AVO-8C-C	200	1.0 usec	1usec-1msec	1	4690

IMPULSE GENERATORS

MODEL	V_{OUT}	PW (nsec)	PRF (MHz)	PRICE (US)
AVH-S-1	0-10	0.130	0-1.0	1686
AVH	0-30	1.0	0-1.0	763
AVMH-3-C	0-50	0.6	0-25	3090
AVH-HV1	0-100	1.0	0-0.1	1812
AVG-1	0-250	4.0	0-0.02	1573
AVG-4-C	0-650	4.0	0-0.02	3990

MONOCYCLE GENERATORS

MODEL	V_{OUT}	F_O (MHz)	PRF (MHz)	PRICE (US)
AVD	20	400-1500	0-1.0	864
AVA	20	200-400	0-1.0	864
AVC-V	35	20-200	0-1.0	1017
AVB1	100	200-400	0-0.1	1833
AVB2-C	300	100-200	0-5 KHz	3449
AVB3-C	400	50-100	0-5 KHz	3990

PULSE AND CW AMPLIFIERS

MODEL	GAIN (db)	BW (MHz)	t_r (nsec)	PRICE (US)
AV-131	40	1-500	1.0	465
AV-132	20	1-500	1.0	349
AV-134	10	1-2000	0.3	606
AV-141	20	DC-2500	0.2	1034
AV-142	10	DC-100	3.0	770
AV-143	20	DC-75	4.0	770

SAMPLE AND HOLD AMPLIFIERS

-Two models
-Sample gate widths variable from 0.2 to 4 nsec and 4.0 to 20 nsec
-For one shot transient or repetitive inputs
-Unity gain
-Sampling rates to 100 KHz
-DC and 3 usec output signals

DELAY GENERATORS

-5 models
-30 to 150 nsec delays
-0.1 to 10 usec delays
-10 to 100 usec delays
-Jitter to 10 psec
-Will drive 50 ohms
-PRF to 50 MHz
-Combined delay-pulsers available

ACCESSORIES

TRANSFORMERS
-Rise times as low as 60 psec
-Inverting & matching types

SPLITTERS & COMBINERS
-Inverting & non-inverting
-100 psec rise times

BIAS INSERTION UNITS
-For CW and baseband pulses
-PW from 0.2 nsec to 100 usec

SCOPE PROBES
-5 GHz bandwidth
-100 psec rise time

SPECIALS

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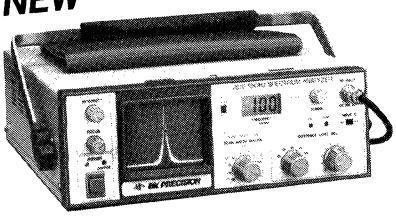
1.0 GHz PORTABLE BATTERY/AC/DC SPECTRUM ANALYZER

NEW



Model 2610 $2995.00

■ 1 MHz to 1 GHz frequency coverage ■ Fully portable for field service ■ Durable, metal case construction ■ Weighs less than 20 lbs ■ Measures only 4.5 x 11.8 x 13.4 inches ■ 12 VDC internal rechargeable battery or 12-15 VDC external source or AC power ■ Up to 1 hour battery operation after 2 hour recharge ■ Audible low battery indication ■ Bandwidth setting at fixed (1 MHz) fixes 3 dB bandwith at 1000 kHz regardless of scan width setting—ideal for observing video/TV/CATV signals ■ Switch selectable 50 ohms/75 ohm input ■ Field calibratible using internally generaged 100 MHz, 80 dBμV signal ■ Pemanently attached accessory pouch ■ Accessories included: AC power cord, DC source connector, 75 ohm input cable, BNC-to-F adaptor, CRT hood, adjustment screwdriver, spare fuses.

SPECIFICATIONS

FREQUENCY CHARACTERISTICS:
Measuring Frequency Range: 1 to 1000 MHz **Center Frequency Resolution:** 1 MHz **Center Frequency Accuracy:** ±3 MHz after calibration **Frequency Span and Resolution Bandwidths:**

Frequency Scan, MHz/DIV	3dB Bandwidth, kHz	
	NORM	FIXED
100	1000	1000
50		
20	300	
10		
5	100	
2		
1	30	
0.5		
0.2	10	
0.1		

Sweep Width: Approx. 3 ms/DIV; adjustable approx. 5%

AMPLITUDE CHARACTERISTICS:
Measurement Range: 15 to 123 dBμV (80 to 123 dBμV on panel and 15 to 80 dBμV on screen) **Dynamic Range:** 70 dB at frequencies above 10 MHz, 60 dB at frequencies below 10 MHz **Frequency Response:** Flat within ±2 dB **Display Scale:** 10 dB/DIV fixed, 8 divisions **Display Accuracy:** ±2 dB **Input Impedance:** 50Ω/75Ω, switch selectable, VSWR 1.5 at inputs over 100 dBμV
CALIBRATION OUTPUT SIGNAL:
Frequency: 100 MHz±10kHz (plus harmonics) **Amplitude:** 80 dBμV±0.5 dB (terminated into 75Ω) **Output Impedance:** 75 ohms
GENERAL:
CRT Type: 3.5 inch rectangular with internal graticule **Display Area:** 8×10 divisions (0.25"/DIV) **Center Frequency Indication:** 3-1/2 digit LCD display **Operating Temperature Range:** 0 to 40°C **Power Requirements:** AC: 100/115/215/230 V ±10%, 50/60 Hz; DC: 12 to 15 V, less than 1.2 A **Battery:** 12 V, 1.8 Ah internal rechargeable nickel-cadmium (1 hour or more continuous operation following 2 hour recharge cycle) **Dimensions (H×W×D):** Approx. 11.5×30×34 cm (4.5×11.8×13.4") **Weight:** Approx. 7.5 kg (16.5 lb.)

AUTO/MANUAL RANGING 3¾ DIGIT ANALOG BAR GRAPH DMMs

Model 2912 $149.00

■ 40 ranges ■ 0.3% DCV accuracy ■ 41 segment analog bar graph ■ Auto/Manual ranging ■ 4,000 count digital display ■ Large high contrast LCD ■ Audible continuity ■ 10-amp range ■ High-energy fuse ■ Diode check ■ Data hold and peak hold ■ Capacitance measurement ■ Frequency measurement to 400 kHz ■ Min-Max memory ■ Overload protected

Model 2911 $89.00

■ 20 ranges ■ 0.5% DCV accuracy ■ 41 segment analog bar graph ■ Auto/Manual ranging ■ 4,000 count digital display ■ Large high contrast LCD ■ Audible continuity ■ 10-amp range ■ Diode check ■ Overload protected

SPECIFICATIONS

DC VOLTAGE (Auto Ranging) Accuracy: 2912 ± (0.3% rdg + 1 dgt) **2911** ±(0.5% rdg + 1 dgt) **Resolution:** 0.1 mV (400 mV range; 500VDC, 350 VAC rms). **AC VOLTAGE (Auto Ranging)** Average responding reads rms value of sine-wave **Accuracy: 2912** ±(1% rdg + 1 dgt) 40-500 Hz **2911** ±(2% rdg + 4 dgts) 45 Hz-1 kHz **DC CURRENT (Auto Ranging) Basic Accuracy:** ±(1.5% rdg + 2 dgts) **Resolution:** 100nA **AC CURRENT (Auto Ranging)** Average responding reads rms value of sinewave **Accuracy: 2912** ± (2% rdg + 4 dgt) 40-500 Hz **2911** (10A) ±(2.5% rdg + 1 dgt) **Resolution:** 100nA **2912 RESISTANCE (Auto Ranging) Basic Accuracy:** ±(0.3% rdg + 1 dgts) **Resolution:** 0.1Ω **2911 RESISTANCE (Auto Ranging) Basic Accuracy:** ±(1% rdg + 1 dgt) **Resolution:** 0.1Ω
GENERAL SPECIFICATIONS:
Analog Bargraphs: 41 segment **Digital Display:** 3¾digit (3999 count) 14 mm digits **Temperature Range:** Operation: 0 to 50°C.,0-70% R.H. **Power Requirements:** Single 9V battery, NEDA 1604. **Battery Life:** Approx. 150 hours, 2912; (200 hours, 2911) alkaline battery **Dimensions:** (H×W×D): 17.2×8.1×3.3cm (6.8×3.2×1.3") **Weight:** 320g (13 oz.) including battery **Accessories Supplied:** Test leads (pair), spare fuse battery, instruction manual.

3½ DIGIT COMPACT DMMs

Model 2704 $65.00

■ 34 ranges ■ 0.5% DCV accuracy ■ Capacitance measurement ■ Transistor hFE measurement ■ Audible continuity ■ Diode check ■ 10 amp range ■ Overload protected

Model 2703 $44.00

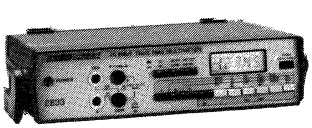
■ 19 ranges ■ 0.8% DCV accuracy ■ Audible continuity ■ Diode check ■ 10 amp range ■ Overload protected

SPECIFICATIONS

(Accuracy specified at 23°C.±5°, 75% max. R.H.) **DC VOLTAGE (Manual Ranging) Basic Accuracy: 2704** ±(0.5% rdg. + 1 dgt.) **2703** ± (0.8% reg. +1 dgt.) **Resolution:** 0.1mV **AC VOLTAGE Basic Accuracy: 50Hz-500Hz** ±(1.0% rdg. + 4 dgts.) **Resolution:** 0.1mV **Basic Accuracy:** ± (1.0% rdg. + 1 dgt.) **Resolution:** 100nA **AC CURRENT Basic Accuracy:** ±(1.2% rdg + 4 dgts.) 50Hz-500Hz **Resolution:** 100nA **RESISTANCE (Manual Ranging) Basic Accuracy:** ±(0.8% rdg. + 1 dgt.) **CAPACITANCE* Accuracy:** ±(3% rdg. + 10 dgts.) **Resolution:** 1pF **TRANSISTOR GAIN TEST (hFE)* Vce Voltage:** 3V **Gain Indication:** 0-1000. Base Current: 10 μA.

CONTINUITY CHECK.
DIODE TEST:
GENERAL SPECIFICATIONS:
Display: 3-1/2 digit LCD. (1999 counts.) **Temp. Range:** Operation: 0 to 50°C. 0-70% R.H. **Power Requirements:** Single 9V battery, NEDA 1604. **Battery Life:** 2704: 300 hrs; 2703: 200 hrs., Alkaline. **Dimensions** (H×W×D): 12.7×7.2×3.5 cm (5×2⅞×1⅜") **Weight:** 255g. (9 oz.) including battery. **Accessories Supplied:** Test leads (pair), battery, instruction manual. *Model 2704 Only

4½ DIGIT, TRUE RMS DMM



Model 2833 $356.00

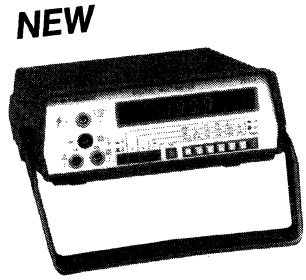
■ 4½ digit resolution ■ Basic accuracy: 0.05% (VDC) ■ True RMS reading ■ Data hold feature ■ Current to 20A DC and AC ■ Resistance to 20 MΩ ■ dBm from −48 dB to 62.21 dB ■ Frequency to 200 kHz ■ Audible continuity check, diode test ■ Overload protected

SPECIFICATIONS

AC/DC VOLTAGE (Manual Ranging) DC Accuracy: 0.05% + 3 counts Resolution: 10ΩV AC VOLTAGE (True rms, Manual Ranging) For input values greater than 10% f.s. Basic Accuracy: 45 H to 1 kHz ±(0.5% + 10 counts) Resolution: Same as DC Overload Protection: 1000 VDC or 1000 V AC rms max (200 mV range: 500 V DC or AC rms max.) DC CURRENT (Manual ranging) Basic Accuracy: ±(0.3% rdg. + 10 counts) AC CURRENT (True rms, AC coupled). RESISTANCE (Manual Ranging) Basic Accuracy: ±(0.2% + 5 cts. + 0.04Ω) FREQUENCY MEASUREMENT (Input to V jack) Resolution: 1Hz, 20 kHz; range 10 Hz, 200 kHz range. DATA HOLD Hold display reading; all functions and ranges. DISPLAY: 4½ digit (LCD (+ or − 19999 counts.)) Power Supply: 6 "C" size cells. (Not supplied) AC adapter (supplied). Battery Life: Approx. 1000 hr. with alkaline cells. Fuses: 250 V, 2A and 600 V, 4 A. Dimensions (W×H×D) 240×64×190 mm (9.4×2.5×7.5") (Less Handle). Weight: Approx. 1.68 kg 3¾ lb.) (Less batteries). ACCESSORIES SUPPLIED WITH MODEL 2833 AC Adapter. Safety test leads. Spare Fuse, 2A, 250V. Manual. Schematic Diagram & Parts List.

3½ DIGIT BENCH DMM

NEW



■ Bright, 0.5-inch LED display ■ 0.1% accuracy (DCV) ■ Measures current to 20A ■ Measures voltage to 1200 VDC or 1000 VAC ■ Audible continuity check ■ Diode test ■ Overload protection ■ Measures AC voltage and current to 40kHz

Model 2831A $295.00

SPECIFICATIONS

DC VOLTAGE Accuracy: ±(0.1% + 1 digit) **Resolution:** 0.1mV **AC VOLTAGE Basic Accuracy:** ±(0.5% + 4 digits) **Resolution:** 0.1mV **DC CURRENT Basic Accuracy:** ±(0.2% + 1 digit) **Resolution:** 100nA **AC CURRENT Basic Accuracy:** ±(1% + 4 digits) (40 Hz-2kHz) **Resolution:** 100nA **RESISTANCE Basic Accuracy:** ±(0.2% + 1 digit) **Resolution:** 0.1Ω

CONTINUITY CHECK.
DIODE TEST:
GENERAL SPECIFICATIONS:
Display: 3-1/2 digit 0.50-inch LED **Temp. Range:** Operation: 0 to 50°C., 0-70% R.H. (80% max R.H. to 35°C) **Power Requirements:** 120/240 VAC, 50/60 Hz (5W) **Dimensions** (H×W×D): 95 × 245 × 280 mm (3.7 × 9.6 × 11") **Weight:** 2.5 kg (5.5 lbs.) **ACCESSORIES SUPPLIED** Two test leads, Two spare 2A fuses, Instruction Manual

BK PRECISION / **FUNCTION GENERATORS FREQUENCY COUNTERS**
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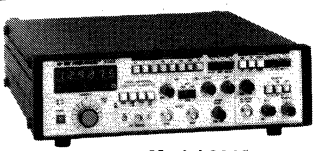
13 MHz UNIVERSAL FUNCTION GENERATOR WITH COUNTER

NEW

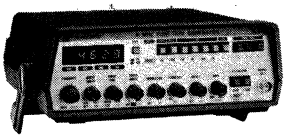


Model 3040
$1,195.00

- Sine, square, triangle, ramp, pulse, triggered, gated burst, TTL outputs
- Internal or external, AM or FM
- 6-digit 30 MHz internal/external frequency counter.
- 1000:1 linear sweep
- 0.1 Hz to 13 MHz frequency range

GENERAL
Power Source: 100/120/220/240 VAC ± 10%, 50/60 Hz
Dimensions: 31 x 9.9 x 38 cm (12.4″ x 4.8″ x 15″)
Weight: 5 kg (11.5 lb)

5 MHz SWEEP/FUNCTION GENERATOR WITH COUNTER



- 5-digit 0.3″ frequency counter for internal or external signals
- Generates sine, square, triangle, ramp, pulse, TTL pulse outputs
- 1000:1 LIN/LOG sweep
- Internal or external AM modulation
- Internal or external gated burst operations

Model 3026
$610.00

GENERAL
Power Source: 120/220/240 VAC ± 10%, 50/60 Hz
Dimensions: 21.4 x 9.5 x 28 cm (8.43″ x 3.74″ x 11.02″)
Weight: 3.175 kg (7 lb) without power cord

2 MHz SWEEP/FUNCTION GENERATOR WITH COUNTER

Model 3022
$450.00

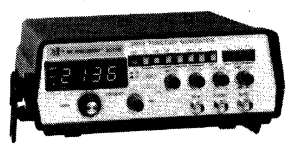
- Sine, square, triangle, ramp, pulse, TTL outputs with variable symmetry
- 5-digit internal/external frequency counter.
- Internal or external, AM or FM
- 0.2 Hz to 2 MHz
- 1000:1 LIN/LOG sweep

GENERAL
Power Source: 120/220/240 VAC ± 10%, 50/60 Hz. **Dimensions:** 25 x 9.5 x 28 cm (9.65″ x 3.74″ x 11.02″). **Weight:** 2.1 kg (4.6 lb)
Operating Environment: 0°C to 50°C (32°F to 122°F)
Ratings are specified at 25°C ±5°C

2 MHz SWEEP FUNCTION GENERATOR

- Similar to 3022 without counter **Model 3017A $330.00**

2 MHz FUNCTION GENERATOR



Model 3011B
$259.00

- 4-digit LED display
- Generates sine, triangle, square, pulse and ramp waveforms
- TTL pulse and CMOS pulse outputs
- Coars and fine frequency controls
- Variable DC offset, with on-off switch
- Variable duty cycle; CAL position for 50% duty cycle

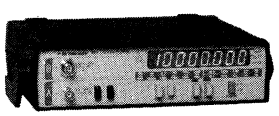
GENERAL
Operating Environment: 0-50°C (specified at 25°C ± 5°C.)
Power Source: 117/234 VAC 50/60 Hz, 8 W. Three-wire cord. CSA listed
Dimensions: (H x W x D): 8.1 x 29 x 20 cm (3.2″ x 11.3″ x 7.8″) including handle at rest position.
Weight: 1.3 kg (2.9 lb)

Model	3040	3026	3022	3017A	3011B
Freq. Range	0.1 Hz to 13 MHz	0.5 Hz to 5 MHz	0.2 Hz to 2 MHz	0.2 Hz to 2 MHz	0.2 Hz to 2 MHz
Sweep					
Lin	1000:1	1000:1	1000:1	1000:1	10:1 (Ext.)
Log	1000:1 (Ext.)	1000:1	1000:1	1000:1	10:1 (Ext.)
Sweep Start/ Stop				√	
Sweep Time (Max.)	100 sec.	2 sec.	30 sec.	30 sec.	
Sweep Output	0-4V	0-2V	0-2V		

Model	3040	3026	3022	3017A	3011B
Waveforms					
Sine	√	√	√	√	√
Square	√	√	√	√	√
Triangle	√	√	√	√	√
AM	Int./Ext.	Int./Ext.	Int./Ext.		
FM	Int./Ext.	Ext.	Int./Ext.	Ext.	Ext.
TTL	√	√	√	√	√
CMOS		√	√	√	√
Pulse	√	√	√	√	√
Tone Burst	Int./Ext.	Int./Ext.			

Model	3040	3026	3022	3017A	3011B
Var. Symmetry	20:80 to 80:20	1:20 to 20:1	1:20 to 20:1	1:10 to 10:1	1:10 to 10:1
Ext. Sweep/ Mod Input	0-2V	0-10V	0-10V	0-10V	0-10V
Counter Digits	6	5	5		4
EXT Freq. Counter	√	√	√		
DC Offset	√	√	√	√	√

NEW



Model 1856
$495.00

1.3 GHz MULTIFUNCTION COUNTER

- Frequency, period, period average, and totalize functions
- Selectable resolution
- 8 digit LED display
- Low pass filter
- Display hold
- Remote start-stop
- 0.5 PPM TCXO Time Base (23 ± 5°C)

SPECIFICATIONS

FREQUENCY CHARACTERISTICS
Range Channel A: kHz Mode: 5 Hz to 10 MHz sinewave. MHz Mode: 5 Hz to 100 MHz sinewave.
Prescale: 80 MHz to 1.3 GHz sinewave.
Accuracy: ± T.B. ± 1 count.

RESOLUTION
Channel A, kHz Mode: 0.1 Hz to 100 Hz, switch selectable in four decade steps.
Channel A, MHz Mode: 1 Hz to 1000 Hz, switch selectable in four decade steps.
Prescale: 10 Hz to 10 kHz, switch selectable in four decase steps.

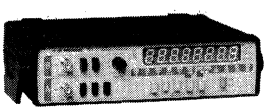
PERIOD CHARACTERISTICS
Range: 0.285 µs to 200,000 µs.
Frequency Range: 5 Hz to 3.5 MHz sinewave.
Accuracy: ± 1 count ± T.B. error ± trigger error.
Resolution: 100 ps to 100 ns. in four decade steps.
Display: µs with decimal point.
Minimum Pulse Width: 250 ns.

TOTALIZE CHARACTERISTICS
Range: 5 Hz to 10 MHz sinewave.
Capacity: 0 to 99,999,999 plus overflow LED.

DISPLAY CHARACTERISTICS
8 LED's: 0.56″ seven segment digits.
LED Indicators: for kHz, MHz, µSEC, GATE, and OVERflow indicators.

GENERAL
Power Requirements: 100/120/220/240 VAC ± 10%, 50/60 Hz.
Dimensions (H x W x D): 2.8 x 10.2 x 8.3″ (7 x 26 x 21 cm).
Weight: 3.3 lbs (1.5 kg)

NEW



Model 1823
$395.00

175 MHz DUAL CHANNEL UNIVERSAL COUNTER

- 5 Hz to 175 MHz range
- Frequency, period, period average, totalize, frequency ratio, and time interval functions
- 8 digit LED display
- 10 PPM time base, 0 to 40° C
- Trigger level and slope switch signal controls
- Display hold and reset feature
- External time base input

SPECIFICATIONS

FREQUENCY CHARACTERISTICS
Channel A:
Range: 5 Hz to 175 MHz; 5 Hz–10 MHz in kHz mode, 50 kHz–175 MHz in MHz mode.
Resolution: 0.1 Hz to 1 kHz, in decade steps.
Accuracy: ± 1 count T.B.

PERIOD CHARACTERISTICS
Channel A
Range: 0.5 µs to 200,000 µs.
Freq. Range: 5 Hz to 2 MHz sinewave.
Resolution: 100 ps to 100 ns in decade steps.
Accuracy: ± 1 count ± T.B.
Min. Pulse Width: 250 ns.
Average: 1, 10, 100 or 1000 cycles averaged.

RATIO CHARACTERISTICS
Channel A/B
Freq. Range A: 5 Hz to 10 MHz sinewave.
Freq. Range B: 5 Hz to 2 MHz sinewave.
Resolution: $\pm \frac{\text{Freq B}}{\text{Freq A} \times N}$ where N = 1, 10, 100, or 1000

Accuracy: $\pm$ (Freq B) + Freq (A + N) $\pm \frac{(\text{Freq B} \times \text{Trigger Error}^1)}{N}$

Display: Numerical ratio with decimal point.

TIME INTERVAL CHARACTERISTICS
Channel A to B
Range: 0.5µs to 200,000 µs.
Freq. Range: 5 Hz to 2 MHz sinewave.
Resolution: 100 ps to 100 ns in decade steps.

TOTALIZE CHARACTERISTICS
Channel A **Range:** 5 Hz to 10 MHz sinewave.
Count Capability: 0 to 99,999,999 before OVERflow.

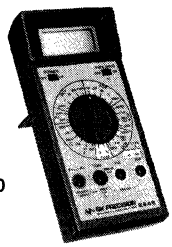
DISPLAY CHARACTERISTICS
8 LED's: 56″ seven-segment digits.
LED Indicator: For kHz/µSec, MHz/MSec, Gate and overflow indicators.

GENERAL
Power Requirements: 100/120/220/240 VAC ± 10%, 50/60 Hz.
Dimensions: (H x W x D): 2.8 x 10.2 x 8.3″ (7 x 26 x 21 cm).
Weight: 4 lbs. (1.8 kg).

BK PRECISION / DIGITAL MULTIMETERS COMPONENT TESTERS

MAXTEC INTERNATIONAL CORP.
6470 W. Cortland St. • Chicago, IL 60635 • 312-889-9295 • TELEX #210017 • FAX 312-794-9740

4½ DIGIT DMMs



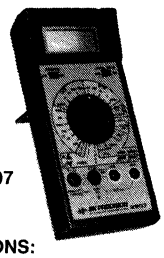
Model 2940
$160.00

■ **0.05% DCV accuracy** ■ **Measures volts to 1000 VDC, and 750 VAC; amps to 10 A DC and AC; and ohms to 20 MΩ** ■ **Includes frequency measurement to 200 kHz** ■ **Data hold** ■ **Diode test** ■ **High energy fuse** ■ **Drop resistant case—4 foot**

SPECIFICATIONS:

Accuracy specified at 23°C. ±5°, 75% max. R.H.) **Accuracy:** ±(0.05% rdg. + 3 dgts.) **Resolution:** 10 µV. **Input Impedance:** 10 mΩ.
AC VOLTAGE:
(Manual Ranging): Average responding reads rms value of sinewave. **Input Impedance:** 10 MΩ, < 100 pF. **Basic Accuracy:** ±(0.75% rdg + 20 dgt). 40 Hz-1 kHz.
DC CURRENT:
Basic Accuracy: ±(0.3% rdg. + 3 dgts.) **Resolution:** 10 nA.
AC CURRENT:
Average responding, reads rms value of sinewave. **Basic Accuracy:** ±(1.0% rdg. + 20 dgts.) 40 Hz to 1 kHz. **Resolution:** 10 nA.
RESISTANCE:
Basic Accuracy: ±(0.1% rdg. + 5 dgts.) **Resolution:** 0.01Ω.
FREQUENCY COUNTER:
Range: 20 Hz to 200 kHz. **Accuracy:** ±(0.5% of range + 1 dgt.) **Sensitivity:** 100 mV.
CONTINUITY CHECK.
DIODE TEST:
Display: Forward junction voltage.
GENERAL SPECIFICATIONS:
Display: 4½ digit 0.67-inch LCD. (19999 counts.) **Sampling:** 2.5 times/sec (nominal). **Temp. Range:** Operation: 0 to 50°C., 0-70% R.H. **Power:** Single 9 V battery, NEDA 1604. Approx. 200 hours, alkaline cell. **Dimensions:** (H x W x D): 19 x 9 x 3.5 cm (7.5 x 3.6 x 1.4"). **Weight:** 370 g (13 oz) including battery.
ACCESSORIES SUPPLIED:
Test leads (pair), spare fuse (2A), battery, instruction manual.

3½ DIGIT TRUE RMS DMMs



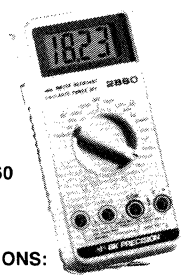
Model 2907
$195.00

■ **0.01% DCV accuracy** ■ **Measures volts to 1000 VDC and 750 VAC; DC/AC amps to 10 A; and ohms to 20 MΩ** ■ **Logic level measurement and peak hold** ■ **Capacitance measurement to 20µF** ■ **Manual Range Selection** ■ **Audible continuity check** ■ **Diode test** ■ **High energy fuse** ■ **Drop resistant case—4 foot** ■ **Overload protected**

SPECIFICATIONS:

Basic Accuracy: ±(0.1% + 1 dgt.) **Resolution:** 100 µV. **Input Impedance:** 10 mΩ.
AC VOLTAGE:
Average responding reads rms value of sinewave. **Basic Accuracy:** 2907 ±(0.75% rdg + 3 dgts.). **Resolution:** 100 µV. **Input Impedance:** 10 MΩ, < 100 pF.
DC CURRENT:
Basic Accuracy: ±(1.0% rdg. + 1 dgt.) **Resolution:** 100 nA.
AC CURRENT:
Average responding reads rms value of sinewave. **Basic Accuracy:** 40 Hz-1 kHz ±(1.5% rdg. + 3 dgts.)
RESISTANCE:
Basic Accuracy: ±(0.2% rdg. + 1 dgt.)
CAPACITANCE:
(Test Freq. 300 Hz) **Resolution:** 2 nF. **Accuracy:** ±(2% of reading + 4 dgts.)
CONTINUITY CHECK.
DIODE TEST:
Display: Forward junction voltage.
GENERAL SPECIFICATIONS:
Display: 3½ digit LCD. (1999 counts.) **Sampling:** 2.5 times/sec (nominal). **Temp. Range:** Operation: 0 to 50°C., 0-70% R.H. **Power:** Single 9 V battery, NEDA 1604. **Battery Life:** Approx. 150 hours, alkaline battery. **Dimensions:** (H x W x D): 19 x 9 x 3.5 cm (7.5 x 3.6 x 1.4"), max. height at tilted window 4.5 cm (1.75"). **Weight:** 370 g (13 oz) including battery.
ACCESSORIES SUPPLIED:
Test leads (pair), spare fuse, battery, instruction manual.

3½ DIGIT RUGGEDIZED DMM



Model 2860
$99.00

■ **Ruggedized construction** ■ **Water resistant case** ■ **Auto power off saves batteries** ■ **Probe holder** ■ **Audible continuity** ■ **20-amp range** ■ **High-energy fuse** ■ **Large 0.8" LCD display** ■ **Overload Protected**

SPECIFICATIONS:

DC VOLTAGE:
Input Impedance: 10 MΩ. **Basic Accuracy:** ±(0.5% rdg. + 1 dig.) **Resolution:** 0.1 mV.
AC VOLTAGE:
Average responding reads rms value of sinewave. **Input Impedance:** 10 MΩ, < 100 pF. **Basic Accuracy:** 40 Hz-500 Hz ±(1.25% of rdg + 4 dig). **Resolution:** 0.1 mV.
DC CURRENT:
Basic Accuracy: ±(0.1% rdg. + 1 dgt.) **Resolution:** 10 nA.
AC CURRENT:
Average responding, reads rms value of sinewave. **Basic Accuracy:** ±(1.5% rdg. + 3 dgts.) 40 Hz to 500 Hz. **Resolution:** 10 nA.
RESISTANCE:
Basic Accuracy: ±(0.75% rdg. + 4 dgts.) **Resolution:** 0.1 Ω
CONTINUITY CHECK.
DIODE TEST:
Display: Forward junction voltage.
GENERAL SPECIFICATIONS:
Display: 3½ digit 0.8-inch high contrast LCD readout. (1999 counts.) **Sampling:** 3 times/sec (nominal). **Temp. Range:** Operation: 0 to 50°C., 0-70% R.H. **Power:** Single 9 V battery, NEDA 1604. **Battery Life:** Approx. 300 hours, alkaline cell. **Dimensions:** (H x W x D): 17.5 x 8.4 x 3.1 cm (6⅞ x 3⅜ x 1¼"). **Weight:** 345 g (12 oz).
ACCESSORIES SUPPLIED:
Test leads (pair), spare fuse, Battery Instruction Manual.

3½ DIGIT HANDY AUTORANGING DMM

NEW

Model 2701
$59.00

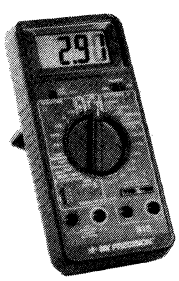
■ **Autoranging operation** ■ **Measures DCV, ACV, DCA, ACA ohms** ■ **Check diodes and continuity** ■ **Data hold freezes displayed reading** ■ **Single-handed operation** ■ **Built-in test probe holder** ■ **Large 0.5" 3½ digit LCD readout** ■ **Hi-Lo ohms** ■ **Built-in belt clip** ■ **Includes carrying case** ■ **Overload protected**

SPECIFICATIONS:

DC VOLTAGE (Autoranging):
Accuracy: ±(0.5% rdg. + 1 dgt.) **Resolution:** 0.1 mV. **Input Impedance:** 10 mΩ. **Overload Protection:** 1100 VDC, 1100 VAC rms.
AC VOLTAGE (Autoranging):
Basic Accuracy: ±(1.25% rdg + 5 dgts). **Resolution:** 1 mV. **Input Impedance:** 10 MΩ, < 100 pF.
DC CURRENT (Manual Ranging):
Accuracy: ±(0.75% rdg. + 1 dgt.) **Resolution:** 10 µA.
AC CURRENT (Manual Ranging):
Accuracy: ±(1.25% rdg. + 5 dgts.) 40 Hz-500 Hz. **Resolution:** 0.1 Ω.
RESISTANCE (Autoranging):
Basic Accuracy: ±(0.75% rdg. + 4 dgts.) **Resolution:** 0.1Ω.
CONTINUITY CHECK.
DIODE TEST:
Open Circuit Voltage: 3.3 V max.
GENERAL SPECIFICATIONS:
Display: 3½ digit 0.5-inch LCD. (1999 counts.) **Sampling:** 2 times/sec (nominal). **Temp. Range:** Operation: 0 to 50°C., 0-70% R.H. **Storage:** −20° to 60°C., 0-80% R.H. w/o battery. **Power:** Single 9 V battery, NEDA 1604. **Battery Life:** 400 hours, alkaline. **Dimensions:** (H x W x D): 6.9 x 2.3 x 1". **Weight:** 7 oz including battery.
ACCESSORIES SUPPLIED:
Test leads (pair), storage pouch, instruction manual.

HAND-HELD PARTS TESTER

■ **Large 0.8" digit, high contrast LCD readout** ■ **26 user ranges for versatile test selection** ■ **Tests resistance from 0.1 ohm through 20 M ohm** ■ **Tests transistors, SCRs, diodes and LEDs** ■ **Tests batteries under actual loaded conditions** ■ **5 foot drop-proof, heavy duty case** ■ **Tilt stand for benchtop use**



Model 815
$104.00

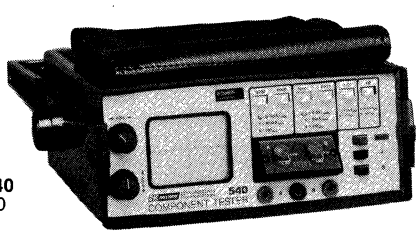
SPECIFICATIONS:

Accuracy specified at 23°C. ±5°, 75% max. R.H.)
CAPACITANCE
Range: 9 (200 PF, 2 nF, 20 nF, 200 nF, 2µF, 200 mF, 2000 µF, 20 mF, 200 µF). **Accuracy:** 200 pF: ± (0.75% rdg. + 1 dgt. + 5 pF). 2 nF-200 µF: ±(0.5% rdg. + 1 dgt.). 2000 µF: ±(1.0 rdg. + 1 dgt.). 20 mF: ±(1.5 rdg. + 1 dgt.).
RESISTANCE:

Range	Resolution	Accuracy
200Ω	0.1Ω	±(0.75% rdg. + 4 dgts.)
2kΩ 20kΩ 200kΩ	1Ω 10Ω 100Ω	±(0.5% rdg. + 1 dgt.)
2MΩ	1kΩ	±(0.75% rdg. + 1 dgt.)
20MΩ	10kΩ	±(1.5% rdg. + 5 dgts.)

Overload Protection: 500 VDC or AC rms max. **Transistor hFE Test, Transistor Leakage Iceo Test:** 0 ~ 1000 hFE values either PNP or NPN transistor.
DIODE TEST:
Display: Forward junction voltage.
LED TEST:
Test Voltage: 3.2 V max.
BATTERY TEST:
Display: Loaded Cell Voltage.
GENERAL SPECIFICATIONS:
Display: 3½ digit 0.8-inch high contrast LCD readout. (1999 counts.) **Measurement Rate:** 2 times/sec (nominal). **Operating Temperature:** 0 to +50°C (below 80% R.H.) **Power:** Single 9 V transistor battery, NEDA 1604 or 1604A. **Dimensions:** (H x W x D): 17.5 x 8.4 x 3.1 cm (6⅞ x 3⅜ x 1¼"). **Weight:** 345 gms (12 oz).
ACCESSORIES SUPPLIED:
Test leads (pair), spare fuse, battery, instruction manual.

COMPONENT TESTER



Model 540
$1,095.00

FAULT LOCATE FUNCTION: ■ **Tracks fault to single component on unpowered board** ■ **Permits in-circuit testing** ■ **Provides easy comparison of failed circuit with known good unit** ■ **Specific circuit knowledge and schematic not required**

CURVE TRACE FUNCTION: ■ **Allows transistor selection and matching** ■ **All probes and interconnecting leads are included and are housed in a pouch on top of the instrument**

SPECIFICATIONS:

Ranges: LO-Open circuit voltage 12 V peak. Short circuit current 125mA peak. Hi-Open circuit voltage 60 V peak. Short circuit current 1.5 mA peak.
NPN/PNP: I_B 7 steps of 100µA. Display sensitivity I_C 8 divs at 2 mA/div. V_{CE} 10 divs at 2 V/div.
NFET/PFET-VGS: 7 steps of 0.5V. Display sensitivity I_D 8 divs at 2 mA/div V_{DS} 10 divs at 2 V/div. **Display:** Integral cathode ray tube display. **Magnifier:** Will increase X and Y sensitivities by x3 (approx.). **Power:** 100-125 VAC or 200-250 VAC 50/60 Hz 12W. **Dimensions:** (H x W x D) 3.8 x 10.2 x 10.2" (97 x 260 x 260 mm). **Weight:** 1.8 lbs (.82 kg).
ACCESSORIES INCLUDED:
Probes, interconnecting leads and user manual, all housed in pouch on top of unit.

Hall Effect Gaussmeters

ALL NEW!
State-of-the-Art
9000 Series
Gaussmeters

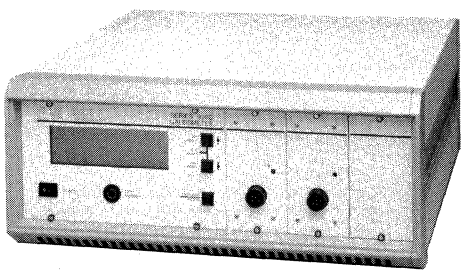
The new 9000 Series gaussmeters represent a major advance in gaussmeter technology. The series includes circuit refinements and user features never before available in this type of instrument.

Most F.W. Bell gaussmeters display either in gauss or tesla and all are microprocessor-based for optimum performance. The 9900 and 9500 are menu-driven.

The new 9000 Series gaussmeters are based on time-proven F.W. Bell technology and quality, plus they have been updated with state-of-the-art circuitry and software capabilities. The 9000 Series assures accuracy and flexibility for the performance of intricate, detailed measurements never before available with a single gaussmeter.

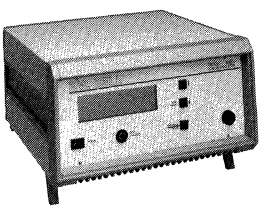
F.W. Bell's proven line of 110 standard probes has been upgraded to the fourth generation, providing increased accuracy and reliability. Probes for use with the 9900 are available for frequencies up to 50 kHz.

SERIES 9900



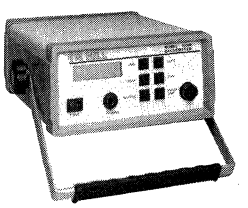
This top-of-the-line series includes 3 models, providing up to three channels for continuous measurements. The display can give the user up to three 4½-digit displays, with or without bar graphs, simultaneously. Other unique features are dc to 50 kHz, peak-hold, dynamic correction, self-diagnostics, probe compensation, IEEE-488 bus, RS-232 port, and a three-volt, full-scale output.

MODEL 9500



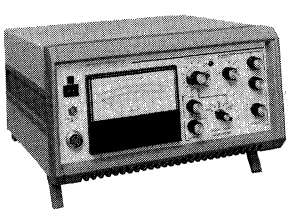
The 9500 is a single channel version of the 9900 and offers the option of the IEEE-488 bus output as well as the RS-232 output.

MODEL 9200



The 9200 offers a 3½ digit LCD, with auto ranging peak-hold. It is portable with built-in battery and recharging circuit. The RS-232 port is optional.

MODEL 9640

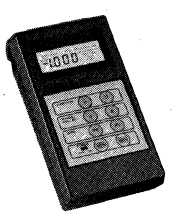


1000X scale expansion with zero-center analog meter readout permits direct measurement of small incremental variations. Twelve ranges, overlapping from 0.1 gauss to 30 kilogauss. Analog outputs of 1 and 5 Vdc are provided.

MODEL 4048

Hand-Held Gauss/Tesla Meter

A hand-held unit utilizing the basics of Bell technology to provide a fully portable, easy-to-use, easy-to-read digital gauss/tesla meter.



SPECIFICATIONS

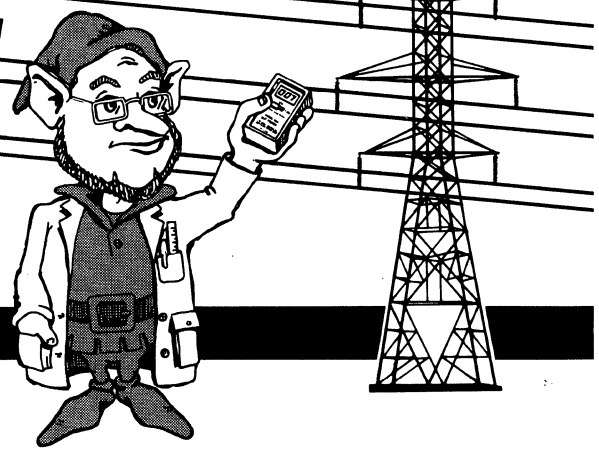
Model	Range (decade steps)	Accuracy	Frequency	Output
9900	3 G to 3 MG	0.1%	dc to 50 kHz	Analog, IEEE-488 & RS-232
9640	0.1 G to 30 kG	0.25%	dc to 400 Hz	Analog only
9500	3 G to 300 kG	0.25%	dc to 10 kHz	Analog, (IEEE-488 & RS-232 are optional)
9200	20 G to 200 kG	1.0%	dc to 10 kHz	Analog, (RS-232 is optional)
4048	200 G to 20 kG	2.0%	dc to 3 kHz	None

F.W. BELL

Request free technical data!

6120 Hanging Moss Road • Orlando, FL 32807
Phone: 407-678-6900 • FAX: 407-677-5765

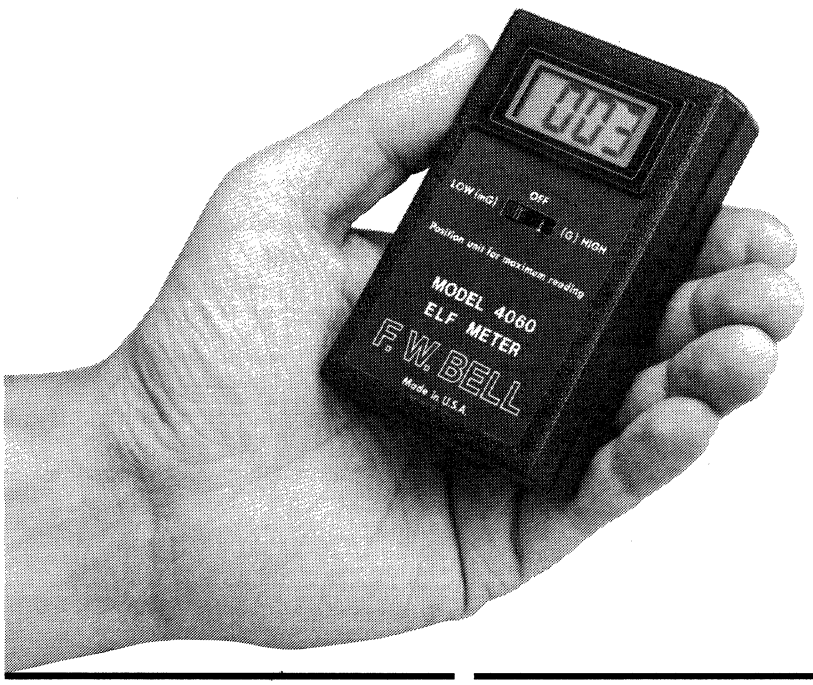
MODEL 4060 ELF METER



MEASURES EXTREMELY LOW FREQUENCY MAGNETIC FIELDS

Extremely Low Frequency magnetic fields are generated by scores of electrical devices ranging from electrical transmission lines to electric blankets. The F.W. Bell Model 4060 ELF Meter measures these fields easily. The large 3½-digit readout indicates the field strength in either milligauss or gauss, depending on the setting.

Model 4060 technology is based on the long line of industrial and laboratory grade gaussmeters (magnetic field measuring instruments) designed and manufactured by F.W. Bell.



Check EMF Generated by:

- *Power Transmission Lines*
- *Computers* • *TVs*
- *Electric Blankets*
- *Electric Appliances*
- *Other Electrical Devices*

SPECIFICATIONS

RANGE: Low: 1 mG to 1.999 G
High: 10 mG to 5.000 G

ACCURACY: ±1% (Typical)

FREQUENCY: 60 Hz ±0.1 Hz 60 Hz Model
50 Hz ±0.1 Hz 50 Hz Model

RESOLUTION: 1 mG/10 mG

OPERATING/STORAGE TEMPERATURE RANGE:
14°F to 122°F (-10°C to +50°C)

SIZE: 2.4" (61 cm) wide x 3.8" (96.5 cm) long x 1" (25.4 cm) thick

WEIGHT: 4.5 oz. (126 g) with battery

• *Single-button Operation*
• *Large 3½-digit Display*
• *50 & 60 Hz Models*

Request Technical Data Today.

F.W. BELL

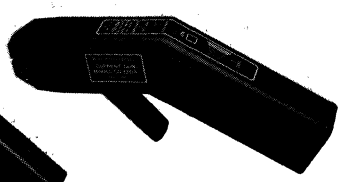
6120 Hanging Moss Road
Orlando, FL 32807
ELF HOTLINE: 407-678-7308

Hand-held Non-contact Meters and Probes to Measure Current & Power

This broad line of hand-held, non-contact meters, and probes include models for measuring current and power. The meters have a digital readout located in the handle, while the probes are used in conjunction with multi-meters, scopes, or recorders.

Models to Handle Conductors up to 2 3/8" Dia.

UM SERIES



CG SERIES

SPECIFICATIONS

Model	Operating Range	Accuracy	Frequency Response	Output	Readout
CG-100A	±10 A (dc or ac) ±100 A (dc or ac)	±2.0% of rated output	dc to 1 kHz, operable to 5.0 kHz	±1.0 V at 10 A ±1.0 V at 100 A	N/A
CG-103A	±50 A (dc or ac) ±500 A (dc or ac)	±2.5% of rated output	dc to 1 kHz	±0.5 V at 50 A ±0.5 V at 500 A	N/A
CG-120A	±50 A (dc or ac) ±500 A (dc or ac)	dc to 150 Hz ±5% of reading; ±5.0 A 151 to 400 Hz ±8% of reading 401 to 1000 Hz ±15% of reading	dc to 1 kHz	±0.5 V at 50 A ±0.5 V at 500 A	N/A
CG-100D	±200 A (dc or ac)	dc or ac (15 Hz to 100 Hz) ±0.75% FS to 100 A (101 Hz to 1 kHz) ±1.5% FS to 100 A	dc to 1 kHz	±2.0 V at 200 A	3½ digit LCD with 5-second readout hold
CG-104D	±500 A (dc or ac)	dc or ac (15 Hz to 100 Hz) ±2.5% FS (101 Hz to 1 kHz) ±3.5% FS	dc to 1 kHz	±0.5 V at 500 A	3½ digit LCD with 5-second readout hold
UM-1000	±1 A to 1000 A (dc or ac) (100% overrange)	Current: dc: ±1 to 700 A, ±1.5% of reading, ±2.0 A 701 to 1000 A, ±2.5% of reading, ±2.0 A ac (0.1 Hz to 100 Hz): 1 to 700 A, ±2.5% of reading, ±1.5 A, 701 to 1000 A, ±4.5% of reading, ±1.5 A For frequencies 101 Hz to 500 Hz, add ±2.5% to above reading	dc to 500 Hz	±1 mV/A	N/A
UM-7700	±1 A to 1000 A dc ±1 A to 1000 A ac 0.1 kW to 330 kW ac (90 to 660 Vac, 1-500 A ac) Useable from 0.1 to 1500 A dc, 0.1 to 1200 A ac, 0.1 to 700 A ac in power mode	Current: dc: ±1 to 700 A ±1.5% of reading, ±2.0 A 701 to 1000 A, ±2.5% of reading, ±2.0 A ac (48 Hz to 62 Hz): 1 to 500 A, ±1.5% of reading, ±1.5 A 501 to 700 A, ±2.5% of reading 701 to 1000 A, ±4.5% of reading Power: 0.10 to 330 kW ac ±2.5% of reading, +500 W	Current: dc to 500 Hz Power: 50/60 Hz, 400 Hz	±1 mVdc/input ampere dc, 1 mVac/input ampere ac, ±1 mVdc/input kW ac	N/A
UM-7900*	±1 to 25 A dc ±25 to 1400 A dc 1 to 25 A ac 25 to 1000 A ac	Current: dc: ±1.0% of reading, ±1.5 A ±1.5% of reading, ±3.0 A ac: ±1.0% of reading, ±1.5 A ±1.5% of reading, ±3.0 A	dc, 45 to 60 Hz and 380 to 420 Hz	RS-232, Serial Interface (1200 Baud Rate)	3½ digit LCD

**Also measures ac current, ac voltage, frequency, phase angle, power factor, actual power, apparent power, reactive power.*

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BNC

Pulse Generators

• High Speed • Digital Delay • Optical Pulse • Fast Rise Time • High Voltage

Universal Pulse and Delay Generator System

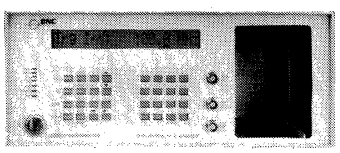
BNC's Model 6040 Pulse System consists of a 100 MHz mainframe pulse source and a series of plug-in modules that produces a variety of both electrical and optical pulses at rates to 700 MHz.

The 6040 mainframe alone serves as a general purpose 5 V and ECL pulse source and trigger-synchronized digital delay generator with up to 1 ns-step resolution. The family of plug-in modules adapts the instrument to an unprecedented choice of additional uses. They include 150 ps transition time logic level operation at rates to 500 MHz and other functions where amplitudes to ±20 V or ±300 V with fast rise times and rep rates are needed. By installing optical output modules, the 6040 can be quickly transformed into a light pulse generator of various wavelengths that can also be externally modulated or provide CW outputs.

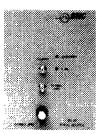
Through use of a crystal-controlled time base, the 6040 System offers frequency accuracy of .01% and delay syncing performance with jitter as low as 25 ps. Both IEEE-488 GPIB and RS-232 programmability are provided along with internal memory storage of parameter settings. The Model 6040 System sets a new standard of pulse generating capabilities and instrument value. Principal specifications for the 6040 mainframe and plug-in modules follow.

MODEL	Output Pulses	Maximum Output	Maximum Frequencies Internal	Ext. Drive	Ext. Mod.	Transition Times Rise	Fall	Pulse Width	Delay* Range	Price (USA)
6040	**Electrical**	5 V/ECL	100 MHz	—	—	1/.7 ns	1.5/.7 ns	3 ns–640 s	0 ns–640 s	$4250
201E	**Electrical**	–5 V/5 V	100 MHz	500 MHz	—	200 ps	200 ps	1 ns–640 s	0 ns–640 s	$2900
202H	**Electrical**	–300 V/300 V	1 MHz	—	—	5 ns	5 ns	12 ns–640 s	0 ns–640 s	$3650
203E	**Electrical**	–20 V/20 V	50 MHz	50 MHz	—	1 ns	1 ns	5 ns–640 s	0 ns–640 s	$3500
085	**Optical 850 nm**	2 mW	100 MHz	300 MHz	400 MHz	1 ns	1 ns	500 ps–CW	0 ns–640 s	$5500
106H	**Optical 1064 nm**	50 mW	2 kHz	—	—	1 ns	5 ns	5 ns–50 ns	0 ns–640 s	$14750
130	**Optical 1310 nm**	1 mW	100 MHz	300 MHz	700 MHz	1 ns	1 ns	400 ps–CW	0 ns–640 s	$6950
150	**Optical 1550 nm**	1 mW	100 MHz	300 MHz	700 MHz	1 ns	1 ns	400 ps–CW	0 ns–640 s	$8950

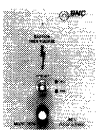
Refer to product data sheets for complete performance information and conditions. *See table below for additional delay specifications.



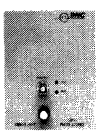
MODEL 6040



MODEL 201E

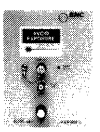


MODEL 202H



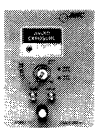
MODEL 203E

MODEL 085



MODEL 106H

MODEL 130



MODEL 155

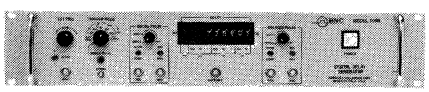
Digital Delay Generators

Digital Delay Generators provide accurate, repeatable control of time. DDGs are a source of stable intervals, pulses, impulses and gates produced as low-jitter outputs for precise triggering, gating, syncing, delaying, blanking, etc. Remote IEEE-488 or BCD programmability is available. Model AP-3 portable or TB-4 rack power supplies house the DC powered (NIM) models. Key specifications are below.

MODEL	Time Resolution	Time Range	Optional Range	Insertion Delay	Indeterminacy	Jitter (RMS)	Trigger Rate	Sensitivity	Oper. Modes	Power Requirements	Price (USA)
7095	50 ps	0–10 µs	0–10 ms[1]	65 ns	None	30 ps	0–5 MHz	200 mV	D,G,I	115/230 VAC	$8635
7030A	1 ns	0–100 µs	—	80 ns	None	50 ps	0–10 MHz	250 mV	D,G	±6, ±12, –24V	$4595
7065	1 ns	0–1 ms	0–1 s[1]	85 ns	None	50 ps	0–5 MHz	200 mV	D,G	115/230 VAC	$6225
7075	1 ns	0–1 ms	0–1 s[1]	85 ns	None	50 ps	0–5 MHz	200 mV	D,G	115/230 VAC	$7115
7085	1 ns	0–100 ms[2]	—	150 ns	None	50 ps	0–5 MHz	200 mV	D/W	115/230 VAC	$9380
7050	10 ns	0–10 ms	0-1 s[1]	55 ns	±5 ns	100 ps	0–5 MHz	200 mV	D,G,P	±6V	$3250
7055	10 ns	0–10 ms	0–1 s[1]	55 ns	±5 ns	100 ps	0–5 MHz	200 mV	D,G,P	115/230 VAC	$4075
7020	100 ns	0–10 ms	0–10 s[1]	110 ns	±50 ns	100 ps	0–1 MHz	100 mV	D,G	±6, ±12V	$2295
7010	100 ns to 1 ms	0–10 ms to 0–100 s[3]		120 ns	±50 ns	500 ps	0–1 MHz	2V	D,G,P E,B[4]	115/230 VAC	$1635
6040	1 ns to 10 ms	0–10 µs to 0–640 s[2]	—	25 ns	None	25 ps[5]	0–100 MHz	100 mV	D/W F,I[6],T	115/230 VAC	$4250

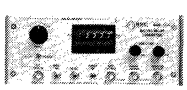
Operating Modes: D—Delay; G—Gate; I—Impulse; D/W—Delay/Width; F—Frequency; P—Period; E—Divide Events; B—Counted Burst; T—Double Pulse.

Notes: [1]Option A. [2]Width of Delayed Pulse also selectable in 1 ns or larger steps. [3]Selectable in 5 decade steps. [4]With Option B. [5]Or 10^{-4} x delay, whichever greater. [6]With installed appropriate module.



MODEL 7095

MODEL 7085



MODEL 7010

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CABLETEST MODEL 180

THE CORDSET TESTER OF THE FUTURE . . . TODAY!
TESTS 2 AND 3 CONDUCTOR POWER SUPPLY CORDS AND CORDSETS!
HELPS YOU MEET UL AND CSA TESTING REQUIREMENTS!

THE MODEL 180 AUTOMATICALLY TESTS:

- **CONTINUITY** • **SHORT CIRCUIT** • **POLARITY**
- **HI-POT** (0 to 2.5 KVAC Programmable dwell time from 0 to 9.9 seconds. Features switch selectable automatic capacitance neutralization so that only resistive leakage will be measured.)

SPECIAL FEATURES OF THE MODEL 180:

- **LCD DISPLAY SCREEN:** Provides vital test data and prompts operator action.
- **CORD DIAGNOSTICS:** If there is a fault in the cord-set, this tester will determine its type and whether it is located in the male end, female end, or in the cable.
- **DATA COUNTERS:** Counter information is stored in computer memory. There are operator viewable/ erasable counters and permanent internal counters.
- **MACHINE DIAGNOSTICS:** Full diagnostics check all vital test functions upon "Power-up" and during each test cycle.
- **RECEPTACLE CONFIGURATION:** Male side is for a standard NEMA 5-15P plug. Female side comes standard with CEE-22 business machine plug receptacle or NEMA5-15R plug receptacle. Polarity pad accommodates open end power supply cords.
- **CAPACITANCE NEUTRALIZATION:** Ensures accurate current leakage measurement during Hi-Pot test, regardless of cordset length or shielding.
- **RS 232/RS 422** Output available for external control applications.
- **SELF CALIBRATING:** Tester will automatically calibrate itself.
- **EXTERNAL PRINTER** Available.
- **RAPID SHUTDOWN** Of high voltage upon detection of failure.
- **FLEX TEST:** Flex type failures are clearly indicated when flexed.
- **TESTER DESIGN AND CONSTRUCTION PARAMETERS:** Unit is microprocessor controlled for maximum flexibility and reliability. All test parameters are input through menu switches, and are stored in computer memory. Test system consists of electronic tester/controller, which mounts on standard height work surface.

SPECIFICATIONS: • **POWER REQUIREMENT: 120 VOLTS / 60 Hz / 2 AMPS**
(Foreign Voltages Available.)
• **DIMENSIONS: 24"W x 14"H x 15"D**

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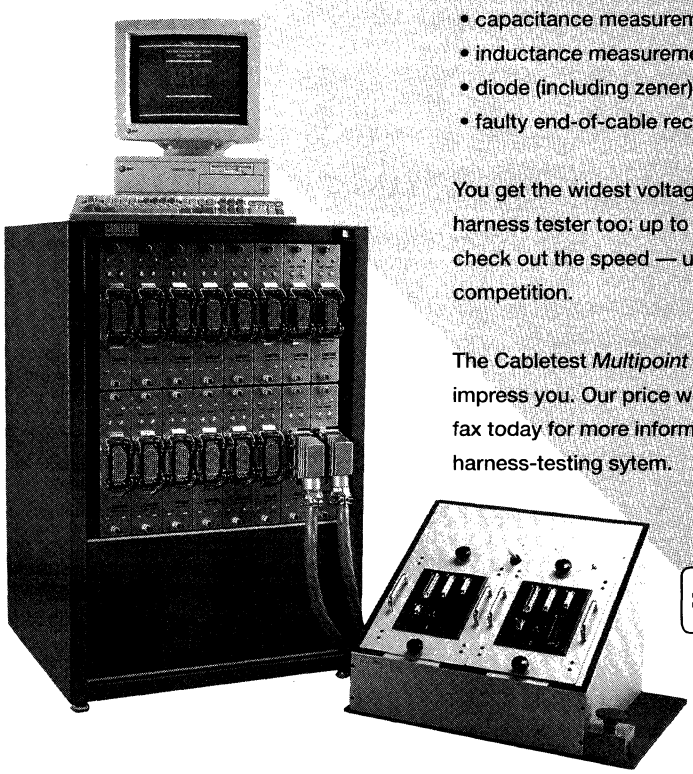
How can a harness tester do all this and cost $20,000* less?

No problem, if it's the Cabletest *Multipoint Series 1000*. Quite simply, it outperforms all its competitors — at a fraction of the price!

This system is loaded, with standard features that are usually optional or not even available.

- high-resolution resistance measurement
- four-wire Kelvin resistance measurement
- capacitance measurement
- inductance measurement
- diode (including zener) measurement
- faulty end-of-cable recognition



You get the widest voltage range of any commercial harness tester too: up to 2.5 kV AC and 3.0 kV DC. And check out the speed — up to 50 times faster than the competition.

The Cabletest *Multipoint Series 1000*. Our specs will impress you. Our price will astound you. Call, write or fax today for more information about the ultimate harness-testing sytem.

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* Cabletest *Multipoint Series 1000* versus any comparably equipped system

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C.C.M.II

COMPREHENSIVE CORD MEASUREMENT SYSTEM II

THE MOST COMPREHENSIVE CORD TESTING SYSTEM AVAILABLE!

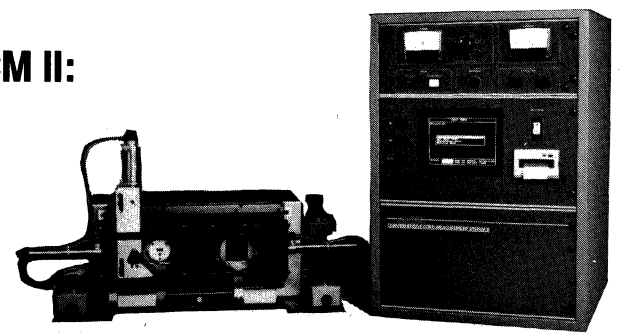
THE CCM II MEETS IBM'S CORDSET TESTING REQUIREMENTS!

THE CCM II AUTOMATICALLY TESTS:

- **CONTINUITY** • **SHORT CIRCUIT** • **POLARITY**
- **HI-POT** (0 to 3.5 KVAC Programmable dwell time from 0 to 9.9 seconds. Features switch selectable automatic capacitance neutralization so that only resistive leakage will be measured.)
- **SKIN TEST** (Tests conductor to plug surface HI-POT as above.)
- **CONDUCTOR RESISTANCE** (25 amps at 12 VAC with variable trip level from .02 to .5 ohm sensitivity. Resistance test can be performed on ground conductor only or all 3 conductors).

SPECIAL FEATURES OF THE CCM II:

- **CUT-OFF KNIFE** (Automatically chops male plug off of rejected cord.)
- **ACCEPTANCE BRANDER** (Automatically brands face of male plug on "good" cords.)
- **DATA COUNTERS** (Counter information is stored in computer memory. There are operator viewable/ erasable counters and permanent internal counters.)
- **PRINTER** (Panel mount printer for "hard copy" of vital job statistics.)
- **CORD DIAGNOSTICS** (If there is a fault in the cord-set, the unit will determine whether it is located in the male end, female end, or in the cable.)
- **MACHINE DIAGNOSTICS** (Full diagnostics check all vital test functions upon "Power-up" and during each test cycle.)
- **ZERO INSERTION FORCE RECEPTACLES** (Prevent operator fatigue and assure proper electrical contact during testing.)
- **RECEPTACLE CONFIGURATION** (Male side is for a standard NEMA 5-15P plug. Female side has receptacles for CEE-22 business machine plug and also for power supply cords with stripped ends or noninsulated terminals. Additional receptacle configurations quoted upon request.)



- **CYCLE TIMES** (The complete test cycle, excluding insertion and withdrawal of the test cord, requires 3 to 4.5 seconds, depending upon the number of tests and dwell times chosen.)
- **TESTER DESIGN AND CONSTRUCTION PARAMETERS** (Unit is microprocessor controlled for maximum flexibility and reliability. Status and prompt are via CRT screen. All test parameters are input through menu switches, and are stored in computer memory. Test system consists of electronic tester/ controller, and mechanical fixture, both of which mount on standard height work surface. Unit is fully bus-compatible with IBM PC-type computer. The advantage of this open architecture design allows the customer to plug in industry standard PC type boards if future expansion or options are required.)

SPECIFICATIONS: • **TEST CYCLE TIME: 3 TO 4.5 SECONDS** • **AIR REQUIREMENT: 90 PSI** • **POWER REQUIREMENT: 120 VOLTS / 60 Hz / 5 AMPS**

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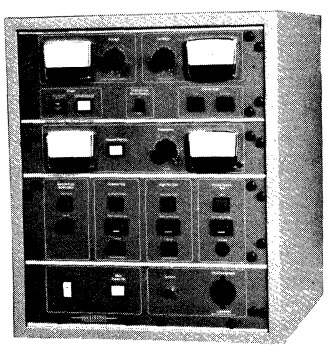
CABLETEST EQUIPMENT

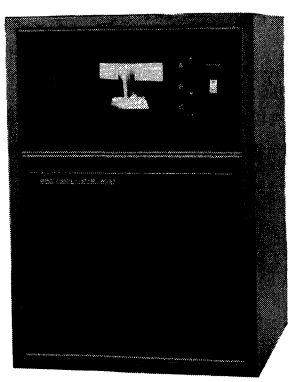
• MULTIWIRE TEST SYSTEM

Rapid and accurate testing of continuity, short circuit, polarity and hi-pot (0-2.5 KVAC) of multiconductor cables. Suitable for telephone, keyboard and all other custom cable assemblies up to 8 conductors. Automatically identifies the location (male plug, female plug, or the cable) and the type of failure. Virtually, any receptacle configuration is available with replaceable "quick change" fixtures. These testers are used by the largest manufacturers of modular jack cordsets.



• HI-POT / GROUND INTEGRITY TESTER

The FAST / SAFE / ACCURATE way to verify dielectric strength (Hi-Pot) variable from 0 - 2.5 KVAC (higher voltages on request) and 0 - .25 Ohms ground resistance. This unit can be used as laboratory equipment or interfaced with automatic controls for production line testing. Tester features automatic capacitance neutralization to ignore the capacitive leakage due to filters, etc., while measuring true resistive leakage levels. Tester features rapid shut-down of high voltage for safety. It also features switch / fuse verification.

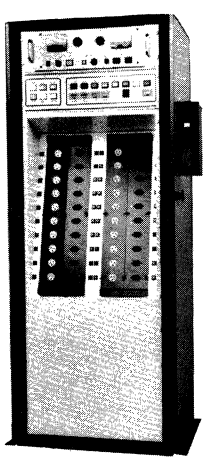


• WIRE VISION SYSTEMS

True color recognition systems (superior to gray scale interpretation) enable the automatic processing of multiple conductor, polarized cordsets. Typical functions are: specific wire orientation to attach polarized terminals, and polarity verification prior to molding cycle. These systems can be integrated into most color/vision applications.

• MULTIPLUG-20 TEST SYSTEM

Automatically tests continuity, short circuit, polarity and Hi-Pot (0 - 2.5 KVAC). 20 cordsets can be loaded in any order or position and tester automatically locates corresponding ends, performs the tests, and indicates the location of both ends of a faulty cordset. This unit comes complete with data counters and 20 NEMA 5-15 receptacles and 20 CEE-22 business machine plug receptacles. Others available.



• CUSTOM TESTING EQUIPMENT

Cabletest builds custom testing equipment to meet your needs. Just let us know your requirements.

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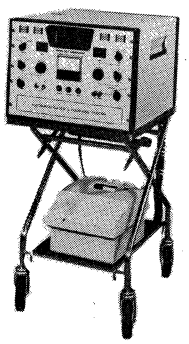
CABLEMASTER DIVISION
(818) 341-9200

AUTOMATIC CABLE HARNESS AND CONNECTOR TESTERS

CABLEMASTER 400-C

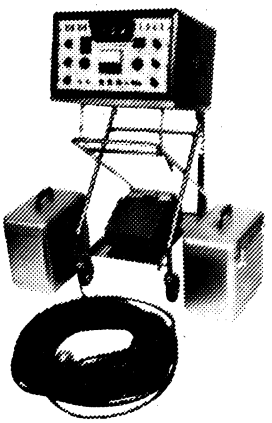


The Cablemaster Model 400-C is a 400 point sequential tester which measures continuity, insulation resistance and dielectric strength (hipot) quickly — accurately — economically. It is ideal for use in receiving inspection, production, quality control, laboratories, field maintenance, operational sites and in a wide range of applications where complete and reliable cable or connector testing is desired with one compact unit. It is equipped with a removable mobile carrier. The 400-C sequences thru the 400 points at a rate of up to 120 steps per minute checking each point for the parameter under test.

CHECK THESE OUTSTANDING FEATURES

- Continuity to 59 ohms, and to 3 amps
- Insulation resistance to 5K meg variable voltage
- Dielectric strength (hipot) AC and DC to 3000 volt
- Simplified multiple circuit testing. (More than 2 ends to each wire)

CABLEMASTER 400S

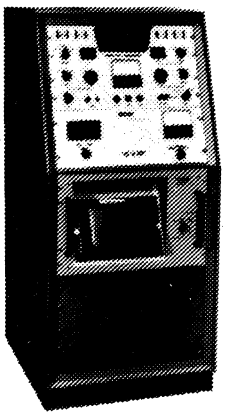


The Model 400-S Cablemaster is a modified Model 400-C, designed to test long, installed cables in ships, aircraft, launch facilities and nuclear plants where test points may be hundreds of feet apart. It contains a scanning feature for finding crossed wires which is used in making retrofits and troubleshooting new systems.

OPTIONS

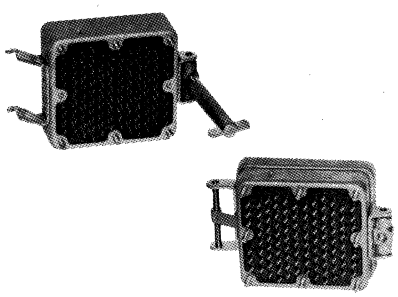
- Printed record
- AC current monitor for actual current readings
- AC capacitance compensation
- Megohmmeter panel for exact resistance measurements
- Low ohms analyzer for discrete low resistance values
- Digital readout of discrete values for each of the above accessories
- Digital printout of measurement values
- Rise time control for application of high voltage
- 220 Volt units available

CABLEMASTER 1200-C



The Model 1200-C Cablemaster incorporates all of the features of the Model 400-C and functions identically except that it has the capability to test up to 1200 points. To accommodate the additional number of output modules it is mounted in a mobile console. When accessories such as a printer, low ohm analyzer, etc. are incorporated they are mounted within the same console. The 1200-C is modular in design and construction.

HIGH VOLTAGE CONNECTORS WITH QUICK DISCONNECT

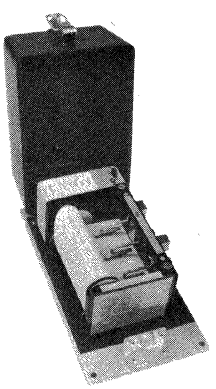


High voltage, high current connector with hinge action mating; comes in 50 pin and 100 pin configurations. Will accommodate 50 or 100 No. 16 wires, and is nominally rated at 2000 volts at RMS 60 Hz at sea level. Available with various types of contacts.

IMPACT-O-GRAPH DIVISION
(818) 341-3000

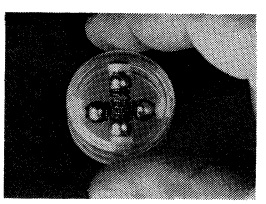
IMPACT & VIBRATION INDICATORS, ACCELEROMETERS AND RECORDERS

IMPACT-O-GRAPH RECORDER



Impact-O-Graph recorders are available in sensitivities of 2g to 300g full scale deflection. Recording period of various models is from (1) one minute to (6) six months. Independent styli record time, direction and magnitude of impacts in (3) three separate axes. Lightweight and compact. Self-contained — no outside power necessary. Used to monitor shipping and handling abuse and to design packaging.

IMPACT INDICATOR



Resettable and non-resettable impact indicators (accelerometers) are used to monitor impacts accurately from all directions to give a visual indication that a specific "g" level has been exceeded. Used to monitor shipping and handling abuse. Available up to 300g.

CHATSWORTH DATA CORPORATION

DEPT. EM, 20710 LASSEN STREET/CHATSWORTH, CALIFORNIA 91311/(818) 341-9200
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Cable/Harness Testing Made Easy.

Continuity / Resistance / Hipot

CIRRIS SYSTEMS CORP

Cirris Systems Signature™ cable/harness quality assurance systems are easy to use, rugged and affordable. The systems feature self-programming, non-volatile memory, and the industry's widest choice of interchangeable adapters. Systems offer both audible and visual information to verify quality, and to direct guided assembly work.

Cirris's commitment to overnight service, customer support, and immediate availability is unmatched. All equipment carries a full 1-year warranty.

1000H/2000H Affordable Hipot Testing from $2,995

Specifications:

Capacity:	128 (1000H)/ 256(2000H) points
Test Rate:	128 points per second
Test Levels:	5 to 630 VDC
Sensitivity:	Conductance: .5 to 1K ohms Leakage: 5M to 500M ohms
Size (inches):	4.5 x 7 x12 / 5 x 7 x 19

1000H+ New Product! 1000V Hipot, Expandable

Specifications:

Capacity:	128 to 512 points with expansion boxes
Test Rate:	128 points per second
Test Levels:	5-1000 VDC
Sensitivity:	Conductance: .1 to 100 K ohms Leakage: 5M to 500M ohms
Size (inches):	5 x 6.5 x 13
Expansion:	128 points per expansion box to 512

1000R+ Resistance/Continuity Testing, Expandable

Specifications:

Capacity:	128 to 512 points with expansion boxes
Test Rate:	128 points per second
Test Levels:	5 VDC @ .3mA
Sensitivity:	.1 to 5M ohms
Size (inches):	2 x 6.7 x 10.5
Expansion:	128 points per expansion box to 512

1000M/2000 Priced from $995

Specifications:

Capacity:	128 (1000M)/256 (2000) points
Test Rate:	.2 sec (128 points)
Test Levels:	5 VDC @ 1mA
Sensitivity:	shorts < 1K ohms, opens > 1.5K ohms
Size (inches):	2 x 7 x 12 / 2 x 7 x 19

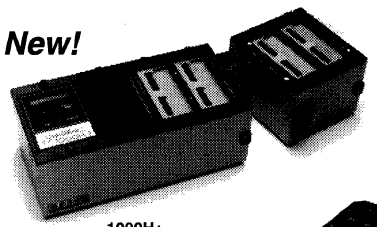
5000/5000A PC-based for Total Flexibility

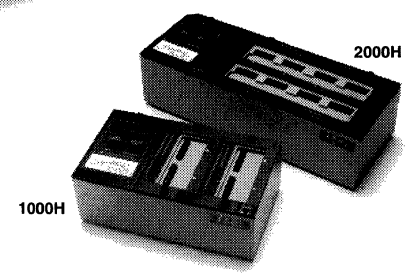
Specifications:

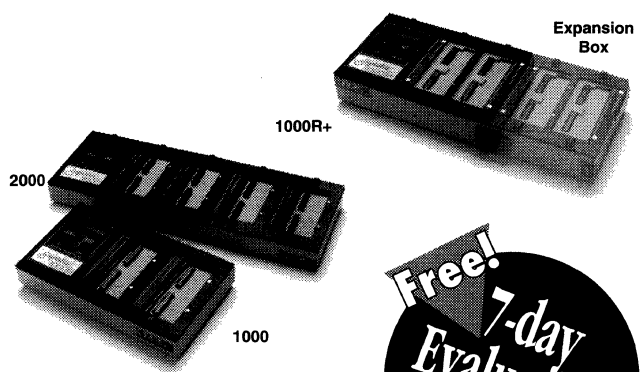
Capacity:	512-16,384 points
Test Rate:	1000 points/sec.
Test Levels:	5 VDC @ 1mA
Sensitivity:	shorts < 2.5K ohms, opens > 8K ohms
Size (inches):	2 x 7 x 24

Specifications subject to change without notice

Signature 1000/2000 Series

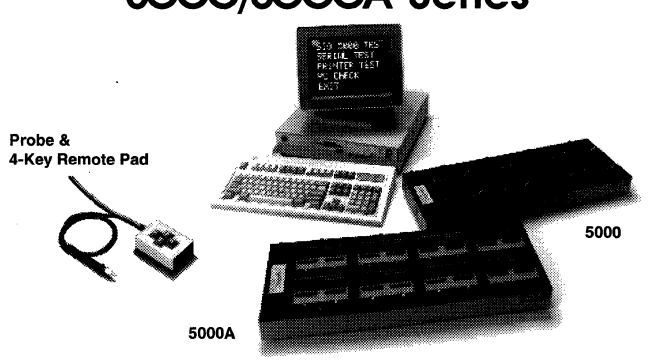






Free! 7-day Evaluation Or 30 Days With Your Purchase Order.

Signature 5000/5000A Series



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VOLT-AMPERE WATTMETERS

IEEE-488

MODEL 259

clarke·hess

VOLT-AMPERE-WATTMETERS are broadband digital instruments. They may be supplied to yield full scale current readings from 50.00 μA to 500.0 A; full scale voltage readings from 100.0 mV to 1000 V; and full scale power readings from 5000 nW to 500.0 kW. All of the 255-259 series of instruments may be equipped with an optically isolated IEEE-488 interface or with an optically isolated analog output. Different instruments are available that span the frequency range from DC to 1 MHz. Measurements down to 1 Hz are readily available from most instruments. All instruments are well suited to, and are calibrated for, the measurement of distorted and/or low power factor inputs.

Model 255/256
DC Coupled
I and V specified to 300 kHz
P specified to 100 kHz

Typical ranges
CURRENT - mA
5.000/50.00/500.0/5000
VOLTAGE - volts
20.00/200.0/1000

$1700.

Model 258
AC Coupled
I, V, and P specified
from 50 Hz to 1 MHz

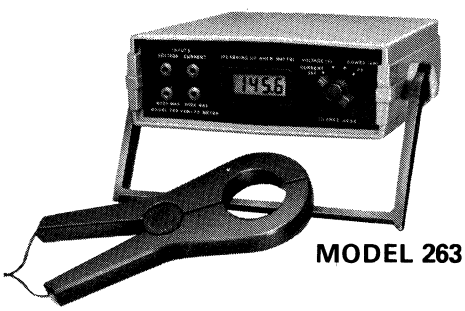
Typical ranges
CURRENT - mA
50.00/250.0/500.0/2500
VOLTAGE - volts
20.00/100.0/200.0

$2735.
(including current transformer)

Model 259
DC Coupled
I, V, and P specified
from DC to 50 kHz

Typical ranges
CURRENT - mA
5.000/50.00/500.0/5000
VOLTAGE - volts
20.00/100.0/1000

$2245.

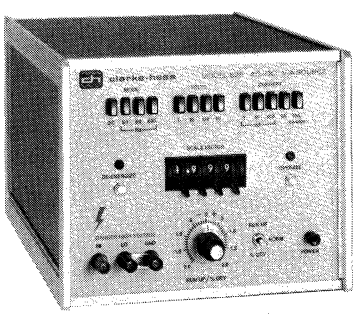


MODEL 263

Model 263 Power Factor Meter measures CURRENT, VOLTAGE, POWER and POWER FACTOR from 50Hz to 1000Hz. The portable instrument features AUTO-RANGING for all functions. Two current ranges (19.99A and 199.9A), two voltage ranges (199.9V and 600V), four power ranges (199.9W, 1.999kW, 19.99kW and 120kW), and a single power factor range.

$895.00

VOLT-AMPERE SOURCE



Model 828 AC/DC V-A Source is a light-weight, truly portable device capable of calibrating analog and digital panel meters in the lab, on the production line or in field installations. Low cost, compact and highly accurate. Voltage Ranges of 1V, 10V, 100V and 1000V. Current Ranges of 1mA, 10mA, 100mA, 1A and 10A (5A max.). Resolution 0.1% of Range. Accuracy: DC voltage ±0.1%, AC voltage ±0.15%, AC/DC current ±0.2%.

$3,495.00

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TRACEABLE TO NIST

IEEE-488 **MODEL 5000 AND 5500**

- High Phase Resolution of 1m°
- Outputs from 50mV to 120V RMS
- Frequency Range 1Hz to 100kHz
- High Phase Accuracy of 5m°
- Amplitude Accuracy of 0.1% Typically
- Frequency Accuracy of 25ppm Typically
- Low Distortion Sinewaves Typically below -80dB
- Phase Accuracy Maintained with Voltage Ratios up to 1000:1
- All Parameters Stable with Time and Temperature

PHASE METER

EASY TO CALIBRATE
EASY TO USE

IEEE-488 **MODEL 6000**

- Waveshape Independent
- 10mV to 350V Input Voltages
- 10,000:1 Input Ratios
- Completely Autoranging
- 10m° Resolution
- 20m° Typical Accuracy
- 5 Hz to 500 kHz
- Analog Output
- Low Drift With Time and Temperature

$3,295.00

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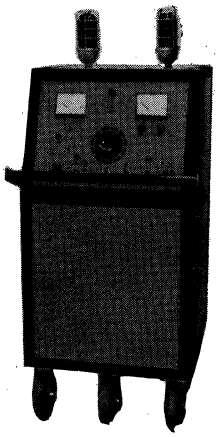
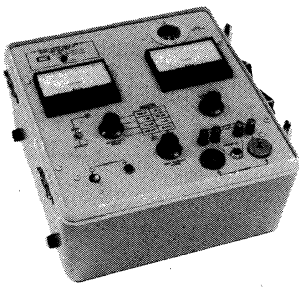
TEST EQUIPMENT



CUSTOM-BUILT HIGH-VOLTAGE TESTING EQUIPMENT

Criterion Instruments Limited specializes in the design and manufacture of special high-voltage test equipment, for dielectric strength testing or for other applications.

- Any ac line input.
- Output voltage to 100 kV.
- Rating to 20 kVA (higher on short duty cycle).
- More than 20 special options are available.



CONTACT-RESISTANCE TESTER

The AOT-10 is designed to test the contact resistance of circuit breakers, connectors, bus bar connections, etc. A four-terminal ohmmeter, it will measure resistance over five ranges from 0-10 micro-ohms to 0.1 ohm. Two test current ranges are standard on the unit, 0-10 A and 0-100 A. The ohmmeter reads accurate resistance for any indicated test current within its range.

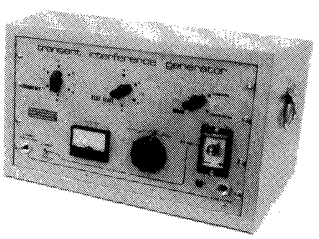
CAPACITANCE BRIDGE

MODEL TCB-108

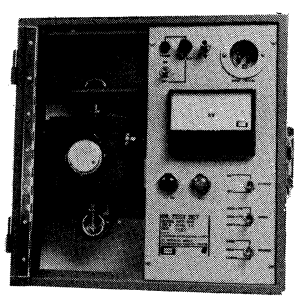
Model TCB-108 Capacitance Bridge is a general-purpose bridge for moderate-accuracy measurements for public utility and laboratory use for the measurement of capacitors or dielectric material. It comprises a transformer-type bridge operating from an internal 108-Hz generator, with digital readout of capacitance from 1 pF to 99.999 µF over four ranges, and digital readout of D (dissipation factor) in percentage from 0 to 50%.

TRANSIENT INTERFERENCE GENERATOR

MODEL TIG-1



Model TIG-1 for Transient Interference Immunity Tests on Electronic Equipment - No. C-5043-74". Also one of the test waveforms is essentially in compliance with the requirements of IEEE Standard 472/ANSI C37.90a (1974) "Guide for Surge Withstand Capability (SWC) Tests".



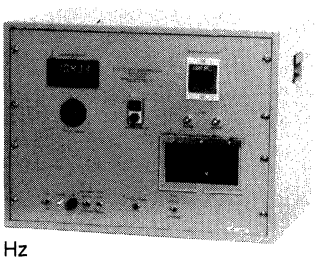
PORTABLE OIL TEST SET

AV0-600–A high voltage test set to establish dielectric breakdown of transformer and other insulating oils. This unit features 3 selectable motorized rates of voltage rise to a maximum of 60 kV. The voltmeter freezes at the breakdown voltage. The unit meets ASTM specifications.

TRANSIENT GENERATOR

MODEL TIG-2

FOR TESTING SMOKE DETECTORS TO UL 217



INPUT	120V, 60 Hz
OUTPUT	120V, 60 Hz, 1 kVA
OUTPUT (transient)	damped oscillatory transient variable up to 10 kV peak approx 500 kHz decay constant: approx 50% between successive peaks variable phase relative to 60 Hz inupt A pluse occurs about every 10 seconds.

OTHER PRODUCTS (Not illustrated)–
MICRO-OHMMETERS, CABLE TESTERS, DIELECTRIC STRENGTH TESTERS,
HOT STICKS, DIGITAL OHMMETERS,
BATTERY DISCHARGE TESTERS, POWER SUPPLIES AC & DC,
COLOR METERS AND PHOTO METER.

For further information on our STANDARD PRODUCTS,
CUSTOM DESIGNS, or manufacturing to your own specifications, please contact:

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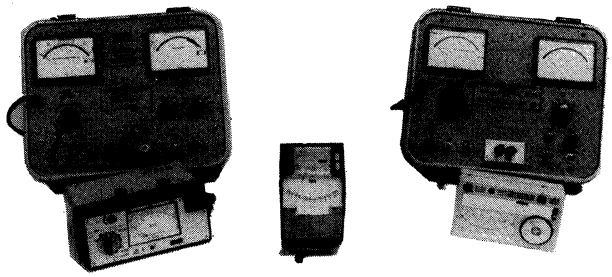
INSULATION RESISTANCE TESTERS



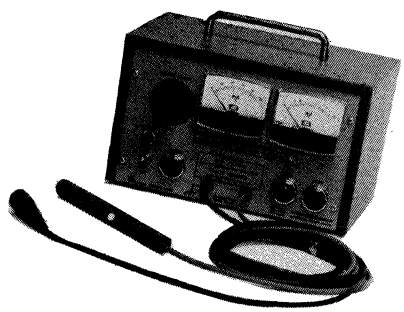
CONDENSED SPECIFICATIONS

MODEL No.	TEST VOLTAGE	RESISTANCE RANGE	POWER SOURCE
IRT-5000A (Bulletin 7-1)	0-5,000 V unregulated	1-10^6 MΩ	ac line
BIRT-5000B (Bulletin 7-2)	400-5000 V well regulated	1-10^6 MΩ	battery and ac line
BIRT-7500B	500-7500 V well regulated	1-10^6 MΩ	battery and ac line
ISO-JK 5000N (Gossen) (Bulletin 7-15)	1000, 2500, 5000V	0.2-5000 MΩ	hand crank
1806-30303 (Norma) (Bulletin 7-20)	100, 250, 500 1000 V partly regulated	0.02-20,000 MΩ (plus continuity ranges) 0-28Ω & 0-1/20 kΩ)	battery
F200 series (5 different models (Fuso) (Bulletin 7-25)	500, 1000 V	0-2000 MΩ (plus continuity range 0-200Ω on one model)	hand crank
IR-250	250 V nominal regulated	0-250 MΩ	ac line
IR-500	500 V nominal regulated	0-500 MΩ	ac line
IR-1000	1000 V nominal regulated	0-1000 MΩ	ac line

Higher-voltage testers or other special units can be designed to meet your particular specifications.

DIELECTRIC STRENGTH TESTERS

SERIES AV, DV, AND AV/DV



MODELS AVAILABLE

The model number listed below are for ac output.
For dc output change prefix from AV to DV.
If both ac and dc outputs are required (not simultaneously), the prefix becomes AV/DV.

Example: –ac and dc outputs to 5 kV
–trip current adjustable from 2 to 10 mA
–with milliammeter
–Model No. is AV/DV-50VA-10V

CONDENSED SPECIFICATIONS

MODEL NO. WITH MILLIAMMETER	MODEL NO. WITHOUT MILLIAMMETER	OUTPUT VOLTAGE	TRIP CURRENT
AV-25VA-5	AV-25V-5	0-2.5 kV	5 mA
AV-25VA-5V	AV-25V-5V	0-2.5 kV	2-5 mA
AV-25VA-10	AV-25V-10	0-2.5 kV	10 mA
AV-25VA-10V	AV-25V-10V	0-2.5 kV	2-10 mA
AV-25VA-20	AV-25V-20	0-2.5 kV	20 mA
AV-25VA-20V	AV-25V-20V	0-2.5 kV	2-20 mA
AV-25VA-40	AV-25V-40	0-2.5 kV	40 mA
AV-25VA-40V	AV-25V-40V	0-2.5 kV	2-40 mA
AV-50VA-5	AV-50V-5	0-5 kV	5 mA
AV-50VA-5V	AV-50V-5V	0-5 kV	2-5 mA
AV-50VA-10	AV-50V-10	0-5 kV	10 mA
AV-50VA-10V	AV-50V-10V	0-5 kV	2-10 mA
AV-50VA-20	AV-50V-20	0-5 kV	20 mA
AV-50VA-20V	AV-50V-20V	0-5 kV	2-20 mA
AV-100VA-5	AV-100V-5	0-10 kV	5 mA
AV-100VA-5V	AV-100V-5V	0-10 kV	2-5 mA
AV-100VA-10	AV-100V-10	0-10 kV	10 mA
AV-100VA-10V	AV-100V-10V	0-10 kV	2-10 mA
AV-150VA-5	AV-150V-5	0-15 kV	5 mA
AV-150VA-5V	AV-150V-5V	0-15 kV	2-5 mA

Other voltages and currents on special order up to 100 kV, up to 20 kVA.

For more information please contact:

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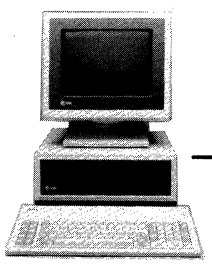
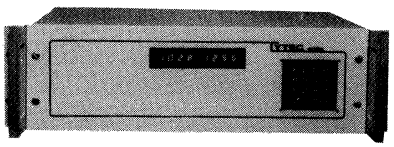
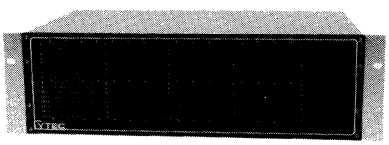


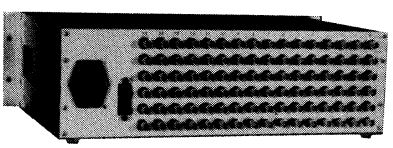
CONTROL OPTIONS
- IEEE488 BUS
- VXI BUS
- RS232 SERIAL
- PC/XT/AT INTERFACE
- 16 BIT PARALLEL PORT
- PRINTER PORT
- MANUAL CONTROLS



MULTIPLEXERS



MATRICES



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- MULTIPLE POLE RELAYS from single pole.
- HIGH FREQUENCY from DC to 400 MHz.
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- LOW LEAKAGE CURRENT less than 1 picoamp.
- HIGH POWER RELAYS up to 2000 VA.
- DIGITAL I/O MODULES

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- SEMICONDUCTOR TESTING
- "BED OF NAILS" TESTING
- CABLE TESTING
- COMMUNICATIONS
- NETWORK TESTING
- PROGRAMMABLE PATCH PANELS

SPECIAL FEATURES
- MATRIX STATUS DISPLAY LEDs in series with the selected relays give absolute indication that the relays are energized.
- STATUS FEEDBACK The Status of the Matrix is fed back to the controlling computer via the Interface Bus.

OTHER SWITCHING MODULES INCLUDE:
- PC/XT/AT Compatible Modules
- STD BUS Modules

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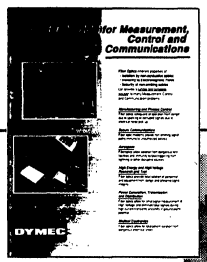


ANALOG INSTRUMENTATION LINKS

DC-10KHz BANDWIDTH

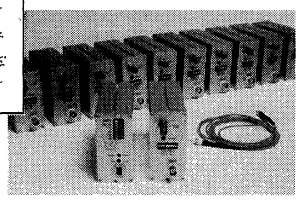
LOW COST	5600 SERIES
LOW POWER	5610 SERIES
OEM	5660 SERIES
STAND ALONE	6600 SERIES

DC-1MHz BANDWIDTH

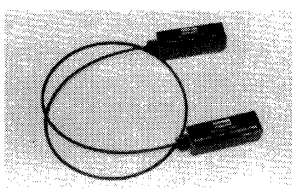
OEM	5700 SERIES
STAND ALONE	6700 SERIES
AC POWERED	6720 SERIES

DIGITAL COMMUNICATIONS MODEMS

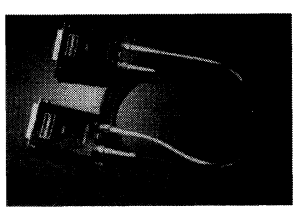
RS232C	5810 SERIES
RS422	5820 SERIES



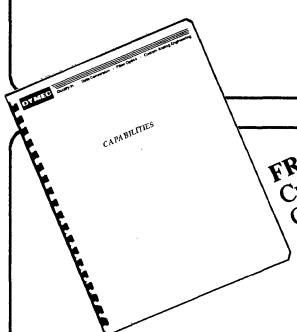
1MHz, DC Powered, Stand Alone (6710 Series)



10KHz Low cost, PC Mount (5660 Series)



RS232 Modem (5810 Series)



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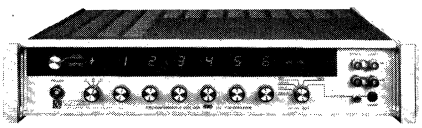
Line (mains) Power: 117 Vac and 230 Vac; from 50 Hz to 400 Hz.
All instruments are available under G.S.A. CONTRACT to authorized organizations.
(Request Page J-7).

D.C. VOLTAGE & CURRENT STANDARD — MODEL 521 (See Page A-3)

INTEGRATED MICROPROCESSOR IEEE-488 GP-IB, INTERFACE

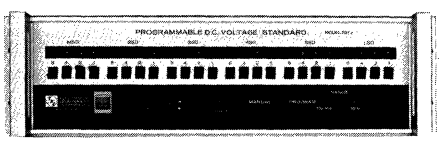


- IEEE-488 interface is included. No extra charge.
- Floating output. Optically isolated from the logic.
- True bipolar, balanced zero.
- "Crowbar" zero reference.
- 100 Volts COMPLIANCE in the current mode.
- ±1V, ±1000V or ±1500V optional.
- Complete output terminal sets on both front and rear panels. No extra charge.
- Bench or rack mountable. No extra charge.
- Weight 14 lbs., 6.35 kg.

D.C. VOLTAGE MODE				D.C. CURRENT MODE		OPTIONAL RANGES
Model 521	**100 mV range**	**10 V range**	**100 V range**	**10 mA range**	**100 mA range**	
Output, d.c.	±100.0000 mV	±10.000 00 V	±100.000 0 V	±10.000 00 mA	±100.000 0 mA	RA-5±1000V
Resolution (1 ppm)	±0.1μV	±10μV	±100μV	±10 nA	±100 nA	RA-6±1500V
Accuracy	±0.002%	±0.002%	±0.002%	±0.005%	±0.005%	RA-7±1.0V
Accuracies stated are of setting plus range residual, "worst case" method, valid for 12 months.						
Noise	±0.0005% of range +2μV in a band pass of 0.1 Hz to 100 kHz.					See page A-3 for details
Compliance	emf into 400Ω	100 mA	100 mA	100 V	100 V	

DIGITALLY PROGRAMMABLE D.C. STANDARDS, MODEL 501 J (See Page A-7)

"Building Block" Concept: Purchase only what you need.
Switching and setting time: 50μS
Program Formats: BCD or BINARY; **Entry:** Serial or Parallel or IEEE 488 (GP/IB).
Certification: NBS traceability



	MAIN FRAME Model (501 J)	100 mV RANGE Option: D	AC & DC CURRENT PCS-2
See Page	**A-7**	**A-9**	**B-2**
Output d.c.	10.0000Vdc	100.000mVdc	1Ma, 10mA, 100mA, 1A, 10A ac/dc
Resolution	100μV (10 ppm)	1μV (10 ppm)	10nA, 100nA, 1mA, 10mA, 100mA
w/opt. B	10μV (1 ppm)	0.1μV (1 ppm)	1nA, 10nA, 100nA, 1mA, 10mA
Accuracy	±0.002%	±0.002%	DC: ±0.01%; AC: ±0.05%
Noise	0.0005%	0.0005%	0.15% to 0.00375%
Compliance	50mA	in to 400Ωload	1.5V-5Vdc

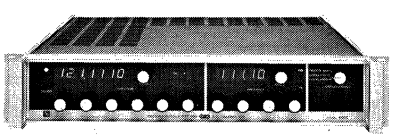
ACCESSORIES

- **AK-1** Negative programming logic.
- **AM-1** Front panel display and control (for BCD).
- **AM-2** Front panel display and control (for BINARY).
- **IS-40** Opto-Isolation.
- **KT-488** IEEE 488 interface (Kit)

PROGRAMMABLE AC CALIBRATOR, MODEL 4503 (See Page A-11)

Completely Solid State. 60 Second warm up. Light Weight — 20 lbs. (9.1 kg)

Programming Format: BCD; **Entry:** Parallel or Serial or IEEE-488. GP-IB



5 Output Ranges	1mV to 111 Vac	**Resolution**	1 ppm
Accuracy (Amplitude)	0.04%	**Distortion**	0.1%
4 Frequency Ranges	30 Hz to 111 kHz	**Resolution**	100 ppm
Accuracy (Frequency)	0.001%	**AC Current**	See Model PCS-2 (Page B-2)

ELECTRONIC DEVELOPMENT CORPORATION
11 Hamlin Street, Boston, Mass. 02127-4198, U.S.A.
TEL: (617) 268-9696; TLX: 951596 (ELECDEVCO BSN); FAX: (617) 268-6754

ELECTRONIC DEVELOPMENT CORPORATION

Digitally Programmable Standards AC and DC Voltage and Current

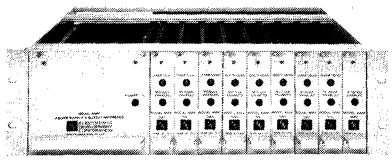
MULTIPLE OUTPUT AC and/or DC REFERENCE/IMBEDDED STANDARD — System 408

(See Page A-13)

GP-IB IEEE-488 Compatible. Up to 8 individually variable voltage outputs in one chassis with one MLA address.

NOTE: — Certain modifications can be effected to meet individual requirements.

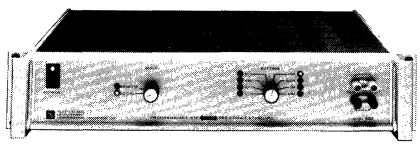
Range	10mV to 30V ac or dc	**Accuracy**	ac: 0.05%; dc: 0.02%
Resolution	1mV	**Phase Angle Control**	0° and 180°
Current	50mA	**Distortion**	0.07%



RESISTANCE CALIBRATOR — MODEL 620A (See Page A-15)

PROGRAMMABLE IEEE-488 GP-IB , MICROPROCESSOR BASED

Values	1 ohm to 10 Megohms (8 cardinal Resistance points)
Accuracies	0.002% to 0.125%
Connections	2 or 4 wire

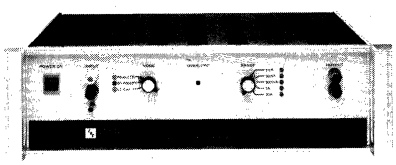


10 AMP AC & DC CURRENT CALIBRATOR, MODEL PCS-2B (See Page B-2)

GP-IB IEEE-488 Bus compatable.

This is a transconductance amplifier, with an individual bus address, that can be used with dc or ac calibrated inputs from either EDC or other manufacturers.

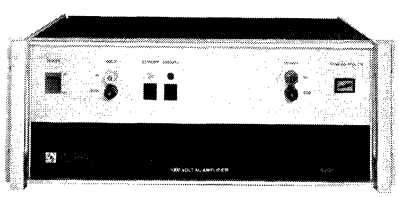
Ranges (ac or dc):	10A, 1A, 100mA, 10mA and 1mA.
Accuracy (dc):	±(0.01% of setting + 10μA)
(ac):	±(0.05% of setting + 20μA)
Voltage Compliance:	3V (min.) to 5V (max)



1000 VOLT AC AMPLIFIER — Model 4200 (See Page B-5)

Low cost. Designed to work with EDC Model 4501 or any ac voltage calibrator.

Range	100V to 1100Vac
Gain	100 (fixed)
Accuracy	0.05%

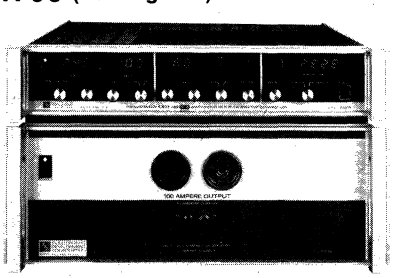


AC WATT (HOUR) METER CALIBRATION SYSTEM — SYSTEM 4700 (See Page G-2)

PROGRAMMABLE IEEE-488 GP-IB , MICROPROCESSOR BASED

This sytem provides independent control of voltage, current, phase angle (power factor), frequency and elapsed time.

Voltages:	120V, 220V, 270V, 480V ±10%
Currents:	100, 50, 15, 10, 5, 3, 2.5, 1.5, 1A, 500 and 150mA
Accuracy:	±0.05% (at unity power factor)

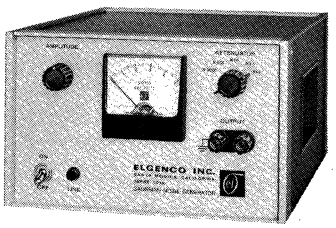


ELECTRONIC DEVELOPMENT CORPORATION

11 Hamlin Street, Boston, Mass. 02127-4198, U.S.A.

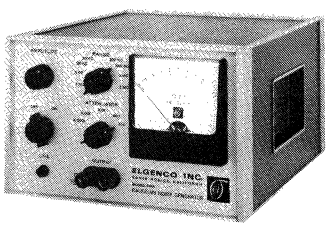
TEL: (617) 268-9696; TLX: 951596 (ELECDEVCO BSN); FAX: (617) 268-6754

ELGENCO NOISE GENERATORS



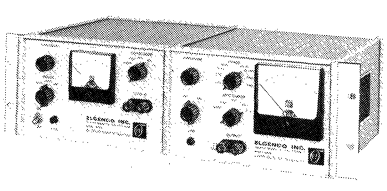
SOLID STATE NOISE GENERATORS

MODEL 602A–1390 5 Hz to 5 MHz, 3 Ranges.....$2,615
MODEL 602A–200 5 Hz to 5 MHz, 3 Ranges.....$2,705
MODEL 603A 5 Hz to 5 MHz, 3 Ranges.....$3,195
FREQ. RANGES: 5 Hz to 20 KHz, 5 Hz to 500 KHz, 5 Hz to 5 MHz
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, and X.0001;
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform all ranges.
OUTPUT METER: 0-5 volts rms.



Model 610A 5 Hz to 5 mHz, 8 Ranges $6,470

FREQ. RANGES: 10 Hz to 2 kHz, 10 Hz to 5 kHz, 10 Hz to 20 kHz, 10 Hz to 50 kHz, 10 Hz to 200 kHz, 10 Hz to 500 kHz, 10 Hz to 2 mHz, and 10 Hz to 5 mHz.
OUTPUT SPECTRUM: Uniform ±0.5 db from 10 Hz to 500 kHz and ±2.0 db from 500 kHz to 5 mHz.
OUTPUT LEVEL: 0 to 1 volt rms, adjustable by front panel amplitude control. A dynamic range of 5 to 1 peak to rms value is provided.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, X.0001. Accuracy ±0.25 db/step to 500 kHz; ±0.063 db/step to 5 mHz.
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical Gaussian all ranges.
OUTPUT METER: 0 to 1 volt rms. Accuracy ±2% of full scale to 2 mHz; ±5% to 5 mHz.
MAXIMUM LOAD: 500 ohms on direct output.
OUTPUT IMPEDANCE: 50 ohms
POWER REQUIREMENTS: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz. ac.



Models 602A and **610A** combined by dual unit adapter kit.

SERIES 624 A FIXED FREQUENCY NOISE GENERATORS

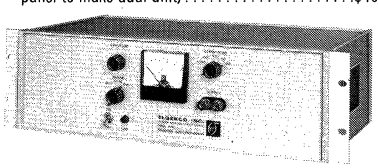
OUTPUT LEVEL: (open circuit) 3 volts rms.
OUTPUT IMPEDANCE: 200 ohms ±10%.
MAX. LOAD: (on direct output) 700 ohms.
OUTPUT STEP ATTENUATOR: X1.0, X0.1, X.01, X.001, and X.0001; calibrated to work into open circuit. Output Impedance: 200 ohms ±1%.
AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform.
OUTPUT METER: 0-5 volts rms.
POWER: 115/230 volts ±10/20 volts, 50 to 1,000 Hertz ac.
DIMENSIONS: 5¼" high × 8⅝" wide × 11" deep.
Some of the many frequency ranges available are listed below. Write for further information.

MODEL 624A

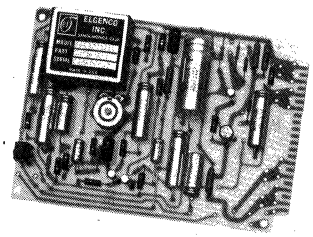
-12124 20 Hz to 20 kHz ±1db	$2,520
-11124 10 Hz to 20 kHz ±1db	$2,665
-12154 20 Hz to 50 kHz ±1db	$2,532
-11154 10 Hz to 50 kHz ±1db	$2,677
-12115 20 Hz to 100 kHz ±1db	$2,544
-11115 10 Hz to 100 kHz ±1db	$2,689
-12125 20 Hz to 200 kHz ±1db	$2,556
-11125 10 Hz to 200 kHz ±1db	$2,701
-12155 20 Hz to 500 kHz ±1db	$2,578
-11155 10 Hz to 500 kHz ±1db	$2,723
-22154 20 Hz to 50 kHz ±2db	$2,520
-21154 10 Hz to 50 kHz ±2db	$2,665
-22115 20 Hz to 100 kHz ±2db	$2,532
-21115 10 Hz to 100 kHz ±2db	$2,677
-22125 20 Hz to 200 kHz ±2db	$2,544
-21125 10 Hz to 200 kHz ±2db	$2,689
-22155 20 Hz to 500 kHz ±2db	$2,566
-21155 10 Hz to 500 kHz ±2db	$2,711
-32155 20 Hz to 500 kHz ±3db	$2,544
-31155 10 Hz to 500 kHz ±3db	$2,689
-52124 20 Hz to 20 kHz ±½db	$2,641
-51124 10 Hz to 20 kHz ±½db	$2,808
-52154 20 Hz to 50 kHz ±½db	$2,655
-51154 10 Hz to 50 kHz ±½db	$2,822
-51125 10 Hz to 200 kHz ±½db	$2,850
-52155 20 Hz to 500 kHz ±½db	$2,711
-51155 10 Hz to 500 kHz ±½db	$2,878

OPTIONS & ACCESSORIES FOR MODELS 602A, 603A, 610A & SERIES 624A

Full rack width cabinet and rack mounting hardware option add	$410
Adapter kit, dual unit and rack mountin ghardware	$95
Adapter kit, single unit rack mounting (includes blank panel to make dual unit)	$400



Model 602A with full rack width mounting option.



FIXED FREQUENCY NOISE GENERATOR CARDS

AMPLITUDE PROBABILITY DISTRIBUTION: Symmetrical non-clipped Gaussian waveform.
OUTPUT LEVEL: (open circuit) 3 volts rms.
AMPLITUDE CONTROL: Continuously variable.
SIZE: 4½×6½"×1".
POWER: −30 volts dc, −24 volts dc optional.
Some of the many frequency ranges available are listed below. Write for further information.

MODEL 3602A

-12224 200 Hz to 20 kHz ±1db	$689
-15124 50 Hz to 20 kHz ±1db	$723
-12124 20 Hz to 20 kHz ±1db	$784
-11124 10 Hz to 20 kHz ±1db	$929

MODEL 3603A

-12215 200 Hz to 100 kHz ±1db	$713
-15115 50 Hz to 100 kHz ±1db	$747
-12115 20 Hz to 100 kHz ±1db	$808
-11115 10 Hz to 100 kHz ±1db	$953
-11125 10 Hz to 200 kHz ±1db	$965
-11155 10 Hz to 500 kHz ±1db	$987

MODEL 3606A

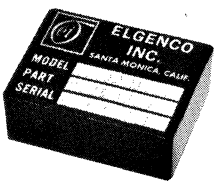
-51124 10 Hz to 20 kHz ±½db	$1,135
-51154 10 Hz to 50 kHz ±½db	$1,149
-51125 10 Hz to 200 kHz ±½db	$1,177
-51155 10 Hz to 500 kHz ±½db	$1,204

MODEL 3607A

-15316 5 kHz to 1 mHz ±1db	$969
-35316 5 kHz to 1 mHz ±3db	$716
-25356 5 kHz to 5 mHz ±2db	$1,268
-35356 5 kHz to 5 mHz ±3db	$1,102

MODEL 3609A Power Supply Card $345

(supplies power for up to 2 noise generator cards)
SIZE: 4½"×6½".
INPUT: 115/230 volts±10/20 volts, 50 to 1000 Hz.



ENCAPSULATED NOISE SOURCE MODULES

SERIES 1600.....$605 to $1,139
5 Hz to 5 mHz
SERIES 1800.....$626 to $2,028
10 kHz to 100 mHz
Various frequency ranges and output flatness available. Contact Elgenco for details.

ELGENCO, INC. P.O. Box 460 • Hurricane, Utah 84737 • 801-635-4954 • FAX 801-635-2158

ELECTRO MECHANICAL DESIGN SERVICES INC

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SDI-3: MICROPROCESSOR BASED PRECISION MAGNETOMETER WITH ON BOARD A/D CONVERSION

Single 19 × 22.2 cm. electronics card, complete Magnetic Field data acquisition instrument with separate triaxial fluxgate sensing head. Each axis has a separate 20 bit resolution integrating, A/D convertor. This allows simultaneous data acquisition on all axes. The conversion process attenuates 60 Hertz noise by >70 DB. Full scale range ±1.2 gauss with 0.1 nanotesla resolution. CMOS Microprocessor for data scaling and formatting (firmware provided). ASCII data output at selectable baud rates (RS232C or RS485). Addressable (RS485 tri-state option only). Averaging and Gradiometer modes. Accepts commands over serial link to null background field, etc.

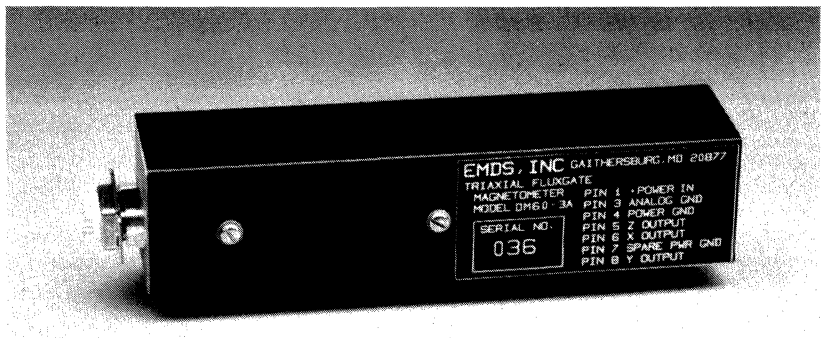
GR2-200KL: DUAL AXIS MAGNETIC FIELD GRADIOMETER

Dual axis quad probe magnetic field gradiometer for precisely measuring down to 0.1 nT. level fields. The GR2-200KL is ruggedized for shipboard, field or general laboratory usage. It is powered by a D.C. input and is lightweight, making it suitable for portable gradient survey work. It is ideal for magnetically screening material or components while rejecting background magnetic noise.

Axial Alignment: ±0.1 Degree
Input Voltage: 16.5 to 26 VDC
Input Current: <.165 Ampere
Field Measurement Range: ±2 Gauss
Linearity: <.0005% Full Scale
Gradiometer Sensitivity: ±1000 nT. to ±20 nT. = ±10 VDC
Sensor Spacing: 20.3 cm. nominal
Scale Factor/Temp. Shift: <.0005%/°C
Noise: <.1nT. P-P .1 to 10 Hz
Cross Field Error: <.003% Full Scale
Output Ripple: <1 mv RMS @ 2nd Harmonic
Zero Offset: <25 nT.
Zero vs Temperature: <.015 nT/°C −40 to +70°C
Time Stability: <1.0 nT./24 Hours
Susceptibility to Probe Perm: <±.5 nT. shift @ ±5 Gauss Perming Field
Output Impedance: <100 Ohms
Frequency Response: >65 Hz with 40 Db 60 Hz Notch Filter
Weight: Electronic Chassis <3.2 Kg. Sensor and Mount <1.4 Kg.
Size: Chassis 29×11.27×22.6 cm. Sensor 32.7×4.5×6.4 cm.
Sensor Cable Length: 9 meters

MAGNETIC FIELD INSTRUMENTATION

EMDS designs and builds high stability, low noise fluxgate magnetometers. These instruments can be configured for use as gradiometers or to meet special requirements for instrument packaging or electrical specifications. EMDS is capable of delivering magnetometers with noise levels of <.005 nanotesla* RMS √Hz and zero offset drift of <±.5 nanotesla from −30° to +60° Celsius. We supply high reliability magnetometers for use in Aerospace, Remotely Piloted Vehicles, Naval and Scientific applications.



DM60-3A: TRIAXIAL FLUXGATE MAGNETOMETER

Miniature Triaxial Fluxgate Magnetometer for general magnetic measurements in the laboratory or field applications such as remotely piloted vehicles, data buoys, sounding rockets, etc. This instrument is designed for the highest reliability and uses no potentiometers or switches.

Axial Alignment: Orthogonality better than ±1 degree
Input Voltage: +20 to 28 VDC
Input Current: ≤55 milliamps
Field Measurement Range: ±0.85 gauss
Accuracy: ±1.5% of full scale
Linearity: ±0.15% of full scale
Sensitivity: 100 microvolt/nanotesla
Scale Factor Temperature Shift: ≤0.01% full scale/° celsius
Noise: ≤0.5 nanotesla peak to peak 0.1 to 10 Hz
Output Ripple: ≤5 millivolt RMS @ 2nd harmonic
Analog Output @ Zero Field: ≤±0.025 volt (±250 nanotesla)
Zero Shift with Temperature: ≤±30 nanotesla 0° to 60° celsius
Susceptibility to Perming: ≤±20 nT. shift with ±5 gauss applied
Output Impedance: 470 OHM ±5%
Frequency Response: −3 DB @ >500 Hz
Weight: 6.4 oz.
Size: 1.38″W×1.38″H×6.05″D
Connector: Chassis mounted 9 pin male "D" type (mating connector supplied)
Connector Pins:

1. (Power In)
2. (N.C.)
3. (Floating Signal Ground)
4. (Power and Case Ground)
5. (Z Axis Out)
6. (X Axis Out)
7. (Redundant Ground)
8. (Y Axis Out)
9. (N.C.)

STANDARD MODEL INSTRUMENTS

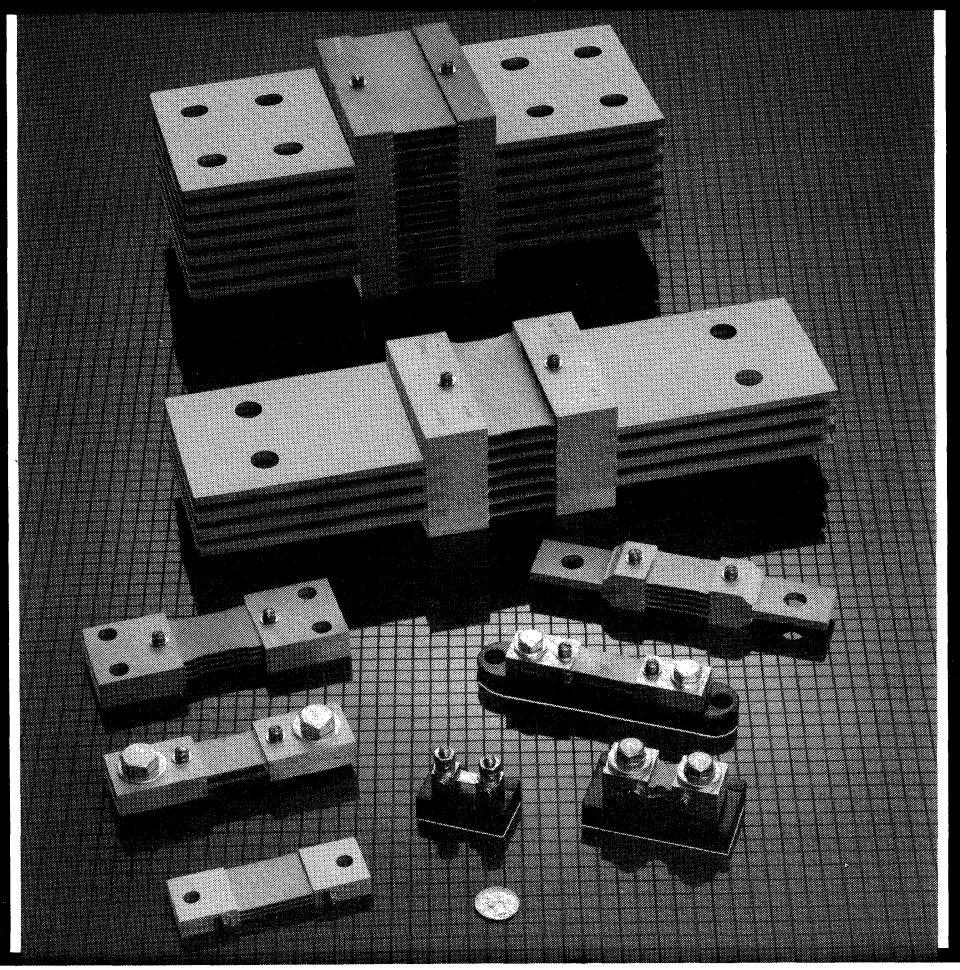
Model	Range (Gauss)	Linearity % F.S.	Noise P-P .1Hz-10Hz	Zero Offset	Input Voltage /Power	Features
GR2-200KL**	±2.0	±.005	<.1nT.	<25nT.	16.5-26V	Gradiometric Measurements NEW PRODUCT Very Low Long Term Drift
HCCS-3**	±1.0	±.005	<.15nT.	Adjustable to 0	115 VAC	3 Axis Helmholtz Controller NEW PRODUCT with Additional Single Axis Calibration Probe
VLN-3**	±1.0	±.002	<.005nT. Rms √Hz	<10nT.	18-16 V 100 ma.	Very Low Noise, Low Power Magnetometer with 7.62×15.24 cm. Electronics Card
DM60-3A	±.9	±.15	<.5nT.	<25mv.	28-20 V 50 ma.	Miniature Triaxial Sensor Magnetometer for RPVs, Buoys, etc.
SPM3HR	±1.0	±.2	<7.0nT.	<50mv.	28-20 V 50 ma.	ULTRAminiature .457 cm. Ring Core Sensor Magnetometer
SDI-3	±1.2	±.01	<.15nT.	<25nT.	18-16 V 265 ma.	Single Card Triaxial Magnetometer with three 20 bit A/Ds & RS232 or RS485 Output
SDM-3B**	±1.0	±.005	<.1nT.	<10nT.	115 VAC 3 Watts	Very High Stability Triaxial Magnetometer with Analog Output
GP-360**	±1.0	±.005	<.1nT.	<10nT.	115 VAC 2 Watts	Single Axis Magnetometer Very High Stability with Battery Option
DM75K3	±.075 or ±.75	±.01	<.2nT.	<50nT.	±28 VDC	Gimballed Sensor Magnetometer for Degaussing Ranges, Dual Range with Earth's Field Backoff

*1 NANOTESLA (nT) = 10^{-5} Gauss = 1 Gamma

**Available with ABSOLUTE ACCURACY to .03%

COMPLETE PRODUCT SPECIFICATIONS AVAILABLE UPON REQUEST.

Empro gives you the world's widest selection of DC ammeter shunts



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E.I.L. Instruments—Mancib Div.
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Phone (404) 669-0990

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Portland, OR 97217
Phone (503) 283-0132

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Cleveland, OH 44136
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TX, OK, LA
Ev Smith Sales
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Phone (713) 931-0403

Arlington, TX 76017
Phone (817) 572-2911

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Philadelphia, PA 19115
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ILLINOIS
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Chicago, IL 60656
Phone (708) 632-0473

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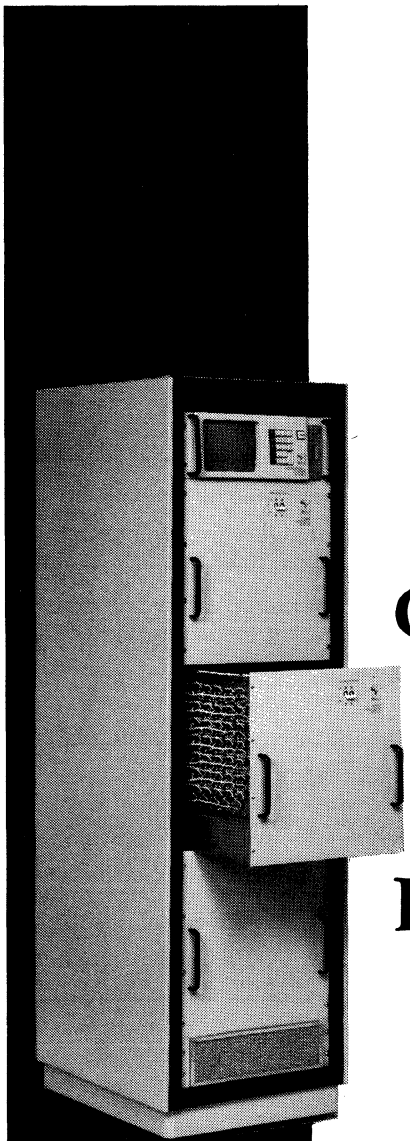

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Multimeters

Fluke 85 Fluke 87

Fluke 80 Series Analog/Digital Multimeters

- $3^{3}/_{4}$ digit, 4000 counts
- 0.3% basic dc accuracy (Fluke 83); 0.1% basic dc accuracy (Fluke 85 & 87)
- Frequency & duty cycle
- Capacitance
- Touch Hold® & Relative
- 43 segment analog bargraph
- Additional for the Fluke 87 model:
  - $4^{1}/_{2}$ digit mode
  - True-rms ac voltage & current
  - 1 ms Peak MIN MAX
  - Back lit display
  - 3 year warranty, 1 year calibration cycle

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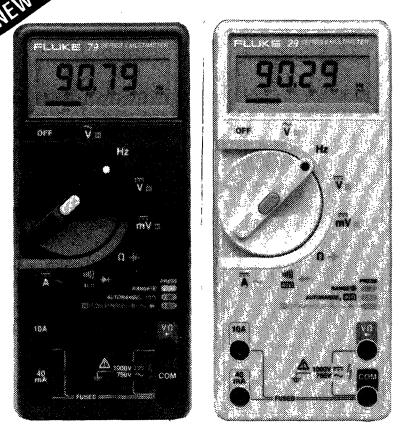

Fluke 79 Fluke 29

Fluke 79 & 29 Series II Analog/Digital Multimeters

- 4000 count digital display (9,999 count for Hz, capacitance and Lo-Ohms)
- 63 segment analog bargraph
- 0.3% basic dc accuracy; 1.0% basic ac accuracy
- 0.5% basic dc current accuracy (4 mA to 10A)
- 0.4% basic resistance accuracy
- Frequency Counter; Capacitance
- Lo-Ohms range with zero calibration
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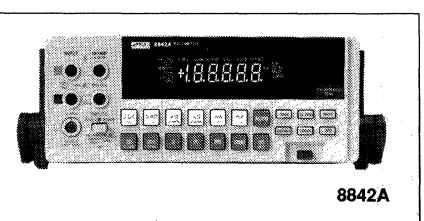
- Autoranging with manual ranging
- TL 75 Test Leads with Hard Points™
- Sleep Mode
- Holster/Flex-Stand™
- Smoothing™
- 3 year warranty



8842A

8840 Series $5^{1}/_{2}$ Digit Multimeters

- Basic 1-year dc accuracies to 0.003%; ohms accuracy to 0.008%
- Ohms and dc current standard, True-rms ac voltage and current optional
- Full system capability with optional GPIB/IEEE-488 interface
- Up to 100 readings/second system speed
- Vacuum fluorescent display
- Closed-case calibration; Comprehensive self-test built-in

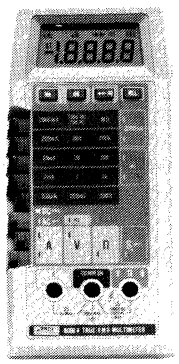
Also see our Oscilloscopes in EEM Section 2975.

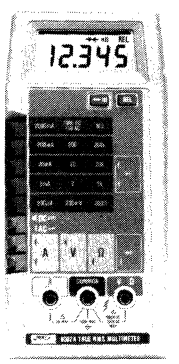
Call Fluke toll-free at 1-800-44-FLUKE to order or for more information

FLUKE AND PHILIPS – THE GLOBAL ALLIANCE IN TEST & MEASUREMENT

FLUKE® PHILIPS

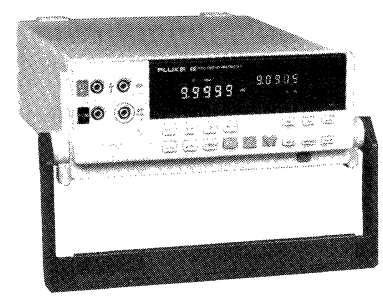
Multimeters


8060A


8062A

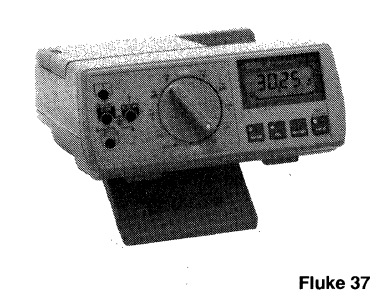
8060A & 8062A 4½ Digit Digital Multimeters

- 4½ digit (20,000 count) resolution
- True-rms ac measurements
- Fast audible/visual continuity tests
- Relative reference (offset)
- Low-power ohms on all resistance ranges
- Constant-current diode test mode
- Resistance measurements to 300 MΩ
- True-rms ac voltages to 30 kHz
- 0.04% basic dc accuracy (8060A) 0.05% basic dc accuracy (8062A)
- Self diagnostics
- UL 1244 listed
- Additional for 8060A model:
  - Frequency Counter: 12 Hz to 200 kHz, functional to 700 kHz
  - dBm or relative dB measurements
  - Conductance measurements


Fluke 45

45 Dual Display Multimeter

- Multi-function vacuum fluorescent dual display for viewing 2 different measurements at the same time
- True-rms voltage and current, including ac + dc
- RS-232 interface standard, GPIB/IEEE-488.2 option
- Frequency measurement to 1 MHz
- dB measurements with selectable reference impedances of 2Ω to 8,000Ω and audio power from 2Ω to 16Ω
- 0.05% dc current accuracy for 4-20 mA current loop service
- Touch Hold®, Relative and Min Max
- Audible continuity and diode test
- Optional rechargeable battery, carrying case, rack mount kit


Fluke 37

Fluke 37 Bench Portable Digital Multimeter

- Sloped front panel for easy viewing
- 3200-count digital display, combined with fast 31-segment analog bargraph
- "Min-Max" and "Relative" modes
- Fast autoranging and Touch Hold® functions
- 0.1% basic dc accuracy, overload protection to 1000V rms, fused 10A range
- Built-in storage compartment for accessories and a detachable tilt stand
- Superior shielding against electromagnetic interference (EMI)
- Survives 6 kV transients on 660V major ac feeders

Also see our Oscilloscopes in EEM Section 2975.

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The all new 1991 version of the world famous Alternate Source Directory is now available in floppy disk form for your IBM XT & AT and 100% compatible personal computer with hard drive.

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The **1991 ICMASD** is fast, convenient and very user friendly!

Complete program documentation is included. When ordering, be sure to specify if you want the **1991 ICMASD** on three, double-sided, double-density disks OR on one high-density disk.

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RF/Microwave Radiation Hazard Measuring Systems

- One hand operation
- Low weight: 2.1 lbs. (Meter and Probe)
- Ultra-broad frequency range in one Probe: 200 kHz-40 GHz
- Small Size
- Rugged Construction
- Hazard Level Alarms
- Wide dynamic range: 40 dB
- Measures ANSI and Other Published Safety Levels
- Battery/Line Operable

RAHAM Model	Freq. Range	Response	Power Range mW/cm^2
10	300 MHz-18 GHz	directional	.2 to 200
20	10 MHz-3 GHz	directional	.2 to 200
30	300 MHz-18 GHz	isotropic	.2 to 200
40	200 kHz-40 GHz	isotropic	.002 to 20
50	200 kHz-40 GHz	isotropic	.02 to 200
NEW 70	200 kHz-1.2 GHz	isotropic	.002 to 20

FIELD TEST SOURCE

The Model 309 RAHAM Test Source provides a convenient means for verifying the operational performance of a RAHAM system. The Model 309 Test Source is portable, battery operated and can be conveniently housed within the RAHAM carrying case.

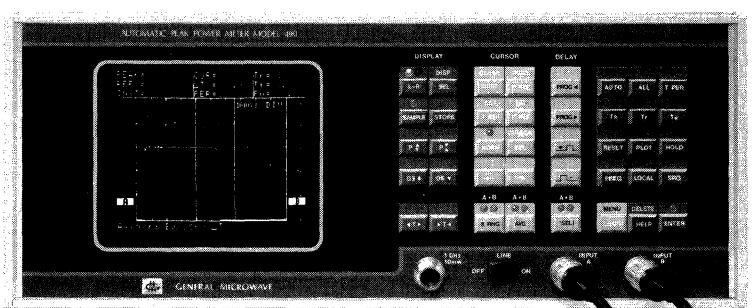
AUTOMATIC Peak Power Meter
Dual Input, Dual Trace, Multi-Color Display

KEY PERFORMANCE CHARACTERISTICS

- Frequency Range: 10 MHz to 40 GHz
- Power Range: −30 dBm to +15 dBm
- Accuracy: ±0.15 dB
- Minimum Measurable Pulse Width: 15 nsec.

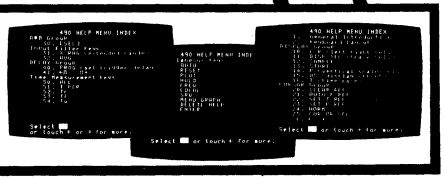
UNIQUE FEATURES

- One Command, Bus or Keystroke, measures and displays Rise Time, Fall Time, Pulse Width and Period.
- Automatic measurement of Peak and Instantaneous Power and the Power Ratio of two input signals.
- Simultaneous display of both waveforms on a calibrated graticule, each in a different color.
- Digital display of the pulse characteristics of each input, color-keyed to the waveform.
- Built-in RF Power Reference.
- Pulse measurement algorithms reduce GPIB and system controller time.



HELP SCREENS

A Help Mode feature has been added to the Model 490 Automatic Peak Power Meter to provide information for all of the 490 key functions.



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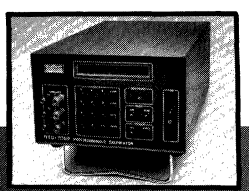
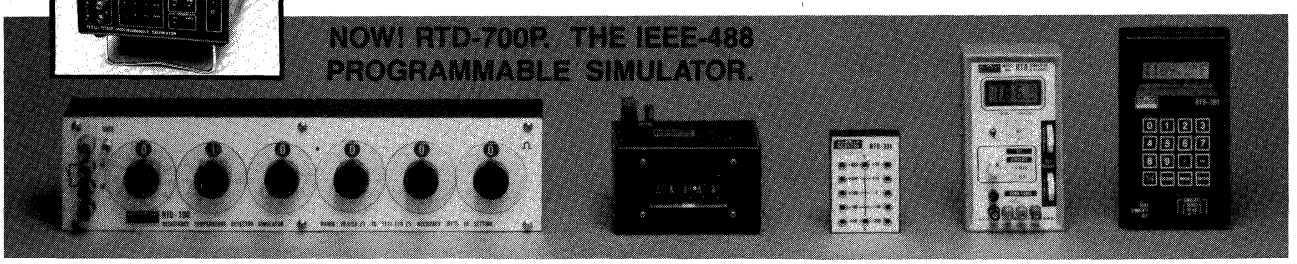
- ○ Accuracies up to ±0.005% absolute.
- ○ Over 50 models.



Whatever your RTD . . . 10Ω copper to 1000Ω platinum . . . DIN, ANSI or W.H.Y. . . . accuracy anywhere up to ±0.005% absolute . . . resistance value from 10Ω to 10kΩ. *Whatever your application. There is a GR instrument just right for you.*

When accuracy is paramount in RTD simulation, it is critical that you use the tool *specifically designed for the purpose.* [Resistance decades *will* do the job, for example, but at settings below 400Ω "0" resistance and contact resistance often *exceed* the basic accuracy statement of the resistance box.] For top level accuracy it is recommended that you specify GR models RTD-100X, 100, 500/1000 or 200. When the convenience of portability is of primary importance you may prefer to specify models in the RTD-300, 400 or 700 series. When a resistance decade *is* sufficient for the application, specify one of GR's comprehensive range of instruments (see back cover). Note also that GR's E-35 Instant Lab is designed for effective performance as an RTD or Thermocouple simulator.



RTD-100X Table model	Absolute accuracies previously unattainable in RTD simulation with no adders. Standards lab performance, yet ruggedly constructed to perform in the most demanding field applications.	○ Overall accuracy ±0.005% ○ Resolution 0.001Ω ○ Range 10 to 1111.110Ω
RTD-100 Table model		○ Overall accuracy ±0.01% ○ Other specs as above
RTD-500/ 1000 Table model	Similar in performance to RTD-100X and RTD-100 but specifically designed for use with new higher accuracy 1000Ω platinum RTDs.	○ Overall accuracy ±0.005% ○ Resolution 0.01Ω ○ Other specs same as RTD-100
RTD-200 Table model	Based upon same Waidner-Wolf operating principle as Model RTD-100X . . . with savings in original cost.	○ Overall accuracy ±0.02% ○ Resolution 0.01Ω ○ Range 20.00 to 1121.10Ω
RTD-301, 302, 303 Shirt-pocket portable	High accuracy, low cost units designed to test or calibrate on-line RTD systems dedicated to the maintenance of specific temperatures.	○ 10 standard temperatures ○ OR 10 temperatures of customer's choice ○ OR 5 standard, 5 choice
RTD-401, 2 Portable	Use either as simulator or readout for instrumentation, process and quality control applications. Battery-powered.	○ RTD-401 for 100Ω pt RTDs ○ RTD-402 for 10Ω cu RTDs ○ 1mA test current
RTD-700 Portable	High accuracy simulator and readout combination for use with DIN pt 100 RTD systems. Microprocessor control, key-board entry, instant warm up.	○ Accuracy ±0.1% of setting + 1 digit (simulator) ○ Resolution 0.1° (full 4 digit readout)
RTD-700P Table Model	Same specs as RTD-700 above . . . **AND PROGRAMMABLE (IEEE-488).**	

Thermocouple Simulators

Ultra-precise for calibration of virtually *any* T/C system . . . *any* T/C material . . . *any* temperature . . . with standards lab accuracy.

Provide ±¼% accuracy. Can be used to calibrate virtually any T/C system at any temperature with internal cold function compensation referenced to 0°C. Zero output impedance insures that system element under test or calibration responds *only* to the simulated temperature signal. *This eliminates need to disconnect system thermocouple.*

Instant Lab E-35B

The 5-in-1 battery-operated calibrator

- ○ Thermocouple or RTD simulator.
- ○ Decade resistance box.
- ○ Current source or voltage source.
- ○ All at basic ±0.1% accuracy.

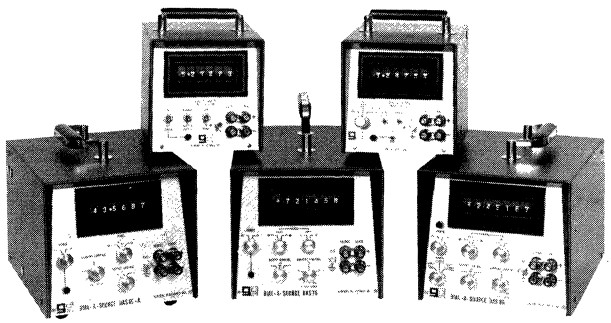
Model E-35B simulates the output of thermocouples B, E, J, K, N, R, S and T, as well as any RTD with resistances from 0 to 2000Ω — 10Ω copper, 120Ω nickel, and 100, 500 and 1000Ω platinum. It also outputs 0-200mVdc, 0-20Vdc and 0-200mAdc.

Basic accuracy for all functions is ±0.1% of setting with readout provided in a simple in-line easy-to-read format.

Dial-A-Source

VOLTAGE/CURRENT SOURCES

- Ultra-precise voltage and current sources.
- Transducer simulation, instrument calibration and component evaluation.
- Calibration of 4-20 and 10-50 mA transmitters.



These easy-to-use dialable reference/calibration sources are available in a complete family of instruments. All models have been specifically engineered for extremely stable, highly accurate performance in standards laboratories. All models have been ruggedly designed for use in the plant. Special battery-operated units are ideal for field usage. And there is a series of remarkably versatile instruments that have been built to offer compact lightweight portable performance at a moderate price.

Whatever your application, there is a GR model engineered to do the job.

PARTIAL SPECIFICATIONS

SEE BULLETIN GR-103, VOLTAGE/CURRENT SOURCES, FOR COMPLETE SPECIFICATION TABLE

Constant Voltage & Current Sources	DAS-45CC	DAS-56A	DAS-56AX	DAS-56AL	DAS-57AL			DAS-86	E-35B
Constant Voltage Sources*		DAS-46A	DAS-46AX	DAS-46AL	DAS-47AL	DAS-66A	DAS-66AX		
Battery/line operated models available	No	Yes (Change "A" in model number suffix to "B")				No	No	No	Yes
Output EMF, F.S., ranges, dc	±0.1,1,10V	±1V & 10V				±1V & 10V & 100V		±1V,10V	±200mV & ±20V
Resolution, EMF, per step (LSD): 0.1V range	1μV	1V range: 1μV			1V range 0.1μV	1V range: 1μV		1V range 0.1μV	200mV range: 1μV
1.0V range	10μV	10V range: 10μV			10V range 1μV	10 range: 10μV		10V range 1μV	20V range: 1mV
10.0V range	100μV					100V range: 100μV			
Accuracy(1), EMF, %, ±	0.0075	0.005	0.0025	0.0015	0.0015	0.005	0.0025	0.005	±0.1% ±100μV
Output current, max. load, ±	50mA	50mA all battery operated; line-only models, 30mA						1 Amp.	2.00mA
Resolution(3), as constant current source, per step (LSD): 1V range	—	10nA*			1nA*	—	—	1μA*	10.0μA
10V range	—	100nA*			10nA*	—	—	10μA*	10μA
Accuracy(2), as constant current source, %, ±	0.015	0.008*	0.0055*	0.0045*	0.0045*	—	—	0.008*	±0.1% ±10μA F.S.

*Current resolution and accuracy specifications apply only to the DAS-45CC and 50 Series and the DAS-86 and the DAS-40 Series when used with DAA-40 Adaptor.

(1) Of actual setting: ±5μV max. possible offset @ 25°C, nom. line voltage or battery condition, no load, after warm-up (±10μV on 10V range of DAS-45/45CC).

(2) Use only on 1V range. Compliance voltage is 12V.

(3) Of actual setting: plus the effect of ±5μV max. possible offset across the integral sensing resistor @ 25°C, nom. line voltage or battery condition, after warm-up.

Resistance Decades

- Resistance to 111.111 Meg, resolution to 0.01Ω.
- Accuracies from ±1.0% to ±0.01%.
- 3, 4, 5, 6, 7 decade, OEM, console or bench models.

Both the RDS and DA Series are General Resistance quality instruments based upon the GR ultra-precision wirewound resistor that the company has been producing for almost 30 years. Both offer 111.111 megohm resistance values, accuracies to ±0.01% resolutions to 0.01Ω and models of up to 7 decades.

RESIST-O-STAT MODELS (RDS Series)

Two versions — with basic accuracies of either ±0.025% or ±0.01%. Resistors used are low reactance types permitting the RDS to be used from dc through audio frequencies. Zero resistance is 0.0015Ω/decade. Numerical readout is positive and in-line.

DIAL-AN-OHM UNITS (DA Series)

Reliable performance at less than one-half the cost of the RDS models, partly because DA thumbwheel switches are far less expensive than RDS rotary switches.

NOW! A GUARANTEED CALIBRATION/RECERTIFICATION SERVICE ON ALL OF OUR PASSIVE RTD SIMULATORS AND RESISTANCE DECADE BOXES

General Resistance RTD Simulators stand alone as far as accuracy is concerned. Our Decade Boxes are also superior or equal in performance to any in the industry. But... remember ... even the finest and most sophisticated tools require periodic recertification and service.

Who better to check/calibrate and certify them than the General Resistance people. The people who designed and built them. The same General Resistance people who pioneered the concept of "NO ADDER ACCURACY" incorporated in the RTD-100, RTD-100X, RTD-200 and RTD-1000/500.

Call the number below and ask how you can take advantage of this critical, yet competitively priced service with GUARANTEED TURNAROUND TIME.

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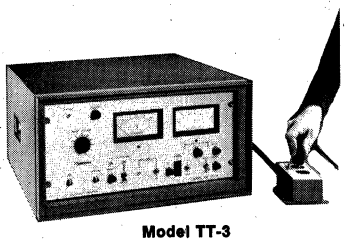
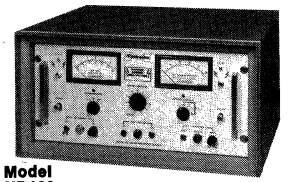
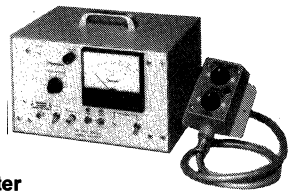


Model TT-3



Model HD106



Model HA3AT-C

Non-Destructive hipots for measurements of Leakage Current or Resistance, Dielectric Strength and Corona Discharge. Applications include hipot testing transformers, motors, cables, insulation material, electrical appliances, electronic assemblies, capacitors, etc.

300 Series — Five Megohm Range

Model No.	H301B	H303B	H306B
Output AC	1.0 kV	2.5 kV	5.0 kV
Output DC	1.5 kV	3.0 kV	6.0 kV

100 Series — Voltage & Current Readout

Model No.	HD103	HD106	HD115	HD125	HD140
Output AC	2.5 kV	5.0 kV	12.0 kV	10.0 kV	15.0 kV
Output DC	3.0 kV	6.0 kV	15.0 kV	25.0 kV	40.0 kV

A-B Series — Simple Low Cost AC or DC Models

	AC			DC		
Model No.	HDA3	HDA5	HDA10	HDB4	HDB6	HDB12
Output	3 kV AC	5 kV AC	10 kV AC	4 kV DC	6 kV DC	12 kV DC

A-T Series — Electrical Appliance Testing to UL Standards

Model No.	A1-AT-C	HA3-AT, HA3-AT-C, HA3-AT-CT	HA5-AT	HDB4-AT
Output	1200 VAC	0-3000 VAC	0-5000 VAC	0-4000 VDC

TT-3 Model — Tool & Appliance Tester

Designed for unskilled or semi skilled personnel to use on a go/no-go basis in testing of electrical tools and appliances. Unit performs three major functions:

1. Test for Wire Continuity
2. AC Hipot Testing
3. Run Test Sample at 115V/220V — 3 Amps

For more information request Catalog 1.

700 SERIES AC DIELECTRIC TESTERS

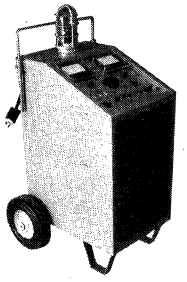
For thirty years Hipotronics has designed and built test equipment to meet industry needs for testing to ASTM, NEMA, IPECA, CSA, UL and other industry specifications. This "700 Series" of equipment is available in a wide variety of configurations and power ratings from .5 kVA up to 500 kVA. Model 705-2M, for example, has casters for mobility within the factory or laboratory.

Model 750-2/D149, with its controls, regulator, high voltage section and test chamber takes up less than four square feet of floor space. Specifically designed to test to ASTM-D149 specification, this unit has adjustable automatic rate of voltage rise, preset test voltage meter relay, memory meter circuit, and a safety interlocked test chamber with transparent door.

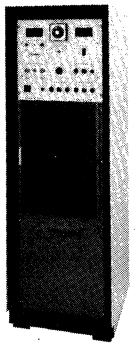
Partial discharge detection equipment is also available for use with these versatile ac dielectric testers. Ask for Catalogs 16, 17 and 18 as well as for Catalog 44, describing Hipotronics' Series Resonant Test Equipment for capacitive loads above 500 kVA.

No. of Models	Power Rating (KVA)*	AC Volt Range (KV)
8	0.5	1-30
8	1	1-30
9	2	1-50
11	5	1-100
13	10	1-150
15	20	1-200
16	40	1-300
17	60	1-350
20	100	1-400
21	150	1-500
22	200	1-600
23	250	1-750
23	300	1-750
23	400	1-750
23	500	1-750

* Higher KVA Ratings Available.
For more information request Catalog 16.

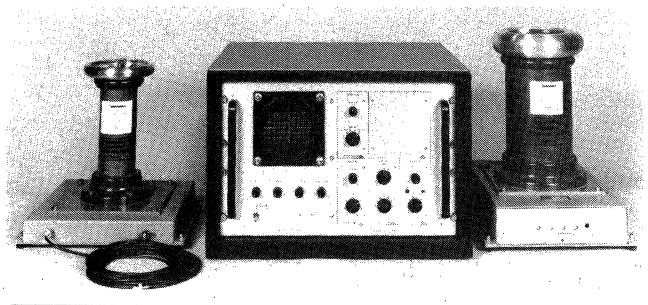


Model 705-2M



Model 750-2/D149

PARTIAL DISCHARGE DETECTION SYSTEMS



The Corona detector measures partial discharge levels within the test specimen and is designed to provide flexible selection of desirable features for various test configurations.

The Model CD077A Detector (middle unit in photo at right) provides instrumentation to measure partial discharge pulses isolated from high voltage by a power separation filter (PSF) (on the right). These, in conjunction with the calibration injection capacitor (CIC) (on the left), and a power source (as in the 700 series above) are basic elements for testing the insulation of electrical apparatus and electronic components.

Hipotronics has long standing experience in the design and manufacture of a *complete line* of integrated units that incorporate a matched HV source (either ac or dc) and the partial discharge detection system. For more information request catalog section 8205.

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30 YEARS OF SERVICE

Hipotronics®

HIGH VOLTAGE MEGOHMMETERS

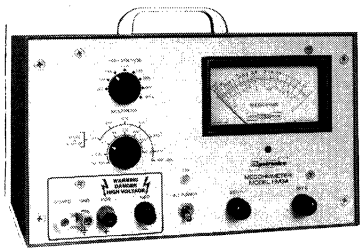
Model HV5
HEAVY DUTY INDUSTRIAL MEGOHMMETERS

A complete range of megohmmeters for testing insulation resistance on all electrical equipment including wire, cable, motors, regulators, connectors, transformers, switchgear, circuit breakers, generators, and much more.

For more information request Catalog pages indicated.

The HV Series is designed for portable use in the field or factory. They are ideally suited to use in industrial or substation environments when measurements to 300,000 megohms at voltages up to 15 kV are required.

The HM Series is designed for general purpose laboratory use with test voltages to 1 kV and readings to 20,000,000 megohms.



Model HM3A
LABORATORY MEGOHMMETER

HV Series

Model No.	Output Voltage	Megohm Range	Range Switch
HV2.5	0- 2,500	.1 to 50,000	X.01, .1, 1, 10
HV5	0- 5,000	.1 to 100,000	X.1, 1, 10, 100
HV10	0-10,000	.1 to 200,000	X.1, 1, 10, 100
HV15	0-15,000	.1 to 300,000	X.1, 1, 10, 100

HM Series

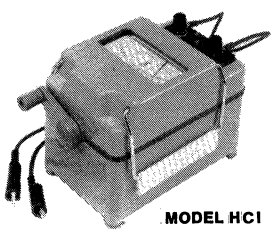
Model No.	Output Voltage	Megohm Range
HM3A	50 100 500 1000	0.1 to 1,000,000 0.2 to 2,000,000 1 to 10,000,000 2 to 20,000,000
HM6B	50 250	0.1 to 1,000,000 0.5 to 5,000,000

For more information request Catalog pages 2-1, 4.

MODEL HV5C
RESISTANCE
ANALYZER

Model HV5C microprocessor-based, battery-operated, voltage insulation resistance analyzer, features automatic testing programming to save manual calculations and interpolation and make fast, accurate tests.

Hand Crank Insulation Testers
These small portable testers are powered by a hand driven ac generator, for measuring insulation resistance of motors, transformers, cables, etc. The instruments are simple and easy to use with a long clear scale, wide range and give results that are not affected by ground current.



MODEL HC1

Model HV5C Range Specifications

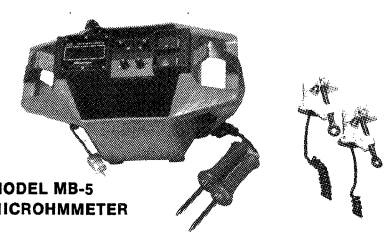
DC Test Voltages	500 V, 1 kV, 2.5 kV, 5 kV selectable by a six position rotary switch
Insulation Resistance Ranges	Fully autoranging allowing resistance measurement from 100 k Ohm to 100 G Ohm
Minimum Resistance	5000 V

Model HV5B performs Resistance, Polarization index and Go/No-Go tests with a LCD display for all measurements and an analog meter showing terminal volts (for safety) and battery condition. Batteries are rechargeable. Ask for Catalog Pages 2-3, 4.

HC Series

Model No.	Rated Voltage	Test Voltage	Effective Measuring Range
HC.5L	500 V	1.5 KV	1 ~ 1000 m Ohms
HC.5H	500 V	1.5 KV	1 ~ 2000 m Ohms
HC1	1000 V	2 KV	2 ~ 2000 m Ohms
HC2.5	2500 V	3.5 KV	5 ~ 5000 m Ohms

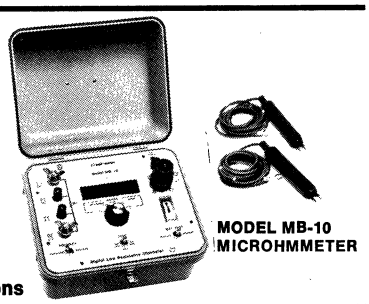
Ask For Catalog Number HP9010



MODEL MB-5
MICROHMMETER

Model MB-5 is a battery powered, highly reliable and easy to use instrument for low resistance measurements. It is capable of displaying a 4 wire resistance measurement of 4 digits in approximately 5 seconds.

Model MB-10 microhmmeter is also battery powered and uses the four wire Kelvin method to measure resistance over the range of 60 ohms to 1 microhm with a test current up to 10 A.



MODEL MB-10
MICROHMMETER

Model MB-5 Specifications

Test Current Capability:	5 Amps
Range Switch Settings:	Milliohm Four settings Microhm Three settings Plus automatic range selection for optimum test level
Resolution:	10 Ohms to 1 Microhm
Test Current:	5 mA to 5 Amps

For more information request Catalog pages 2-7, 8.

Model MB-10 Specifications

Test Ranges	Resolution	Test Current
0- 60 Ohms	10 milliohm	1 mA
0- 6 Ohms	1 milliohm	10 mA
0-600 milliohms	100 microhm	100 mA
0- 60 milliohms	10 microhm	1 A
0- 6 microhms	1 microhm	10 A

For more information request Catalog pages 2-9, 10.

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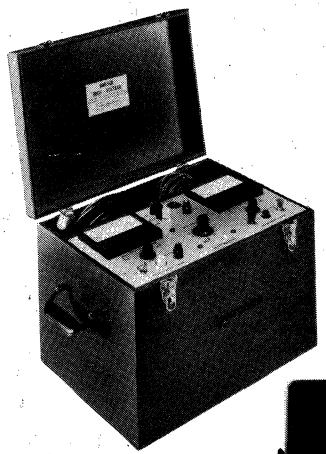
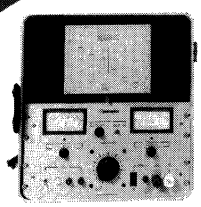
30 YEARS OF SERVICE

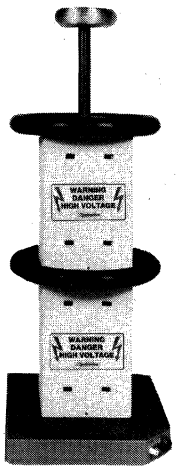
Hipotronics®

PORTABLE HIGH VOLTAGE DC HIPOTS



Model 860 PL





Model 8120 PL

800 PL Series

Both the control unit and the HV section are contained wtihin fully-instrumented case. The safe, hermetically-sealed, oil filled HV section is mounted below the control panel. Cables are stored behind the control panel.

Input	115V, 60 Hz or 220V, 50/60 Hz, 3 Amp	
Output	Model 880 PL	0-80 kV
	Model 860 PL	0-60 kV
	Model 815 PL	0-15 kV
	Model 8120-5 PL	0-120 kV
	Model 8170-5 PL	0-170 kV

For more information request Catalog 3.

8060 PL Series — Air Insulated DC Insulation Tester

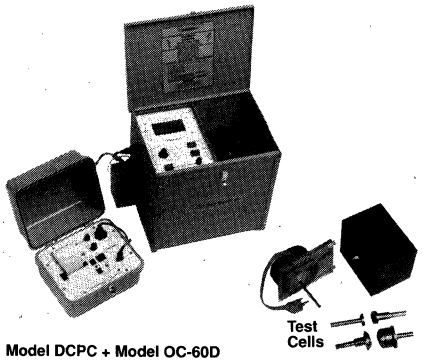
The cascaded circuitry (patent #3,643,105) of the 8060 PL series eliminates the major disadvantages of the widely used Cockroft Walton multiplier circuit: there is no decrease in power capability as more HV sections are added. Each HV module is a complete voltage doubler with its own epoxy-encapsulated transformer; each transformer has a tertiary winding to feed the succeeding stage. The standard controller has a continuous rating of 1 KW, which can be raised to 2 KW during cable charging for short duration.

Input	115V, 60 Hz or 220V, 50/60 Hz 1. KVA full load		
Output	Model No.	Number of 60 KV Modules	Output
	8060 PL	1	0-60 kV @ 16.0 mA 0-50 kV @ 20.0 mA
	8120 PL	2	0-120 kV @ 8.0 mA 0-100 kV @ 10.0 mA
	8180 PL	3	0-180 kV @ 5.5 mA 0-150 kV @ 7.5 mA
	8240 PL	4	0-240 kV @ 4.1 mA 0-200 kV @ 5.0 mA
	8300 PL	5	0-300 kV @ 3.3 mA 0-250 kV @ 4.0 mA

8175 PL Series — Gas Insulated Modular Unit

The high voltage circuitry in this unit is a patented cascade system, which overcomes the disadvantages of conventional voltage-multiplier circuits. Each high voltage section is a complete voltage doubler with its own transformer, rectifiers, capacitors, series resistors, meter multiplier, and an insulated tertiary to feed the next stage. The conservatively designed transformers can be overloaded repeatedly. Anticorona toroids are provided as needed.

Input	115V, 50/60 Hz or 220V, 50/60 Hz	
Output	Model 8175-PL-1	0-175 kV @ 17.0 mA
	Model 8175-PL-2	0-350 kV @ 8.5 mA
	Model 8175-PL-3	0-525 kV @ 5.7 mA
	Model 8175-PL-4	0-700 kV @ 4.3 mA
	Model 8175-PL-5	0-875 kV @ 3.4 mA
	Model 8175-PL-6	0-1050 kV @ 3.0 mA



Test Cells

Model DCPC + Model OC-60D

LIQUID DIELECTRIC TESTERS

Designed to test breakdown voltages of insulating oil at ASTM specifications. Provided with test voltage capability to accommodate dielectric fluids currently being used in transformers, bushings, capacitors, etc. Output stable to 2% for input line regulation of ± 10%. New digital metered oil testers are now available as well as the optional Model OC-PC for full automatic operation and printout of test results. No longer any need to record and calculate readings by hand. For more information request Catalog 6.

OC Series — Oil Testers

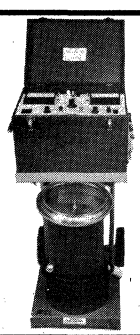
Input	115V(50/60 Hz, 2 Amps, Single Phase (220V also available)	
Output	Model OC-60A Model OC-60D	0-60 kV rms @ 2 KVA
	Model OC-90A Model OC-90D	0-90 kV rms @ 2 KVA
	Model OC-51M*	0-50 kV rms @ 2 KVA

* Manual Rate of Rise Adjustment.

TC Series — ASTM Test Cells

Test Cell Model	TC/DE	TC/VDE	TC/CE90*
Specification tested to	D-877	D-1816	D-877 D-1816

*Only for use with OC-90A.
For more information request Catalog 6.



Model 100 HVT

PORTABLE AC INSULATION TEST SETS

Model 100HVT is useful for measuring leakage current in many different High Voltage ac applications such as on rotating machinery, hot sticks, ropes, aerial platforms, bucket trucks and, for example, measurements on insulated platform and linings in accordance with ANSI/A922. Unit has an external capacitive voltage divider and an output voltage rating of 100 kV rms. Large wheels make this unit easy to transport indoors or outside.

Model 100HVT Specifications

Output	100 kV at 50 mA — 5 kVA 50 kV at 100 mA — 5 kVA

Triple range voltmeter connected directly across output for maximum accuracy. Triple range current meter (1/10/100 mA) for low current readings.

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30 YEARS OF SERVICE

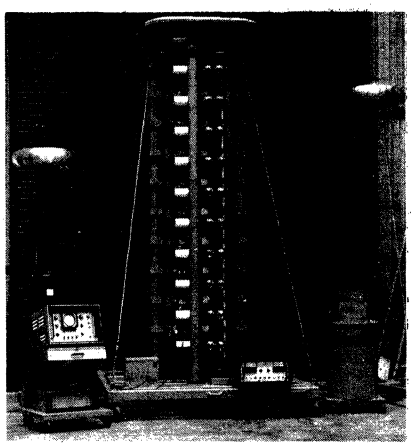
Hipotronics®

HIGH VOLTAGE DIELECTRIC TEST EQUIPMENT

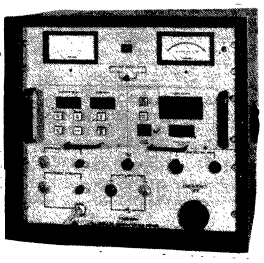
IMPULSE GENERATOR TEST SYSTEMS

Designed for Flexibility, Impluse Systems simulate Lightning or Transient Voltage Phenomena Associated with power transmission.

Standard Systems available in 100 kV and 200 kV stages, and can be purchased to be expandable to cover future Test Requirements.



IMPULSE ACCESSORIES



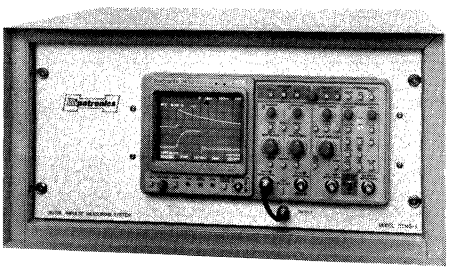
Waveshaping Resistors, Multiple Element Chopping Gaps, Sphere Gaps, Recurrent Surge Generator, Step Pulse Generator, Voltage Dividers (Damped capacitive and resistive) and Wide Band Current measurement equipment.

DIGITAL IMPULSE MEASUREMENT SYSTEMS

These instruments are specifically designed and packaged for use in high voltage impulse tests. Model DIMS-1 and DIMS-2 are 8-bit, one and two channel respectively. Model DIMS-5 is a 10-bit, dual channel design with an option for 4-channels. Model IG1.5-CAL is a Precision Impulse Calibrator designed to provide calibration pulses for digitizer calibration.

Digital capture of all measurements has many advantages over conventional analog oscilloscopes, cameras and film. Interference so often associated with high electromagnetic fields and high voltage and high current impulse testing is overcome by particular attention to shielding.

All equipment is designed to meet the approved standards ANSI/IEEE std. 1122-1987 and IEC-604 for digital recorders. For more information, ask for catalogs.



Model DIMS-1

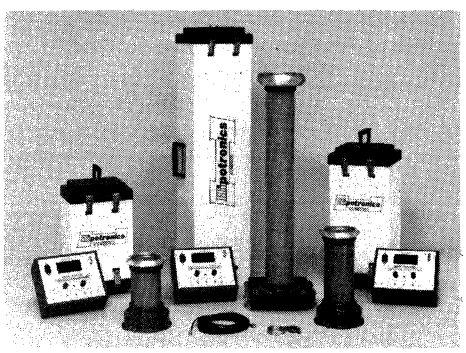
KILOVOLTMETERS

KV Series — AC/DC Kilovoltmeters

Two piece laboratory instruments with analog meter and separate divider for AC and DC testing. Packaged in an oil-filled insulating section.

Model	KV25A	KV100A	KV200A
Meter Scale	0-5/10/25	0-20/50/100	0-40/100/200

Model KV100A



KVM Series — Digital Kilovoltmeter System

Two component system with 3½ digit dual range DVM. Functions include DC, AC, RMS, + Peak, − Peak, Sine reference or absolute.

For more information request Catalog 14.

Model No.	KVM200	KVM100	KVM20
High Range Low Range	0-199.9 kV 0-19.99 kV	0-100 kV 0-10.0 kV	0-19.99 kV 0-1.999 kV
Voltage Rating	200 kVac (285 kVp) 200 kVdc	100 kVac (142 kVp) 100 kVdc	20 kVac 28.5 kVp 20 kVdc
Ratio	2000:1*	1000:1*	200:1*

* (With Load Impedance of One Megohm and <500 pF.)

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IET LABS, INC.

DEPT. EM, 534 MAIN STREET WESTBURY, NY 11590, (516) 334-5959 FAX: (516) 334-5988

PRECISION INSTRUMENTS FOR TEST AND MEASUREMENT

SELECTION GUIDE

DECADE SUBSTITUTERS • STANDARDS • DIVIDERS

RESISTANCE

SERIES	TYPE	BASIC ACCURACY	RANGE	MAX. RESOLUTION	FEATURES	PAGE
RS	General Purpose	0.1%(or better) -1%	0-1000 MΩ	0.01 Ω	General purpose; economical; thumbwheel switches	D•1259
HARS-X	High accuracy	0.01%	0-11 MΩ	0.001 Ω	Laboratory grade; high accuracy; high stability; low zero resistance; low temperature coefficient; suitable for RTD simulation.	D•1260
HARS-A	High accuracy	0.05%	0-11 MΩ	0.01 Ω		
HARS-Q	High accuracy	0.02%	0-11 MΩ	0.01 Ω		
HARS-L	Lab/cal grade	0.0025%	0.01 Ω-11 MΩ	0.001 Ω		
HRRS	High resistance	0.1%(or better)-1%	0-1,110 MΩ	0.01 MΩ	High resistance	D•1260
HPRS	High power	1%	0-10 MΩ	0.01 Ω	High power, 25 W/step, 250 W max	D•1260
PRS	Programmable	0.05%-1%	0-100 MΩ	0.1 Ω (or lower)	IEEE-488 or BCD	D•1262
PRTD	Programmable RTD	0.05%-1%	10 Ω-10 MΩ	0.001 Ω	absolute accuracy	D•1262
HATS-LR	Transfer standard	1 ppm transfer	10 Ω-100 kΩ/step	1 Ω	High accuracy transfer standard	D•1261
HATS-Y		2 ppm transfer	100 kΩ-100 MΩ/step	10 kΩ		D•1261
KVD-600 KVD-700	Kelvin-Varley Divider	0.1 ppm linearity	10 kΩ, 100 kΩ	0.1 ppm	Voltage divider for calibration and test	D•1261
KVD-500		0.05%-1%	1 kΩ-100 kΩ	1 ppm	General purpose; suitable for OEM; thumbwheel switches	D•1261
DP-500	True digital pot.	0.05%-1%	0-50 MΩ	1 ppm	Suitable as component	D•1261
SR	Standards	20 ppm	1 Ω-10 MΩ		4-terminal, stable, economical	D•1263

CAPACITANCE

SERIES	TYPE	BASIC ACCURACY	RANGE	MAX. RESOLUTION	FEATURES	PAGE
CS	General Purpose	1%(or better)-4%	0-100 μF	1 pF	General purpose; economical; thumbwheel switches	D•1259
HACS	High accuracy	0.05%-0.1%	100 pF-1.111 μF	100 pF	Laboratory grade; high accuracy; high stability low temperature coefficient	D•1263
HACS-Z	High accuracy; low zero capacitance	0.05%-0.1%	0-1000 μF	1 pF		
PCS	Programmable	1%(or better)-4%	0-100 μF	100 pF	IEEE-488 or BCD programmable	D•1262
SC-900	Precision variable air capacitor	0.04 pF-0.6 pF	10-1100 pF	0.02 pF	High resolution and stability; suitable for bridges	D•1263
SC	Standards	0.05% + 0.1 pF	100 pF-100 μF		Accurate; stable; economical	D•1263

INDUCTANCE

SERIES	TYPE	BASIC ACCURACY	RANGE	MAX. RESOLUTION	FEATURES	PAGE
LS	General Purpose	1%(or better)-2%	0-100 H	1 μH	General purpose; economical; thumbwheel switches	D•1259
PLS	Programmable	1% typical	0-100 H	0.1 mH	IEEE-488 or BCD programmable	D•1262
SL	Standards	0.25%	10 μH-10 H		Toroidal; stable; economical	D•1263

TEST INSTRUMENTS

SERIES	INSTRUMENT TYPE	FEATURES	PAGE
VI-700	Precision Voltage and Current Source	General purpose; programmable	D•1265
HSVR	High stability voltage reference	High stability; trimmable	D•1265
TRD-800	Transformer ratio divider	0.1 ppm resolution	Consult IET
IMF-600A	Impedance and Multifunction Meter	Multipurpose; digital output	D•1264
CM-500	Autoranging Capacitance Meter	Autoranging; digital output	D•1265
STS-1500	Component and Semiconductor Tester	Integrates with user's scope	Consult IET

IET DESIGNS & MANUFACTURES TO MIL-SPEC & COMMERCIAL CUSTOM REQUIREMENTS

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RS - CS - LS Series

Digital Decade Substituters for Resistance • Capacitance • Inductance

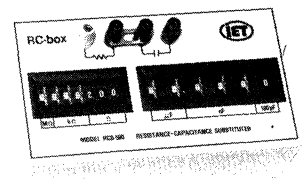
R-BOX
RS Series
Digital Resistance Substituter
Available from .01Ω to 999.9999999 MΩ

- **Direct reading — no fumbling with multiple slide or rotary switches**
- **Wide range**
- **Accurate**

C-BOX
CS Series
Digital Capacitance Substituter
Available from 1 pF to 999.999999 μF

- **Compact, convenient, and rugged**
- **Standard and custom models**
- **Error proof**

L-BOX
LS Series
Digital Inductance Substituter
Available from 1 μH to 99.99999 H



RC-BOX
RCS Series
Digital Resistance Capacitance Substituter

- **Color coded**
- **Options:**
  - **Shielded case with grounding post**
  - **Panel mounting**
  - **Low residual impedance switch**
  - **Protection fuse**
  - **Programmable and IEEE-488 option**

STANDARD MODELS — SPECIFICATIONS

MODEL	RS-200	RS-201	RS-200W	RS-201W	CS-300	CS-301	RCS-500	RCS-502	LS-400	LS-400A
TYPE OF SUBSTITUTER	Resistance	Precision Resistance	Wide Range Resistance	Wide Range Precision Resistance	Capacitance	Precision Capacitance	Resistance-Capacitance	Precision Resistance-Capacitance	Wide Range Inductance	Inductance
ACCURACY†	1%	0.1%	1%	0.1%	4%	1%			1.5% max, 1% typical	
DECADES	7		9		6				4	3
RANGE	1-9,999,999Ω		0.1-99,999,999.9Ω		100 pF — 99.9999 μF				1 mH-9.999 H	1 mH-999 mH
TYPE OF COMPONENTS	Metal Film Resistors (0.1-0.9Ω Wirewound Resistors)				100-900 pF: Mica .001-.009 μF: Polystyrene .01-0.9 μF: Polycarbonate 1-9 μF: Polyester 10-90 μF: Polarized Tantalum		Combines the RS-200 and CS-300	Combines the RS-201 and CS-301	Toroidal Inductors	
RATING	0.5 watt**				100 volts (20V 10-100 μF)				See table below	
RESIDUAL* IMPEDANCE	0.3Ω (.04Ω/decade)*, typ		0.4Ω (.04Ω/decade)*, typ		30 pF (5 pF/decade)*, typ				0.2Ω (.04Ω/decade)*, typ	
PHYSICAL	3.2x3.1x2.2 in, 6.5 oz (8.1x7.9x5.6 cm, 184 g)		4.7x3.1x2.2 in, 8.3 oz (12x7.9x5.6 cm, 235 g)		4.7x3.1x2.2 in, 8.3 oz (12x7.9x5.6 cm, 235 g)		7.4x4.3x2.4 in, 14 oz (18.8x11x6 cm, 410 g)		4.7x3.1x2.2 in, 8 oz (12x7.9x5.6 cm, 230 g)	
PRICE	$129.00	$249.00	$239.00	$429.00	$139.00	$269.00	$249.00	$489.00	$489.00	$369.00

† Accuracy = ±(Specified basic accuracy +.08 x Residual Impedance) after subtraction of Residual Impedance.

* Residual impedance is reduced to .04Ω or 5 pF for lowest decade with LR Option. This makes for more effective usage of low impedances. Lowest decade is isolated from the others with a switch when desired.

** Higher power resistance substituters (1 watt or higher) available; see below.

ADDITIONAL INFORMATION FOR INDUCTANCE SUBSTITUTERS

INDUCTANCE	FREQUENCY RANGE	MAX. Q	RATING
0.1-0.9 mH	300 Hz-2 MHz	100 at 800 kHz	700 mA
1-9 mH	300 Hz-1 MHz	80 at 40 kHz	500 mA
10-90 mH	300 Hz-800 kHz	80 at 40 kHz	300 mA
0.1-0.9 H	300 Hz-200 kHz	40 at 20 kHz	100 mA
1-9 H	200 Hz-20 kHz	30 at 8 kHz	20 mA
10-90 H	200 Hz-6 kHz	60 at 2 kHz	4 mA

LABORATORY STANDARD MODELS

See HARS and HACS Series data sheets for standards grade resistance and capacitance substituters

OPTIONAL MODELS

In order to satisfy any requirements for decade substituters, generate a part number from the table below.

RS — F — 4 — 0.1 — WC — (Example: 0.1-999.9Ω, 1%, Resistance Substituter in a case)

TYPE OF SUBSTITUTER	†ACCURACY	NO. OF DECADES	IMPEDANCE PER STEP FOR LOWEST DECADE	PACKAGING	RATING
RS Resistance CS Capacitance LS Inductance	X .01% XA .025% A .05% B 0.1% C 0.5% F 1% G 2% H 4%	1 to 11	.01Ω to 100 MΩ 1 pf to 100μF 1 μH to 10H	WC Packaged in a standard case with binding posts PM Supplied without case for panel mounting or other applications	Nil Standard rating Other Specify

OPTIONS

LR Option: Residual Impedance is reduced to .04Ω or 5 pF on lowest decade ..... Add $49.00
SC Option: Shielded case with grounding terminal ..... Add 43.00
FP Option: Unit supplied with series 2A fuse for added protection ..... Add 19.00
(User may substitute other fuses; residual impedance will increase by .06Ω for 2A fuse)
PM Option: Unit supplied without case for panel mounting ..... Subtract $ 5.00
LP Option: Unit supplied with low profile binding posts ..... Add 4.00
Model CC-25 Lead Clip: Plugs into dual binding posts for convenient lead connections 12.00
Programmable Option: ..... See PZS Series

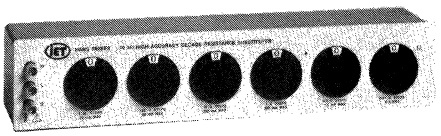
IET DESIGNS & MANUFACTURES TO MIL-SPEC & COMMERCIAL CUSTOM REQUIREMENTS

IET LABS, INC.

DEPT. EM, 534 MAIN STREET WESTBURY, NY 11590, (516) 334-5959 FAX: (516) 334-5988

HARS Series High Accuracy Decade Resistance Substituter

Tight tolerance calibration grade decade substituter for applications requiring a cost effective high performance resistance unit for laboratory and test applications.



- **High Accuracy**
- **Low Temperature Coefficient**
- **Excellent Frequency Characteristics**
- **High Stability**
- **Low Zero Resistance**

MAJOR SPECIFICATIONS

Accuracy:
X: ±(0.01% + 2mΩ) from zero setting.
A: ±(0.05% + 5mΩ) from zero setting.
L: ±(0.0025% + 0.5mΩ)

Zero Resistance:
X: <1mΩ per decade, at dc.
A: <3mΩ per decade + 2mΩ, at dc.
L: 10 mΩ ± 0.5 mΩ, at dc.

Maximum Applied Voltage:
X,A: 2000 V peak.
L: 1000 V peak.

Power per Step:
X,A: 0.5 W for 1Ω step and over, temp. rise <30°C;
0.25 W for 0.1 Ω step, temp. rise <40°C;
0.16 W for 0.01 Ω step, temp. rise <40°C.
L: 0.5 W

Resistance Temperature Coefficient:
L: < 5 ppm/°C for 100 Ω and over
X: < ± 10 ppm/°C for values over 100 Ω;
<±20 ppm/°C for values 100 Ω and under.
A: < ±20 ppm/°C.

Switch Type:
11 positions, 0-10, ceramic dielectric.

Switch Capacitance:
Less than 4 pF per switch, low loss.

Terminals:
Gold plated binding posts for low thermal emf; standard 3/4 inch spacing; one binding post connected to the case for shielding. Rear outputs are available as an option.

STANDARD MODELS

MODEL	TOTAL RES.	DECADES	RESOLUTION
HARS-X*-4-.01	111.1 Ω	4	0.01 Ω
HARS-X*-4-.1	1,111 Ω	4	0.1 Ω
HARS-X*-4-1	11,110 Ω	4	1 Ω
HARS-X*-4-10	111,100 Ω	4	10 Ω
HARS-X*-4-100	1,111,000 Ω	4	100 Ω
HARS-X*-4-1k	11,110,000 Ω	4	1 kΩ
HARS-X*-5-.01	1,111.1 Ω	5	0.01 Ω
HARS-X*-5-0.1	11,111 Ω	5	0.1 Ω
HARS-X*-5-1	111,110 Ω	5	1 Ω
HARS-X*-5-10	1,111,100 Ω	5	10 Ω
HARS-X*-5-100	11,111,000 Ω	5	100 Ω

MODEL	TOTAL RES.	DECADES	RESOLUTION
HARS-X*-6-.01	11,111.1 Ω	6	0.01 Ω
HARS-X*-6-0.1	111,111 Ω	6	0.1 Ω
HARS-X*-6-1	1,111,110 Ω	6	1 Ω
HARS-X*-6-10	1,111,100 Ω	6	10 Ω
HARS-X*-7-.001	111,111.11 Ω	7	.001 Ω
HARS-X*-7-.01	111,111.1 Ω	7	.01 Ω
HARS-X*-7-0.1	1,111,111 Ω	7	0.1 Ω
HARS-X*-7-1	11,111,110 Ω	7	1 Ω
HARS-X*-8-.001	121,111.11 Ω	8	.001 Ω
HARS-X*-8-.01	1,211,111.1 Ω	8	.01 Ω
HARS-X*-9-.001	1,211,111.11 Ω	9	.001 Ω

ACCURACY

*: **X** for 0.01% accuracy
Substitute **A** for 0.05%
Substitute **L** for 0.0025%

OPTIONS

RM - Rack mount
RO - Rear output
Single decade units, programmable devices.

HRRS Series High Resistance Decade Substituter

The HRRS series provides a broad range of high performance resistance decade substituters for high resistance values, up to 11 kMΩ, with a resolution of one to seven decades. Optimal specifications are achieved by state of the art, precision precious metal-oxide film resistors for high stability and low temperature coefficient.

- **Broad selection of standard models**
- **High accuracy - 0.1% and 1.0%**
- **High stability - 0.01%/year shelf life**
- **Low zero resistance - 3 mΩ/decade**
- **Resistance from 10 kΩ to 11 kMΩ**
- **Low temperature coefficient - 20 to 50 ppm/°C**
- **High performance gold plated, solid silver contact switches for low current applications**

STANDARD MODELS

Accuracy 0.1%	Accuracy 1%	No. of Decades	Range
HRRS-B-3-1M	HRRS-F-3-1 M	3	0 to 1,110.0 MΩ, 1MΩ steps
HRRS-B-4-0.1M	HRRS-F-4-0.1 M	4	0 to 1,111.0 MΩ, 0.1 MΩ steps
HRRS-B-5-0.1M	HRRS-F-5-0.1 M	5	0 to 11,111.0 MΩ, 0.1 MΩ steps
HRRS-B-6-0.01M	HRRS-F-6-0.01 M	6	0 to 11,111.10 MΩ, 0.01 MΩ steps

HPRS Series High Power Resistance Substituter

Economical solution for applications that require more power than can be handled by conventional resistance boxes such as the IET Labs RS-200 series.

- **1000 volt rating**
- **Programmable version available**
- **1% accuracy**
- **Power of 25 watts/decade, 250 watts max.**
- **Resistance from 0.1 Ω to 10 MΩ.**
- **6 to 8 decades.**

STANDARD MODELS

MODEL	TOT RES.	No. of DECADES	RESOLUTION
HPRS-150	999,999 Ω	6	1 Ω
HPRS-200	999,999.9 Ω	7	0.1 Ω
HPRS-200W	9,999,999.9 Ω	8	0.1 Ω

OPTIONS: RM - Rack mount; RO - Rear output; single decade units, programmable devices, and other combinations are available.

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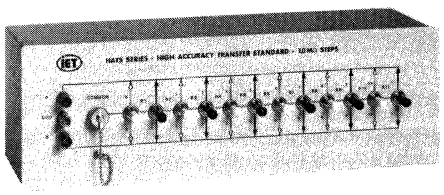
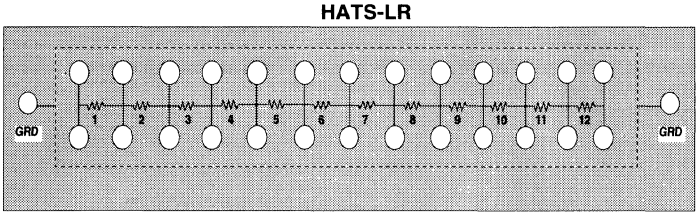
HATS - Series High Accuracy Transfer Standards

In order to make resistance transfer measurements with a high degree of accuracy, the HATS series may be employed. Consisting of matched, stable equal value precision resistors, calibration resistance values are transferred from a standard of one value to a resistance at a different value.

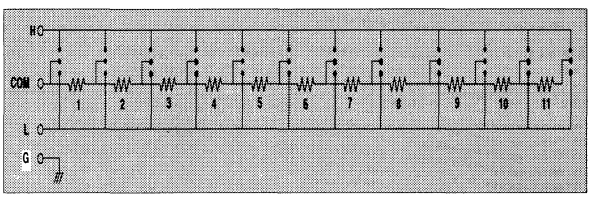


HATS-LR



10 Ω-100 kΩ steps, 12 matched resistors

HATS-Y



100 kΩ-10 MΩ steps, 11 matched resistors

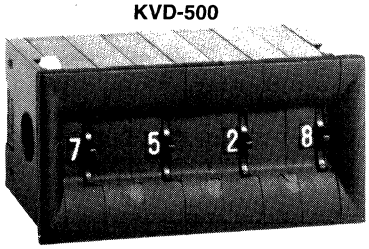
MAJOR SPECIFICATIONS

Step Size:	10 Ω, 100 Ω, 1 kΩ, 10 kΩ, or 100 kΩ	100 kΩ, 1 MΩ, or 10 MΩ
Accuracy:	Initial: ±20 ppm Initial data supplied with instrument Transfer: ±1 ppm, typical.	100 kΩ / 1 MΩ / 10 MΩ Initial: ±20 ppm / ±25 ppm / ±30 ppm Calibration: ±10 ppm / ±10 ppm / ±15 ppm Initial data supplied with instrument. Transfer: ±2 ppm, typical.
Long Term Stability:	±50 ppm for nominal value.	±50 ppm of nominal value.
Calibration Conditions:	Four-wire kelvin measurements, low power, at 23°C	3 terminal measurement, low power, at 23°C
Leakage Resistance:	Greater than 1 TΩ from terminal to case.	Greater than 10 TΩ from terminal to case.
Temperature Coefficient:	Less than ±5 ppm/°C.	Less than ±5 ppm/°C.
Power Coefficient:	±100 ppm/W.	±50 ppm/W per resistor.

KVD - Series Kelvin - Varley Voltage Divider

Precision decade voltage divider employing the Kelvin-Varley circuit, providing known voltage and current ratios for calibration, bridges, linearity determination, and other applications. The Models KVD 600 and KVD 700 provide 1 ppm long term linearity and 0.1 ppm resolution. The KVD 500 is suitable as an instrument component.

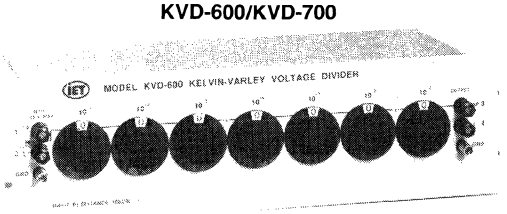
KVD-500



Thumbwheel style - economical - Component series

- **Update instruments with KVD-600 for any digital controls**
- **Eliminates the need for dials and multiturn potentiometers**
- **Precise repeatability of setting**
- **Unlimited choice of resistance values, 1 Ω to 50 MΩ**
- **In-line digital readout**
- **Convenient (snap in) panel mounting with bezel**
- **Excellent for meter calibration, linearity checking ratio measurement, synchro testing, etc.**
- **Number of decades: 1,2,3,4,5, 6 or higher**
- **Linearity temperature coefficient: 20 ppm/°C.**

KVD-600/KVD-700



High Accuracy Laboratory Series

LINEARITY	**KVD-600**	**KVD-700**
Absolute Initial:	±0.5 ppm	±0.1 (self calibrating)
Absolute long term:	±1 ppm	±1 ppm
Temperature Coefficient of Linearity:	±0.2 ppm/°C	±0.1 ppm/°C
Power Coefficient of Linearity:	±1 ppm/W	±0.2 ppm/W

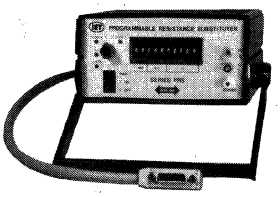
INPUT RESISTANCE: 100 kΩ, accuracy of ±0.005%
NUMBER OF DECADES: 7, others optional
MAXIMUM INPUT: Power: 2.5 watts continuous, 5 watts intermittent
Voltage: 700 V rms

IET DESIGNS & MANUFACTURES TO MIL-SPEC & COMMERCIAL CUSTOM REQUIREMENTS

IET LABS, INC.

DEPT. EM, 534 MAIN STREET, WESTBURY, NY 11590, (516) 334-5959. FAX: (516) 334-5988

PZS Series Programmable Decade Substituters for Resistance • RTD • Capacitance • Inductance



- **High resolution and wide range, up to 10 decades**
- **Constant "zero" residual impedance**
- **Special relays for low thermal emf and high stability**
- **Special RTD and other custom impedance combinations available**
- **Rack mounting available**
- **Programmable "open circuit" and "short circuit" states optional**
- **Manual thumbwheel operation or programmable digital input, parallel BCD or IEEE-488 interface**
- **Suited for calibration, automatic testing computer control and design, programmable loads, RTD simulation, and many other laboratory applications**

IEEE-488

SPECIFICATIONS

Accuracy: Indicated accuracy applies after subtraction of "zero" setting residual impedance.

Accuracy (RTD): Absolute accuracy applies without need to subtract "zero" setting.

Min. setting (RTD): ≥ 10Ω customer specified.

Thermal emf: < 15 μV for 0.1% & 0.05% resistance units; < 50-100 μV (depending on setting) for 1% resistance units; due to relay contacts.

Switching time: < 4 ms per change: < 7 ms for 0.05% units.

Digital input: BCD parallel, TTL positive; IEEE-488 optional.

Power requirements: 105-125V or 210-250V; 50-60 Hz, W W

Dimensions: Bench: 8.5″ W × 9.25″ D × 4.44″ H (22 × 24 × 12 cm). Rack: 19″ W × 12″ D × 7″ H (43.2 × 30.4 × 19.8 cm)

STANDARD MODELS

MODEL	PRS-200	PRS-201	PRS-200W	PRS-201W	PRS-202	PRS-202W	PCS-300	PCS-301	PLS400	PLS-400A
TYPE OF SUBSTITUTER	Resistance	Precision Resistance	Wide Range Resistance	Wide Range Precision Resistance	High Precision Resistance	Wide Range High Precision Resistance	Capacitance	Precision Capacitance	Wide Range Inductance	Inductance
ACCURACY *	1% ± 70mΩ	0.1% ± 30mΩ	1% ± 70mΩ	0.1% ± 30mΩ	0.05% ± 15mΩ		4% ± 5 pF	1% ± 1 pF	1.5% max, 1% typ. ± 20μH	
DECADES	7		9		7	9	6		4	3
RANGE	1-9,999,999Ω		0.1-99,999,999.9Ω		1-9,999,999Ω	0.1-99,999,999.9	100 pF-99.9999 μF		1 mH-9.999 H	1 mH-999 mH
TYPE OF COMPONENTS	Metal Film Resistors (0.9Ω & less wirewound)						100-900 pF: Mica .001-.009 μF: Polystyrene .01-0.9 μF: Polycarbonate 1-9 μF: Polyester 10-90 μF: Polarized Tantalum		Toroidal Inductors	
RATINGS	0.5 watt						100 volts (20V 10-100 μF)		See LS data sheet	
RESIDUAL IMPEDANCE	500 mΩ typical constant		800 mΩ typical constant		30 mΩ per decade constant		30 pF typical, constant		See LS data sheet	

* Accuracy for 10 M Ω and over (PRS 201W: 0.5%; PRS 202W: 0.2%)

OPTIONAL MODELS

In order to satisfy any requirements for programmable substituters, generate part number from the table below.

(Example: 100 μH-9999.9 mH, 1%, 50 mA, Rack Mount Programmable Inductance Substituter with IEEE-488.)

PLS - F - 5 - 100 μH - RM - 50 mA - IEEE

TYPE OF SUBSTITUTER	TOLERANCE	NO. OF DECADES	IMPEDANCE PER STEP FOR LOWEST DECADE	PACKAGING	RATING	CONTROL
RS Resistance CS Capacitance LS Inductance RTD RTD Simulator	X .01% XA .025% A .05% B 0.1% C 0.5% F 1% G 2% H 4%	1 to 11	.01Ω to 100 MΩ (in ohms) 1 pF to 100 μF 1 μH to 10H	WC Packaged in a standard case with binding posts RM Rack Mount	Nil Standard rating Other Specify	Nil Standard BCD IEEE IEEE-488

ORDERING INFORMATION

—Select Standard or Special Model ..... Consult IET for price.
—IEEE Optional (IEEE-488 Remote Programming) $495.00
—IBM or Compatible PC IEEE-488 Controller Board .. 475.00
—IEEE-488 Cable 79.00

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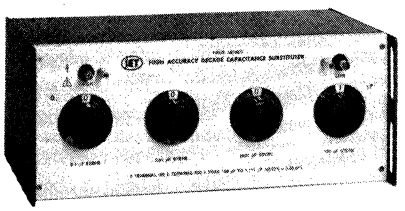
DEPT. EM, 534 MAIN STREET WESTBURY, NY 11590, (516) 334-5959 FAX: (516) 334-5988

HACS Series High Accuracy Decade Capacitance Substituter

- **High accuracy: 0.1% or 0.05%**
- **Broad range of user choices**
- **Programmable version available**
- **Special and custom configurations available**
- **Optional double shielded construction for virtually equivalent 2- or 3-terminal measurement**
- **Trimmable capacitors for lower decades**



4 Decade Model with Double Shielded Construction

MAJOR SPECIFICATIONS

Accuracy:
A: ±(0.05%+ 0.05 pF)
B: ±(0.10%+ 0.50 pF) at 1kHz, at 23°C, (measured with 3-terminal connection for optional double shielded construction)

Dissipation Factor at 1kHz:
<.0010 for 100 pF to 1000 pF
<.0005 for 1100 pF to 2000 pF
<.0003 for 2100 pF to 1.2 µF

Range:
100 pF to 1000 µF, 100 pF steps

Stability:
A: better than ±(100 ppm+ 0.05 pF) per year.
B: better than ±(250 ppm+ 0.10 pF) per year.

Rating:
500 V peak up to 10 kHz

Temperature Coefficient:
A: < +20 ppm/°C between 10-50°C.
B: < +50 ppm/°C between 10-50°C.

Insulation Resistance:
>50,000 MΩ to 0.1 µF and
>5,000 MΩ from 0.1 µF to 10 µF.

Operating Temperature Range:
10 to 50°C.

Shielding:
Standard: single shielded construction
Optional : double shielded construction

Dimensions:
43.2 cm W x 17.8 cm H x 23.9 cm D(17" x 7.0" x 9.4"), for 4 decade models

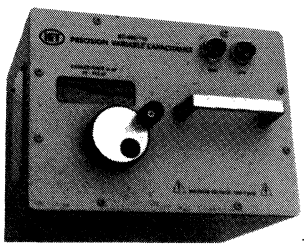
HACS-Z-Series High Accuracy Low Level Decade Capacitance Substituter

Whenever low capacitance or small capacitance increments are required, the HACS-Z series may be used. It provides very low zero capacitance with high accuracy and excellent stability.

- **Basic accuracy of 0.1% or 0.05%**
- **Capacitance from 1 pF to 1000 µF**
- **High stability**
- **Very low zero capacitance < 0.1 pF**
- **3- Terminal Shielded construction**
- **Optional BCD output.**

SC-900 Series Precision Variable Capacitor

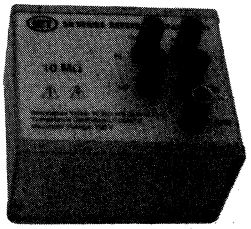
MODEL	SC-900-110	SC-900-1100	SC-900-D (Dual)
Range	10-110 pF	50-1100 pF	35-115 pF (Range 1) 100-1150 pF (Range 2)
Accuracy, Initial	±0.1 pF	±0.6 pF	±0.1 pF (Range 1) ±0.6 pF (Range 2)
Accuracy, Corrected	±0.04 pF or better	±0.3 pF or better	±0.04 pF (Range 1) ±0.3 pF (Range 2)



SR•SC•SL Series Standard•Resistance•Capacitance•Inductance

Resistance

Model	Nominal Value (Ω)	Adjustment to Nominal Value (ppm)	Initial Accuracy (ppm)	Stability (ppm) 6 months	Stability (ppm) 12 months	Calibration Accuracy (ppm)	Temperature Coefficient (ppm/°C)	Power Coefficient (ppm/mW)	Max. Power Rating (watts)
SR-1	1	500	200	30	50	20	20	2	0.5
SR-10	10	100	100	10	18	15	20	1	0.5
SR-100	100	30	20	8	15	10	5	0.4	1
SR-1k	1 k	30	20	8	15	10	5	0.4	1
SR-10k	10 k	30	20	8	15	10	5	0.4	1
SR-100k	100 k	50	20	8	15	10	5	0.4	1
SR-1M	1 M	50	50	30	50	20	5	0.4	0.16 (400 V)
SR-10M	10 M	50	50	30	50	20	5	0.4	0.016 (400 V)



CAPACITANCE

Nominal Value: 100 pF to 100 µF.
Adjustment to Nominal: 0.05% + 0.5 pF.
Initial Accuracy: 0.05% + 0.5 pF, at 23°C.
Stability: 0.01% + 0.1 pF per year.

INDUCTANCE

Nominal Value: 100 µH to 10 H.
Adjustment to Nominal: 0.25%
Initial Accuracy: 0.05% at 23°C
Stability: 0.05% per year

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DEPT. EM, 534 MAIN STREET WESTBURY, NY 11590, (516) 334-5959 FAX: (516) 334-5988

IMF-600A Digital Impedance and Multifunction Meter

COMBINES MOST OF THE COMMONLY NEEDED LABORATORY MEASUREMENTS

AUTOMATIC MEASUREMENT
Measurement for all functions is provided automatically in a 3½ digit display. At 4 measurements per second — no balancing or manual operations are required.

HIGH ACCURACY
The basic impedance accuracy is 0.25%; for multimeter functions, basic accuracy is 0.1%.

DISSIPATION FOR CAPACITORS & 1/Q FOR INDUCTORS
Capacitors and inductors are easy to classify in two dimensions. Dissipation is important in selection of low loss capacitors, especially for low power and critical designs.

WIDE RANGE
The full spectrum capability covers virtually all likely applications.

BATTERY OPERATION
The internal rechargeable battery option allows field operation away from the bench. A built in power management circuit prevents erroneous measurements.

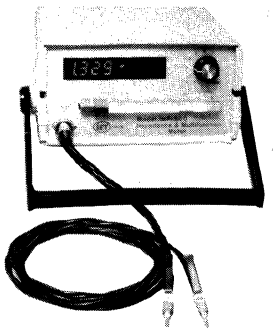
CRYSTAL CONTROLLED PERFORMANCE
1 kHz test frequency insures wide temperature range accuracy. (Other frequencies optional)

PROTECTED CIRCUITRY
The IMF-600 will handle charged capacitors and active powered circuits on all functions.

ANALOG & DIGITAL OUTPUTS
Analog and optional digital outputs may be used to interface to comparator or other devices.

4-TERMINAL SHIELDED KELVIN TEST TERMINALS
Insures precision measurements even for very low impedances like contact or wire resistance, as well as high impedances.

COMPANION COMPARATOR UNIT
The Model LC-603 Digital Limits Comparator can test or select any component or function within upper and lower limits, and may be cascaded for D or (1/Q) sequential checking. The combination becomes an economical GO/NO GO test or selection system.



• Voltage (DC or RMS) • Current (DC or RMS) • Resistance • Capacitance • Inductance • Conductance • Dissipation for Capacitors • 1/Q for Inductors • Frequency & Event Counter

SPECIFICATIONS

CAPACITANCE (C)
Number of ranges: 8 (7 for IMF-600A).
Full scale ranges: 200.0 pF to 2000 µF; up to 20,000 µF may be measured using the inductance function.
Accuracy: ±(0.25% + 1 LSD + 1% of G reading in absolute digit counts on same range).
Bias: Up to 100 Vdc may be applied in series with unknown impedance.
Test voltage: 1.0 Vrms on ranges 1, 2; 0.10 Vrms on ranges 3-7; and 0.01 Vrms on range 8.
Input protection: 220 Vrms for IMF-600.
Impedance model: C, G

INDUCTANCE (L)
Number of ranges: 7.
Full scale ranges: 200.0 µH to 200.0 H.
Accuracy: ±(0.25% + 1 LSD + 1% of R reading in absolute digit counts on same range).
Test current: 100 mA on range 1; 10 mA on range 2; 1.0 mA on range 3; 100 µA on range 4; 10 µA on ranges 5-6; 1.0 µA on ranges 7-8.
Input protection: 220 Vrms for IMF-600.
Impedance model: R — L

RESISTANCE (R)
Type of measurement: 1 kHz ac resistance
Number of ranges: 7.
Full scale ranges: 2.000 Ω to 2,000 kΩ; up to 1,000 MΩ may be measured using the conductance function.
Accuracy: ±(0.25% + 1 LSD + 1% of L reading in absolute digit counts on same range).
Test current: Same as inductance.
Input protection: 220 Vrms for IMF-600.
Impedance model: See INDUCTANCE.

CONDUCTANCE (G)
Type of measurement: 1 kHz ac conductance.
Number of ranges: 7.
Full scale ranges: 2.000 µS to 2000. mS (S=1/Ω)
Accuracy: ±(0.25% + 1 LSD + 1% of C reading in absolute digit counts on same range)
Test current: Same as capacitance.
Input protection: 220 Vrms for IMF-600.
Impedance model: See CAPACITANCE.

DISSIPATION (D or 1/Q)
Type of measurement: D=G/2πfC; D=1/Q=R/2πfL, where f is frequency;
see impedance model.
Full scale range: 2.000; higher values may be computed from readings.
Accuracy: ±(1% + 2 LSD) for C or L > 500 counts; ±(1% + 4 LSD) for C or L 200-500 counts.

DC VOLTAGE (V DC)
Number of ranges: 5.
Full scale ranges: 200.0 mV to 1000. V.
Accuracy: ±(0.1% + 1 LSD).
Input impedance: 10 MΩ.
Maximum input: 1000 V peak; common mode voltage (low terminal to ground): 500 V peak.

DC CURRENT (I DC)
Number of ranges: 5.
Full scale ranges: 200.0 µA to 2000. mA.
Accuracy: ±(0.2% + 1 LSD).
Burden voltage: 0.3 V max. on ranges 1-4; 1.4 V max. on range 5.
Maximum input: 2 A fuse and diode network protected.

TRUE RMS VOLTAGE (V True RMS), AC COUPLED
Number of ranges: 5.
Full scale ranges: 200.0 mV to 750. V.
Accuracy: ±(% of reading + number of least significant digits)

FREQ	50 Hz-100 Hz	100 Hz-500 Hz	500 Hz-1 kHz	1 kHz-10 kHz	10 kHz-20 kHz
200.0 mV	1% + 2	1% + 2	1% + 2	1% + 2	1.5% + 2
2.000 V	1.5% + 2	1% + 2	1% + 2	1% + 2	1.5% + 2
20.00 V	1.5% + 2	1% + 2	1% + 2	1.5% + 2	1.5% + 2
200.0 V	1.5% + 2	1.5% + 2	2% + 2	not specified	
750 V	1.5% + 2	2% + 2	not specified		

Input impedance: 10 MΩ.
Maximum input: Same as DC VOLTAGE

TRUE RMS CURRENT (I True RMS), AC COUPLED
Number of ranges: 5.
Full scale accuracy: 200.0 µA to 2000. mA.
Accuracy: ±(% of reading + number of least significant digits).

FREQ	50 Hz-100 Hz	100 Hz-500 Hz	500 Hz-1 kHz	1 kHz-10 kHz	10 kHz-20 kHz
200.0 µA	0.5% + 2	0.5% + 2	0.5% + 2	1% + 2	2% + 2
2.000 mA	0.5% + 2	0.5% + 2	0.5% + 2	1% + 2	2% + 2
20.00 mA	1% + 2	1% + 2	1% + 2	2% + 2	2% + 2
200.0 mA	1% + 2	1% + 2	1% + 2	2% + 2	2% + 2
2000 mA	2% + 2	2% + 2	2% + 2	3% + 2	3% + 2

Burden voltage: Same as DC CURRENT.
Maximum input: Same as DC CURRENT.

TEST CONDITIONS
Performance specifications apply
1) after correction for test lead zero reading;
2) after a 10 minute warm-up;
3) between 15°C-35°C.

GENERAL SPECIFICATIONS
Test frequency: 1 kHz for impedance functions.
Reading rate: 4 measurements per second.
Display: 3½ digit 1.2 cm (0.5") LCD (LED for IMF-600), with corresponding annunciator showing units. All decimal points on indicate overrange or illegal condition.
Autoranging: Optional.
Analog outputs: L,C,R, or G scales at 1 V/1000 counts (0.1 V/1000 counts for IMF-600A); output impedance: 900 Ω.
Digital output(optional): BCD parallel output representing 3½ digit reading for any quantity.
Test terminals: 4-terminal shielded Kelvin test leads, 50" (127 cm) long.
Operating controls: Push-button ON/OFF and function select switches; rotary RANGE select switch.
Power requirements: 105-125 V or 210-250 V; 50-60 Hz; 5 W.
Dimensions: 22 cm W x 24 cm D x 12 cm H (8.5" x 9.25" x 4.44").
Weight: 2.7 kg (6 lb).

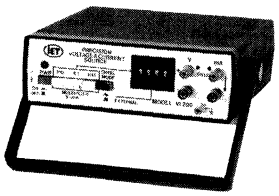
ORDERING INFORMATION:
Model IMF-600A Impedance Meter
(without voltage and current functions) $1089.00
Model IMF-600 Impedance and Multifunction Meter
(with voltage and current functions) 1579.00
-K Option (Autoranging) 199.00
-DO Option (Digital Output) 189.00
-HSC Option (High Sensitivity 20.00 pF) 109.00
-HSL Option (High Sensitivity 20.00 µH) 109.00
Model LC-603 Single Channel Digital Limits Comparator 429.00
(Requires DO option; may be cascaded)
-10 kHz Option ..... Consult IET

IET LABS, INC.

DEPT. EM, 534 MAIN STREET WESTBURY, NY 11590, (516) 334-5959 FAX: (516) 334-5988

VI-700 Precision Manual or Programmable Voltage and Current Source

- Voltage output range of 100 μV to 20V
- Current output range of 0.1 μA to 20 mA
- 3½ digit resolution
- High accuracy and low noise
- Manual thumbwheel operation or programmable digital input—parallel BCD or IEEE-488 interface
- High output current
- Battery operation optional
- Suitable for calibration—testing of A/D-D/A converters—gain & linearity evaluation—waveform synthesis with digital input



IEEE-488

SPECIFICATIONS

VOLTAGE	OUTPUT RANGES:	200 mV, 2V, 20V
	RESOLUTION:	100 μV, 1 mV, 10 mV
	ACCURACY:	0.0075% ±0.5 LSD (least significant digit) @ 25°C, nominal line voltage, no load, after warmup; worst case error <0.75LSD
	OUTPUT CURRENT:	70 mA, maximum load; with LED overload indicator
	OUTPUT IMPEDANCE:	5 mΩ typical, 40 mΩ for 20V range
	NOISE AND RIPPLE:	50 μV on 200 mV & 2 V ranges, 100 μV rms on 20 V range
	TEMPCO:	±10 ppm/°C typical, ±15 ppm/°C max
CURRENT	OUTPUT RANGES:	200 μA, 2 mA, 20 mA
	RESOLUTION:	0.1 μA, 1 μA, 10 μA
	ACCURACY:	0.0075% ±0.75 LSD (least significant digit) @ 25°C, nominal line voltage, after warmup; worst case error <1 LSD
	COMPLIANCE:	0-20V; with LED overload indicator
GENERAL	DIGITAL INPUT:	3½ digit parallel BCD or IEEE-488 interface; front panel pushbuttons select range and REMOTE OR LOCAL operation
	POWER REQUIREMENTS:	105-125V or 210-250V; 50-60 Hz; 5W
	BATTERY OPERATION: (Optional)	NiCd rechargeable batteries; up to 8 hours operation; low battery warning indicator and automatic shutoff
	DIMENSIONS:	8.5" W x 2.8" H x 9.0" D (7.1 x 12.6 x 22.9 cm); 8.5" W x 9.25" D x 4.4" H (22 x 12 x 24 cm) for IEEE option.
	WEIGHT:	5 lbs. (2.3 kg)

ORDERING INFORMATION:

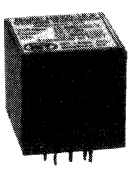
Model VI-700 Precision Voltage and Current Source $495.00
—B Option (Rechargeable Battery Operation) 699.00
—BCD Option (Parallel BCD Remote Programming) 195.00
—IEEE Option (IEEE-488 Remote Programming) 495.00
—IBM or Compatible PC IEEE-488 Controller Board 475.00
—IEEE-488 Cable 79.00

HSVR Series High Stability Voltage Reference

Model	Input Voltage	Output Voltage Max.	Output Current
HSVR-1.01	9-15 V	1.01 V	1 mA
HSVR-6.3	15-20 V	6.3 V	1 mA
HSVR-12.6	18-25 V	12.6 V	1 mA
HSVR-18.9	25-35 V	18.9 V	1 mA

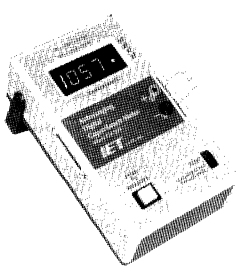
Output Voltage Stability: 1 ppm per 24 hours; 10 ppm per month; 25 ppm per 6 months.

Temperature Coefficient: < 1 ppm/°C for temperature range of 0°C to 50°C.



CM-500 Professional Quality Autoranging Digital Capacitance Meter

- Easy to use for any capacitor value
- Digital output
- Autoranging — mistake proof
- High accuracy
- Indispensable for laboratory or field use
- Computer interface capability
- Wide measurement range
- Convenient portable packaging



Scope shown is a product of B&K

SPECIFICATIONS

Range: 9 ranges for measuring capacitance from 1 pF to 200,000 μF. The full scale value is automatically selected from one of the following to give maximum resolution: 2000. pF, 20.00 nF, 200.0 nF, 2.000 μF, 20.00 μF, 200.0 μF, 2000. μF, 20.00 mF, 200.0 mF. (Note: nF=103 pF=10-3 μF; mF=103 μF=10-3 F)

Accuracy: 2000. pF to 20.00 μF scales: 0.1% ±1 LSD; 200.0 μF to 2000. μF scales: 0.8% ±1 LSD; 20.00 mF to 200.0 mF scales: 1.0% ±1 LSD;Temperature Range : 10°C to 40°C.

Reading Rate: 2000. pF to 200.0 μF scales : 0.25 sec.
2000. μF to 20.00 mF scales: 0.8 sec.
200.0 mF scale : 6.4 sec.

Test Method: Determination of the time constant of the unknown capacitor and a known resistor. The maximum applied test voltage is less than 3.2 volts.

Power: Battery Operation: 5 standard "D" cells. AC Adapter: IET Labs AC Adapter Model CM-5001 (110 volts) or Model CM-5002 (220 volts) may be used with or without batteries in place.

Digital Output: The range, BCD capacitance value, overrange signal, sampling strobe signal, power supply, and system ground are available through a 26 pin header connector.

Input Protection: The capacitance test terminal are shorted together as long as the **MEASURE** button is not depressed. During this time, a charged capacitor will automatically be discharged. No fuse is required.

Physical: **Dimensions:** 18.8 cm L x 11 cm W x 6 cm H (7.4" x 4.33" x 2.36"). **Weight:** 0.9 kg (31 oz), including batteries. **Test Terminals:** Connector strips, component clips, and banana plug-alligator clip test leads. **Display:** 0.5" high, 3½ digit LED display with 4 LED range indicators.

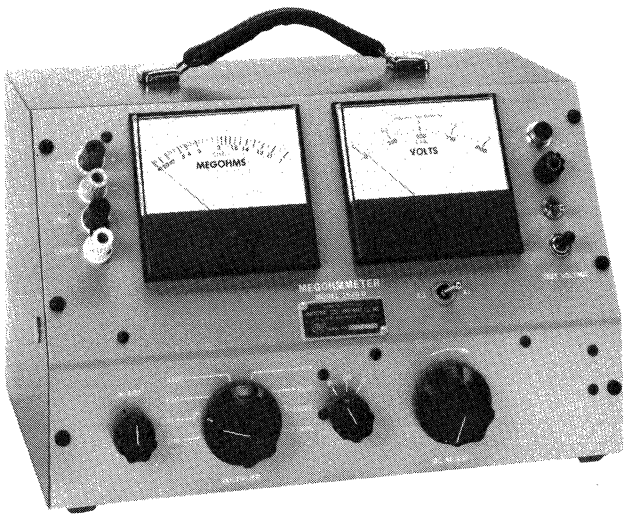
ORDERING INFORMATION

Model CM-500 Autoranging Digital Capacitance Meter $379.00
Model CC-25 Component Clip 12.00
Model TL-26 Alligator Clip Test Leads 9.00
Model CM-5001 (110) Volt AC Adapter 21.00
Model CM-5002 (220) Volt AC Adapter 31.00
Model CLC-502 Capacitance Limits Comparator 429.00
Model CB-27 Connector Cable (for CM-500 BCD output) 31.00

IET DESIGNS & MANUFACTURES TO MIL-SPEC & COMMERCIAL CUSTOM REQUIREMENTS

INDUSTRIAL TEST EQUIPMENT COMPANY, INC.

Powertron® Freed Megohmmeters®



GENERAL SPECIFICATIONS:

Input power: 105-130v 50/60 Hz
Dimensions: 15 x 9 x 7-1/2 in
Weight: 24 lbs
Accuracy: 5%

TYPE	MEGOHM RANGE	DC TEST VOLTS
1620-A	.01 – 4,000,000	5-1000, variable
1620-B	1.0 – 2,000,000	250-2500, variable
1620-D	.01 – 40,000,000	5-1000, variable
1620-E	1.0 – 200,000,000	5-1000, variable
1020-C	.01 – 2,000,000	50, 100, 500, fixed

OPTION #1 – Alarm with warning lite, buzzer and auxillary contacts. Ordering code "W": for example (1620-AW).

OPTION #2 – Rack mount

OPTION #3 – 220V/50 Hz input

THE "STANDARD" OF THE INDUSTRY SINCE 1929

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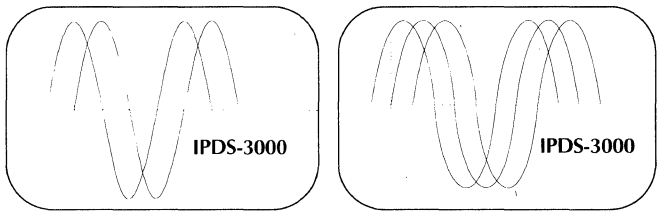
Integrated Technologies Solutions, Inc.

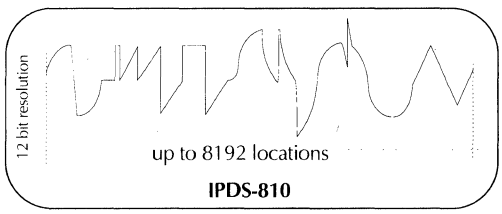
402 Chestnut Lane, East Meadow, New York 11554 Phone (516)481-0857 — Fax (516)292-3115

•Sine wave generator
Series IPDS-3000
Single, two and three phase
High resolution to .001 Hz
20 Hz to 25 Khz frequency range
Low distortion to .01%
Amplitude and frequency modulation capabilities from the front panel or via the interface



IEEE 488 & RS232 Control

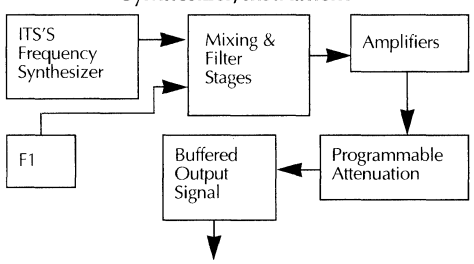
•Arbitrary Wave Form Generator
Series IPDS-810
12 bit resolution, 8192 points deep
Std library of wave forms
Sync capabilities of multi phases
Amplitude and frequency modulation



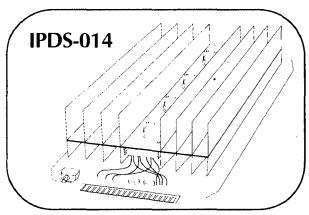
• Custon Design Frequency Synthesizer/Generator
Series IPDS-800
A patented approach is used in generating a precise programmed frequency. •Very low noise, center frequency 1Mhz to 1Gighz and above •Sweep range to 1Mhz with .05Hz resolution •Sweep rate to 40Khz

•Data acquisition module
Series IPDS-900
12 bit resolution, 16k words deep
500,000 samples/sec, auto calibration
Programmable gain

Typical Configuration for a Board Level Frequency Synthesizer/Instrument



•Power Amplifiers/Sources
Series IPDS-014 •Very low Noise and distortion •High frequency respond
Multiple output ranges •Can be interfaced to any of the above.
AC/DC power amplifiers. •Voltage and current sources, 50 Watt to 6KW per Phase Temperature and over current protection.
Easily integrated with IPDS-3000



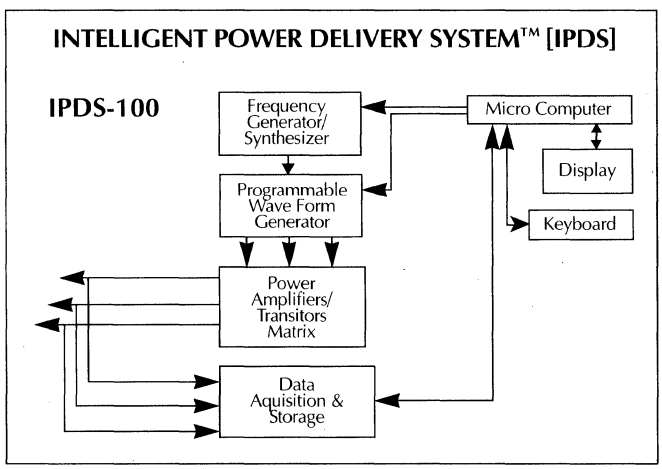
•Intelligent Power Delivery System™ [IPDS]

The **IPDS** is a configurable modular system. A user can configure a variety of test sets by selecting appropriate modules.

Some of the products are:
Transient Generator, AC/DC Power Source, Simulator/Emulator, Destructive Tester, Relay and Motor Tester, Incoming and QC test set as well as Power Development, Tools, Motor Controllers, Inverters and Drivers.

Features: A personal computer is used as the system controller and for user's interface. A user friendly interface includes a color graphic menu with a hand held device for user interaction(Mouse). Standard software includes extensive Editing, as well as Run Mode capabilities. Options include Standard units with Software drivers, as well as tailored turn-key systems.

INTELLIGENT POWER DELIVERY SYSTEM™ [IPDS]



Application notes and demo software are available

Options for the modules above include Std 19" 1U, or as a single board instrument with IEEE488 interface as well as RS232.

**** Fast turn around for custom design of any of the above. Inquiries are welcomed***

GAS SENSORS

Authorized U.S. Rep. of

FIGARO

Gas Sensors

Category	Model	Typical detection ranges	Features
Combustible gases	TGS109	LP-Gas (propane, butane) 500~10000 ppm	• 100V circuit voltage type • Large output signal • Pre-calibrated sensor modules are available (see Table-2)
	TGS109T	Natural gas 500~10000 ppm	
	TGS813 TGS816	General combustible gases 500~10000 ppm	• For various combustible gas detection • TSG816: Heat resistant type
	TGS842	Methane, Propane, Butane 500~10000 ppm	• Low sensitivity to noise gases
	TGS815	Methane 500~10000 ppm	• Small dependency on humidity and temperature
	TGS821	Hydrogen 50~1000 ppm	• High selectivity and sensitivity to hydrogen
Toxic gases	TGS203	Carbon monoxide 50~1000 ppm	• High sensitivity and selectivity to carbon monoxide • Microprocessor and hybrid IC are available (see Table-3)
	TGS824	Ammonia 30~300 ppm	• High sensitivity to ammonia
	TGS825	Hydrogen sulphide 5~100 ppm	• High sensitivity to hydrogen sulphide
Organic solvents detection	TGS822 TGS823	Alcohol, Toluene Xylene, etc. 50~5000 ppm	• High sensitivity to alcohol and organic solvents TSG823: Heat resistant type
CFCs (Chlorofluorocarbons)	TGS830	R-113, R-22 100~3000 ppm	• High sensitivity to various CFCs • Good cross sensitivity
	TGS831	R-21, R-22 100~3000 ppm	• Quick response to R-21, R-22
Odor detection	TGS501	Sulphur compounds 0.1~10 ppm	• Ultra high sensitivity to sulphur compounds • Low power consumption • For intermittent detection
Ventilation controls	TGS100 TGS800	Air contaminants (Cigarette smoke, Gasoline vapors, etc.) Less than 10 ppm	• Highly sensitive detection of contaminants in air with microprocessors (see Table-3) • Pre-calibrated sensor modules are available (see Table-2)
Cooking controls	TGS880 TGS881	Volatile gases, vapors from food (Gas, Humidity, Smoke, and odor)	• Total gas detection in cooking process • TSG881: Heat resistant ceramic housing
	TGS883T	Humidity, volatile gas and vapors from food	• High sensitivity to humidity

Other sensors and products	• New sensors such as NOx sensor, Ozone sensor, etc. are under development • Other modules and complete products for various gas detection fields are available Please contact Figaro or your local distributor for further information about these products, other applications (combustion monitoring/controlling, fermentation controls, etc.) and other sensors (OXYGEN and HUMIDITY sensors)

Rely On Our Over 30 Years Experience!

TEL: (708) 251-3600 **FAX: (708) 251-3738**

JEMA

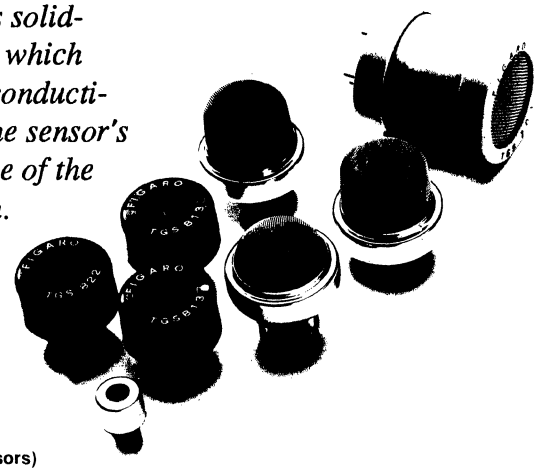
JAPAN ELECTRONIC MANUFACTURERS AGENCY, INC.

1000 Skokie Blvd., Wilmette, IL 60091

GAS SENSORS

Japan Electronic Manufacturers Agency represents the world's leading gas sensor manufacturer. Their technical expertise has led them to produce the most innovative sensors in the world market. Each is solid-state, mainly composed of a sintered tin dioxide which detects gases through an increase in electrical conductivity when the reducing gases are absorbed on the sensor's surface. The excellent stability and performance of the sensors provide unique features in gas detection.

Authorized U.S. Rep. of
FIGARO



Sensor Modules (Pre-calibrated or pre-classified sensors)

Category	Model	Typical detection ranges	Features
Combustible gases	LPS109	LP-Gas 1%~25% of LEL	• 100V circuit voltage type • Pre-calibrated module for LP-Gas detection
	NGS109	Natural gas 1%~25% of LEL	• 100V circuit voltage type • Pre-calibrated module for natural gas detection
	TGS813C	LP-Gas or Natural gas 1%~25% of LEL	• Pre-classified sensor with fixed resistor
Air quality controls	AMS100 AMS800	Air contaminants less than 10 ppm	• Pre-calibrated sensor modules • AMS100: for 100V circuit voltage • AMS800: for under 24V circuit voltage

Related Products (Modules and Microprocessors)

Category	Model	Type of products	Features
CO detection	FIC5401	Hybrid IC	• Hybrid IC with the necessary functions for driving the TGS203 and output signals for alarm systems
	M50761-904P	Microprocessor	• Microprocessor chip used in the FIC5401
Air quality controls	FIGARO 6604 FIGARO 5603	Microprocessor	• Including the following functions • Signal processing (see page 11) • ON/OFF signals for ventilation • Output signals for pollution level indicators • FIGARO 5603: with simple function
	AM-100 AM-800	Evaluation modules	• Evaluation module for gas sensor and the 5603 including driving circuit of gas sensor • LED indicators and output signals • AM-100: for TGS100, AM-800: for TGS800

From Prototype to Production ... Count on Japan Electronic!

TEL: (708) 251-3600 FAX: (708) 251-3738

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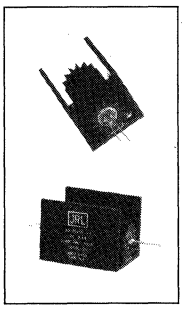
JULIE RESEARCH LABORATORIES INCORPORATED — PRECISION MEASURING & REFERENCE EQUIPMENT

CH-48T4HK OIL FILLED FOUR TERMINAL PRECISION HEAT-SINK RESISTORS

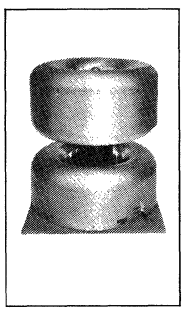


JULIE RESEARCH, for 35 years a leading manufacturer of ultra-precise, ultra-stable wirewound resistors, has developed the CH-48T4HK Precision Resistor featuring high accuracy, high dissipation power, and low self-heating coefficient at low ohm values.

The CH-48T4HK is a hermetically sealed, oil-filled, four terminal resistor mounted on a specially designed heat sink. The heat sink is optimized for maximum heat dissipation, keeping the internal temperature rise at high currents to a negligible value. The metal encasement of the CH-48T4HK increases the dissipation power and decreases the thermal time constant, thus providing a self-heating coefficient as low as 0.0025% per watt.

The CH-48T4HK is available in the resistance range of 0.1 to 100 ohms, and with accuracy from 1% to 0.002%. For further details, contact Julie Research Laboratories.

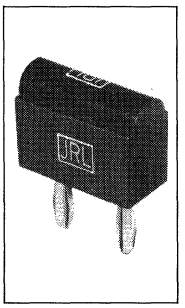
HVA-50 AND HVA-100 PRECISION AC/DC HIGH VOLTAGE DIVIDERS



The HVA Series High Voltage Dividers are designed as calibration standards of DC and AC voltages up to 100 KV (HVA-100) or 50 KV (HVA-50). These dividers feature accuracy better than 0.01% DC, and better than 0.05% at 60 Hz. They also have a stability within 0.005% per year.

The unique shield structure of the HVA Dividers produces no appreciable capacitance. In normal laboratory environments, temperature coefficient, humidity effects and proximity effects are negligible. For further details, contact Julie Research Laboratories.

PRS-1 PRECISION BANANA-PLUG STANDARD RESISTOR

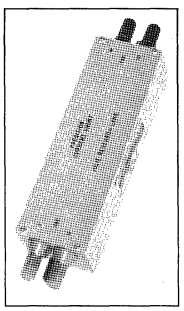


For production prototypes, laboratory plug-in standards, and easy assembly of resistance sets, Julie Research Laboratories has developed the PRS-1 Banana-Plug Standard Resistor. Some of its outstanding features are high accuracy and stability, low temperature coefficient, and compact, convenient banana-plug styling.

The PRS-1 is a high temperature epoxy encapsulated resistor which readily plugs into normal banana jackets with 3/4" spacing. The combination of this design and the high accuracies available allow the PRS-1 to be plugged directly into resistance bridges for calibration purposes. When used in production, its accuracy and stability can eliminate the need for "trimming" potentiometers.

Values of the PRS-1 range from 1 ohm to 2 megohms. Absolute accuracy is available from 1% to 0.0025%. For further details, contact Julie Research Laboratories.

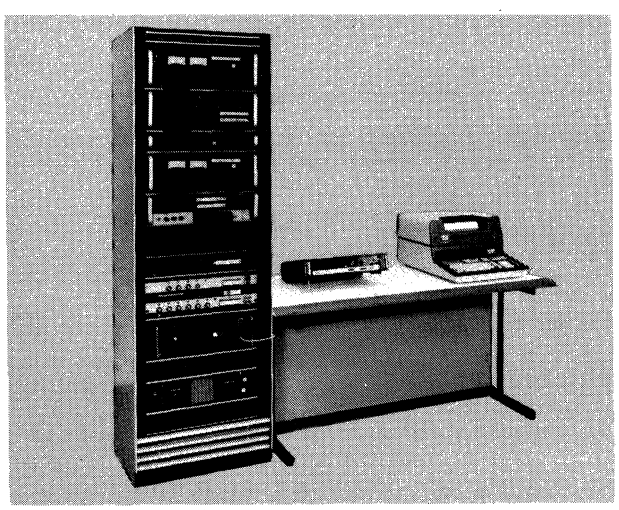
CS-105 SERIES PRECISION AC/DC CURRENT SHUNTS



The CS-105 Series Current Shunts use a special Julie Research Laboratories designed frequency-compensated, wirewound or ribbon resistor with an AC-DC difference accuracy of less than 0.02% at 20 kilohertz. Each of the shunts is designed to provide approximately 1 volt output when used in conjunction with our TNB-102/T2.5 Thermocouple, thus forming a unique instrument in the measurement of AC/DC currents.

The CS-105 Shunts are available in values from 0.005 amperes to 50 amperes. For values up to 200 amperes, see our CS-106 Series Current Shunts. They can be purchased individually, or in sets. For further details, contact Julie Research Laboratories.

LOCOST-106 PRECISION AC/DC AUTOMATED CALIBRATION SYSTEM



BASIC COMPONENTS

6½ Digit, 1 PPM Programmable DC Digital Multimeter, Model DM-1060

Ratio and DC Volts: 0.000000 to 1.199999V; 4 ranges to 1199.999V F.S. *DC Current:* 0.000000 to 1.199999mA; 5 ranges to 11.99999A F.S. *Resistance:* 1.000000 to 119.9999 ohms; 6 ranges to 11.99999 Megohms F.S.

AC Voltage/Current ranges provided by compatible AC/DC converter accessories. Kilovolt ranges to 119.9999 kilovolts using compatible voltbox accessories. Other standard accessories extend resistance ranges by 1000:1 (up or down), and voltage ranges to nanovolt region.

Programmable Absolute DC Current/Voltage Sources, Models ACS-106 and AVS-106

Up to 12 A (in 5 ranges) @ 10V compliance; up to 1200V (in 3 ranges) @ 0-34mA. 6-digit resolution (1nA, 10uV). Accuracy better than 0.0005% (current) and 0.0003% (voltage). Extended current and voltage ranges on special order. Both sources incorporate separately accessible programmable 0.0001% dividers.

Programmable Absolute AC Calibrator, Model AC-129

10 Hz to 1.099 MHz. 6 decades. Up to 121.110 Vrms in 5 ranges (1nV resolution). Output current to 200mA (depends on range). In-phase and precise fixed quadrature outputs for broadband programmable phase generation. Standard options extend output capabilities to 1200V and 120A.

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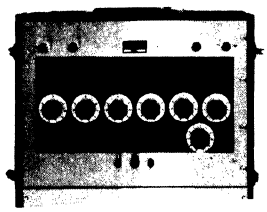
VOLTAGE DIVIDERS

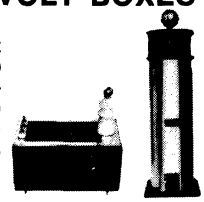


Model	Accu. (ppm)	Lin. Resol. (ppm)	Stability (ppm/yr.)	Resistance (Kohms)	Max. Volts	Mode of Operation
VDR-106/7H	1 (5 yr.)	1	1	100	700	Manual
VDR-106/7	1 (5 yr.)	.1	.2	100	300	Manual
VDR-307	1	.1	1	100	700	Manual
VDR-307H	1	.1	1	100/120	700	Manual
VDR-307J	1	.1	1	100/110/120	700	Manual
*RVD-106	1	1	.5	100	200	Prog./Manual
*RVD-126	1	1	.5	100/110/120	200	Prog./Manual

*BCD input/output standard, IEEE-488 Interface available.

HIGH VOLTAGE DIVIDERS/VOLT BOXES

The Julie High Voltage Dividers and Volt Boxes on the table below are used to "drop" high voltages to a level that traditional precision potentiometers and high impedance electronic voltmeters can safely measure (such as the Julie models PVP-1000S and PVP-1000C).



AC/DC Model	Input Ranges Lowest	Input Ranges Highest	Input Imped.	Output Taps	Acc. (%) DC	Acc. (%) AC	1 Year Stab. (%)
DV-1500	1 v	1500 v	1 Kohm/v	1/1.5 v	.001	—	.001
DV-1000	1 v	1000 v	1 Kohm/v	1/1.5 v	.001	—	.001
DV-1000B	1 v	1000 v	1 Kohm/v	1 v	.001	—	.001
HV-100/w	100 Kv	100 Kv	1 Kohm/v	1 v	.05	—	.005
HV-100	100 Kv	100 Kv	4 Kohm/v	1 v	.05	—	.1
HVA-50	50 Kv	50 Kv	1 Kohm/v	0.5/5 v	.01	.05	.005
HVA-100	100 Kv	100 Kv	1 Kohm/v	1 v	.01	.05	.005
KV-50/.01	50 Kv	50 Kv	1 Kohm/v	1/10 v	.01	—	.0015
KV-25/.01	25 Kv	25 Kv	1 Kohm/v	1/10 v	.01	—	.0015
KV-10/.01	10 Kv	10 Kv	1 Kohm/v	1/10 v	.01	—	.0015
KV-10R	10 Kv	10 Kv	1 Kohm/v	1/10 v	.01	—	.0015
KV-VB-10	10 Kv	10 Kv	2 Kohm/v	10 v	.05	—	.005

VOLTAGE REFERENCES

SATURATED STANDARD CELL OVENS

The best voltage reference possible must meet two basic critical requirements —

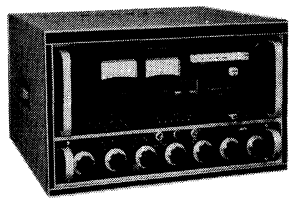
1. Time performance; the three saturated cells used must have minimum output voltage change with time.
2. The enclosure must maintain its nominal temperature with time.

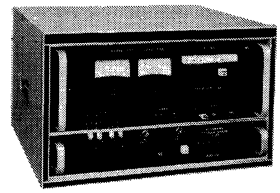
Stability Specs		Temperature	Time
SC0-106	cells	.64 ppm/.01°C	1 ppm/yr. max.
	oven	.01°C/day max.	.05°C/yr. max.

DIALABLE PRECISION DCV SOURCES

The GTX-300 Series is a high quality, compact, portable voltage source. Output settings on this 1 ppm resolution instrument range from 1 microvolt to 10 volts DC and can be made simply by dialing the desired value. Accuracies of from 0.001% to 0.005% can be ordered. Loads requiring up to 25 mA can be tolerated without accuracy deterioration. An output stability of ±3 ppm/24 hours is standard on all units.

DC VOLTAGE AND CURRENT SOURCES, MANUAL AND PROGRAMMABLE





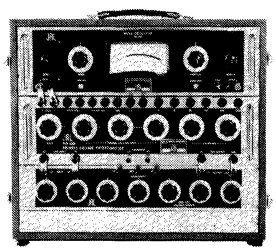
Model	Outputs	
*AVS-106	0 to ±12, 120, 1200V, 6 digits	
DVS-106	0 to ±12, 120, 1200V at 35 ma, 7 digits	
DVS-106D	0 to ±12, 120, 1200V at 35 ma, 6 digits	
*ACS-106	0 to ±1.2, 12, 120 ma; 1.2, 12 Amps	
DCS-105	0 to ±1.2, 12, 120 ma; 1.2, 12 Amps	
DCS-106	0 to ±1.2, 12, 120 ma; 1.2, 120 Amps	
*ACV-106	0 to ±1.2, 12 ma; 0-12V, 120 Volts	
Accuracy	**Stability**	**Linearity**
To 2 ppm	To 5 ppm/30 days	To 1 ppm

* Compliance Programmable

POTENTIOMETERS

Through the use of POTENTIOMETER Plug-ins, the Multivider system is made into various precision voltage measuring systems. (Systems listed in the table below include null detector and voltage divider.)

Range Volts	PVP-1000S Accuracy (w/self cal.)
1000	8 ppm +1 ppm f.s.
300	8 ppm +1 ppm f.s.
100	8 ppm +1 ppm f.s.
30	8 ppm +1 ppm f.s.
12	—
10	5 ppm +1 ppm f.s.
3	5 ppm +1 ppm f.s.
1.2	—
1.1	+1 μv (cell compar.)
1.0	2 ppm +1 ppm f.s.
.12	—
.012	—
.0012	—

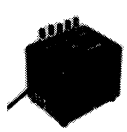


PVP-1000C Potentiometer/Voltbox Plug-in with ranges to 1000 volts and with accuracy as shown below for PVP-1000S:
PVP-1001J Universal Potentiometer Plug-in is used.

SOLID STATE REFERENCES — ZENERS

Line Regulation: 1 ppm for 10% line change for all models.
Output: +1.018, +1.0 and −5.0 volts all models except ZVR-500 Series.
Room Temp. Efficiency: 0.3 ppm/°C (20°C to 30°C) for ZVR-106 Series and 0.2 ppm/°C (20°C to 30°C) for ZVR-500 Series.

Model	MM	Size
ZVR-106B ZVR-106MV (10v, 1v, .1v, .01v)	152.4 x 152.4 x 101.6 152.4 x 152.4 x 101.6	6″ x 6″ x 4″ 6″ x 6″ x 4″
ZVR-506 (6.3v) ZVR-512 (12.6v) ZVR-518 (18.9v)	21.3 x 21.3 x 19.1 21.3 x 21.3 x 19.1 21.3 x 21.3 x 19.1	.84″ x .84″ x .75″ — —
ZTS-106	1.000, 1.018 + Delta; + Delta VDC 0 to 1000 μV (Delta), ±2 ppm Accur.; 1 μV Resol.; ±3 ppm/Mo. Stable	



AC-DC THERMAL VOLTAGE TRANSFER STANDARDS

TNB-102 Series

This set of two Thermoelement Modules (2.5 ma and 5 ma) and six Resistor Modules provide highest available transfer accuracy from 0.5 v to 1000 v up to 1 MHz.

Model TNB-102 Series Coaxial AC/DC Transfer Standards

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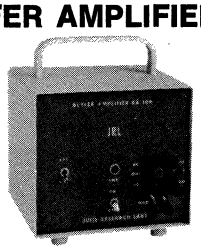
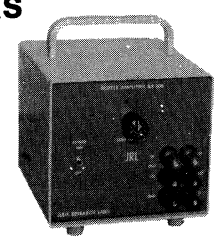
BUFFER AMPLIFIERS


BA106


BA107, BA108

Line Operated High Performance Floating Amplifier

Specification	BA106	BA107	BA108
Gain	1.0 ±1.5 PPM 10.0 ±1 PPM	100 ±1 PPM	1000 ±1 PPM
Max. Output	±12 Volts	±12 Volts	±12 Volts

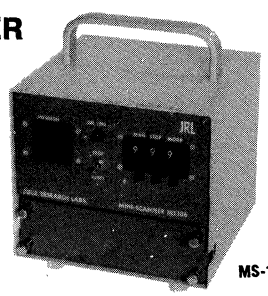
NULL DETECTORS

Model	Ranges	Sensitivity	Dimensions
ND-106	(9) 3 μv to 30 mv	.1 μv	19 x 5¼ x 8

AUTOMATIC RANDOM ACCESS SCANNER

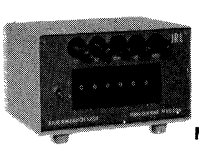
Features: Random bussing capabilities, will not degrade 1 ppm measurements, up to 10 individually Addressable Decades, 2-Pole 100-Position and most combinations in-between. Programmable, sequential, or manual modes. Thermal EMF of 0.2 μV max. Please call us for custom applications.

MINI SCANNER


MS-106

(1) Only .1 to .2 μV thermals, (can be used in 1 PPM accuracy systems)
(2) Manual and complete on line (computer) capabilities
(3) 10 test positions plus 2 mutually exclusive dual form A closures
(4) Random or sequential access
(5) Manually settable or programmable lower limit and manually settable upper limit in the sequential mode
(6) I/O, standard positive BCD code, TTL levels
(7) Illuminated test position display
(8) Automatic stop and hold position or repeat previous scan pattern capabilities.

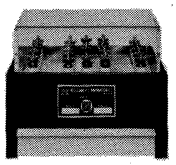
MINIDIVIDER


MVD306

6 Reading Switches — Ratios from .000001 to .999999 — Over Range Switch to 1:100000 Ratio

Enclosure ..... 3½" x 4" x 6"
MVD306 ..... 2.5 PPM Accuracy
MVD306 ..... 5 PPM Accuracy
MVD306 ..... 10 PPM Accuracy

RESISTANCE REFERENCES

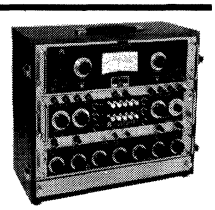

DMR

MRS-106

PRO-106

Model	Absolute Resistance Values	Accuracy (ppm)	Room Temp. Eff. (ppm/°C)	Approximate Size (inches)
PRO-106	10 ohms to 1 Meg.	8	.1(0-28°C)	10 × 14 × 15
PRO-106L	.001 ohms to 10 ohms	50-100	.1(0-28°C)	10 × 14 × 15
MRS-106	100 ohms to 1 Meg.	15	2.5/°C	4 × 2 × 4
MRS-105	.1 ohms to 100 ohms	30-100	2.5/°C	4 × 2 × 4
DMR Series	10 ohms to 1 Meg.	15	2.5/°C	5 × 4 × 3
BMR Series	29,996,131,071 ohms	15-50	5/°C	5 × 4 × 3
BDR Series	100,000 ohms Max.	15	5/°C	5 × 4 × 3
DTR Series	10 ohms to 100K	15	2/°C	9½ × 2½ × 2

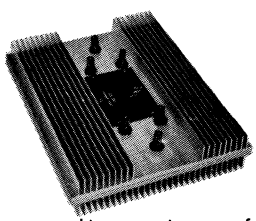
PRECISION RESISTANCE MEASURING SYSTEMS



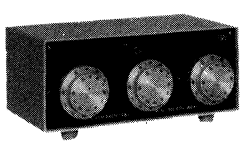
PRB-205C PLUG IN	
0-1000Ω	±1 ppm Setting ±1 ppm f.s.
0-10K	±1 ppm Setting ±1 ppm f.s.
0-100K	±1 ppm Setting ±1 ppm f.s.
0-1 Meg.	±2 ppm Setting ±1 ppm f.s.
0-10 Meg.	±3 ppm Setting ±1 ppm f.s.

PRB205L & PRB205H available extending resistance range from .01 ohms to 100 K Meg.

CURRENT SHUNTS



Our CS-105 and CS-106 Series Current Shunts are high precision, ultra-stable 4-terminal resistors specially designed to operate at relatively high current levels without suffering appreciable resistance change. Maximum current ranges from 0.005 A to 50 A for CS-105 and 0.001 A to 200 A for CS-106. Accuracies range from 0.05% to 0.01%, stability is ± 0.01%/year, and temperature coefficient is 5 ppm/°C or better. Finned heat-sinks are used to reduce heat in high current models. CS-105 Series is specially designed for use with our TNB-102 Thermocouples. Call J.R.L. for data sheets.



Manual and Programmable Boxes Available — DR100, RD100 Series:
Ranges: 1 Ohm to 11 Meg.
Accuracy to 0.01%

Max. Res. 1,111,110Ω
Ohms Per Step 1Ω
Decade Ranges 6
Enclosure ..... 3½" x 4" x 9" Metal Case
IEEE-488 option available for RD-100 Series.

PRIMARY RESISTANCE AND RATIO STANDARDS

NB SERIES

These ultra-stable oil-immersed resistors, provide absolute accuracy and stability heretofore unattainable in conventional precision components
(See JRL Bulletins B-5 and B-6)

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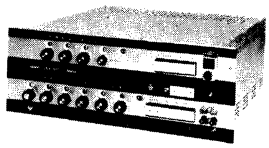
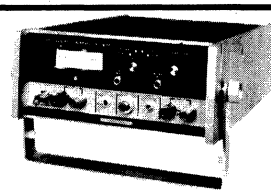



PRECISION OSCILLATORS

Model	Frequency Range	Frequency Accuracy	Output Voltage	Output Current	Frequency Response	Features
RCD-10	.1 Hz-100 kHz	1%	0-5		±.5%	General Purpose Oscillator
RCD-902	10 Hz-1 MHz	1.0%	0-5			Wide Band
RCD-904	10 Hz-1 MHz	0.1%	0-11.11 absolute	100 MA	±.05%	Remote Sensing

POWER OSCILLATORS

Model	Power VA	Frequency Range	Voltage*	Features
AC-50	50	0.1 Hz to 100 kHz	15	Precision High Power

* Options are available to extend V+1 ranges of all power oscillators and amplifiers.

PRECISION POLYPHASE OSCILLATORS/POWER OSCILLATORS

Model	Phases Power/ϕ	Output V/ϕ	1/ϕ	Regulation	Frequency Range	Amplitude Stability	Distortion	Features
AC-153	2/3 45	150	2a	adj. to Zero	10 Hz to 10 kHz	100 ppm	.05%	Switchable 2 or 3ϕ
RCD-11	2/3	5			.01 Hz to 10 kHz	100 ppm	.02%	General Purpose Oscillator

PRECISION POLYPHASE OSCILLATORS/POWER OSCILLATORS

- High Power — to 50 VA per phase
- Low Distortion — to less than 0.02%
- Fixed or Variable Stable Frequency
- Adjustable Load Regulation
- Perfectly Suited for Gyro Testing

POWER OSCILLATORS

- Accurate Digital Frequency Selection
- Stable Amplitude — less than 0.01% variation
- Stable Frequency — 10 ppm available
- Low Distortion — less than 0.05%
- Wide Frequency Range — up to 110 kHz
- Absolute Stability Regardless of Load
- Up to 50 VA Output

POWER AMPLIFIERS

- Low Distortion — under 0.05%
- Stable Voltage Gain — to 1 ppm
- Wide Frequency Ranges — DC to 2 Mhz
- Adjustable Output Impedance
- Absolute Stability Regardless of Load
- Voltage or Current Regulation

PRECISION SOURCES

- Stable Amplitude — less than 20 ppm variation
- Low Distortion — under 0.05%
- High Power Output — up to 200 VA
- Stable Frequency — less than 0.01% variation
- Wide Frequency Range — to 100 kHz at 1000 V
- Constant Voltage/Current—to 1500 V: to 40 Amps

PRECISION OSCILLATORS

- Absolute Amplitude Accuracy — ±0.05%
- Amplitude Stability — ±0.01% month
- Output — from 11 Volts to 100 Milliamperes
- Remote Sensing Available
- Quadrature Phase Accuracy — 0.05°
- Frequency Range — 10 Hz to 1 MHz
- Frequency Accuracy — to 0.1%

ABSOLUTE CALIBRATORS FOR:

Ammeters - Voltmeters - Wattmeters - Phasemeters - Digital Multimeters

- Programmable Models
- Highest Accuracy Available
- 10 Hz to 1 MHz
- Compact and Lightweight
- Complete Systems Available

ABSOLUTE CALIBRATORS

Model	Output Range	Accuracy DC	Accuracy AC*	Frequency Range	Features
AC125/PA225	10 NV to 1211.11V		0.02%	10 Hz to 1.1 MHz	Fixed Amplitude Quadrature Output
AC129/PA225	10 NV to 1211.11V		0.02%	10 Hz to 1.1 MHz	Fully Programmable
AC160	0-600V		0.05%	25 Hz to 10 kHz	Calibrates Volt, Amp and Watt Meters — Variable Phase
CS112	0-10 Amps 1 μa to 2.2 Amp	.005%	0.05% 0.02%	10 Hz to 100 kHz	Absolute Power Factor Bi-polar DC
CS128	1 μa to 2 Amp		0.02%	10 Hz to 100 kHz	Programmable
QCS110	1 μa to 1.1 Amp		0.02%	10 Hz to 100 kHz	Phase Calibrated From 0-360° ±0.05°
PA270	1 Amp to 110 Amp		0.02%	10 Hz to 100 kHz	High Current—Self Calibrating
RCD709	0 to 5V RMS			10 Hz to 100 kHz	Absolute Phase Standard ±.05°

* Typical Midband

PRECISION SOURCES

Model	Voltage	Current	Resolution	Frequency Range	Distortion	Stability	Features
AC50CAL	500V	10A	10 ppm	10 Hz to 100 kHz	<.05%	±20 ppm	High Performance at Low Cost
AC104	1500V	20A	10 ppm	10 Hz to 100 kHz	<.05%	±20 ppm	Full Power Output From 45 Hz to 100 kHz

POWER AMPS

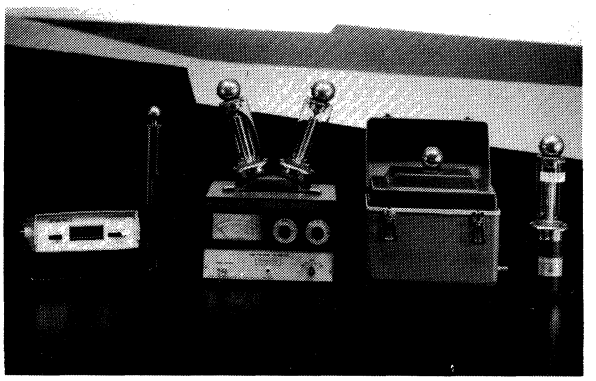
Model	Power (VA)	Voltage	Current	Band Width Full Power	Band Width Extended	Distortion	Features
PA25	25	150		DC - 1 MHz	DC - 2 MHz	<.02%	Sine/Pulse—1500V μS
PA50	50	15		DC - 20 kHz	DC - 100 kHz	<.05%	Wide band
PA50T	45	150		45 Hz - 20 kHz	10 Hz - 100 kHz	<.05%	Voltage Regulated
PA50T/10A	45		10 Amps	45 Hz - 2 kHz	10 Hz - 100 kHz	<.05%	Current Regulated
PA50T/500	45	500	10 Amps	55 Hz - 10 kHz	10 Hz - 100 kHz	<.05%	High Voltage
PA250AC	250	150	10 Amps	25 Hz - 20 kHz	15 Hz - 40 kHz	<.05%	Adjust. Output Imped.
PA250H	250	300	5 Amps	45 Hz - 60 kHz	20 Hz - 100 kHz	<.05%	Absolute Load Stability

OPTIMATION
JULIE RESEARCH LABORATORIES, INC.
508 W 26 ST., NEW YORK, NY 10001 • (212) 633-6625 • TWX 710-581-5138 • FAX 212-691-3320

JENNINGS HV TEST EQUIPMENT

Jennings high voltage instruments allow direct measurement of the most important voltage parameters that apply to all AC waveforms, whether sinusoidal, pulse, repetitive transient or combination signals. The instruments are small, easily portable, and operate directly from line voltages. The instruments are versatile in a variety of applications including — production processing on continuous monitoring of voltage withstand, use in laboratories for verification of design capabilities, and troubleshooting for onsite installations.

Comprehensive data sheets on individual instruments are available upon request. Our sales engineers can provide an on-site demonstration if requested.



Photo, left to right: 12500, J-1005, JHP-70A (transformer), 13200

50KV AC/DC DIGITAL KILOVOLTMETER

Model Number	12500
Output Voltage (Two Ranges)	0–20KV DC or AC RMS; 0–50KV DC or AC RMS
Digital Display	Three and 1/2 digits automatically display correct DC polarity
Accuracy	± 1% of full range
Frequency Range	0 Hz to 20 KHz
Input Impedance	10^{10} ohms, less than 10 pF
Oscilloscope Jack Output	0–20KV : 3,000 to 1; 0–50KV : 30,000 to 1
Power Requirements	117 VAC or 230 VAC, 50/60 Hz
Weight	Instrument: 3½ pounds Probe: 3½ pounds
Size (Inches)	Instrument: 3.5 × 8.5 × 9 Probe: 1.5 (D) × 13.5 (H)

SOLID STATE AC VOLTMETER

Model Number	J-1005
Voltage Ranges	Peak Kilovolts (single-ended) 0–2.5, 0–5, 0–10, 0–25, 0–50 Peak Kikovolts (double-ended) 0–2.5, 0–5, 0–10, 0–25, 0–50, 0–100
Frequency Response	10 Hz to 30 MHz at full rate voltage
Accuracy	3% of full scale on all voltage ranges
Oscilloscope Connection	600 to 1 division ratio (approx.)
Meter Calibration	The meter is calibrated in peak kilovolts with linear voltage scales of 0–2.5, 0–5, 0–10, 0–25, 0–50
Input Impedance	Greater than 2 × 10^{12} ohms and approx. 4 pf single-ended to ground, 2 pf double-ended
Power Supply	117/230 volts ± 10%, 50/60 Hz, 5 watts, or rechargeable battery
Dimensions	Height, 16″; width 10¾″; depth, 8″
Net Weight	12 pounds (approx.)

PORTABLE AC HIGH VOLTAGE TESTER

Model Number	JHP-70A
Maximum Output Voltage	70 kV Peak
Maximum Continuous Current	21 ma RMS
Short Circuit	100 mA RMS
Power Requirements	105–125 Volts RMS*
Frequency	50–60 Hz
Current	15 Amps
Surge Current	20 Amps
Weight:	
Control Cabinet	28 lbs.
Transformer	43 lbs.

*NOTE: 230 volt version available upon special request.

HIGH VOLTAGE AC DIVIDER

Model Number	13200
Voltage	50 kV peak
Current	12.5 amperes RMS
Input Impedence	Above 10^{12} ohms, 4 pfd.
High Frequency Response	Flat to 10 MHz at 50 kV peak; maximum frequency 50 MHz at 20 kV peak
Division Ratio	As requested, 325:1, 1000:1 or 2000:1
Low Frequency Response when operated into shunt resistance of:	
1 megohm	1000 Hz
10 megohms	100 Hz
Weight	2 lbs. 4 oz.

50 KV AC/DC Digital Kilovoltmeter Model 12500

The smallest AC/DC kilovoltmeter available. The 12500 measures to 50 KV DC or AC RMS in 2 ranges. Applications include cathode ray tube display systems, electrostatic smoke precipitators, contamination monitors for radioactivity, and virtually any metering requirements in the 50 KV range. True RMS measurements as well for applications such as power line and substation equipment, x-ray and neon sign transformers, and TV scan and flyback circuits.

Solid State AC Voltmeter Model J-1005

A compact, portable instrument for the accurate, direct reading of very high voltages at rf, audio and power frequencies... determination of the amplitude of pulses with oscilloscope connections for viewing wave shapes...removable high voltage input circuit for remote panel mounting of the meter...internal battery and ac line operation.

Portable AC High Voltage Tester Model JHP-70A (Not shown)

The smallest and lightest instrument available at its power level the JHP-70A will generate and measure 70,000 volts peak for on-site testing of high voltage components such as capacitors, switches, transformers, bushings, vacuum tubes, etc.

High Voltage AC Divider Model 13200

These dividers can be used with an oscilloscope to measure and observe voltages up to 50 kv at frequencies up to 20 MHz. Their low circuit loading design and shielding construction make them particularly suitable for rf measurement applications including tank circuit and transmission line voltages, pulse parameters, modulation voltages, and transient wave characteristics.

JENNINGS 970 McLaughlin Ave., San Jose, CA 95122
(408) 292-4025

Accurate Measurements

Keithley Digital Multimeters

Nine different DMMs that offer outstanding resolution, accuracy and speed with the versatility and performance required for your application. An autoranging DMM with memory. A DMM with a built-in 8-channel scanner. A complete line of DMMs to meet your needs, available from one manufacturer. A manufacturer that built its name and reputation on quality, service, innovation, and integrity—Keithley Instruments.

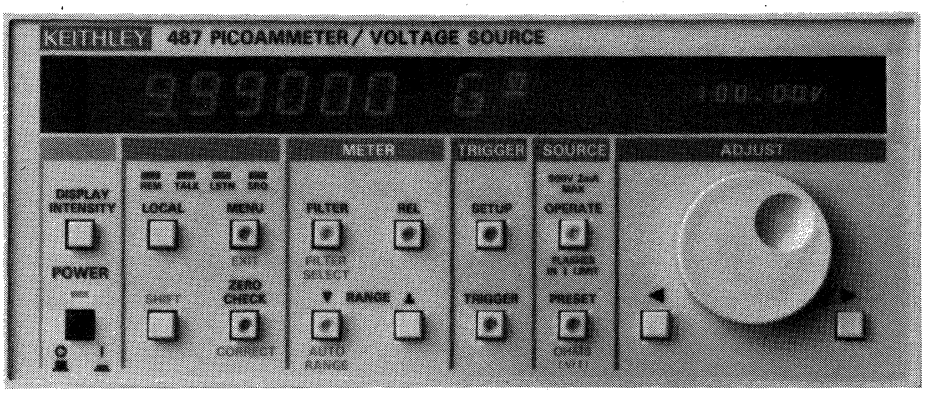
Send for our new 36-page brochure on Keithley digital multimeters. Learn what Keithley customers have to say about Keithley DMMs.

MODEL	169	175A	179A	177	193A	195A	197A	196	199
Digits	3½	4½	4½	4½	3½ to 6½	3½ to 5½	5½	3½ to 6½	4½ to 5½
Display	LCD	LCD	LED	LED	LED	LED	LCD	LED	LED
DC VOLTS									
Sensitivity	100 µV	10 µV	10 µV	1 µV	100 nV	100 nV	1 µV	100 nV	1 µV
Max. Reading	1000 V	1000 V	1200 V	1200 V	1000 V	1000 V	1000 V	300 V	300 V
Accuracy	0.25%	0.03%	0.04%	0.03%	0.003%	0.025%	0.011%	0.003%	0.006%
AC VOLTS									
Sensitivity	100 µV	10 µV	10 µV	10 µV	1 µV	1 µV	1 µV	1 µV	1 µV
Max. Reading	1000 V	750 V	1000 V	1000 V	700 V	700 V	750 V	300 V	300 V
Accuracy	0.75%	0.5%	0.5%	0.5%	0.25%	0.3%	0.35%	0.15%	0.15%
OHMS									
Sensitivity	100 mΩ	10 mΩ	100 mΩ	1 mΩ	100 µΩ	100 µΩ	1 mΩ	100 µΩ	1 mΩ
Max. Reading	20 MΩ	200 MΩ	20 MΩ	20 MΩ	220 MΩ	20 MΩ	220 MΩ	300 MΩ	300 MΩ
Accuracy	0.2%	0.05%	0.04%	0.04%	0.005%	0.025%	0.018%	0.005%	0.008%
DC AMPS									
Sensitivity	100 nA	10 nA	10 nA	1 nA	1 nA	100 pA	1 nA	1 nA	100 nA
Max. Reading	2 A	10 A	20 A	2 A	2 A	2 A	10 A	3 A	3 A
Accuracy	0.75%	0.15%	0.2%	0.2%	0.09%	0.09%	0.1%	0.05%	0.05%
AC AMPS									
Sensitivity	100 nA	10 nA	10 nA	10 nA	1 nA	1 nA	1 nA	1 nA	100 nA
Max. Reading	2 A	10 A	20 A	2 A	2 A	2 A	10 A	3 A	3 A
Accuracy	1.5%	0.8%	1.0%	0.8%	0.6%	0.6%	0.8%	0.6%	0.6%

KEITHLEY INSTRUMENTS

Instruments Division, Keithley Instruments, Inc.
28775 Aurora Road • Cleveland, Ohio 44139
(800) 552-1115 • Fax: (216) 248-6168

Sensitive Measurements



Keithley Electrometers and Picoammeters

When extremely low level measurements are required, the Keithley line of electrometers and picoammeters are the instruments of choice. Found in universities and research facilities around the world for more than forty years, Keithley instrumentation is recognized as the standard of the industry.

The Model 487 Picoammeter/Voltage Source is designed for measurement of low current and very high resistances. The new Model 182 Sensitive Digital Voltmeter features unmatched 1nV sensitivity, 5ppm transfer stability, and less than 3nV rms noise.

Call our Applications Department at **1-800-348-3735** for technical assistance, before or after your purchase.

ELECTROMETERS	602	610C	614	617	642	236, 237, 238
CURRENT						
From	1 fA	1 fA	10 fA	100 aA	10 aA	10 fA
To	300 mA	300 mA	2 mA	20 mA	100 nA	100 mA, 1 A
VOLTAGE						
From	10 µV	10 µV	10 µV	10 µV	20 µV	10 µV
To	10 V	100 V	20 V	200 V	11 V	110 V, 1100 V
RESISTANCE						
From	10 Ω	1 Ω	1 Ω	100 mΩ	N/A	100 µΩ
To	10 TΩ	100 TΩ	200 GΩ	10 PΩ		10 TΩ, 100 TΩ
CHARGE						
From	1 fC	1 fC	10 fC	10 fC	800 aC	N/A
To	1 µC	10 µC	20 nC	20 nC	100 pC	
Input Connection	Triax	UHF	Triax	Triax	BNC, special sapphire adapter	Triax

PICOAMMETERS	480	485	486	487
From	1 pA	100 fA	10 fA	10 fA
To	2 mA	2 mA	2 mA	2 mA
Input Connection	BNC	BNC	3-lug triax	3-lug triax

VOLTMETER	182
Sensitivity	1 nV
Basic Accuracy	0.005%
Input Connection	Special low thermal

KEITHLEY INSTRUMENTS

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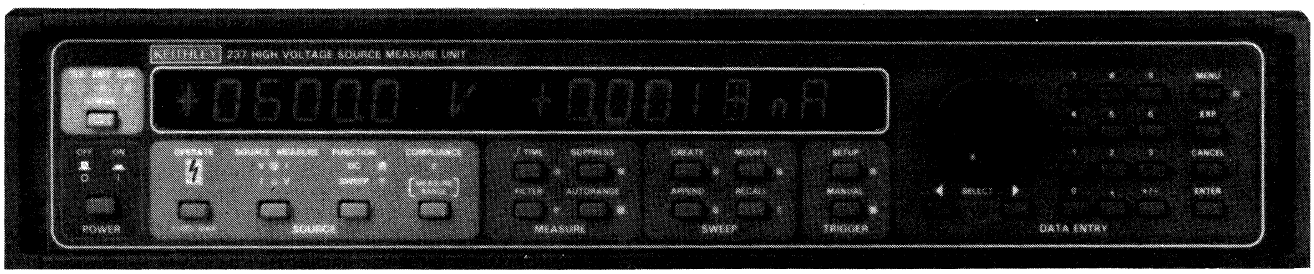
(800) 552-1115 • Fax: (216) 248-6168

I-V and C-V Measurements



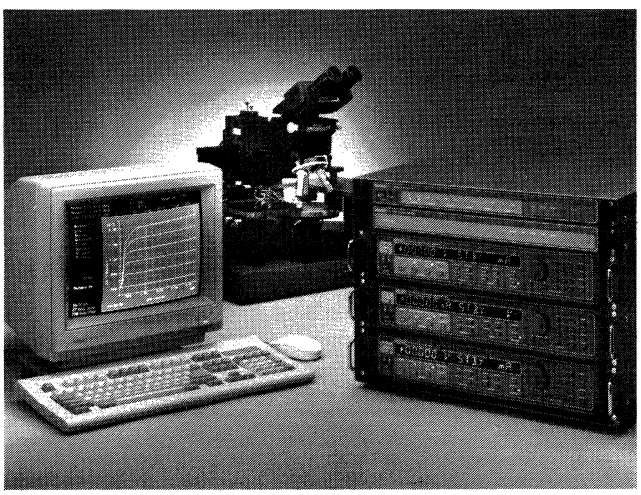
Keithley Semiconductor Measurements

Keithley offers a comprehensive line of sensitive instrumentation and flexible software for a complete range of I-V and C-V testing. Whether you need a single instrument for rack and stack configurations or a complete analysis workstation, Keithley has a solution that's right for you.

Our new Source-Measure Units will measure current from 10fA to 1A and voltage from 10μV to 1100V with 0.03% accuracy. Our I-V test software adds powerful acquisition and graphical analysis capabilities to your PC environment. And our complete line of C-V instruments, systems and accessories offers superior solutions to simultaneous C-V, Quasistatic C-V and High Frequency C-V.

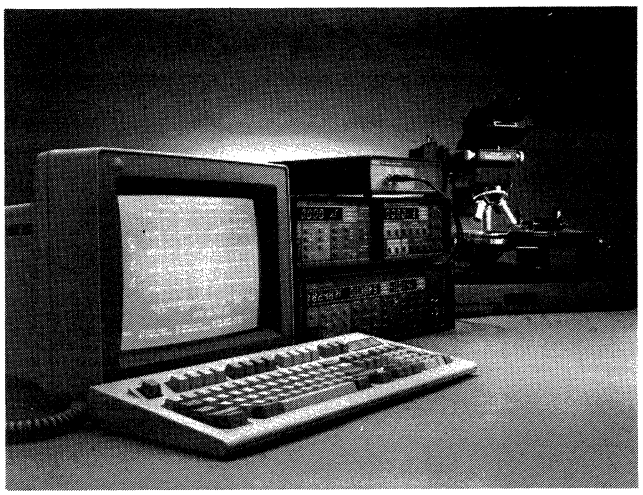
Models 236, 237. 238 Source-Measure Units

	236	237	238
V_{MAX}	110 V	1100 V	110 V
V_{SENS}	10 μV	10 μV	10 μV
I_{MAX}	110 mA	110 mA	1 A
I_{SENS}	10 fA	10 fA	10 fA



Model 251 I-V Test Software

Interactive testing of current vs. voltage is easily controlled from a PC for complete characterization of semiconductor devices. This software uses fast and sensitive Source-Measure Units to measure and display I-V curve families, breakdown voltage, leakage current, DC or differential gain and resistance. A library of standard tests is supplied, and there is no programming or knowledge of GPIB commands required.



Model 82 C-V System

Menu-driven software steps through the process for fast and accurate C-V analysis. It corrects for system leakages and cabling effects, finds oxide capacitance and equilibrium sweep rate, makes simultaneous high frequency and quasistatic C-V measurements, analyzes the data, and plots the output graphs. All of the calculations and graphs commonly used for C-V analysis are included, such as Dit, doping profiles and band bending.

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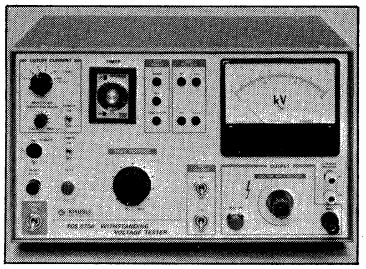
KIK Hi-Pot Testers

Meet Worldwide Safety Requirements. Test UL, CSA, CEE, BS, and VDE. AC & DC, up to 10 kV

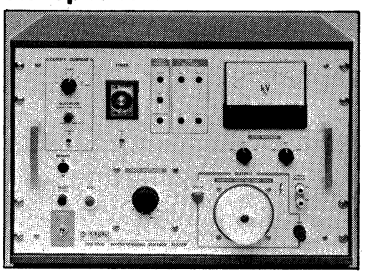
- Zero Cross Turn-On for Gradual and Uniform Waveforms with No Transients.
- Local or Remote Operation.
- Tests Manual/Timed, GO/NOGO.
- Tests up to 10 kVAC/DC. 50 mA DC up to 100 mA AC.
- Window Comparator.
- 1 Year Warranty.

GP-IB

AC and DC Hi-Pots: Up to 10kV

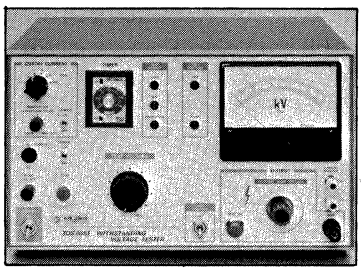


TOS 8750 AC/DC test, 5 kV, 500 VA AC. 100 mA AC, 10 mA DC.

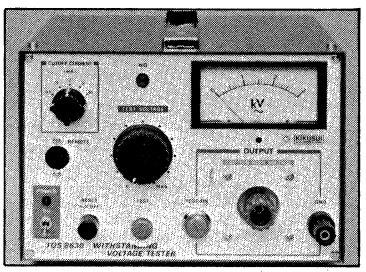


TOS 8700 AC/DC test, 10 kV, 500 VA. 50 mA AC, 10 mA DC.

Low Cost Manual Hi-Pots



TOS 8650/51 AC test only, 5 kV, 500 VA. 100 mA.

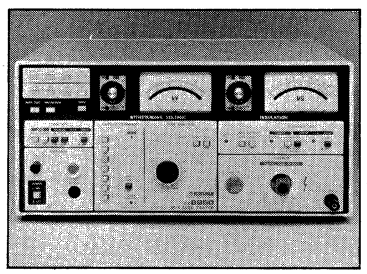


TOS 8630 AC test only, 3 kV, 30 VA. 10 mA.

Safety Features

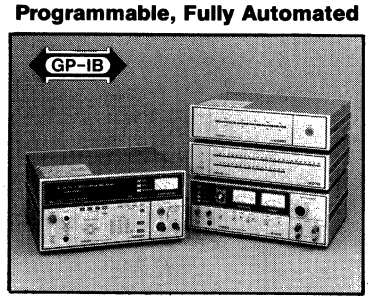
- Remote Operation (optional)
- "Hands Off" Remote Operation (optional)
- High Visibility Warning Lamp (optional)
- Remote (optional) and Internal Buzzers
- Window Comparator Measurement System
- Multiple Interlock Protector Circuit
- Remote Protector, for use with External Interlock Switches

Hi-Pot & Insulation Resistance



TOS 8850 AC test, 5 kV. 1 kVDC, 2000 Mohm Insulation. 180 mA.

Programmable, Fully Automated

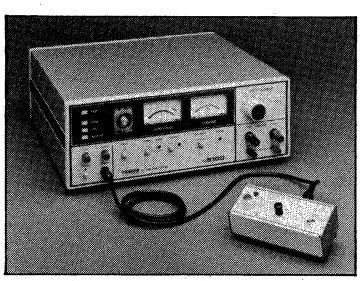


Computer-based TOS 9000 GPIB or front-panel controllable with 15 programs (98 steps each). Fully automatic. AC: Up to 5 kVAC, 40 mA. DC: Up to 1 kVDC, 9999 Mohm insulation. Ground continuity up to 30 amps.

Also see our ads under Power Supplies, AC Sources, Oscilloscopes.

For sales and service available nationwide call us.

TOS 6100 Ground Continuity Tester



For resistance measurements and testing of earth continuity for Class I electrical equipment.

- 0-.12 ohm, 0-.6 ohm.
- 3-30 A
- Audible alarm
- Adjustable test times (.5 sec-10 min.)

Accessories:
Remote control boxes, warning lights, buzzers, HV test leads and probes.

Specifications subject to change without notice

KIK®

Kikusui International Corporation

(800) KIK-8784

KROHN-HITE CORPORATION

255 Bodwell Street, Avon, Massachusetts 02322
Tel: (508)580-1660; Fax: (508)583-8989

SYNTHESIZERS, FUNCTION GENERATORS AND RC OSCILLATORS

MODEL	FREQUENCY RANGE	ACC. %	OPERATING MODES: CONT	GATE	TRIG	SWP	PULSE	BURST	ARB	MAX. OUTPUT	FREQUENCY RESPONSE	SALIENT FEATURES	RACK MOUNT KIT	PRICE $
1000A	0.2Hz - 3MHz	5	●							20Vp-p	0.1dB	1500:1 Tuning Dial, High/Lo Main Outputs	RK-39	550
1200A	0.2Hz - 3MHz	5	●			●				20Vp-p	0.1dB	DC Offset, Lin Sweep, Ramp and TTL Outputs	RK-39	700
1400A	0.2Hz - 3MHz	5	●	●	●	●	●	●		20Vp-p	0.1dB	Calibrated Sweep Start/Stop, Calibrated Attenuator	RK-314	1050
1600A	0.2Hz - 3MHz	5	●	●	●	●	●	●		20Vp-p	0.1dB	Variable Start Phase/Trigger Level, Frequency Marker	RK-314	1150
2000	0.003Hz - 30MHz	5	●				●			30Vp-p	0.1dB	Calibrated CV Output, Calibrated Attenuator, Fixed or Variable DC Offset, 1/2 Watt Output Power	RK-58	1375
2100A **	0.03Hz - 31.16MHz	0.5* ppm	●	●	●	●	●	●		30Vp-p	0.1dB	Synthesized, Data Modifier Knob, Non-Volatile Memory, Opto-Isolation	RK-516	4495
2100A-7 **	0.03Hz - 31.16MHz	0.5* ppm	●	●	●	●	●	●		30Vp-p	0.025dB	Synthesized, Flat Response, Data Modifier Knob Non-Volatile Memory, Opto-Isolation	RK-516	4750
2200	0.003Hz - 30MHz	5	●	●	●	●	●	●		30Vp-p	0.1dB	Dual DC Offset Controls, Frequency Marker, Ramp and TTL Outputs, Lin/Log Sweeps (up and down)	RK-519	1850
2400	0.003Hz - 30MHz	5	●	●	●	●	●	●		30Vp-p	0.1dB	AM, FM, Phase Lock, Two Independent Generators	RK-519	1950
4100B	0.01Hz - 1MHz	0.5	RC OSCILLATORS Low Distortion from 0.1% to as low as <0.001%							10Vrms	0.05dB	1/2 Watt Output, 0.02% Distortion, Squarewave Output	RK-58	1750
4180 **	1Hz - 1MHz	0.1								10Vrms	0.05dB	Aux. Squarewave Output	RK-519	3500
4200B	10Hz - 10MHz	2								10Vrms	0.025dB	0.02% Amplitude Stability, Aux. 1Volt Output	RK-58	1050
4300B	10Hz - 10MHz	2								10Vrms	0.025dB	0.02% Amplitude Stability, Selectable Sqaurewave	RK-58	1100
4400A	1Hz - 110kHz	0.5								7Vrms	0.05dB	Quadrature and Inverted Outputs, <0.001% Distortion	RK-39	1050
4500	1Hz - 100kHz	10								7Vrms	0.05dB	Continuous Frequency Tuning, Inverted Output, Selectable Squarewave, <0.001% Distortion	RK-39	1000
5400C	0.002Hz - 5MHz	1	●				●			30Vp-p	0.05dB	Calibrated Atten., Symmetry Control, Aux. Squarewave	RK-58	1425
5600	0.002Hz - 2MHz	3	●							15Vp-p	0.1dB	Balanced 600 Ohm Output, Battery Operated, DC Offset	N/A	1100
5900C **	0.0001Hz - 5MHz	0.5	●	●	●	●	●	●		30Vp-p	0.05dB	Frequency Stabilized, 1000 Step Auto-Programmer	RK-516	3000
5920 **	0.0001Hz - 10MHz ‡	0.5	●	●	●	●	●	●	●	30Vp-p	0.05dB	Arbitrary Waveforms, Frequency Stabilized, 1000 Step Auto-Programmer, Z-Axis, 30k Bytes Non-Volatile Memory	RK-516	3995

*‡5MHz Function Generator; *Option 006: High Stability Reference of 0.01ppm; **IEEE-488 Programmable*

WIDEBAND AMPLIFIERS

MODEL	FREQUENCY RANGE	OUTPUT POWER (WATTS)	DIST. %	FREQUENCY RESPONSE (dB)	INPUT VOLTS (rms)	MAXIMUM VOLTAGE GAIN	MATCHED LOAD (ohms)	MAXIMUM OUTPUT VOLTS	MAXIMUM OUTPUT CURRENT	RACK MOUNT KIT	PRICE $
DCA-10	DC-1MHz	10	0.1	+/–0.1	10	10	600 to 1k	105rms	130mA	*	2400
7500	DC-1MHz	75	0.1	+/–0.1	1.25	100	200	125rms	625mA	RK-519	2250
MT-56R	30Hz-1MHz	75	–	–	125	–	2 to 1k	100rms	6.5A	N/A	850†

*†Accessory Matching Transformer; *Rack Model (19" Front Panel): Add Suffix 'R' to Model No. ($50)*

DISTORTION ANALYZERS

MODEL	FREQUENCY RANGE	INPUT SENSITIVITY (Vrms)	DISPLAY	DISTORTION RANGE %	VOLTMETER RANGE (Vrms)	INTERNAL OSCILLATOR	ADDITIONAL FEATURES	RACK MOUNT KIT	PRICE $
6880A	10Hz-110kHz †	0.1-130	3 Digit	%: .003 to 50.0 dB: –6 to –90	0.01-130	1kHz 5Vrms	Frequency Counter IEEE-488 Programmability	RK-519	3500
6900B ‡	5Hz-1MHz	0.1-130	3 Digit	.000 to 19.0	1-130	1kHz 5Vrms	Distortion Output Analog Output	RK-319	2400

†Option 001: 1Hz operation; ‡Optional BCD Output

PRECISION PHASEMETERS

MODEL	FREQUENCY RANGE †	PHASE ACCURACY	RESOLUTION	INPUT WAVEFORMS	INPUT VOLTAGE RANGE	DISPLAY RANGE	RACK MOUNTING KIT	PRICE $
6200B ‡	10Hz-1MHz	0.5°	0.1°		0.1-120Vrms	–180°/+180°	RK-38	1200
6600 †‡	10Hz-10MHz	0.1°	0.1°		0.01-320Vrms	0°-360°	RK-316	2295
6610 †‡	10Hz-10MHz	0.05°	0.01°		0.01-320Vrms	0°-360°, +/–180°	RK-316	2995
6620 †*¶	10Hz-10MHz	0.05°	0.01°		0.01-320Vrms	0°-360°, +/–180°	RK-316	3695

*†Option 002: 1Hz operation; ‡Option 001: BCD output; ¶(AMC) Auto Meter Correct; *Option 004: RS232 replaces IEEE-488 interface*

SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

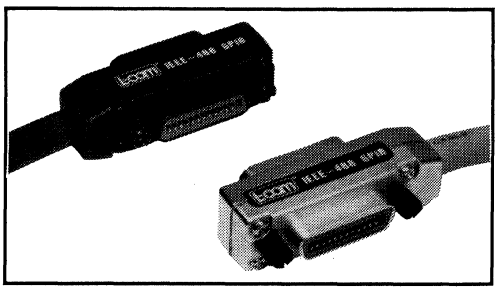
United States (NEMA) National Electrical Manufacturers Association

United States (ANSI) American National Standards Institute

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

L-com® IEEE-488 CABLE PRODUCTS



IEEE-488 Cables - *Meet or Exceed Industry Standards*

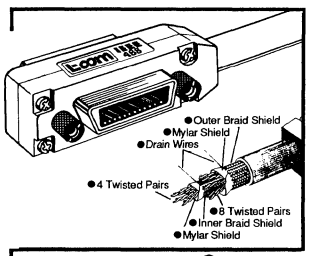
L-Com General Purpose Interface Bus (GPIB) cables are designed and assembled to the latest IEEE-488 standard, "Interface for Programmable Instrumentation". Careful consideration has been given to design and materials to provide cables that are very flexible and have better-than-average strain reliefs to prevent cable failure when bending at sharp angles. **L-Com** Premium and Deluxe cables have tough nickel-plated cast aluminum connector shells for maximum protection against damage. Standard-grade cables have resilient molded cable ends for long life in rough service.

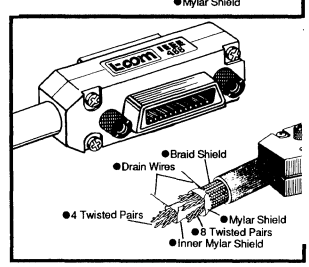
IEEE-488 cables are used for interconnection of programmable measurement and instrumentation devices to form integrated systems. **L-Com** cables are designed to minimize cross talk between signal lines, susceptibility to external noise and signal transmission to external environments. They are directly interchangeable with equivalent HP, AMP and Amphenol cables.

CIB Series Premium IEEE-488 Cables -

The finest GPIB cables available anywhere. 4 shields (2 braid, 2 mylar) for best EMI performance. Nickel-plated cast aluminum shells with 4 assembly screws withstand severe abuse. UL recognized insulation. **(MB)** suffix on model numbers indicate all black, no-glare finish, same price. Six types only.

MODEL-Mtrs	LENGTH (ft)	PRICE
CIB24-03M	1.09'	66.00
CIB24-05M	1.64'	67.00
CIB24-1M or MB	3.28'	69.50
CIB24-2M or MB	6.56'	75.00
CIB24-3M or MB	9.84'	80.50
CIB24-4M or MB	13.12'	86.00
CIB24-5M or MB	16.40'	91.50
CIB24-6M or MB	19.68'	97.00
CIB24-8M	26.24'	108.00
CIB24-10M	32.80'	119.00
CIB24-12M	39.36'	133.00
CIB24-15M	49.20'	159.00
CIB24-18M	59.04'	189.00

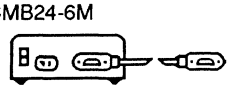




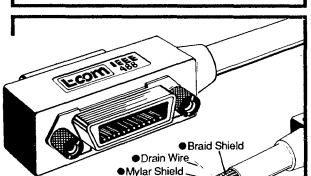
CMB Standard Entry IEEE-488 Cables -

for general purpose use. 2 shields with molded connector ends and rugged strain relief design. An economical solution to many GPIB interconnections. UL insulation.

MODEL-Mtrs	LENGTH (ft)	PRICE
CMB24-05M	1.64'	44.00
CMB24-1M	3.28'	46.00
CMB24-2M	6.56'	50.50
CMB24-3M	9.84'	55.00
CMB24-4M	13.12'	59.50
CMB24-5M	16.40'	64.00
CMB24-6M	19.68'	68.50



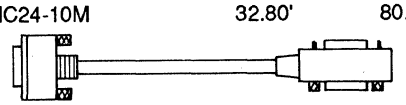
CABLE EXITS TO RIGHT OF EQUIPMENT PANEL

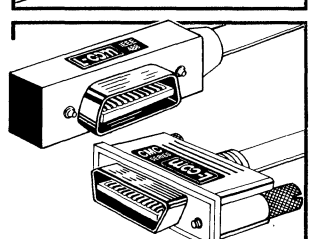


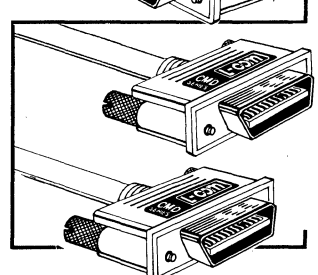
CMC Single-Ended IEEE-488 Cables-

have standard M/F headed GPIB connector on one end and single-ended in-line male connector on the other. Permits straight entry to connector on crowded panel. Two shields with molded connector ends and rugged strain relief design. UL recognized insulation.

MODEL-Mtrs	LENGTH (ft)	PRICE
CMC24-05M	1.64'	37.50
CMC24-1M	3.28'	39.50
CMC24-2M	6.56'	44.00
CMC24-3M	9.84'	48.50
CMC24-4M	13.12'	53.00
CMC24-5M	16.40'	57.50
CMC24-10M	32.80'	80.00







CIF Series Deluxe IEEE-488 Cables -

This Series of cables meet all industry standards and is L-com's **best buy**. All features identical to our CIB24 Series, but with one less copper braid shield. Comparable to industry's best recognized GPIB cables.

MODEL-Mtrs	LENGTH (ft)	PRICE
CIF24-03M	1.09'	57.50
CIF24-05M	1.64'	58.50
CIF24-1M	3.28'	61.00
CIF24-2M	6.56'	66.00
CIF24-3M	9.84'	71.00
CIF24-4M	13.12'	76.00
CIF24-5M	16.40'	81.00
CIF24-6M	19.68'	86.00
CIF24-8M	26.24'	96.00

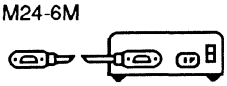
CABLE EXITS TO RIGHT OF EQUIPMENT PANEL

Quantity discounts apply to all Cable Series

CIM Reverse-Entry IEEE-488 Cables

Same performance and design features as CMB cables. Connector ends designed for reverse entry (see diagram) to avoid interference with other panel components.

MODEL-Mtrs	LENGTH (ft)	PRICE
CIM24-05M	1.64'	44.00
CIM24-1M	3.28'	46.00
CIM24-2M	6.56'	50.50
CIM24-3M	9.84'	55.00
CIM24-4M	13.12'	59.50
CIM24-5M	16.40'	64.00
CIM24-6M	19.68'	68.50

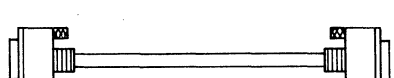


CABLE EXITS TO LEFT OF EQUIPMENT PANEL

CMD Single-Ended IEEE-488 Cables

have single-ended in-line male connectors on both ends. Permits straight entry to connectors on crowded panels. Two shields with molded connector ends and rugged strain relief design. UL recognized insulation.

MODEL-Mtrs	LENGTH (ft)	PRICE
CMD24-05M	1.64'	31.00
CMD24-1M	3.28'	33.00
CMD24-2M	6.56'	37.50
CMD24-3M	9.84'	42.00
CMD24-4M	13.12'	46.50
CMD24-5M	16.40'	51.00
CMD24-10M	32.80'	73.50



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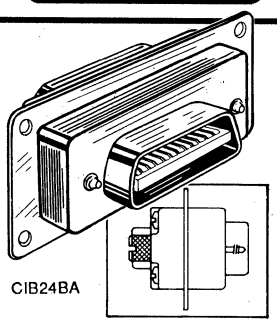
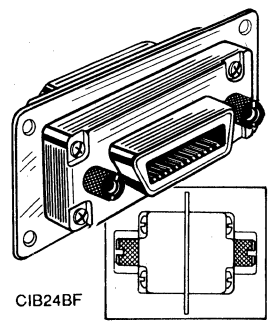
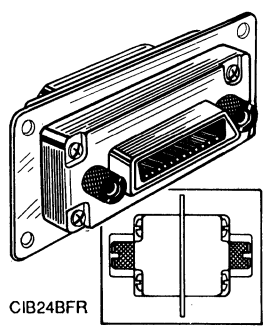
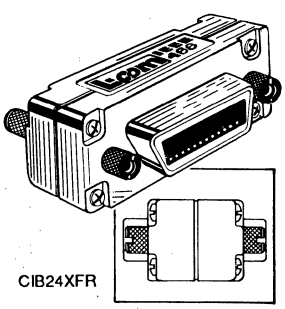
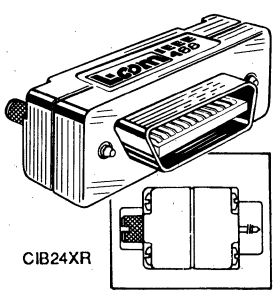
L-com® IEEE-488 ADAPTORS


CIB24BA


CIB24BF


CIB24BFR


CIB24XFR


CIB24XR

MODEL	DESCRIPTION	ENTRY	1-9

IEEE-488 Accessories - Carefully Study These New and Useful IEEE-488 Products

L-com is the first company to offer a full line of IEEE-488 accessory products to the instrumentation industry. Some of these innovative components are proprietary, a direct result of listening to many engineers and technicians. Possibly, you will also find these accessories useful in your day-to-day test or production activities. Fabricated from the best materials for a long and useful life, these products will mate perfectly with **all L-com** IEEE-488 Cables and equivalents.

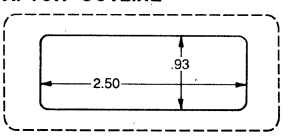
GPIB Bulkhead Adaptors - The Easiest Way to Feed GPIB Cables Thru Panels

IEEE-488 Bulkhead adaptors originated because of a need by design and test engineers. These adaptors provide the best means of passing an IEEE-488 cable through enclosure walls and panels, and will also provide access to a console work table when mounted on a panel.

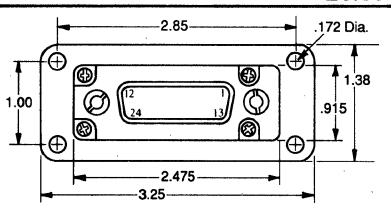
Two basic models are available. The "BA" version has the conventional male - female entry, whereas the "BF" version has two female entries. The latter allows more than one cable to be mounted piggy-back on both sides of the panel.

CIB24BA	GPIB Bulkhead Adaptor, M-F	A	24.50
CIB24BF	GPIB Bulkhead Adaptor, F-F	A	26.50

BULKHEAD ADAPTOR OUTLINE



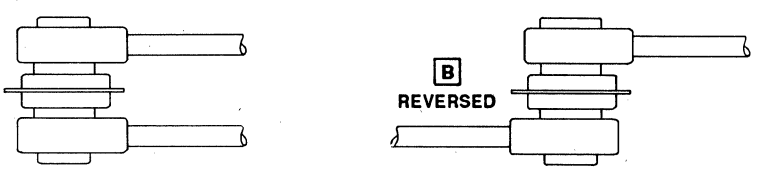
Recommended Hole Opening



Reverse Entry Adaptors - The Ultimate Solution for Many Difficult Situations

A new twist has been added to IEEE-488 networking by the introduction of Reverse Entry adaptors as listed below. Normal entry has always been to exit the GPIB cable in the same direction as it entered, as shown in figure "A". However, there are many instances when it is beneficial to exit a cable in the reverse direction as shown in figure "B". The need is sometimes prompted because of interference caused by other cables or equipment being in the way. A variety of reverse entry adaptors are now available as listed below.

CABLE ENTRY



Bulkhead Adaptor - With Reverse Entry for Those Unusual Requirements

Very similar to the model CIB24BF listed above except that the cables exit in opposite directions. This feature is sometimes desirable and necessary to avoid nearby obstructions.

CIB24BFR	Reverse Entry Bulkhead Adaptor, F-F	B	26.50

GPIB Adaptor - Reverses for Easy Extension of Two Standard IEEE-488 Cables

Normally when an attempt is made to mate and extend two standard IEEE-488 cables, the result is that the cables tend to go in the same direction as shown in entry A. The XFR Reverse Adaptor will properly orient the two cables so as to be in line as shown in entry B. The double female entry makes it easy to assemble. Made of cast aluminum for light weight and durability.

CIB24XFR	180° Reverse GPIB Adaptor, F-F	B	21.00

Reverse Adaptor - Changes Cable Direction 180° to Expedite Wiring Procedure

This is probably the most versatile adaptor to have handy just in case an IEEE-488 cable exit interferes with other equipment on the same rack. Simply install the Reverse Adaptor between the receptacle and GPIB cable.

CIB24XR	180° Reverse GPIB Adaptor, M-F	B	21.00

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L-com® IEEE-488 ACCESSORIES

MODEL	DESCRIPTION	ENTRY	1-9

IEEE-488 Accessory Products - Useful Add-ons For Your GPIB Network System

A few more accessory products have been developed to aid the test engineer in his day to day work. Listed below is a mixture of products, all related and useful in the networking procedure of an IEEE-488 system. Do study each item and consider its usefulness in your particular environment.

Right Angle Adaptor - Used to Change Direction and Avoid Tight Cable Bending

This adaptor is handy to have and to use whenever the cable direction needs to be turned 90° to avoid obstacles that would otherwise demand sharp bends in cable placement and possible cable damage. All molded construction.

CIM24RA	GPIB Right Angle Adaptor, M-F		28.00

IEEE-488 Extender - This Handy Device Provides a One Inch Added Clearance

Our extender is sometimes used to provide a one inch extension allowing right angle cables that extra margin to clear adjoining obstacles. A very handy item to have on hand in case of an emergency situation. Made of cast aluminum.

CIB24X	GPIB Extension Adaptor, M-F	A	19.50

Slimline Extender - Fits Undersized Openings and Provides 1" Added Clearance

With the advent of more and more IEEE-488 interface boards being installed into personal computers, there is a need for an extender that will allow the right angle GPIB connector to extend further out. However, the problem is further compounded by the fact that some computers did not take IEEE-488 usage into consideration, and as a result the cabinet entry hole is too narrow because it was designed for a conventional D-Sub connector. The ultimate solution is the **Slimline Adaptor with a width of only 0.9",** and still provides the usual 1" extension. Made of cast aluminum.

CIB24XC	Slimline GPIB Ext. Adaptor, M-F	A	22.50
CIB24XCR	Reverse Slimline Adaptor, M-F	B	24.00

Connector Covers - Protect Against Contamination, Physical Damage and RFI

A cast aluminum cover that mates to the female end only. This cover has many uses such as in production or shipping to protect against dirt or damage to the exposed connector. In the lab, it provides the added service of warning, identifying, or limiting the port's accessibility. One piece cast aluminum construction with two machine screws which are captivated to prevent loss. Available in natural or black anodized finish. O.E.M. quantity pricing available and quoted upon request.

CIB24C	Metal Cover, Mates Female GPIB Connectors	4.50
CIB24CB	Metal Cover, As Above but Black Anodized Finish	4.50

GPIB Socket / Connectors - Standard 24 Pin, Mates with all IEEE-488 Interfaces

GPIB sockets listed below meet the highest quality standards. Contacts and terminals are gold plated for good conductivity and for easier soldering. All plastic materials meet UL94VO flammability tests. For production or replacement use. Quantity pricing available upon request.

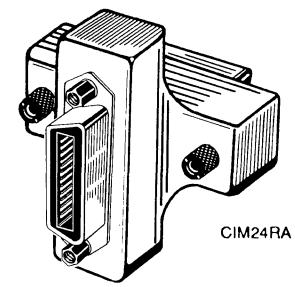
CIB24S	Female Connector, Solder Lug Terminals	4.95
CIB24SPC	Female Connector, Straight PC Terminals	4.95
CIB24SRA	Female Connector, Right Angle PC Terminals	5.95

GPIB Adaptor Cable - Matches & Extends Two Standard IEEE-488 Cables

L-com offers the *ultimate approach* in the CEX24 adaptor cable. A female-female extender (0.5 meter) designed expressly for the purpose of interconnecting standard IEEE-488 cables to create an extension and achieve "in-line" credibility. This product results from a need by engineers to make use of existing cables in their inventory to create longer runs.

It's true that all GPIB cables will interconnect with each other and will operate electrically, however, they do not usually mate properly (in-line) resulting in an unsatisfactory installation with potential harm to the cables if stretched or pulled too hard. The illustrations show how you would normally join standard GPIB cables used as extenders. Compare the use of traditional method "B" with the CEX24 shown in the upper illustration "A" - need we say more!

CEX24	Female-Female Extender Cable, 0.5 Meters	31.50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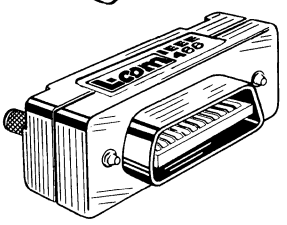
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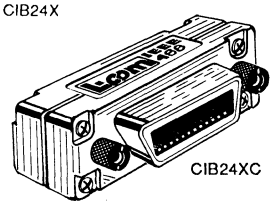
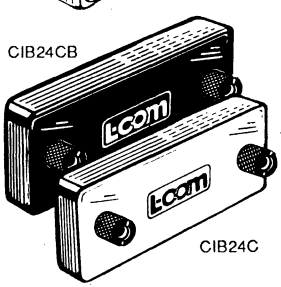
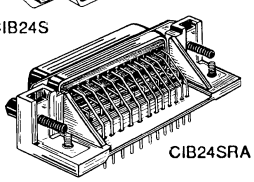
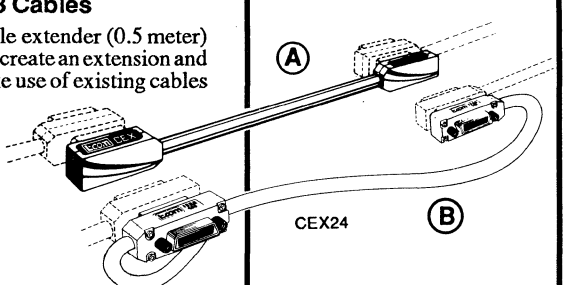

CIB24XC

CIB24CB


CIB24C

CIB24S


CIB24SRA



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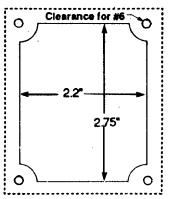
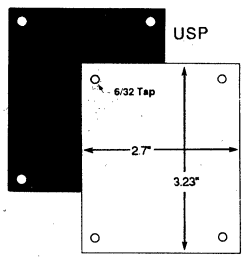
L-com® IEEE-488 RACK COMPONENTS

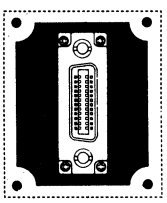
OPENING DETAIL



UPR35



USP-P



USP24BF

MODEL	DESCRIPTION	1-4

Universal 3-1/2" x 19" Rack Panel - Accepts up to 6 Sub-Panels or 3 Switch Boxes

L-com has developed an innovative modular solution for mounting IEEE-488 Feed-thru adaptors and switch boxes on a rack panel. In essence, you are now able to create many types of patching and switching panels for IEEE-488 networking possibilities. Just one popular size rack panel is offered. Fabricated of heavy gauge steel and enamelled in bone or black, today's most popular colors. Assembly of the sub-panels or switch boxes is accomplished in minutes, using only an ordinary screwdriver. Blank panels are also available to fill the unused openings or to custom fabricate per your specific requirements. A reminder that a comprehensive catalog is also available which lists nearly 100 Universal sub-panels to compliment the IEEE-488 usage shown here. Please ask for a copy from your dealer today.

UPR35-6	Universal Rack Panel, Bone w/6 Openings as shown	23.50
UPR35-6B	Universal Rack Panel, Black w/6 Openings as shown	23.50

Universal Blank Sub-Panels - Cover Unused Openings or for Custom Fabrication

Two blank sub-panels are available, prepunched and ready for installation. Used to cover vacant openings or may be tooled to accept other mating components. Your choice of steel, finished in contrasting blue enamel or in white plastic which allows for easier fabrication per your needs.

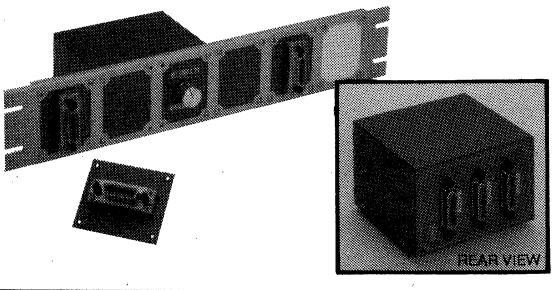
USP	Universal Blank Sub-Panel, Blue Metal	3.95
USP-P	Universal Blank Sub-Panel, White Plastic	3.85

Universal Bulkhead Adaptor - Easiest Way to Feed GPIB Cables Thru Panels

The CIB24BF IEEE-488 Bulkhead Adaptor is mounted on a steel sub-panel and made ready for assembly onto the Universal Panel. This adaptor provides the shortest path and most expedient way to terminate IEEE-488 wiring network on a panel for easy access. The adaptor has two female entries, each allowing more than one cable to be mounted piggyback on both sides of the panel.

USP24BF	Universal IEEE-488 (F-F) Adaptor Sub-Panel	32.25
USP24BFR	Universal IEEE-488 (F-F) Reverse Entry Adaptor	32.25

Universal IEEE-488 Transfer Switches - Allow a Quick Change of Signal Paths

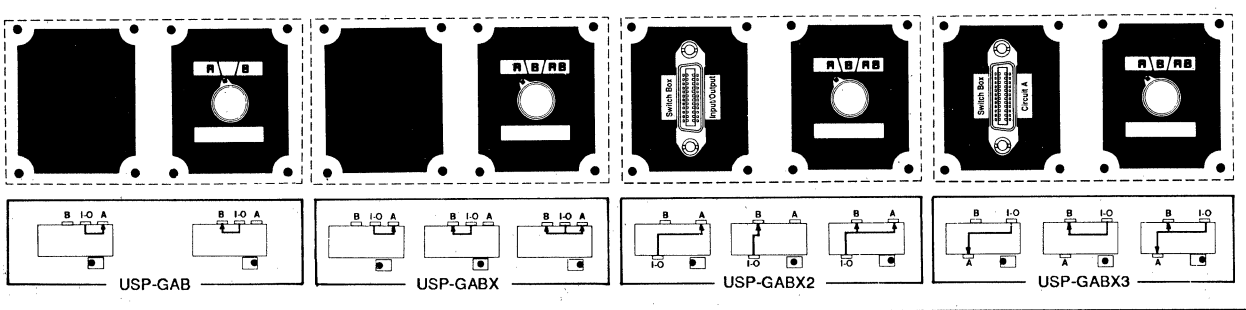


These compact IEEE-488 transfer switch boxes measure only 5.5"W x 3.25"H x 4.35"D. Constructed of heavy gauge steel to withstand abuse and afford maximum RFI/EMI protection, Three switching variations are offered. The traditonal A-B two position type, and a newly devised version with a unique three position switching arrangement. The latter provides the ability to select peripherals A or B independently or both and connected to the system I/O as needed. A further option is to have the I/O port mounted on the rear or on the front panel.

A heavy duty rotary switch is used and all twenty-four lines are simultaneously switched for total isolation. These switch boxes can be used independently or will readily mount in two openings on the Universal panel listed above. We would strongly suggest use of CMC or CMD IEEE-488 single ended cables with these switch boxes for maximum convenience.

IEEE-488 GPIB

USP-GAB	2 Way GPIB Sw Box, A or B to I-O	95.00
USP-GABX	3 Way GPIB Sw Box, A, B or A & B to Rear I-O	120.00
USP-GABX2	3 Way GPIB Sw Box, A, B or A & B to Front I-O	125.00
USP-GABX3	3 Way GPIB Sw Box, Front A or B to I-O or A & B to I-O	125.00



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L-com® PORTABLE CABLE TESTERS

MODEL	DESCRIPTION	1-4

These Handy Test Sets Diagnose Modular and Coax Cable Problems in Seconds

L-com has sensed a need for simplistic pocket-type testers required by field installers, service technicians and also by novices to locate their cabling problems. The test sets listed below employ high impact cases to withstand day to day abuse. They are easy to use and instantly identify whether a cable is good, open or cross wired. We urge third party maintenance organizations to inquire about quantity pricing considerations.

Modular Cable Checkers - Test any 2, 4, 6, or 8 Wire RJ Type Telco or Data Cable

Each of these pocket-sized instruments will instantly evaluate the integrity of any RJ11 or RJ45 or even the DEC MMJ equipped Modular Telco/Data cable. Easy to use, just plug in both cable ends, and the "two color" LEDs identify which pair shows continuity or open. Simultaneously, the color of the LEDs determine whether the cable is properly wired for data use with straight-thru pinning (lights red), or for voice communication with crossed pinning (lights green). Full instructions appear on the label. The high impact case is only 2.4" x 3.75" x 1.1" and operates from one alkaline 9V battery (included) with a life expectancy of many thousand tests. Saves time and guesswork. The ideal tool for the field technician or as a handy checker around the office.

DX50	RJ11 (6x6) Modular Cable Checker	29.95
DX50DEC	MMJ (DEC) Modular Cable Checker	32.95
DX45	RJ45 (Keyed) Modular Cable Checker	36.95
DXCC	Leatherette Carry Case	6.95

DX35A Portable Test Set - Tests Popular BNC, TNC, or Wang Terminated Cables

A means of quickly identifying good or bad coaxial cables that have BNC, TNC or a combination of both as used in Wang interfaces. A short circuit between the center conductors and shield is indicated by a red illumination and good usable cable is identified by green LEDs. A pushbutton switch changes the test mode from short to open, or continuity. Supplied with terminators that allow testing of cables that are already installed. Small in size, its high impact case measures only 3.75" x 2.4" x 1.1" and is powered by a self enclosed 9V alkaline battery (included). Supplied with carry case that holds the tester and terminators.

DX35A	BNC / TNC Cable Test Set	59.95

Portable Test Set - Checks Cables Terminated with Twin BNC Type Connectors

A means of quickly identifying good or bad status of twin shielded cables terminated with twin bayonet-lock (BNC) connector. Features are identical to the DX35A listed above. A short circuit between either of the two center conductors to shield is indicated by either one or two red LEDs. A good usable cable is indicated by two green LEDs. A pushbutton switch changes test mode from short to open, or continuity. Supplied with terminator that allows testing of cables already installed. Its small size measures only 3.75" x 2.4" x 1.1" and is powered by a self enclosed 9V alkaline battery (included). Supplied complete with portable carry case.

DX35B	Twin BNC Cable Test Set	69.95

DX100B Portable Test Set - For Field Checking of Std Twinaxial Coaxial Cables

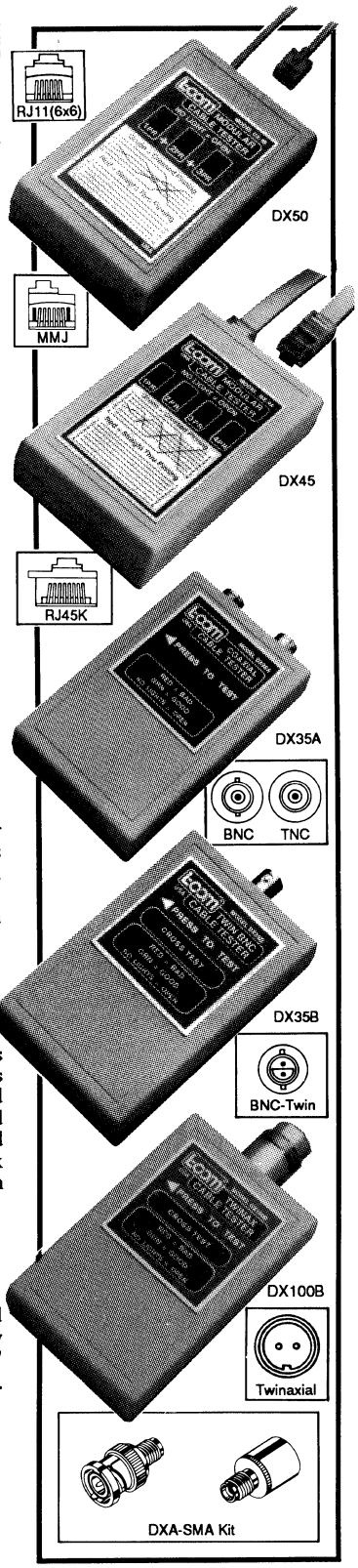
A pocket-sized test set to help identify possible sources of trouble in the interconnection system that uses IBM type Twinaxial Coaxial Cables. Supplied with a termination device which allows testing of cables that are either portable, or fully installed, by simply teminating the end. Each cable is simultaneously tested for several parameters. Continuity test of each inner conductor and short circuit between conductors and shield. Also tests for shorts between the two center conductors, and tests for crossed wires in newly wired cables. Red and green LEDs tell the status of cable. The DX100 Hi-Impact plastic case measures 3.75" x 2.4" x 1.1". Uses one self contained 9V alkaline battery (included) and comes complete with termination device. Supplied with carry case that holds tester and terminator.

DX100B	Twinaxial (IBM) Cable Test Set	79.95

Adaptor / Terminator Kits - Allow Testing of Other Types of Terminated Cables

The DX35A BNC/TNC Tester described above is easily adapted to test the following types of terminated coaxial cables. Each kit contains a BNC adaptor which plugs in the tester and a mating terminator to allow the testing of cables ***even if they are already installed.*** Your choice of SMA, RCA, "F", UHF, or "N" adaptor/terminator pairs in a handy carry case. Expand the use of your DX35A tester for a minimal cost.

DXA-F	Adaptor/Terminator Kit for "F" Connector Cables	12.95
DXA-N	Adaptor/Terminator Kit for "N" Connector Cables	17.95
DXA-RCA	Adaptor/Terminator Kit for RCA Connector Cables	12.95
DXA-SMA	Adaptor/Terminator Kit for SMA Connector Cables	18.75
DXA-UHF	Adaptor/Terminator Kit for UHF Connector Cables	14.95



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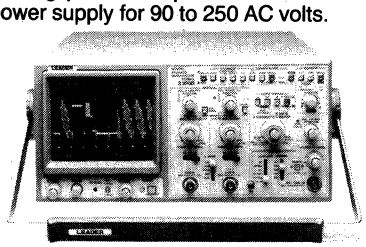
OSCILLOSCOPES

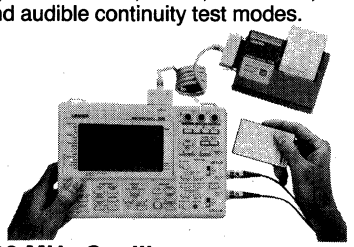
100-MHz Digital Storage Oscilloscope

The Model 3100D is an auto-ranging 100-MHz analog/DSO. Features are CRT readouts with menus for cursors and/or automatic measurement by selected parameters, comment lines, selectable averaging from 2 to 256 bits, TV-field and full line selection. The 3100D has complete 2-channel operation, dual time bases with calibrated delayed sweep and up to X100 expansion at trigger point. Additional standard features are GPIB, HP-GL and analog plotter outputs and a universal power supply for 90 to 250 AC volts.



2-Channel Handheld Portable Problem Solver

The Model 300 handheld, multi-function test instrument includes a DSO, DMM, Data Logger and a Logic Analyzer. The 30-MS/s DSO features auto setup, selectable on-screen readouts of frequency and Channels 1 and 2 V p-p, 10 MHz equivalent bandwidth, 180 and 1.8k user selectable word lengths. Resident memory bank stores up to 10 waveforms per channel and are transferable to the optional 32k byte memory IC card for storage of 80 waveforms. Stored screens can be output to the optional portable thermal printer with all information on screen and DSO setup parameters. The DSO and DMM are fully isolated and can be operated simultaneously. The DMM has a printout capability with manual override of the auto-ranging 3199 count display for standard AC/DC voltage and current, ohms, low ohms, diode and audible continuity test modes.

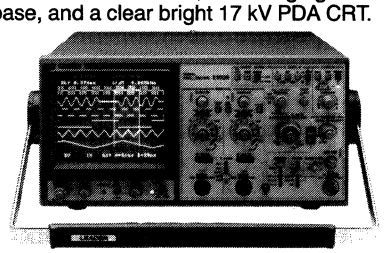


20 MHz Oscilloscope

The 1021 is an extremely economical 20 MHz 2-channel oscilloscope ideal for the educational and service markets. It has all the features expected on a lab scope including 1 mV sensitivity. TV-sync separators, high and low frequency rejection, vertical and horizontal magnification, variable holdoff and graticule illumination.

100 MHz CRT Readout Oscilloscope

Spend no time calculating values or doing conversions. The Model 2100AR CRT Readout Oscilloscope with Cursors allows the user to observe waveform setting conditions,with four cursors simultaneously and measured values on the screen at the same time. The readout functions include setting conditions, voltage, time, frequency, voltage and time difference ratios and phase difference. The 2100AR features 100 MHz 3-channel operation, 0.5 mV sensitivity, full line select for field 1 and 2, auto-ranging time base, and a clear bright 17 kV PDA CRT.

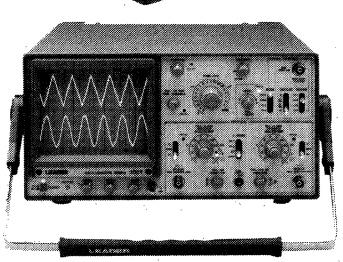


Battery-Powered Oscilloscopes

The 60-MHz LBO-315 and 20-MHz LBO-313 are compact, lightweight, full-featured oscilloscopes that operate from a supplied 12 Vdc battery, an external dc source, or from 85 to 264 Vac–without rewiring or external switching.

The LBO-315 features 2-channel, dual time base operation, with calibrated delay plus alternate sweep and triggering. Its large 3½-inch PDA CRT and 12 kV accelerating potential make waveforms easy to see. For less demanding field service applications, the LBO-313 offers 20-MHz, 2-channel operation.

Each of these oscilloscopes puts all the features of a bench oscilloscope right at hand, always ready.



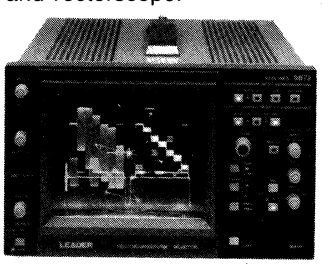
VIDEO PRODUCTS

Component Waveform Monitor

The Model 5100 provides 4-channel monitoring of component and composite signals and has multi-format capability—525/60, 625/50 and 1125/60. Also featured is a vector display of color difference or RGB signals and display of the unique "shark fin" signal developed by Leader (Model 425) to provide a relative timing reading over a wide band of frequencies.

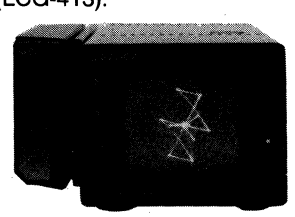
New Affordable Combination Waveform Monitor/Vectorscope

An affordable alternative to the top-of-the-line Model 5870, the Model 5872 Combination Waveform Monitor/Vectorscope maintains all of the features of the Model 5870, except SCH phase measurement and line selection. Get two instruments in one plus overlaid or side-by-side waveform displays of A and B inputs, superimposed waveform and vector display, dual filter mode, R-Y mode and DC power along with a universal AC power supply for less than the cost of a basic half-rack waveform monitor and vectorscope.



The Smallest Vectorscope Ever Built

This lightweight, battery powered vectorscope is the newest addition to Leader's EFP Instrumentation. The 5854 encompasses large vectorscope features in a highly portable package. A variety of options allow for stand-alone operation, rackmounted operation or attachment to the EFP waveform monitor (5864A) or even to a signal generator (LCG-413).



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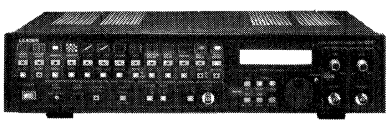
VIDEO PRODUCTS

Video Generator Provides Composite, Y/R-Y/B-Y, S-VHS and RGB Outputs

Over 80 different video test patterns including SMPTE and full field color bars, circle, convergence, demodulator, and 5 and 10 step staircase are available from the Model 408 a state-of-the-art generator, and are output in composite, Y/R-Y/B-Y, S-VHS, and RGB signal formats. Multiburst and sweep further enhance the 408's pattern generation capabilities. An RF modulator is built in and covers all broadcast and CATV channels. A menu-driven CPU with on-screen capability guides the user through RF channel selection as well as video signal control in terms of luminance, chrominance, sync, burst and setup levels. GPIB or remote control is optional extending the unit's control capabilities.



Digitally Synthesized NTSC Test/Sync Signal Generators

Designed using the latest in digital technology and manufacturing processes, the Models 411 and 425 are highly accurate test/signal generators suited for a variety of broadcast operations. The 425 is a component test signal generator designed for Betacam or MII environments. It includes Y/B-Y/R-Y, GBR, Y/C and composite outputs. Both units are in a package that neatly fits into one rack unit (1¾ in.)

Lightweight and Compact Hand Held NTSC Pattern Generator

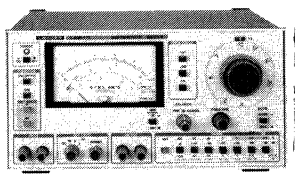
Weighing less than 1 pound including the 6 "AA" battery cells that power it, the LCG-412B is capable of producing NTSC color bars, dots, crosshatch and red, green, blue and white rasters. Composite and RF outputs are provided to allow for testing and troubleshooting monitors, TVs, VCRs, transmission links, etc. The RF output covers all VHF and UHF broadcast channels with picture and switchable audio test tone modulation.

AUDIO PRODUCTS

Semi-Automatic Distortion Meter

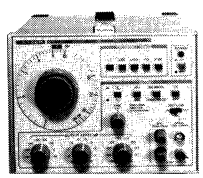
Distortion measurements on audio and low frequency equipment have been made easier by the introduction of Leader's new Semi-Automatic Distortion Meter, LDM-171. Designed with economy and user-friendliness in mind, this versatile instrument incorporates an automatic nulling feature that greatly reduces the time to make THD + N measurements.

Level and S/N measurement features enhance the value of the LDM-171.



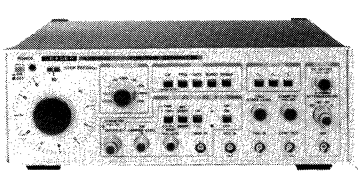
Low Distortion Audio Generator with Balanced Outputs

The LAG-126S is a Low Distortion Audio Generator with balanced and unbalanced outputs. It covers the 5-Hz to 500-kHz frequency band, in 5 ranges. A step attenuator in 0.1 dB increments, and a fine level adjust output, as well as an output ON/OFF function for signal to noise measurements are provided. Distortion is less than 0.005% throughout the audio range, and a square wave output is also available.



10-MHz Sweep/Function Generator

Research and development, design, service and education personnel will all welcome the addition of the LFG-1310 10-MHz Sweep/Function Generator to the Leader line. Outputs include waveforms required for almost every application: sine, square, triangle, ramp and pulse. Five different output modes—CW, triggered, gate, burst and sweep—enable the LFG-1310 to be used as a source for both general and specialized measurement techniques.

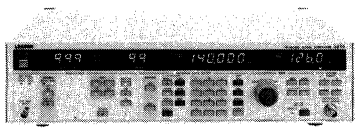


SIGNAL GENERATORS

AM/FM Synthesized Signal Generators

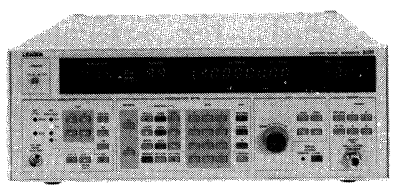
Three generators all feature optional GPIB listener interface.

The 3215 features a range of 100 kHz to 140 MHz. RF output level is from – 20 to 126 dBμ with 0.1 dB resolution. The user friendly keypad facilitates programming and edit functions to increase test flexibility.



The 3216 has all the features and functions of the 3215 plus stereo separation of >55 dB programmable stereo modes and deviation of (L,R,L + R,L-R) and pilot.

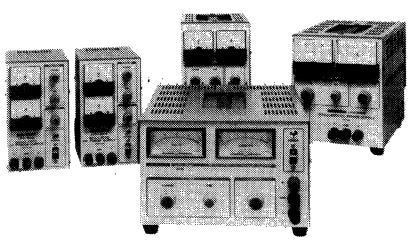
The 3220 is a highly stable wide band generator featuring a frequency range of (100kHz - 1.3 GHz) with AM/FM and DC-FM modes. RF frequency resolution is 20 Hz or better. RF output level is selectable between dBμ or dBm with 0.1 dB resolution.



DC POWER SUPPLIES

General Purpose DC Power Supplies

To meet a growing demand for bench dc power supplies, Leader offers the LPS-160A through LPS-164A. Each has a voltage range of 0-32 Vdc, and load currents of 0.5 to 5 A are available, depending on the model selected. They feature excellent regulation and control facilities and can be stacked electronically for higher voltage output. A tracking facility permits parallel operation for greater load current.



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OSCILLOSCOPES

3060D	60 MS/s, 2-CH Digital Storage
3100D	100 MHz, 2-CH Digital Storage
300	DSO/DMM/Data Logger/Logic Analyzer
LCD-100	Storage Scope/Digital Multimeter
LBO-315	60 MHz, 2-CH, Dual Time Base, Attache Case Size, Battery Powered
LBO-325	60 MHz, 2-CH, Dual Time Base, Attache Case Size
2100AR	100 MHz, CRT Readout, 3-CH Dual Time Base
1100	100 MHz, 3-CH, Dual Time Base
1060	60 MHz, 3-CH, Dual Time Base
1041	40-MHz, 2-CH, Dual Time Base
1021	20-MHz, 2-CH
LBO-313	20 MHz, 2-CH, Attache Case Size, Battery Powered
LBO-323	20 MHz, 2-CH, Attache Case Size
LBO-310A	4 MHz, Recurrent Sweep

DISPLAY AND IMAGING PRODUCTS

LBO-51MA	3 MHz, Half Rack, X-Y Display Module
LBO-9C	9-inch X-Y Display Module

VIDEO PRODUCTS

5130	Half Rack NTSC Color Monitor
5100	Component Waveform Monitor
425	Component Test Signal Generator
435B	Monoscope Generator
5870	Combination Waveform and Vectorscope with SCH
5872	Combination Waveform and Vectorscope, Economy Model
5860C	NTSC Waveform Monitor
5861V	PAL Waveform Monitor
LBO-5860H	NTSC Waveform Monitor with Line Select
5850C	NTSC Vectorscope
5851V	PAL Vectorscope
5864A	Two Channel EFP/ENG Waveform Monitor
5854	EFP/ENG Vectorscope
LVM-5863A	EFP/ENG Monitor
LCG-420	Broadcast Quality, NTSC Sync/Test Signal Generator
420-U01	Multiburst/Sweep Plug-in Module for LCG-420
420-U02	Pulse & Bar Plug-in Module for LCG-420
420-U03	Linearity Plug-in Module for LCG-420
410C	Synthesized NTSC Sync/Test Signal Generator
411	Synthesized NTSC Sync/Test Signal Generator
408	NTSC Sync/Test Pattern Generator w/Sweep & Multiburst
LCG-400M/S	NTSC Sync/Test Pattern Generator
LCG-413	EFP/ENG Video Test Signal Generator with SID
LCG-396	NTSC Pattern Generator
LCG-396 PAL	PAL-M Pattern Generator
LCG-399A	PAL Pattern Generator
LCG-409	Battery Powered NTSC Pattern Generator
LCG-412B	Handheld NTSC Pattern Generator
430	Video Sweep Generator
LFC-944B	CATV/MATV Level Meter
LFC-945	CATV/MATV Level Meter

PROGRAMMABLE RGB VIDEO GENERATORS

1604A	125 MHz Programmable RGB Video Generator
1602	60 MHz RGB Video Generator, Economy Model

POWER SUPPLIES

LPS-151	Triple Output
LPS-152	Triple Output, High Current
LPS-160A	32V, 0.5A Single Output
LPS-161A	32V, 1.2A Single Output
LPS-162A	32V, 2A Single Output
LPS-163A	32V, 3A Single Output
LPS-164A	32V, 5A Single Output

FREQUENCY COUNTERS

LDC-825	1000 MHz Frequency/Period Counter
LDC-824S	520 MHz Frequency/Period Counter
LDC-823S	250 MHz Frequency/Period Counter
LDC-822	80 MHz Frequency/Period Counter

AUDIO PRODUCTS

LMV-181A	AC Millivoltmeter, 100 μV to 300 V
LAG-120B	Sine/Square Wave Generator, 0.05% Distortion
LAG-126S	Sine/Square Wave Generator, 0.005% Distortion
LDM-171	Semi-Automatic Distortion Meter
27A	Audio Signal Generator, 10 Hz to 1 MHz
LFM-39A	Wow/Flutter & Drift Meter
LAV-192A	2-CH Multi-Purpose Audio Tester
LPM-8000	Laser Power Meter

FUNCTION AND RF SIGNAL GENERATORS

17A	RF Signal Generator, 0.1 to 450 MHz
LSG-221B	VHF/UHF Synthesized Signal Generator
LSW-359	1.5 GHz Sweep Generator
LSW-359-SO1	Band Stack Sweep Controller
LFG-1310	10 MHz Sweep/Function Generator
LFG-1300S	2 MHz Sweep/Function Generator
3220	1.3 GHz Synthesized Signal Generator
3215	140 MHz Synthesized Signal Generator
3216	AM/FM Stereo Synthesized Signal Generator

METERS AND BRIDGES

LPM-8000	Laser Power Meter
LCR-740	LCR Bridge
LCR-745G	Digital LCR Meter
LCR-745-02	LCR Comparator Unit
LTC-906	Automatic Transistor Checker
LTC-905	Semiconductor Curve Tracer
LCD-100	Storage Scope/Digital Multimeter
856	4½ Digit True RMS Digital Multimeter
LDM-853A	3½ Digit Digital Multimeter

INSTRUMENT CART

LIC-2462	Technicart™ 450 Instrument Cart

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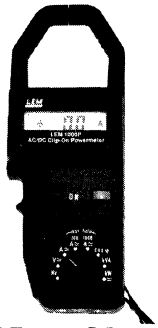
PIONEERING POWER ELECTRONICS

LEM Clamp-on Power Meters, Ammeters & Multimeters. . .

. . .use Hall Effect technology to accurately measure current, power factor, frequency and resistance for diagnostic and analytic applications.

LEM Ammeters
For the Electrical Engineer
Measure to 2000A; DC to 1kHz. True RMS capability. Accuracy ±1%, 3-1/2 Digit Display, Hold facility, Auto Zero, Auto Ranging, Jaw size 22mm x 60mm. Output can be displayed on oscilloscopes and chart recorders.



LEM Power Meters
For the Electrical Engineer.
Measures kW and kVA, Power Factor and Frequency. A 3 phase adapter is available for use when the neutral conductor is not accessible. Output can be displayed on oscilloscopes and chart recorders.

LEM 600 Multimeters
For the Electrician.
Measures to 600A and 750V, both AC and DC with frequency range to 1000Hz. plus resistance to 2000 ohms. Jaw size is 48mm circular.

CLAMP-ON AMMETERS

Current Ranges	Readout	Model	Frequency	Auto Ranging	Hold	Surge	Outputs①
20A/100A DC or AC	True RMS	LEM100	DC to 1kHz	Yes	Yes	Yes	1mV/A
200A/1000A DC or AC	True RMS	LEM1000	DC to 1kHz	Yes	Yes	Yes	1mV/A
200A/1000A DC or AC	Average	LEM 1000AV	DC to 1kHz	Yes	Yes	Yes	1mV/A
200A/2000A DC or AC	True RMS	LEM 2000	DC to 1kHz	Yes	Yes	Yes	0.4mV/A
200A/2000A DC or AC	True RMS	LEM 2000L	DC to 1kHz	Yes	Yes	No	No
20A/200A/ 2000A AC	True RMS Responding	LEM 2000AC	15Hz to 3kHz	20A/200A	Yes	No	No

①Output can be displayed on Oscilloscopes and Chart Recorders

CLAMP-ON PROBES

Current Ranges	Measures	Model	Frequency	Outputs②
20A/200A	DC or AC	PR 200	DC to 10kHz	10mV/A at 20A, 1mV/A at 200A
400A	DC or AC	Auto 400	DC to 10kHz	1mV/A
500A	DC or AC	PR 500	DC to 3kHz	2mV/A
1000A	DC or AC	PR 1000	DC to 3kHz	1mV/A

②For use with Multimeters and Oscilloscopes.

CLAMP-ON MULTIMETERS and POWER METERS

Current Ranges	Model	Volts	Resistance Range	Active Power	Apparent Power	Power Factor	Frequency	Continuity Check	Hold	Ranging	Surge	Outputs①	Insulation
200A/600A DC or AC RMS Responding	600 (Multi-meter)	200V/1000VDC 750VAC RMS Responding	2000 Ohms	No	No	No	15Hz to 1kHz	Buzzer	Yes	Manual	No	No	6kV
20A/200A DC or AC True RMS	200 P (Power Meter)	200V/750V DC or AC True RMS	No	2kW 20kW True RMS	2kVA 20kVA True RMS	0.3 Capactive, Inductive	DC to 1kHz	No	Yes	Auto	Yes	Yes	6kV
200A/1000A DC or AC True RMS	1000P (Power Meter)	200V/750V DC or AC True RMS	No	20kW 200kW True RMS	20kVA 200kVA True RMS	0.3 Capacitive Inductive	DC to 1kHz	No	Yes	Auto	Yes	Yes	kKV

①Output can be displayed on Oscilloscopes and Chart Recorders

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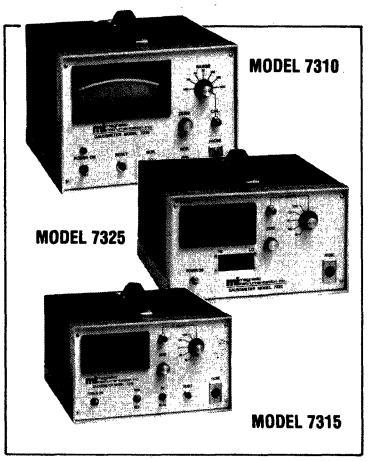
THE PERMANENT MAGNET USER'S EQUIPMENT STORE!

HALL EFFECT GAUSSMETERS

The wide line of Magnetic Instrumentation, Inc. Gaussmeters shares the following features:

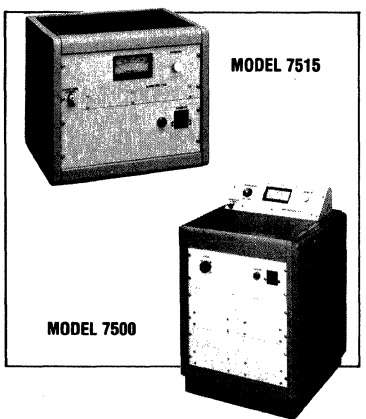
- Magnetic field measurements from 1 Gauss to 100,000 Gauss.
- Output voltage accurate to 10X over range.
- Simple setup and operation with front panel controls.
- Accurate internal calibration.
- Wide range of high linearity Hall probes.



MAGNETIZERS

The Magnetic Instrumentation Capacitive Discharge type Magnetizer line features the following:

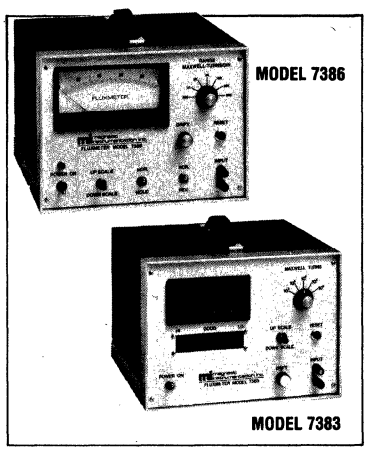
- High speed production operation.
- Energy levels from 300 to 5400 Joules.
- Low voltage — 425 volts maximum.
- Saturation of all Alnico, Barium Ferrite, Rare Earth Cobalt magnetic materials.
- Continuous meter readout of capacitor voltage.
- Wide variety of fixtures including multi-pole fixtures.
- Control prevents firing below preset level.



INTEGRATING FLUXMETERS

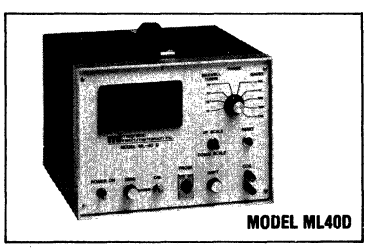
Fluxmeters by Magnetic Instrumentation, Inc. provide:

- Very low drift rate.
- Push button or remote electronic zeroing.
- Up scale and down scale push button drive.
- Simple setup and operation with front panel controls.
- Solid state circuit design.



MAGLAB

Magnetic Instrumentation's perfect answer for a dual-purpose test instrument for use where an Integrating Fluxmeter and a Hall Effect Gaussmeter are needed... but not simultaneously.



MAGNECHARGERS™

The 8000 Series Magnechargers are half cycle type magnetizers designed for use in high volume production situations.

- High speed operation to 3000 charging cycles per hour.
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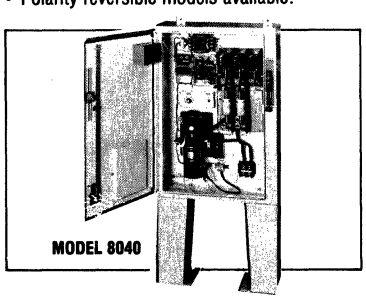
- Safe, heavy-duty NEMA 12 type construction.
- Manual or automatic operation.
- Polarity reversible models available.



CUSTOM INDUSTRIAL MAGNET PROCESSING EQUIPMENT

Magnetic Instrumentation, Inc., can meet your every need from a flexible range of existing designs, modified designs, and custom designs. Our innovative and experienced engineers can provide magnetizing, measuring, stabilizing and demagnetizing systems built to NEMA 12/ JIC specifications. These systems, including automatic parts feeding, are designed to your specifications.

SPECIALISTS IN MAGNETIZING AND CALIBRATING RARE EARTH COBALT MAGNETS, AND NEODYMIUM-IRON-BORON MAGNETS.

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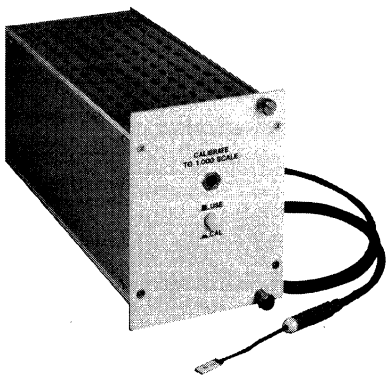
8350 East 48th Street, Indianapolis, Indiana 46226
(317) 545-2102, Telex 27-2111, Fax 317-549-0502

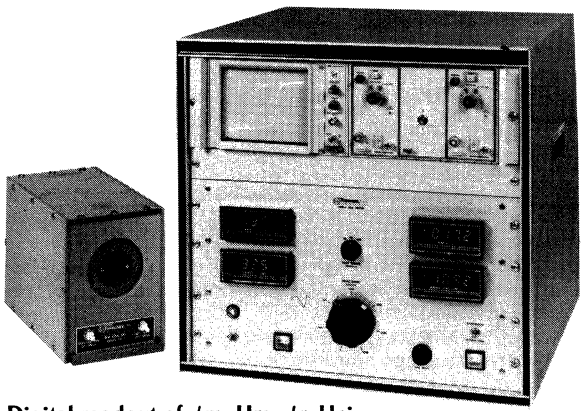
MAGNETIC TEST EQUIPMENT

Model 1607 Field Monitor



- High stability field to volts transducer for O.E.M. applications.
- Sensitivity 0.1V/kG standard Other scale factors available
- Includes pre-calibrated low temperature coefficient probe
- Bare-board version available

Model 1246L-2 B, H Tape Test



- Digital readout of ϕm, Hm, ϕr, Hci
- Peak drive 100–3000 Oe
- Flux sensitivity .1 maxwell to 2 $\times$ 10^3 maxwells
- Accommodates single tape samples as well as loose powder in tubes
- Complete test in less than 10 seconds
- 50 Hz operation available

Model 1600 Hall Effect Gaussmeter

- Scale ranges from 10–100k gauss for standard probes
- DC, AC (to 1k Hz), PEAK modes of operation
- Instrument scales automatically coordinated with probe sensitivity
- Compact rugged case

Model MXM-5 Fluxmeter

- DC and AC flux measurement
- Scale range 1.000 to 9.999 kilomaxwells times 10^1 to 10^3
- DC drift less than 100 Mx turns per minute. No AC drift.
- Digital meter for measurement
- Analog meter for drift control

MAGNOS, Incorporated supplies complete test systems for magnetic analysis and quality control for hard and soft materials, laboratory electromagnets and power supplies, coil test sets, and a complete line of magnetic measuring instruments.

Custom design and assembly of electronic equipment is also available. Manufacturing services include circuit board, chassis, and harness assembly, and are fully supported by in-house facilities for short-run machining, sheet metal fabrication and coil winding.

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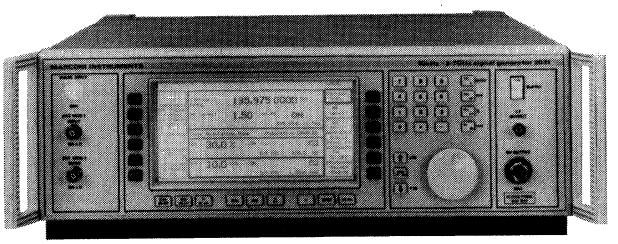
Marconi
Instruments

SIGNAL GENERATORS:

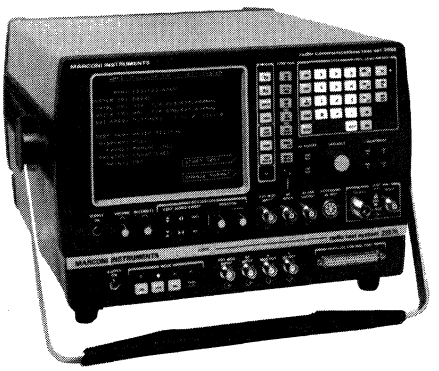


Model 2030/31 AM/FM/ØM/PULSE Signal Generators Combine RF generator, sweep generator, and dual LF source in one unit with RF coverage 10 kHz to 1.35 GHz (2030) or to 2.7 GHz (2031), LF coverage 0.1 Hz to 500 kHz. Step size 0.1 Hz at all frequencies. Computer-like LCD screen shows all functions & readouts within each measurement task. Wideband FM, DC to 10 MHz, Pulse option, 5 ns rise/fall time, 70 dB on/off ratio. IEEE.488.2 interface.

Model 2040/41 Low-Noise Signal Generators are the same as models 2030/31 except, in low noise mode, phase noise is –140 dB/Hz and residual FM is 0.3 Hz (both specified at 1 GHz).

Model 2022D AM/FM/ϕM Signal Generator is a small (half-rack) lightweight high-performance instrument with RF coverage 10 kHz to 1.0 GHz. Optional GPIB.

RADIO COMMS. & CELLULAR TEST-SETS:



Model 2955R Radio Comms Test Set has 2 μV off-air sensitivity. Makes menu selected tests of radios under simplex, duplex, and cross-band duplex (including cross mode) conditions. Most versatile POCSAG, DTMF and CDCSS encode/decode facilities available. Tests systems from audio through RF with incredible ease & speed. AC and DC operation.

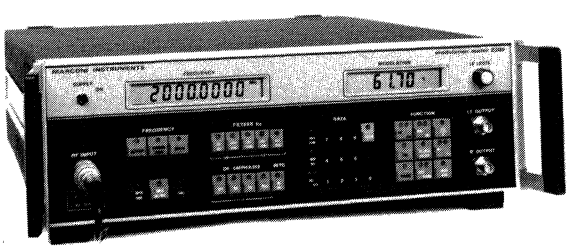
Model 2957A Cellular Test Set performs pass-fail and in-depth testing of cellular telephones. Full cell-site simulation. Custom routines input via optional disk drive. Parallel printer output.

SPECTRUM ANALYZERS:

Model 2386 Spectrum Analyzer has down to 3 Hz resolution bandwidth at all frequencies, covers from 100 Hz to 26.5 GHz (overrange to 30 GHz), and comes standard with a 400 kHz to 4.2 GHz tracking generator. Resolution is 1 Hz and 0.025 dB. Measurements & calibration are fully automatic. Fast trace dumps. Wide dynamic range.

Model 2382 and 2383 Spectrum Analyzers are companion instruments with similar basic specifications except the 2382 covers from 100 Hz to 400 MHz and the 2383 covers from 100 Hz to 4.2 GHz.

MODULATION ANALYZERS:



Both the **Model 2304** field service **AM/FM Modulation Meter** which operates from 25 MHz to 1 GHz and the **Model 2305 AM/FM/ØM Modulation Analyzer** which operates from 50 kHz to the 2.3 GHz offer automatic tuning for ease of operation. In addition, the Model 2305 displays carrier frequency, modulation frequency and optional modulation distortion. It also provides a choice of band-limiting and de-emphasis filters to optimize measurements. The 2305 is a self-calibrating instrument that uses internal standards and has optional GPIB.

Marconi Instruments, Inc.
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Allendale, NJ 07401

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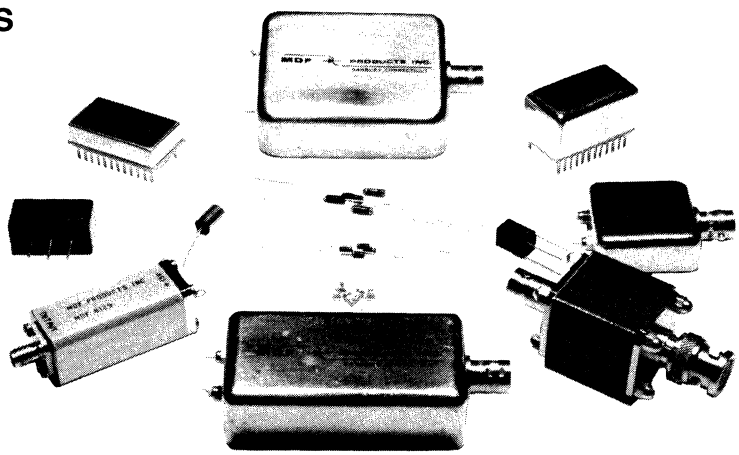
M.D.F. PRODUCTS INC.

WHITE NOISE GENERATORS

DC to 110 GHZ

NOISE MODULES TO 1 GHz
Standard, Miniature, Subminiature, & Custom Packages.

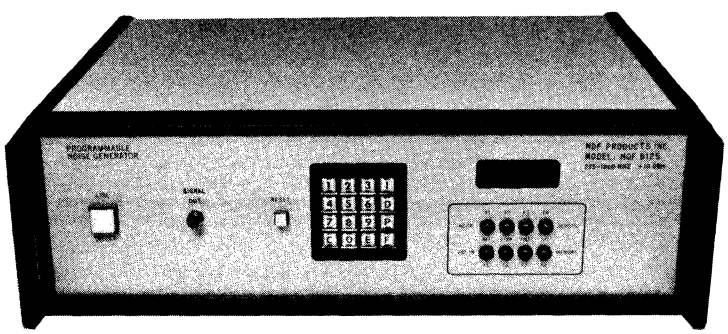


STANDARD NOISE DIODES
DC to 1250 MHz.
DO-7 & DO-35
Glass Packages.

PSEUDO-RANDOM NOISE GENERATORS
8 Pin DIP or Custom Packages.

MICROWAVE NOISE DIODES
DC to 50 GHz.
Glass, Ceramic, & Chip Packages.

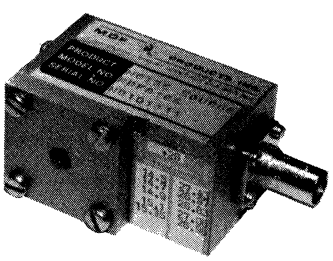
LABORATORY NOISE GENERATOR INSTRUMENTS
DC to 18 GHz Standard, Programmable, IEEE-488 Compatible.
Rack-Mount and Custom Cases.



WAVEGUIDE & COAXIAL NOISE SOURCES
DC to 110 GHz.
Standard or Custom Packages.

ALL DEVICES AVAILABLE TO MIL SPECS

NOTE—Call, FAX, or write for our Complete Catalog. REMEMBER—We are a custom device manufacturer—send us your particular requirements.



WIDEBAND Amplifiers Available —DC to 1 GHz—Inquire

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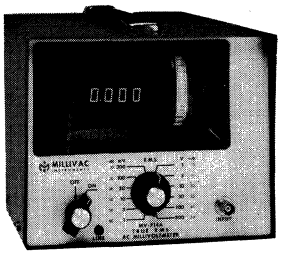
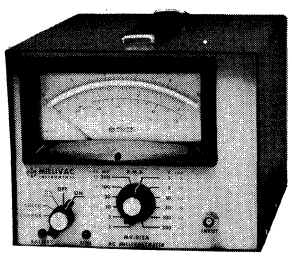
NEW



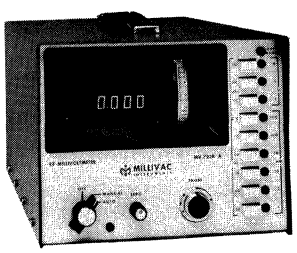
AC MILLIVOLTMETER TRUE RMS MODEL MV-714A

1µV to 300V
-71dB to +52dB
5Hz to 20MHz



AC MILLIVOLTMETER MODEL MV-912A

10µV to 300V
-71dB to +52dB
5Hz to 15MHz
LIne or Battery Operation

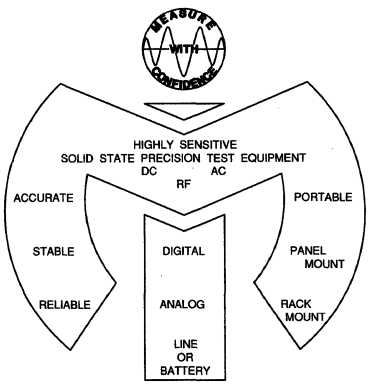


RF MILLIVOLTMETER MODEL MV-723B A

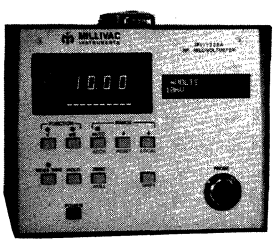
10KHz to 1.5GHz
50µV to 300V
True linear response
True RMS indication
Programmable
Autoranging

LOW NOISE AC AMPLIFIER MODEL MA-168A

10dB to 60dB variable gain
5Hz to 500KHz variable bandpass limits
10KΩ to 10MΩ input impedance



NEW



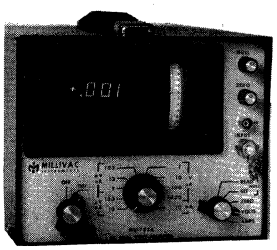
RF MILLIVOLTMETER MODEL MV-1023A

10KHz to 1.5GHz
50µV to 300V
-60db to +63dB
True linear response
True RMS indication
Microprocessor controlled
Autoranging
IEEE 488.2 Interface
SCPI Language
Option - MATE Compatible

NEW

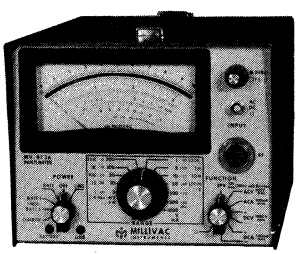
DC KILOVOLTMETER MODEL MV-731A

1V to 10,000V
4.5 Digit Readout
.05% Accuracy
100MΩ Input Impedance



DC NULL METER MODEL MV-753A

±.1µV to ±1,000V
±.1pA to ±10mA
Null from ±.1µV to ±300mV
Floating or chassis ground



MULTIMETER MODEL MV-973A

3mV to 1,000V F.S. DC
3mV to 300V F.S. AC
3mV to 300V F.S. RF
3µA to 300mA F.S. DC, AC
.1Ω to 5,000MΩ
DC to 1.5GHz

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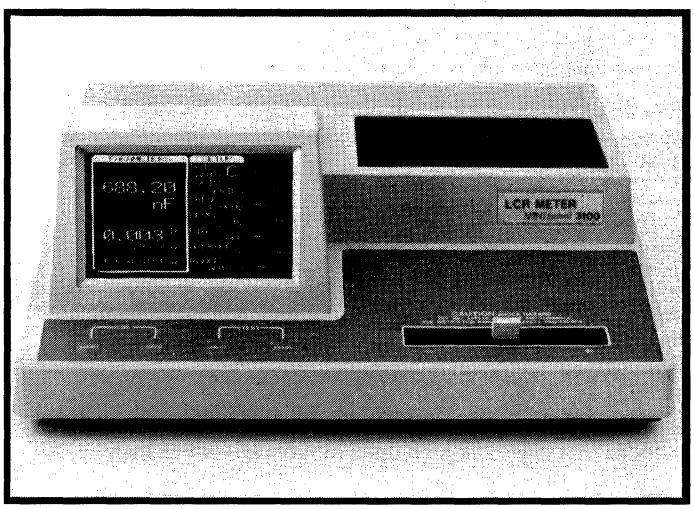
MiNT Systems™

Designed for Versatility



3100 LCR Meter

- **Easy menu-driven operation**
- **0.1% basic accuracy**
- **5-digit resolution**
- **Wide measurement range**
- **100 Hz to 20 KHz; 50 mv to 1 V test signals**
- **Self test and calibration**
- **Complete parameter CRT display**

Specifications

Parameters Measured
Resistance: R, Q, Cp or Cs, Lp or Ls
Inductance: L, Q, ESR or EPR

Display
A 5-inch CRT display

Display Resolution
Dut equivalent values (R, L, C): 5 digits
Dissipation/Quality factors (D, Q): 4 digits

Equivalent Circuit
Series or Parallel selectable for all ranges

Test Frequency
7 menu selectable test frequencies: 100 Hz, 120 Hz, 400 Hz, 1 KHz, 5 KHz, 10 KHz, and 20 KHz

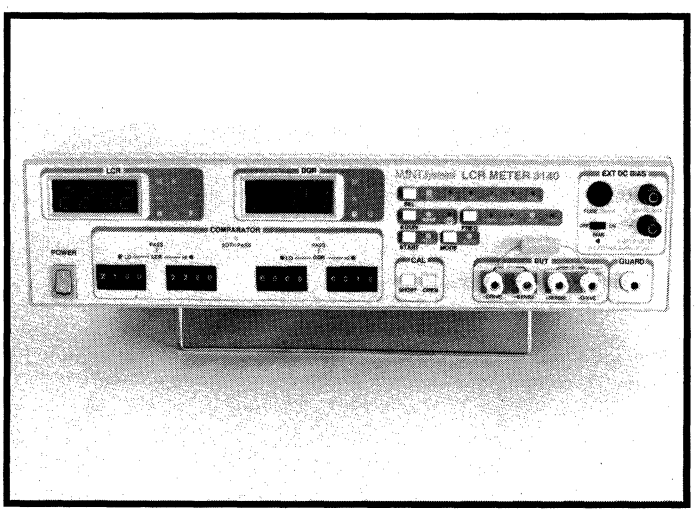
Test Signal Level
5 test signal RMS voltage levels: 50 mV, 100 mV, 250 mV, 500 mV, and 1 V

DC Bias
Internal Bias: Selectable from 0.6 V or 2 V
External Bias: 0 V to 60 V

Display Range
R: 0.0001 ohm to 9999 Mohm
L: 0.0001 uH to 9999 H
C: 0.0001 pF to 9999 mF
D: 0.0001 to 9999
Q: 0.0001 to 9999

Accuracy
L, C, R basic accuracy: 0.1%
D or Q accuracy: 0.1% + 1 digit @ D or Q = 1

Data Averaging
Average reading, selectable from 1, 3, 5, 10, 10, and 100 test sequences



3140 LCR Meter

- **Easy to use**
- **0.2% basic accuracy**
- **4-digit resolution**
- **Wide measurement range**
- **100 Hz to 10 KHz; 250 mV test signal**
- **Self test and calibration**
- **Optional Pass-Fail comparator**
- **Low cost**

To order or obtain more information about the above products or other product lines, such as the standalone **Digital Storage Oscilloscope (DSO)**, **Signal Generator/Synthesizer**, or **LCR Meter**, call (408) 262-7171 or fax (408) 262-5387.

Modular iNstruments and Test Systems

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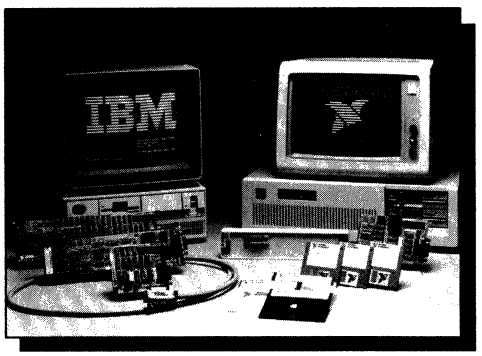
Instrument Control Solutions for Your Computer

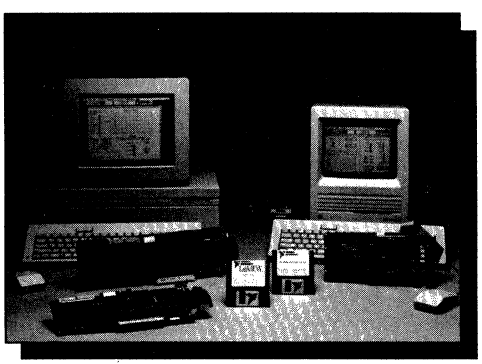
INTERFACES FOR PERSONAL COMPUTERS



IBM PC AT – AT-GPIB
- 16-bit AT bus interface
- NAT4882™ and Turbo488® ASICs for 100% IEEE-488.2 compatibility
- 1Mbytes/sec transfer rates for both reads and writes
- Includes NI-488.2™ MS-DOS and Windows software

IBM PS/2 Micro Channel – MC-GPIB
- NAT4882 and Turbo488 ASICs for 100% IEEE-488.2 compatibility
- PS/2 Programmable Option Set circuitry (no hardware jumpers or switches)
- 1 Mbytes/sec transfer rates for both reads and writes
- Includes NI-488.2 MS-DOS and Windows software

IBM PC/XT/AT – GPIB-PCII/IIA
- DMA transfer rates over 400 kbytes/sec
- NAT4882 ASIC for 100% IEEE-488.2 compatibility
- NEC μPD7210/TI 9914 software compatibility
- Includes NI-488.2 MS-DOS and Windows software



Macintosh II Series –
NB-GPIB
- NAT4882 and Turbo488 ASICs for 100% IEEE-488.2 compatibility
- 800 kbytes/sec programmed I/O transfers
- DMA capability with an NB-DMA board over RTSI® bus
- Includes NI-488® Macintosh OS software (with QuickBASIC, C, and HyperCard interfaces and development utilities)

NB-DMA-8-G
- High-performance 32-bit DMA controller
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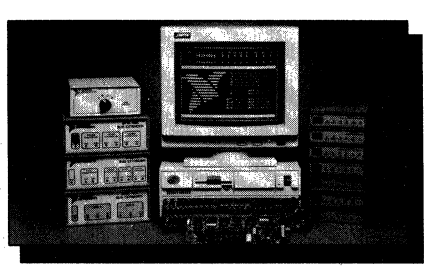
- IEEE-488 interface with transfer rates up to 850 kbytes/sec
- Includes NI-488 Macintosh OS software

NB-DMA2800
- High-performance block-mode 32-bit DMA controller
- High-performance RTSI bus control and DMA service for other boards
- IEEE-488 interface with transfer rates up to 1 Mbytes/sec
- Includes NI-488 Macintosh OS software

Macintosh SE – GPIB-SE
- NAT4882 and Turbo488 ASICs for 100% IEEE-488.2 compatibility
- Transfer rates up to 1 Mbytes/sec
- Includes NI-488 Macintosh OS software

IEEE-488 SUPPORT PRODUCTS

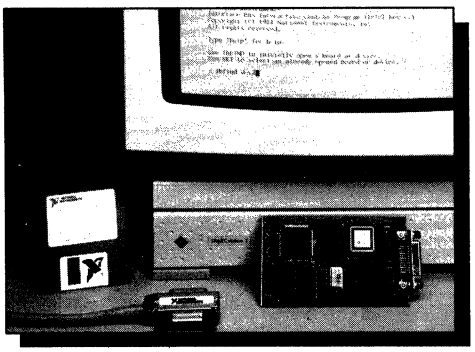


- Parallel or serial IEEE-488 bus extenders
- IEEE-488 bus expander
- IEEE-488 bus analyzer/monitor
- RS-232/422-to-IEEE-488 converters
- RS-232/422-to-IEEE-488 controllers
- IEEE-488 data buffer
- SCSI-to-IEEE-488 controller
- GPIB switch box
- Parallel-to-IEEE-488 converter

INTERFACE KITS FOR WORKSTATIONS

Sun SPARCstation Series - GPIB-SPRC-S

- SCSI-to-IEEE-488 external Controller box
- 64 kilobyte (K) RAM buffer for increased throughput and efficient use of the SCSI bus
- NI-488M™ SunOS multitasking software



Sun SPARCstation Series - GPIB-SPRC-B

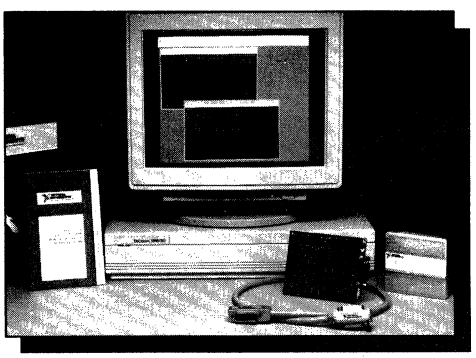
- NAT4882 and Turbo488 ASICs for 100% IEEE-488.2 compatibility
- Highest performance SBus plug-in board
- 1 Mbytes/sec transfer rates for both reads and writes
- NI-488M SunOS multitasking software

Sun-3 and Sun-4 - GPIB-S3/4, GPIB-S3/4D, GPIB-S3/4P, GPIB-S3/4DP

- Plug-in DMA and programmed I/O IEEE-488 boards for the VMEbus
- Complete with adapter brackets and internal cables
- NI-488M SunOS multitasking software

DEC DECstation 5000 - GPIB-DEC5000

- NAT4882 and Turbo488 ASICs for 100% IEEE-488.2 compatibility
- Highest performance plug-in TURBO channel board
- 1 Mbytes/sec transfer rates for both reads and writes
- NI-488.2M ULTRIX multitasking software



DEC MicroVAX - GPIB-MVII and GPIB-MV3000

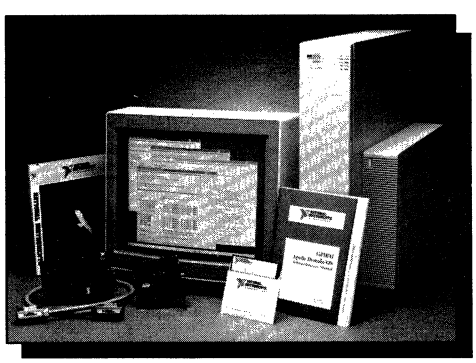
- Plug-in DMA IEEE-488 boards for DEC MicroVAX Series
- GPIB11 VMS multitasking software

DEC VAXstation 3100 - GPIB-VAX3100-V

- SCSI-to-IEEE-488 external Controller box
- 64K RAM buffer for increased throughput and efficient use of the SCSI bus
- GPIB11 VMS multitasking software

IBM RISC System/6000 - GPIB-RS/6000

- NAT4882 and Turbo488 ASICs for 100% IEEE-488.2 compatibility
- Highest performance plug-in Micro Channel board
- 1 Mbytes/sec transfer rates for both reads and writes
- NI-488M AIX multitasking software



HP/Apollo 9000 Series 400 - GPIB-A/PC and GPIB-A/AT

- High-speed AT-GPIB with 1 Mbytes/sec transfer rate (GPIB-A/AT) or GPIB-PCII/IIA with 400 kbytes/sec transfer rate (GPIB-A/PC)
- GPIB11 Domain/OS software in source code

Interface kits are also available for DEC Q-BUS/UNIBUS, MULTIBUS, VMEbus/VXIbus, STD Bus, S-100 Bus, SBX Bus, and AT&T 3B2C

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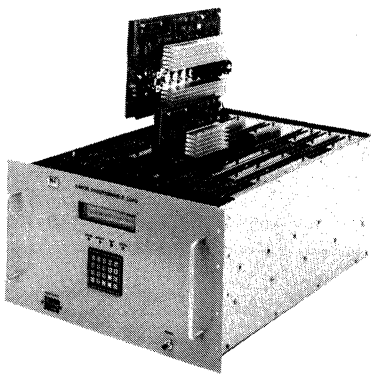
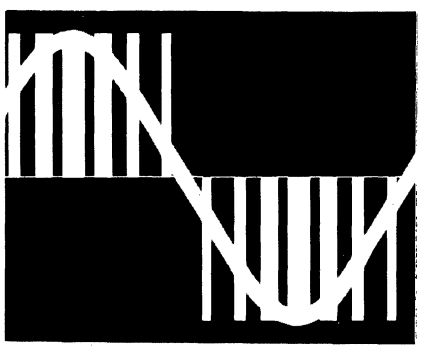
Dynamic Load Subsystem L4000 SERIES

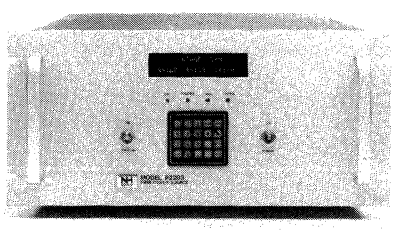


- ❑ Modular high density packaging saves rack space and simplifies maintance.
- ❑ Sophisticated diagnostics and software calibration specifically for use in ATE applications.
- ❑ IEEE-488, MATE (CIIL) or front panel keyboard control.
- ❑ Loads may be used in parellel up to 80KW, 3840 Amps.

The L4000 SERIES Dynamic Load Subsystems are designed using instrument-on-a-card load modules such that a single controller can control up to 32 independant and isolated load modules. The product is configured to match specific load requirements by selecting from a number of standard load modules. Each load module is programmable from 1.5V to 400V, constant current, constant resistance, constant voltage, constant power or pulse modes.

Programmable AC Power Sources P-SERIES



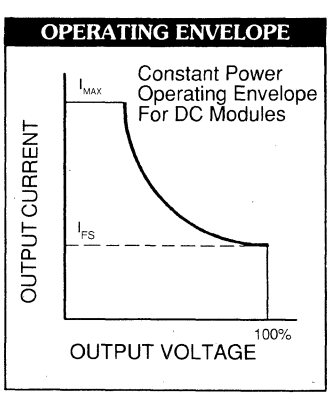


- ❑ High efficiency PWM design reduces size, weight and waste heat.
- ❑ High peak in-rush current for testing switching power supplies and other non-linear loads.
- ❑ Sophisticated diagnostics and software calibration designed specifically for use in ATE applications.
- ❑ Modular high density packaging saves rack space and simplifies maintenance

The key to the 85% efficiency of our PWM Series power sources in pulse-width modulation. The diagram shows how the sine wave output of our AC sources is created electronically, by a series of pulses whose widths vary according to the amplitude they represent.

For you, that means cooler operation, smaller size and less weight than conventional AC sources. With our PWM sources, you can save on the power that's producing wasted heat as well as the cooling power required to get rid of it.

Modular DC Power Subsystem S6000



- ❑ Up to 12 DC Supplies in Single 5 1/4 inch Chassis.
- ❑ Constant Power Operating Envelope.
- ❑ Controllable via IEEE-488.2, SCPI, MATE/CIIL, VXIbus programmer.

The S6000 brings modular DC Power to a new level, combining high density packaging with comprehensive selftest and control. Up to six single (400W), or dual output (200W per channel) modules may be installed into a 5 1/4" chassis. Because the power modules are "constant power" designs, they can deliver current up to any point within their operation envelope. This benefits overall station design because fewer modules are needed to cover a wider range of UUT requirements.

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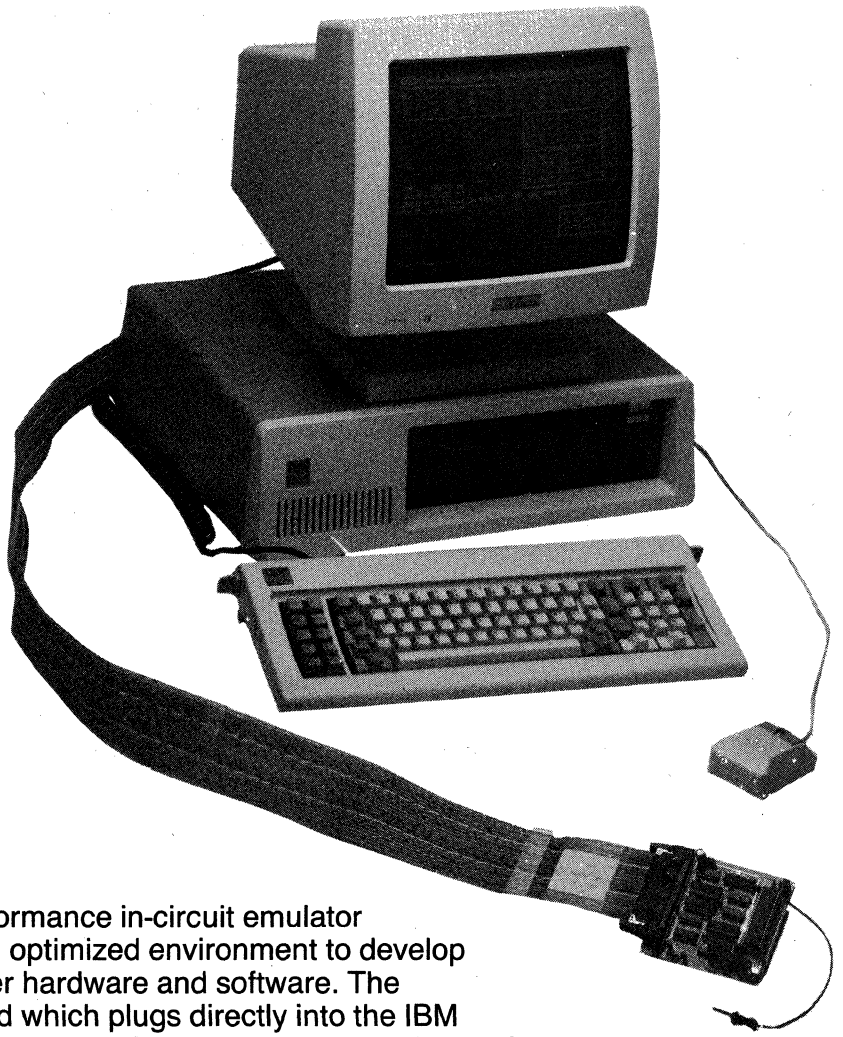
8051 Family In-Circuit Emulator



New! Simul-51 Simulator for the 8051. Same interface as Emul-51. Runs on PC without Emulator hardware.

The EMUL51-PC is a high performance in-circuit emulator specifically designed to give an optimized environment to develop your 8051 family microcontroller hardware and software. The EMUL51-PC consists of a board which plugs directly into the IBM PC/XT/AT bus. The optional Trace board features an advanced trace function with sophisticated trigger capabilities.
The POD, which plugs into the target system, is connected with a 5 ft. ribbon cable to the emulator board to provide a flexible operating range.
This is a unique architecture. It ensures that there are no external boxes or power supplies cluttering your workbench. Nor is there any serial channel to slow down the emulation process.

User friendly

The friendly user interface is one of the key features of the EMUL51-PC. Pull-down menus, mouse support and on-line help make the infrequent user feel instantly at home. The more experienced user will appreciate the fast command line interpreter and the comprehensive command set with powerful macros.
The data windows on the screen contain up-to-date information on symbols and memory areas. All commands are supported with context sensitive help information. If more help is needed the whole manual is on-line, available with a key stroke.

Source level debugging

Using a high-level language for code generation is a way to cut development time. Therefore the EMUL51-PC gives full support for debugging directly in C, PL/M or PASCAL source code. This is a breakthrough in software debugging and eliminates tedious symbolic debugging in assembler.
With the EMUL51-PC you can mark breakpoints directly in the source code window, and it's easy to follow the program execution on the screen listing. All variables, both local and global, can easily be displayed or altered in one of the dedicated windows. Naturally all variables are displayed in the form they were declared in your software. This way you can work directly with floats, arrays, pointers, structures, etc.

Real time Trace

The EMUL51-PC offers trace features not found in other emulators. For instance the trace buffer can record over 16,000 bus cycles with 48 bits of data. The trace can be operated "on-the-fly" which means that it can be viewed, programmed and retriggered without disturbing program execution.
With the trace set-up menu it is possible to define exactly what events are to be stored in the trace buffer. The real-time trace can be stopped (triggered) at a selected event or after a combination of multiple events. By aligning the trigger point anywhere in the trace buffer you have a full choice of pre- and post triggering.

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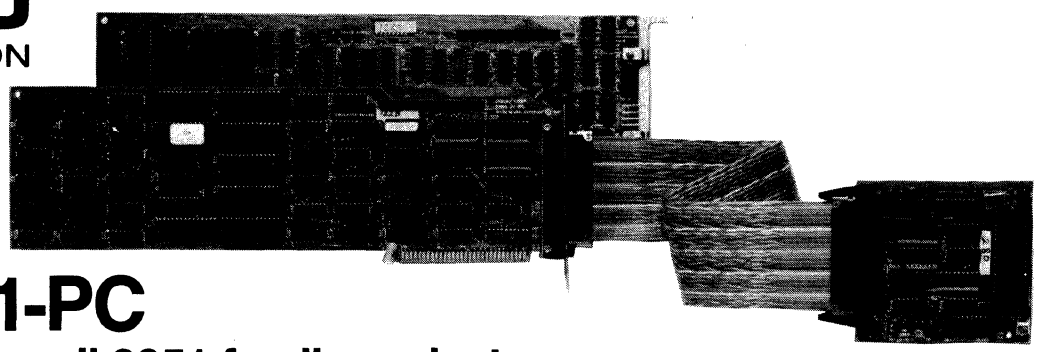

EMUL51-PC

Saves time on all 8051 family projects.

EMUL51-PC is an in-circuit-emulator dedicated to the 8051 family. This architecture has made it possible to create an highly optimized tool without having to compromise on performance. The EMUL51-PC truly emulates the microcontrollers from all manufacturers of 8051 derivatives. This means that your EMUL51-PC will work just like your microcontroller when it is plugged into your target.

System Specification

Host
IBM PC/XT/AT, PS/2 or compatible.
Minimum 512K of RAM.
Monochrome, CGA, EGA or VGA in 25, 43 or 50 line mode.

External Box
The emulator boards can be installed in an external box with serial communication to PC.

Languages supported
Third party assemblers, PL/M-51, Pascal-51 and C-51 compilers.

Source level debugging
Window for source level debugging. Single Step or Line Step with breakpoints marked directly in the code. Full support for local or global variables in C-51.

In-line Assembler and disassembler
Full instruction set and symbols supported.

Symbolic Support
Full symbolic debugging and type checking. Same symbols can be used in different modules.

File formats Supported
Intel HEX/OBJ/OMF/SYM, Avocet, Archimedes, Franklin IAR, HMI SYM, AD2500, American Automation, Relms and more.

Real time Emulation
Full speed emulation up to 30 MHz
No wait states and no intrusion on memory, stack, I/O or Interrupt pins.

Emulation Memory
64K XDATA memory and 64K CODE memory. Up to 512µ with bankswitch option.

Memory Mapping
Mappable in 4K pages.

Macros
Test session automation and macro command definition. IF/ELSE, REPEAT/WHILE structures.

Debug Session Logging
Record emulation session and all setups to a file.

Breakpoints
64 K program breakpoints.
64 K data read and write breakpoints.
Break on external signal.
Break on direct access to internal bit or byte memory.
Break on a range of addresses.

With the trace board option it's possible to break on any 48 bit combination of address, data, RD, WR, OP code fetch, interrupt level, ports or external signals.

Single Stepping
Single or multiple instruction stepping. Step over calls and interrupts.
Line stepping in high level languages.

Execution timer
Resolution down to 500 ns.

Real Time Trace (optional)
256K deep by 64 bits wide with time stamp.

Trace operation
At each cycle of execution 48 bits of address, data, ports and external signals are compared with eight independent "48 bit registers" to produce eight "condition signals". These eight conditions are then combined with six bits from a "64 state state-machine". The combination of these 14 signals creates a new state (or retains the old state). It also produces a TRIG and a FILTER signal that are used to control what is saved in the trace buffer. If the eight condition signals are named A, B, C, D, E, F, G and H an example of how this could be used follows:
A THEN B THEN C THEN D THEN E THEN F THEN G THEN H where A - H could be code addresses.

The trace buffer can be viewed, reprogrammed and restarted without affecting emulation.

Trigger Breakpoint
The 48 bit trace trigger qualifiers can be used to define complex breakpoints also on program execution.

Trace Display
Display trace in disassembled symbolic or binary/hex form, or as high level source code. Display can be saved to a file.
Trace can be started, stopped and displayed independent of program execution.

Program Performance Analyzer
Histogram and statistical information of program execution in real time.

Supported chips

Intel
8051, 8052, 8031, 8032, 80C51, 80C52, 80C31, 80C32, 8751, 87C51, 8344, 80C152, 80C452, 80C51FA, FB, FC

OKI
80C31, 80C51, 80C154

Siemens
8051, 8031, 8031A-20, 80532, 80535, 80C535, 80C515, 80C537, 80C517, 80C515A, 80C517A

Philips, Signetics
8051, 8031, 80C451, 83C451, 80C552, 80C562, 80C652, 83C652, 83C654, 83C751, 83C752/87C752, 80C851, 83C851, 80C528, 80C52, 80C550, 83CL410, 80C592

AMD
8051, 8031, 80C51, 80C31, 80C321, 8751, 87C51, 8053, 8753, 80535, 80C52T2, 80C32T2

MHS
80C31, 80C315, 80C32, 80C154

Dallas
DS5000, DS5001

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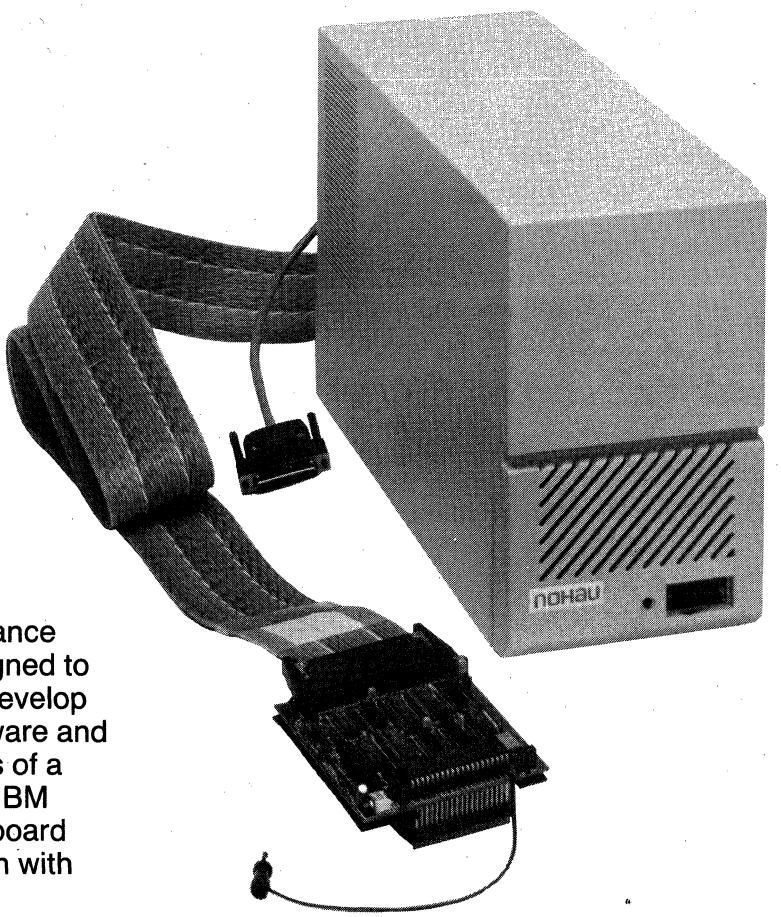
68HC11

In-Circuit Emulator



The EMUL68-PC is a high performance in-circuit emulator specifically designed to give an optimized environment to develop your 68HC11 microcontroller hardware and software. The EMUL68-PC consists of a board which plugs directly into the IBM PC/XT/AT bus. The optional Trace board features an advanced trace function with sophisticated trigger capabilities.
The POD, which plugs into the target system, is connected with a 5 ft. ribbon cable to the emulator board to provide a flexible operating range.
This is a unique architecture. It ensures that there are no external boxes or power supplies cluttering your workbench. Nor is there any serial channel to slow down the emulation process.

New! *Simul-68*
Simulator for the 68HC11
Same interface as Emul-68
Runs on PC without Emulator hardware.

User friendly

The friendly user interface is one of the key features of the EMUL68-PC. Pull-down menus, mouse support and on-line help make the infrequent user feel instantly at home. The more experienced user will appreciate the fast command line interpreter and the comprehensive command set with powerful macros.
The data windows on the screen contain up-to-date information on symbols and memory areas. All commands are supported with context sensitive help information. If more help is needed the whole manual is on-line, available with a key stroke.

Source level debugging

Using a high-level language for code generation is a way to cut development time. Therefore the EMUL68-PC gives full support for debugging directly in C or Modula-2 source code. This is a breakthrough in software debugging and eliminates tedious symbolic debugging in assembler.
With the EMUL68-PC you can mark breakpoints directly in the source code window, and it's easy to follow the program execution on the screen listing. All variables, both local and global, can easily be displayed or altered in one of the dedicated windows. Naturally all variables are displayed in the form they were declared in your software. This way you can work directly with floats, arrays, pointers, structures, etc.

Real time Trace

The EMUL68-PC offers trace features not found in other emulators. For instance the trace buffer can record over 16,000 bus cycles with 64 bits of data. The trace can be operated "on-the-fly" which means that it can be viewed, programmed and retriggered without disturbing program execution.
With the trace set-up menu it is possible to define exactly what events are to be stored in the trace buffer. The real-time trace can be stopped (triggered) at a selected event or after a combination of multiple events. By aligning the trigger point anywhere in the trace buffer you have a full choice of pre- and post triggering.

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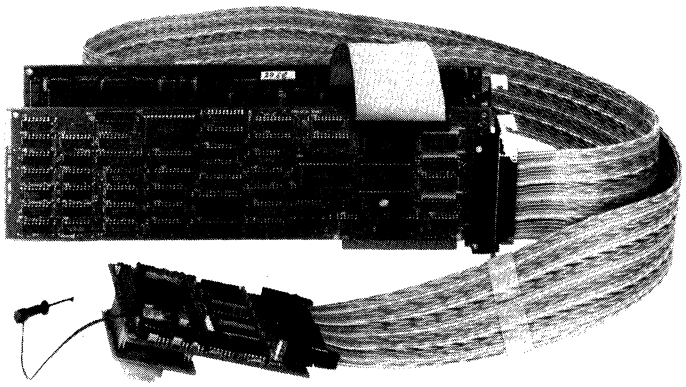


EMUL68-PC

The smart solution for 68HC11 development.

The EMUL68-PC offers you complete control of your 68HC11 hardware or software project at a very attractive price level. The EMUL68-PC gives you more features than any other system, regardless of price.

System Specification

Host
IBM PC/XT/AT, PS/2 or compatible.
Minimum 512K of RAM.
Monochrome, CGA, EGA or VGA.

External Box
The emulator boards can also be installed in an external box with serial communication to PC.

Languages supported
Third party C and Modula-2 compilers and assemblers.

Source level debugging
Window for source level debugging. Single Step or Line Step with breakpoints marked directly in the code. Support for typed local and global variables.

In-line Assembler and disassembler
Full instruction set and symbols supported.

Symbolic Support
Full symbolic debugging and type checking. Same symbols can be used in different modules.

File formats Supported
Motorola S1, Avocet, Archimedes, IAR, Intermetrics, Introl, Microtec, Microtek and more.

Real time Emulation
Full speed emulation up to 16 MHz
No wait states and no intrusion on memory, stack, I/O or interrupt pins.

Emulation Memory
Full 64K of emulation memory.
Bankswitch option has up to 512µ

Memory Mapping
The memory is mappable in 4K (optionally 64 byte) pages either to emulator or target. Memory areas can be write protected.

Macros
Test session automation and macro command definition, IF/ELSE, REPEAT/WHILE structures.

Debug Session Logging
Record emulation session and all setups to a file.

Breakpoints
64 K program breakpoints.
64 K data read and write breakpoints.
Break on address ranges and external signal.
With the Trace board it's possible to break on any 48 bit combination of address, data, RD/WR, OP code fetch, ports and external signals.

Single Stepping
Single or multiple instruction stepping.
Line stepping in high level languages.

Execution timer
Resolution down to 250 ns.

Real Time Trace Memory (optional)
16 K deep by 64 bits wide.
Trace address, data, ports, control signals, time stamp and a maximum of 18 external signals.

Presently supported chips

Motorola
68HC11A0, 68HC11A1,
68HC11A8, 68HC11D3,
68HC711D3, 68HC11E0,
68HC11E1, 68HC811E2,
68HC11E9, 68HC11F1,
68HC11K4

Trace Filter
16 qualifiers of 48 bits to filter tracing.
Post view filtering can record up to 15 frames after a match.

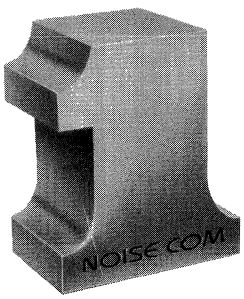
Trace Trigger
Two sets of triggers with 8 qualifiers each. Trigger on combinations of the qualifiers including sequential combinations and loop counter.
Qualifiers can be AND/OR combinations of address, data, ports, op-code fetch, RD/WR, EXT0, EXT1 and interrupt levels.
Trigger point can be selected anywhere within the 16 K buffer to give pre/post trigger alignment.
Trigger can be modified without stopping emulation.

Trace Display
Display trace in disassembled symbolic or binary/hex form, or as high level source code.
Display can be saved to a file.
Trace can be started, stopped and displayed independent of program execution.

Trace Time Stamp
The Time Stamp can be used to display exact execution time or time from last frame in the trace memory.

Program Performance Analyzer
Histogram and statistical information of program execution in real time. Exact timing information on execution time in each program routine.

Nohau Corp. 51 E. Campbell Avenue Campbell, CA 95008 (408) 866-1820 FAX: (408) 378-7869



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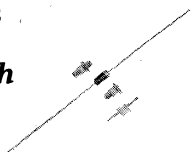
From the leader in noise sources.

Hermetically sealed noise diodes



NC 100 through NC 400 Series

DC to 110 GHz

- Chips and five package options
- Flat output
- Operating temperature -55 to +125° C
- Storage temperatures -65 to + 150° C
- Meet MIL-STD-750
- 50-ohm impedance
- Wide variety of packages

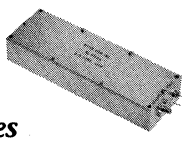
Drop-in noise modules for BITE applications

NC 500 Series

200 kHz to 5 GHz

- Drop-in TO-8 packages
- Economical solution to BITE
- 31 dB ENR output minimum
- Minimum crest factor 5:1
- Operating temperature -55 to +85° C
- Storage temperature -65 to + 175° C
- Temperature coefficient 0.01 dB/° C
- 50-ohm output impedance

Amplified noise modules

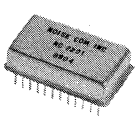


NC 1000 Series

DC to 2000 MHz

- High power—up to 13 dBm
- Minimum crest factor 5:1
- Flat response— ±0.75 dB
- Operating temperature -35 to +100° C
- Storage temperature -65 to +150° C

Plug-in amplified noise modules

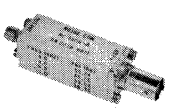


NC 2000 Series

100 Hz to 300 MHz

- 24-pin packages
- Minimum crest factor 5:1
- High-end roll off 6 dB per octave
- Operating voltage of +15 VDC, +12 VDC optional
- Storage temperature -65 to +125° C
- Operating temperature -55 to +85° C
- Temperature coefficient 0.025 dB/° C

Calibrated coaxial noise sources



NC 3000 Series

10 kHz to 40 GHz

- Noise output rise and fall times less than 1 μS
- 6, 15.5, 30 dB ENR and higher outputs available
- Noise output variation with temperature less than 0.01 dB/° C
- Noise output with voltage less than 0.1 dB/% Δ V
- Operating temperature -55 to +85° C
- Storage temperature -65 to +125° C
- Maximum input power +28 VDC at 20 mA

Calibrated millimeter-wave waveguide noise sources

NC 5000 Series

18 to 110 GHz

- Narrow or wideband performance with low or high output
- Noise output rise and fall times less than 1 μS
- VSWR less than 1.35:1
- Noise output variation with temperature less than 0.01 dB/° C
- Noise output with voltage less than 0.1 dB/% Δ V
- Operating temperature -55 to +85° C
- Storage temperature -65 to +125° C
- Maximum input power +28 VDC at 20 mA (+15 VDC available)

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Number One in Noise Sources.

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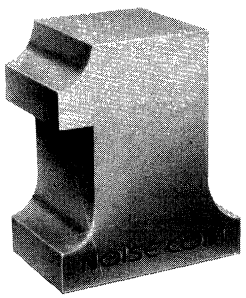

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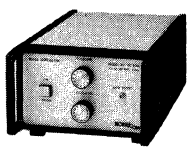
Wideband noise-generating instruments for the bench



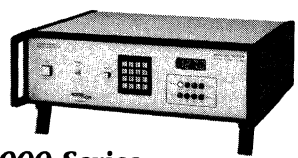
NC 6000 Series

DC to 18 GHz

- Rugged design
- Precision attenuator
- Crest factor 5:1
- Excellent flatness

The NC 6000 Series are rugged noise generating instruments designed for applications on the test bench, or in test stations in which an NC 6000 Series unit is incorporated with other equipment to provide a wide variety of functions.

Programmable broadband noise-generating instruments



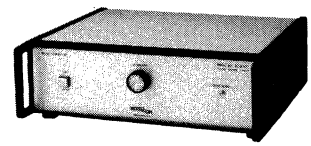
NC 7000 Series

DC to 18 GHz

- Completely programmable—from front panel or IEEE-488 bus
- Non-volatile memory for measurement parameters
- Front panel display
- Fast-switching 127-dB attenuator
- +13 dBm or +30 dBm (1 W) white Gaussian noise output

The NC 7000 Series can be used alone to perform a programmed series of noise measurements, or they can be bus-controlled, for running a battery of tests automatically via any instrument controller.

High-power, broadband noise-generating instruments



NC 8000 Series

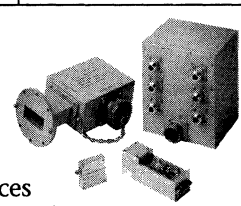
500 Hz to 500 MHz

- High power—up to 1 W (30 dBm)
- Uniform response— ±-2 dB
- Precision attenuator—100 dB in 10-dB steps (10 dB in 1-dB steps optional)
- Can be configured for custom requirements

The NC 8000 Series offers 1 W (+30 dBm) power output for applications such as ECM testing, broadband jamming, jamming simulators, in secure communications channels, and any other area requiring high-level noise.

Custom noise subsystems

Special products for unique applications



- Custom combinations of connectors, operating voltages, electrical performance, and packaging
- Multiple outputs
- Instruments for NPR testing
- Switched noise sources
- Space-qualified noise sources
- High-power noise sources
- Noise sources with filtering, and adjustable power level and clipping

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AC/Synchro/Resolver Instrumentation

AC ANALYZER and Phase Angle Voltmeters

Model 2250
Digital Analyzing Voltmeter
Measures:

- Total
- Fundamental
- In Phase
- Quadrature
- Phase Angle
- Transformation Ratio
- Wideband 10 Hz to 100 kHz
- 20mV to 500 V, 6 ranges
- Harmonics
- % Deviation
- RMS Voltage
- Reference Voltage
- THD
- Harmonic Phase
- Zero Offset

Features:

- CAL and Auto CAL
- Track and Hold
- Offset Input
- IEEE-488 or local
- Null Meter
- MATE IEEE available

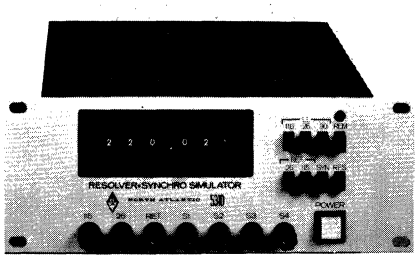
Tests:

- LVDT's
- RVDT's
- Accelerometers
- Transformers
- Filters
- Servo Systems
- Synchros/Resolvers

Model 213C
PHASE ANGLE VOLTMETER

- Single Freq. -30 Hz to 10 kHz
- 300 uV to 300 V
- Phase Accuracy: ± 1 deg.

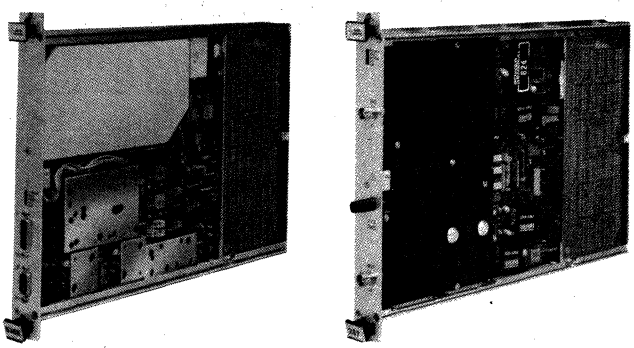
Programmable Resolver/ Synchro Simulator



Model 5310
Programmable R/S Simulator
Features:

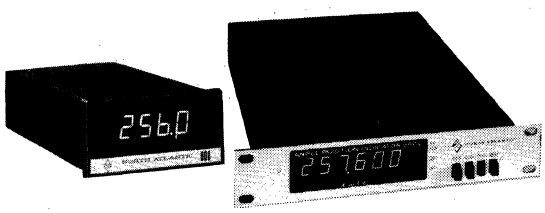
- Variable programmable tracking rate
- 18 bit resolution
- IEEE-488, MATE available
- Local or remote operation
- Variable programmable rate
- Synchro/resolver output
- 36 arc second accuracy
- 3.0 VA output
- Wide Band, 47-440 Hz/360 Hz-5 kHz
- Switchable BCD/Binary programming

VXI Instrumentation



- Phase Angle Voltmeter - Model VXI 227
- Angle Position Indicator - Model VXI 5388
- Synchro/Resolver Simulator - Model VXI 5388

Angle Position Indicators



800/801 Synchro Panel Meter
8500/8800/8810 API

- SPM 0.1 to 0.01 deg. resolution
- 8500 0.01 deg. resolution API
- 8800/8810 0.001 deg. resolution API
- 8810 IEEE-448, MATE available

Resolver Synchro Standards Simulators & Bridges

Model 530, 530/20
Resolver/Synchro Simulator

- L-L 11.8V, 26V, 90V, 115V
- Frequency 50 Hz to 11 kHz
- Accuracy up to 2 arc seconds
- Resolution to .0001 degree

Model 540/10
Resolver/Synchro Bridge

- Direct Measurement R/S Xmitrs
- Constant Null gradient output
- 2 arc second accuracy
- Resolution 0.001 degree

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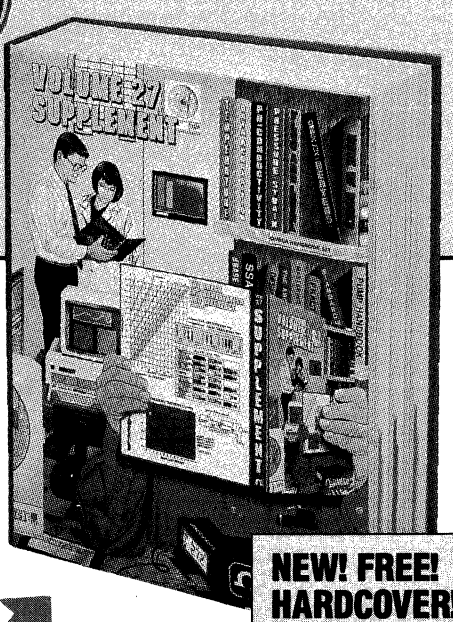

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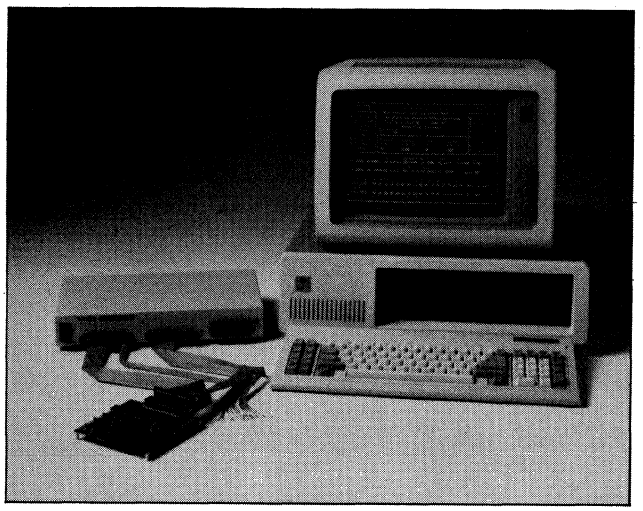
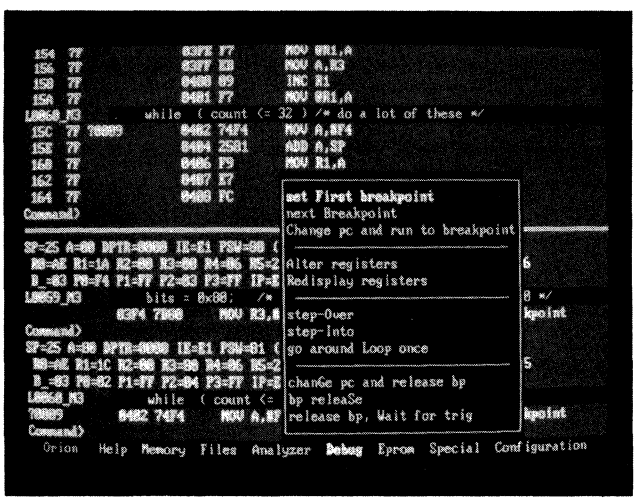
UNILAB 8620

ANALYZER-EMULATOR

Emulators



UniLab the universal system for rapid development of embedded processor systems.



UniLab split screen display includes analyzer trace and breakpoints with high level language source lines. Also shown is PopUp menu interface with debug selections.

More Emulation For Less Cost

The UniLab 8620 combines a bus-state analyzer with an emulator to provide more capability and faster debugging than traditional in-circuit emulators. Whether you're working on single-chip controllers or high speed 8- and 16-bit microprocessors, the UniLab 8620 handles them all at a low, low price.

Over 170 different processors are supported by the same universal system, all with the same software environment. Support for additional processors requires only the purchase of an inexpensive Processor Personality Pak (PPAK).

SOFTWARE DEVELOPMENT TOOLS

- High Level Language/Symbolic debug support for a wide variety of development software packages.
- Source Tracking automatically displays the corresponding sections of your source file in its original format while you work.
- UniLab's trademark ability to debug by symptom with the analyzer—not just breakpointing and single stepping.
- Easy to learn and use PopUp menu interface.
- Program Performance Analysis computes both address and execution time histograms by gathering information while the target system runs at full speed.

INTEGRATED HARDWARE COMPONENTS

- A 48-channel bus state analyzer for real-time trace without stopping the processor.
- 32K to 128K emulation ROM.
- A generous 2730 cycle trace buffer with powerful triggering and selective filtering.
- Integrated EPROM programmer (handles 2716 thru 27512) and stimulus generator built right into the unit to help you quickly complete your project.
- High speed parallel interface zips data between your PC/AT and the 8620 fast—64K bytes from hard disk to emulator in 5 seconds.

UniLab 8620 Supports Over 170 Processors including:

INTEL	HITACHI	MOTOROLA	ROCKWELL	ZILOG
8031	6301	6800	6500	Z180
8032	6303R	6801	6501Q	Z80
8051	6303X	6802	6502	Z8
8085	6303Y	6803	6510	SUPER 8
8086	6305	68HC05C4/C8	6511Q	Z8000
8088	6309	6805	6541Q	
8096	6309E	6809		NEC
80188	64180	6809E	NSC	V20
80C196		68HC11	NSC800	V30
80186	OKI	68000	87P50	V40
80286	80C51VS	68008		V50
	85C154			78310

Details of UniLab 8620 support for these and other processors is available.

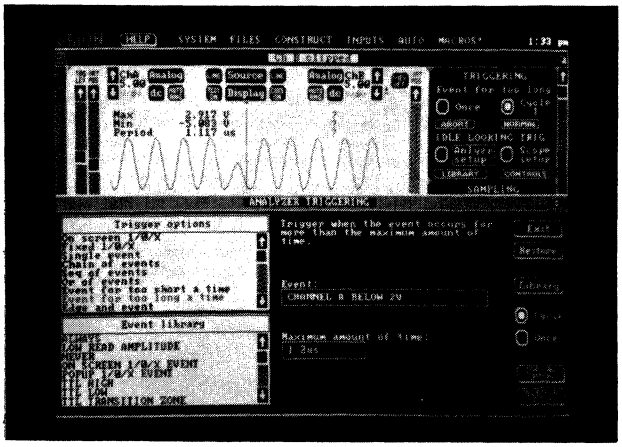
Please call ORION for more information.

ORION INSTRUMENTS **ORION Instruments, Inc.** 180 Independence Drive, Menlo Park, CA 94025 USA
TOLL FREE: 800-729-7700. Fax: 415-327-9881

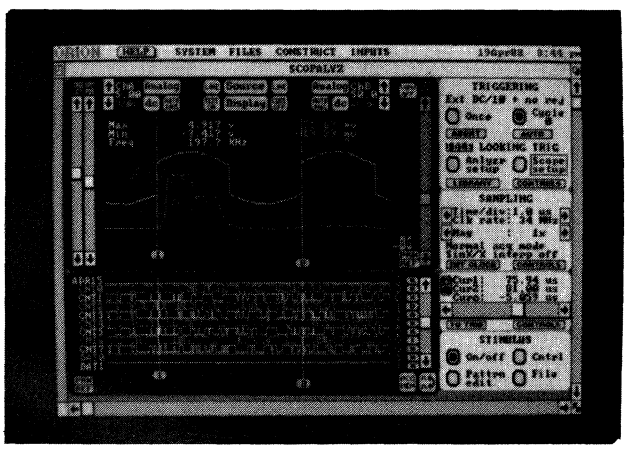
OMNILAB 9000

PROGRAMMABLE BENCH TOP TESTER

Instruments



Time aligned displays
Measurements from the scope and from the state or timing analyzer are time-correlated for an unprecedented view of relationships between analog and digital events.



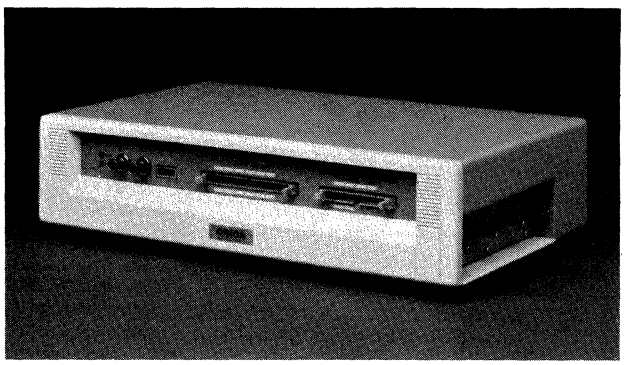
Detect dropouts in a continuous waveform using window triggering
Triggering logic continuously examines analog signals for a value below 2 volts for more than 1.2 microseconds. Any of the other digital and analog inputs could also be examined simultaneously.

Please call to request more information, a free demo disk, and the macro cookbook.

The OmniLab 9000 Series is a highly flexible, PC-based bench top test system. The OmniLab dramatically reduces the time necessary to develop automated test by coupling its powerful OmniMacros™ commands with an easy to use graphical user interface. You are now able to create, debug, and modify test procedures quickly and interactively using software integrated instruments.

INTEGRATED INSTRUMENTATION

- Digital Storage Oscilloscope (100 MHz, Dual-channel, 200 Megasamples/sec)
- Logic Analyzer (48 or 96 channels, 200 MHz)
- 24-Bit Digital Pattern Generator
- Analog Function Generator
- 550 MHz Frequency Counter



FEATURES

- Simple, interactive automated test creation with OmniMacros™.
- Easy to use graphical user interface
- Waveform capture, storage, comparison, analysis, editing, and playback
- Pass/Fail testing with operator prompts
- Time-aligned analog and digital measurements and displays
- Superior Mixed A/D Triggering™
- Easy to import/export data and to print screens for documentation
- Microprocessor disassembly (optional)
- GPIB(IEEE-488) support (optional)

APPLICATIONS

- Low to medium volume manufacturing test
- Pilot /Prototype design testing
- Design engineering
- Automatic data logging
- Quality assurance
- Depot repair/field service testing
- Incoming inspection

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Instrumentation Magnetic Tape Recorders

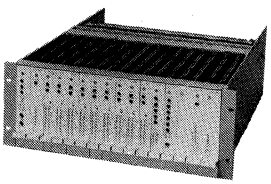
Penny+Giles

Pacesetting----------MDR Multiband Data Recorder

The new MDR Series advances today's performance standards for instrumentation magnetic tape recorders. The recorder features ECAL, a unique Electronic Channel Alignment, which permits up to four user-programmable reproduce settings per channel in IRIG, non-IRIG, and HDDR applications. MDR's advance design wideband head offers the new industry standard 5000 hour or 5-year warranty. Other features include 4 MHz direct, 1 MHz FM, and 40 kbpi HDDR; 7, 14, 28, 32, and 42 channel systems; and remote control interfaces for IEEE-488, RS232, RS449, and TTL.

SE9000 HDRS

Field proven worldwide, our high density digital recording system, the SE9000 HDRS, offers unrivaled performance. Standard features include constant density recording, data on demand in reproduce mode, data transfer rates to 144 Mbps, a microprocessor based operator console, IEEE-488 and RS449 remote control interfaces, and much more.

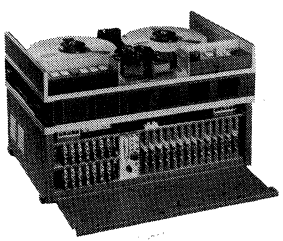


SE9510 Formatter

Provides HDDR capability to most IRIG instrumentation tape recorders. Synchronous/asynchronous data transfer rates to 144 Mbps. Switchable track fan out—2 to 32 tracks—to 4.5 Mbps per track. Auto-ranging reproduce bit synchronization, built-in error detection and correction. Serial, parallel, or word serial modes. Includes standard IEEE-488 and RS449 remote control status interfacing.

SE9502/9503 Formatters

Part of the SE9500 series — SE9502 is a two-channel unit, SE9503 is a three-channel unit. Accommodates multiple asynchronous input data streams. Data transfer rates up to 27 Mbps.

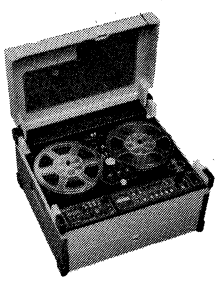


SE7000A, C, and D Field Portable Recorders

IRIG Intermediate and Wideband Group 1 recorders. 7 to 42 tracks. FM, direct, and HDDR in any mix, plus voice log. 1/2 and 1 inch tape, field convertible. 15/16 to 120 ips, tachometer or tape controlled. Built-in calibrator. Hand held or rack mounted remote controls. Optional 20-39 Vdc power, and IEEE-488 interface.

SE7000M Wideband

IRIG Wideband capabilities in the SE7000 chassis. 2 MHz direct, 500 kHz FM, 30 kbpi HDDR. 7 or 14 track. Built-in calibrator. Optional 20-39 Vdc power, and IEEE-488 interface.



Lightweight SE3000 Series

Offers heavyweight features. 1/4 inch or 1/2 inch tape, field convertible. 4, 8, or 14 modular channels in any mix of FM, direct, or HDDR. Buy and carry only the channels you need. 8 speeds, 15/32 to 60 ips. Record up to 34 hours continuously. Built-in calibrator. Operates on 11-30 Vdc or 100-250 Vac (48-420 Hz). HP3964/3968 compatible. Optional IEEE-488 interface.

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Penny & Giles Data Systems, Inc.

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SIGNAL CONDITIONERS

PPM SIGNAL CONDITIONERS AND AMPLIFIERS PROVIDE ULTRA-STABLE EXCITATION, BRIDGE BALANCE, AND CALIBRATION CIRCUITS FOR USE WITH STRAIN-GAGE AND RTD TRANSDUCERS.

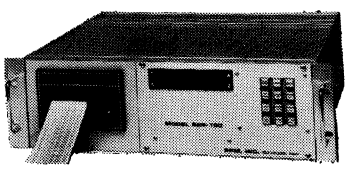
MODEL SG-16-3 (SHOWN) CONTAINS A STABLE, LOW-NOISE, EXCITATION POWER SUPPLY, A PRECISION, ADJUSTABLE-GAIN, WIDE-BAND AMPLIFIER, WITH A 4-STEP, TWO-POLE, LOW-PASS FILTER (OPTIONAL), HIGH-RESOLUTION AUTO-BALANCE CIRCUIT, AND 4-STEP, BI-POLAR SHUNT CALIBRATION CIRCUITRY.

TEN UNITS PLUG INTO A 19-INCH RELAY-RACK-MOUNTING CABINET, 7 INCHES HIGH.

EXCITATION IS EITHER CONSTANT VOLTAGE OR CONSTANT CURRENT, 0-15V AND 0-100 MA. AMPLIFIER STABILITY IS LESS THAN ONE MICROVOLT/DEG C. BANDWIDTH IS GREATER THAN 100 KHZ.

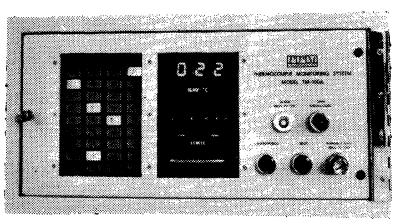
THE MODEL SG-16-4 SERIES PROVIDE SIGNAL-CONDITIONING FOR VARIOUS TYPES OF SIGNALS (DC, AC, FREQUENCY, TEMPERATURE, POWER FACTOR, ETC.) WITH INPUT-OUTPUT ISOLATION GREATER THAN 1500 VOLTS.

THE MODEL SG-160 SYSTEM USES COMPUTER CONTROL TO SET ALL FUNCTIONS, INCLUDING EXCITATION VOLTAGE, BRIDGE-COMPLETION AND CALIBRATION RESISTORS. BALANCE IS AUTOMATIC. THIS "STATE-OF-THE-ART" SYSTEM ELIMINATES MOST MANUAL SET-UP OPERATIONS, INCLUDING SOLDERING.



SEQUENTIAL EVENT RECORDERS

THE MODEL SER-100 SERIES OF SEQUENTIAL EVENTS RECORDERS PROVIDE A PRINTED RECORD OF THE TIME AND SEQUENCE OF INDEPENDENT ON/OFF EVENTS OCCURRING AT A NUMBER OF POINTS. THE SER-100 MAY BE SET TO RECORD EITHER THE TURN-ON TIME OR THE TURN-OFF TIME, OR BOTH, ALONG WITH THE POINT IDENTIFICATION.



THERMOCOUPLE MONITOR

THE MODEL TM-100A SCANS UP TO 100 THERMOCOUPLES, DISPLAYING TEMPERATURE DIGITALLY. A HIGH/LOW LIMIT CIRCUIT COMPARES THE TEMPERATURE WITH PRESET SWITCH SETTINGS; A LAMP MATRIX DISPLAYS ALL OUT-OF-LIMIT CHANNELS. INTERFACES PROVIDE FOR PRINTOUT OR COMPUTER ENTRY OF DATA.

FREQ.-TO-VOLTAGE CONVERTERS

THE MODEL FVI-5 FREQUENCY-TO-VOLTAGE CONVERTERS ARE USED TO CONVERT THE FREQUENCY OF AC SIGNALS FROM TURBINE TYPE FLOW-METERS, OR SIMILAR INSTRUMENTS, TO DC VOLTAGES FOR MEASUREMENT OR CONTROL APPLICATIONS. A NEW TECHNIQUE PROVIDES ZERO RIPPLE IN THE OUTPUT FOR CONSTANT INPUT FREQUENCY.

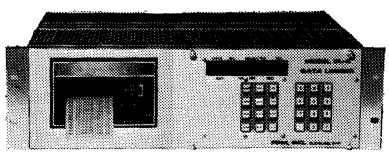
DECADE RESISTOR BOXES

PPM DECADE RESISTOR BOXES AND RESISTOR STANDARDS FEATURE BULK METAL FOIL RESISTORS WITH EXCEPTIONAL STABILITY AND EXTREMELY LOW SERIES INDUCTANCE AND SHUNT CAPACITANCE. TEMPERATURE STABILITY OF 1 PPM PER DEG C IS AVAILABLE ON MANY RANGES.

THE MODEL R4 SERIES IS AVAILABLE WITH EITHER FOUR SWITCHABLE DECADES OR THREE SWITCHABLE DECADES PLUS A 100 DIVISION PRECISION RHEOSTAT. THE R4 UNITS USE A 3-INCH DIAMETER CAN, FOR BUILT-IN APPLICATION.

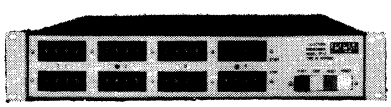
THE MODEL RX SERIES ARE AVAILABLE IN EITHER A RECTANGULAR METAL BOX FOR BENCH USE OR WITH FLANGES FOR RELAY-RACK INSTALLATION, WITH 3 TO 10 DECADES. THE SWITCHES USE SOLID-SILVER CONTACTS AT ALL POSITIONS TO ENSURE LONG LIFE AND LOW CONTACT RESISTANCE.

THE MODEL R-120-X SERIES OF RESISTANCE STANDARDS ARE FOR USE AS SECONDARY RESISTANCE STANDARDS. EACH HAS 12 EQUAL-VALUE RESISTORS WHICH MAY BE USED INDIVIDUALLY, IN SERIES, OR IN PARALLEL (WITH AUXILIARY SHUNTING BARS), TO OBTAIN PRECISION RESISTANCE COVERING A THREE-DECADE RANGE.



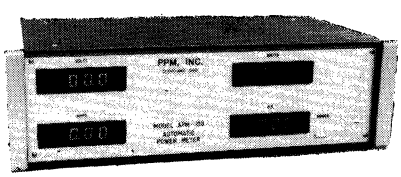
DATA LOGGERS

THE MODEL DL-3 IS A COMPLETE DATA ACQUISITION SYSTEM IN A COMPACT, PORTABLE PACKAGE. IT SCANS UP TO 256 INPUTS, DIGITIZES THEM, AND PRINTS OUT THE VALUES BY MEANS OF A BUILT-IN THERMAL PRINTER. OPTIONS INCLUDE: FLOATING DECIMAL POINT, INTERNAL CALENDER-CLOCK, STRAIN-GAGE OR THERMOCOUPLE CONDITIONING, COMPUTER INTERFACE, LIMIT COMPARATOR, AND ENGINEERING UNITS CONVERSION.



DIGITAL TIMERS-PROGRAMMERS

THE EP-SERIES OF DIGITAL ELECTRONIC PROGRAMMERS PROVIDE RELAY OR SOLID-STATE SWITCH OPERATION AT DIGITALLY-PRESET START AND STOP TIMES. EACH CHANNEL OPERATES INDEPENDENTLY. UNITS RANGE FROM 1 TO 1000 CHANNELS WITH TIMING FROM MICROSECONDS TO HOURS.



AUTOMATIC POWER METER

THE MODEL APM-100 AUTOMATIC POWER METER DISPLAYS "TRUE RMS" VOLTS, AMPERES, KW, AND POWER FACTOR SIMULTANEOUSLY ON FOUR 3.5 DIGIT DISPLAYS. FULL-SCALE RANGES ARE 1000 OR 199.9 VOLTS, 19.99 AMPS, 19.00 OR 1.999 KW, AND 1.000 POWER FACTOR. RANGE CHANGING IS AUTOMATIC. THE MODEL APM-10 PROVIDES THE SAME READINGS ON A SINGLE, SWITCHED, DISPLAY.

PTS
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HIGH-PERFORMANCE DIRECT SYNTHESIZERS

Accurate, stable, quiet frequencies on command, fast. For NMR, imaging, SATCOM, surveillance, ATE. Sources adapting to your needs with options. High demonstrated reliability. Thousands in use.

PTS 040

Range: 0.1–40 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 1–20μs

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –75dBc
Phase Noise: –75dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $5,125.00*

PTS 120

Range: 90–120 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 1–20μs

Output: +3 to +10dBm; 50ohm
Spurious Outputs: –75dBc
Phase Noise: –75dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $5,125.00*

PTS 160

Range: 0.1–160 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 1–20μs

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –75dBc
Phase Noise: –63dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $6.245.00*

PTS 250

Range: 1–250 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 1–20μs

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –70dBc
Phase Noise: –63dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $7,155.00*

PTS 300

Range: 0.1–300 MHz
Resolution: 1Hz
Switching: 1–20μs
Phase Continuous: 1Hz–100KHz steps

Output: +3 to +13dBm; 50ohm
Spurious Outputs: Type 1 –70/65 (typ/spec) Type 2 –65/60dBc
Phase Noise: –68dBc (0.5Hz–15KHz) –63dBc

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: Type 1 $6,175.00* Type 2 $5,625.00*

PTS 500

Range: 1–500 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 1–20μs

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –70dBc
Phase Noise: –63dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $8,385.00*

PTS 620

Range: 1–620 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 1–20μs

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –70dBc
Phase Noise: –63dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $8,675.00*

PTS 1000

Range: 0.1–1000 MHz
Resolution: 0.1Hz–100KHz (opt)
Switching: 5–10μs

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –70dBc (0.1–500 MHz), –65dBc (500–1000 MHz)
Phase Noise: –60dBc (0.5Hz – 15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $11,275.00*

PTS x10

Range: 10 MHz band, selected decade 0.1–100 MHz
Resolution: 1Hz
Switching: 1–5μs
Phase Continuous: 2 MHz band, even or odd steps

Output: +3 to +13dBm; 50ohm
Spurious Outputs: –65/–60dBc (typ/spec)
Phase Noise: –70dBc (0.5Hz–15KHz)

Freq. St'd: OCXO, TCXO, Ext.
Interface: BCD par. or GPIB
Price: $2,575.00*

OTHER OPTIONS

Programmable Attenuator 0–90dB (or 0–99dB with GPIB)
n x 10 MHz output (20–140 MHz) or any 10 MHz line

*Prices are US only, and include manual & remote (BCD) control, 1 Hz resolution, OCXO std.

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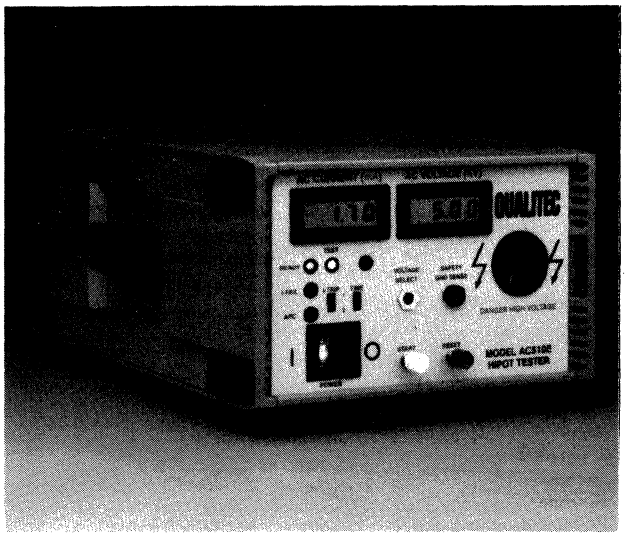

DIGITAL AUTOMATIC

- HIPOT TESTERS
- MEGOHMMETERS
- INSULATION RESISTANCE TESTERS
- 10, 25, 30 AMP GROUND CONTINUITY TESTERS
- REMOTE CONTROLS
- IEEE-488
- MANY OPTIONS

GPIB HPIB

FEATURES

- Variable High Voltage Insulation Testing
- Leakage Current Testing
- Ground Continuity Testing
- Automatic Test Cycle
- Solid State Controls
- Super Sensitive Arc Detection (Less Than 3 µsec)
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- Zero Crossing Ramp Control
- Switch Selectable and Continuously Adjustable Voltage Ramp Rates
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- IEEE-488 Programmable (GPIB & HPIB)
- Digital Panel Meters
- Compact and Lightweight
- Safety Ground Interlock
- User Adjustable Ground Resistance Monitor Levels
- Separate Audible and Visual Failure Alarms for Arcs, Excessive Leakage Current and Ground Continuity Failures
- Usable on products with 2 or 3 Wire Power Cords
- Usable also on products without Power Cords
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- Switch Selectable and Continuously Adjustable Test Dwell Times
- Operates on both 115VAC and 240VAC, 50Hz and 60Hz Line Power Sources
- Warranty - 1 Year Parts & Labor
- Made in USA

SIMPLE and ACCURATE

QUALITEC testers are easy to use. They can be operated accurately and consistently by low skilled personnel who have no prior experience with High Voltage testing. QUALITEC testers incorporate several non-destructive tests in one test cycle, including ARC detection, LEAKAGE CURRENT monitoring, INSULATION RESISTANCE measurement, and GROUND CONTINUITY monitoring with separate audible and visual failure alarms for each type of test; and indicates exactly which type of failure occurred for quick, easy, accurate troubleshooting of the device under test.

VERSATILE

QUALITEC testers have many features which allow versatile use by design engineers, test engineers, reliability engineers, quality control inspectors, production operators and others. A QUALITEC tester is versatile enough to be operated even by your personal computer which will allow you to record, analyze and print out test results. All of QUALITEC's AUTOMATIC Hipot Testers, Insulation Resistance Testers, Meghometers, and 10, 25, 30 Amp Ground Continuity Testers have DIGITAL PANEL METERS and are available with Remote Controls. QUALITEC testers have every feature you need...just **ASK US**.

COMPLIANCE

QUALITEC testers test in compliance to virtually all regulatory agency requirements including UL, CSA, VDE,IEC,BSI, BABT, TUV, FCC, JIS and MIL-SPECS.

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Panduit

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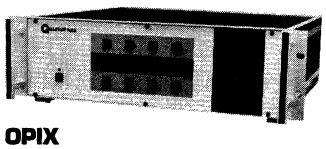
Video test generator selection guide

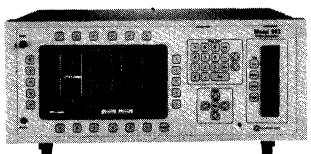
...for businesses involved in:

- **Display Manufacturing**
- **Video Projectors**
- **Engineering Workstations**
- **Personal Computers**
- **Medical Imaging**
- **Military Imaging**
- **Video Monitor Service**
- **Flat Panels**

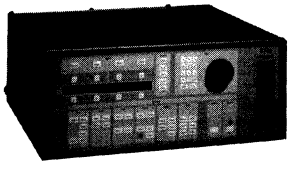
New 801GP



OPIX



New 903



8701-E

Quantum video generators have earned an enviable reputation for quality and reliability in engineering, manufacturing, quality control and service applications throughout the world. They simulate the wide variety of signal timings encountered when evaluating video displays ... save set up time and the expense of buying a multitude of video graphics cards. Call, FAX or write for a video tape and additional product information. We'd like to hear about your application and help you choose the best possible video generator for your needs.

Model Number	801GP	901 *	902 *	8701E-3	Opix	903	8701E-6*	8701E-1
Price	$2,495	$4,950	$8,500	$10,500	$12,500	$11,500	$15,150	$22,700
Analog Outputs MHz	4.7 - 75	1 - 87	2 - 135	2 - 135	1.56 - 200	1 - 250	3.125 - 285	3.125 - 400
Pulse RiseTime	3 nS	3.5 nS	2.5 nS	2.5 nS	2 nS	1.5 nS	800 pS	500 pS
Displayed Colors	16	256	256	256	256	256	256	256
Color Palette Size	16.7 Million	16.7 Million	16.7 Million	16.7 Million	16.7 Million	16.7 Million	16.7 Million	16.7 Million
Gray Levels	256	256	256	256	256	256	256	256
Output Protection	Yes	Yes	Yes	Yes	Ground Bracket	Yes	Yes	Yes
Connectors	BNC,IBM,MAC	BNC	BNC	BNC	BNC	BNC	SMA	SMA
Digital Outputs TTL / ECL (MHz)	4.7-75	1 - 50	1 - 50 /135	1 - 135	1 - 200	1 - 200	(opt) 2- 285 ECL	(opt) 2 -400 ECL
TTL Outputs	6	8	8	8	8	8	None	None
ECL Differential Outputs	None	None	4	8	8	4	3 (opt)	3 (opt)
Colors	16	256	256	256	256	256	8 (opt)	8 (opt)
Output Protection	Yes	Yes	Yes	Yes	No	Yes	No	No
Connectors	IBM,MAC	24 Pin Micro	24 Pin Micro	DB-25	Berg	24 Pin Micro	SMA	SMA
Graphic Video Memory	1K x 1K x 4	2K x 2K x 1	2K x 2K x 1	8,4,2,1 bit / pel	8,4,2,1 bit / pel	2K x 2K x 1	8,4,2,1 bit / pel	8,4,2,1 bit / pel
Horizontal Timing (KHz)	1-100	1 -250	1 -250	8 - 250	1 - 625	1 -250	8 - 250	8 - 250
Resolution	1 Pel	1 Pel	1 Pel	1 Pel	1 Pel	1 Pel	1 Pel	1 Pel
Active Video	1- 1024 Pels	1 - 2048 Pels	1- 2048 Pels	1 - 16384 Pels	1 - 16384 Pels	1 - 2048 Pels	1- 16384 Pels	1- 16384 Pels
Connectors	BNC,IBM,MAC	BNC	BNC	BNC	BNC / Berg	BNC	BNC	BNC
Vertical Timing (Hz)	1 - 650	1 - 650	1 - 650	.061 - 125,000	1 - 34,000	1 - 650	.061 - 125,000	.061 - 125,000
Resolution	1 Line	1 Line	1 Line	1 Line	1 Line	1 Line	1 Line	1 Line
Active Video Lines	1-1024	1 - 2048	1 - 2048	1 - 65535	1 - 4096	1 - 2048	1 - 65535	1 - 65535
Serrations	Yes	On / Off	On / Off	On / Off	On / Off	On / Off	On / Off	On / Off
Equalizing Pulses	Yes	0 - 100	0 - 100	Yes	Yes	0 - 100	Yes	Yes
HDTV Sync (tri-level)	No	Yes	Yes / Prb	No	No	Yes / Prb	No	No
Connectors	BNC,IBM,MAC	BNC	BNC	BNC	BNC/Berg	BNC	BNC	BNC
Format Storage EPROM	50	None	None	None	3	None	None	None
CMOS / Battery	None	None	None	None	12	None	None	None
3 1/2" Floppy Disk	None	500 per disk	500 per disk	99	1200 (option)	500 per disk	99	99
Test Images Built-in	10	35	35	56	56	35	56	56
Custom Image Storage	No	Unlimited	Unlimited	99 per disk	Unlimited	Unlimited	99 per disk	99 per disk
Circle Drawing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test Sequence Storage	None	Unlimited	Unlimited	99 per disk	12	Unlimited	99 per disk	99 per disk
Characters Built-in	7x9	3 Font Sets	3 Font Sets	7 Font Sets	5x7,7x9	3 Font Sets	7 Font Sets	7 Font Sets
Custom	None	Unlimited	Unlimited	None	Unlimited	Unlimited	None	None
Maximum Matrix	None	64 X 64	64 X 64	None	Unlimited	64 X 64	None	None
Font Editor	None	Included	Included	None	Option	Included	None	None
Interfaces RS-232	Yes	Option	Option	Yes	Yes	Option	Yes	Yes
IEEE-488	No	Option	Option	Option	Yes	Option	Option	Option
Printer	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Novell Network	No	Option	Option	No	No	Option	No	No
Features Front Panel Display	LCD 16 x 2 Char	CRT 720 x 348	CRT 720 x 348	LCD 40 X 2 Char	LCD 40 X 2 Char	CRT 720 x 348	LCD 40 X 2 Char	LCD 40 X 2 Char
User Defined Buttons	None	22	22	None	8	22	None	None
HDTV Formats Included	None	4	4	None	None	4	None	None
External Keyboard	No	Yes	Yes	No	No	Yes	No	No
Keyboard Lockout	None	Software	Software	No	Yes	Software	No	No
Clock Output	None	Yes	Yes	Yes	Top Octave	Yes	No	No
Expansion Slots	None	6	6	None	None	6	None	None
Upgrade Option Available	No	Yes *	Yes *	No	No	No	Yes *	No

* An upgrade option is available for this model. You pay the difference between your original sales price and the price of any upgraded model in the same product series. This offer is available anytime within 12 months of your original purchase.

900 Series Products: 901, 902, 903 • **8701 Series Products:** 8701E-1, 8701E-3, 8701E-6

Prices and specifications subject to change without notice.

All Quantum Data products are manufactured in the U.S.A.

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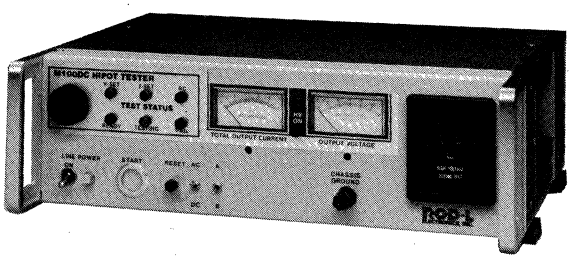
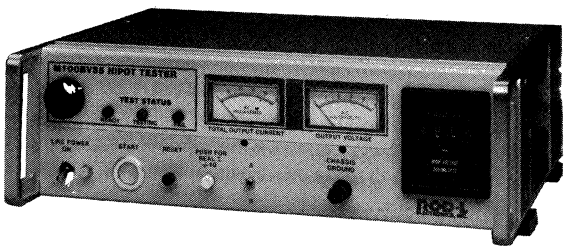
ROD-L Is The Only Manufacturer Of UL Listed Hipot And Ground Continuity Testers.

MODELS M100DC, M100 and M500 HIPOT TESTERS





Perform safe, rapid testing for dielectric withstand and ground continuity in one simple operation.

The ROD-L Hi-Pot Testers are designed to perform the tests specified by U.L., I.E.C., C.S.A., V.D.E. and F.C.C. The hipot test is a potentially dangerous operation, so the ROD-L product line has been designed with emphasis on safety, on efficiency and on speed with which the test can be made.

SAFE, FAST AND EFFICIENT

With a ROD-L Hi-Pot Tester you get these standard features:

- electronically controlled voltage rate-of-rise to ensure gradual, smooth and consistent rise time (eliminates harmful voltage spikes).
- electronically controlled voltage shutdown. Fast shutdown (2 ms) prevents harm to operator and protects the device under test.
- electronic, adjustable timing circuit to provide accurate, reliable test time (1 sec to 90 seconds).
- front panel receptacle, rated to withstand 5000 VAC, for direct plug-in of device under test or for plug-in of test fixture; provides maximum safety and dramatically reduces the time required to perform the test.
- front panel voltmeter to indicate hipot output voltage; front panel ammeter to indicate current drawn by the device under test.
- concurrent dielectric withstand and ground continuity tests in a single operation. Security chassis ground test to ensure operator safety.
- completely solid state for reliability, TTL logic allows computer interface. Rack mountable. Performs all U.L., C.S.A., I.E.C., V.D.E. and F.C.C. etc., test requirements.
- detects arcs of minimum 10 microseconds duration

SIMPLE OPERATION

The hipot tester applies the test voltage to the device being tested for a duration of time preset from 1 second to 90 seconds. The device under test simply plugs into the front panel outlet, rather than being attached with clip leads. Clip leads can be used, however, for devices without a power cord.

Test limits for leakage current are preset by the user. In the event of failure, automatic circuitry turns off the high voltage within 2 ms, lights the "failure" lamp and sets off an audible alarm. This audible and visual alarm must be reset by the user. (Meets U.L. requirements).

Use a ROD-L Hi-Pot Tester for production line testing, incoming inspection, and in-product development.

SPECIFICATIONS

PARAMETER	MODEL M100/M500	MODEL M100DC
Input	115/230 VAC, 44-66 Hz	115/230 VAC, 40-70 Hz
Output Voltage	0-5KVAC	0-5.5KVDC
Voltage Ramp	1-30 Sec.	1-30 Sec.
Output Current	0-500 mA	0-10mA
Test Duration	1-90 Sec.	1-90 Sec.
Voltage Shutdown	2mS	2mS
Arc Detection Sensitivity	≥ 10 MicroSec.	10 MicroSec.
Ground Sense	.1 ohm or .5 ohm	.1 ohm or .5 ohm
Failure Indicator	Visual & Audible	Visual & Audible
Dimensions (43 x 13 x 34 cm)	16¾" x 5¼" x 13¼" (43 x 13 x 34)	16¾" x 5¼" x 13¼" (43 x 13 x 34)
Weight	24 lbs. (11 Kg)	23 lbs. (10.4 Kg)

* Ammeter indicates total current on all units. The ROD-L model M100-BVS5 ammeter on switch selection, also indicates real (Resistive) current.

** Voltage shutdown with complete discharge of DUT with no voltage—transient generation.

*** Ground Resistance threshold standard is .1 ohms, .5 ohm may be specified at time of purchase.

OPTIONS

OPT. NO.	NAME	M100/M500	M100DC
01	Remote Control	√	√
02	Front Panel Test Time Control	√	
03	Front Panel Voltage Ramp Control	√	
*05	Hands Off Control	√	√
06	Rear Panel Lockout Cover	√	√
08	Switch Selected Failure Point	√	√
*09	100 μA Full Scale		√
10	Audible Test Tone	√	√
*14	Special Pin Assignment of Rear Panel Connector	√	√
15	Rack Mount Kit	√	√
16	Divide By 10 Front Panel Switch Current Trip Point	√	
*18	Ohms Sense	√	
19	Remote Control (Programmable)		√
*20	Ohms Sense		√
22	Front Panel Voltage Control	√	
23	Digital Panel Meters	√	√
24	Blank Front Panel Receptacle & Start	√	√
27	"No Load" Trip Point Setting	√	
28	Two-switch Selectable Current Scales	√	

* Not Available when M25 required.

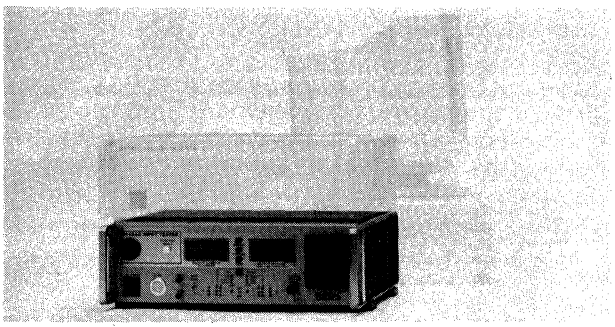
ROD-L ELECTRONICS ■ 923 Hamilton Avenue, Menlo Park, California 94025 ■ (415) 322-0711 ■ Toll Free: 1-800-548-6305 ■ Fax: (415) 326-1993

ROD-L ELECTRONICS, INC.

Fax: (415) 326-1993

ROD-L Is The Only Manufacturer Of UL Listed Hipot And Ground Continuity Testers.

IEEE-488 BUS-COMPATIBLE HIPOT TEST SYSTEM MODEL M150AC



IEEE—488 BUS PROGRAMMING

The Model M150AC Hipot Test System, when operated via the Model M988C IEEE-488 BUS INTERFACE, functions as both a "Talker" (T) and a "Listener" (L) in conjunction with the following signals:

- Output Voltage (T / L) 100-5,000 VAC
- Output Voltage Ramp Rate (L) 1 Sec-30 Sec.
- Test Time (L) 1 sec. to 100 sec.
- Total Current Trip Point (L) 50mA
- Total Current Magnitude (T)
- Real Current Trip Point (L) 50mA
- Real Current Magnitude (T)
- Under Current Trip Point (L) 50mA
- Test Status
  - Ready (T)
  - In-Progress (T)
  - Passed (T)
  - Failed (T)
- Type of Failure (T)
- Start (L)
- Stop (L)
- Reset (L)

OTHER ROD-L PRODUCTS:

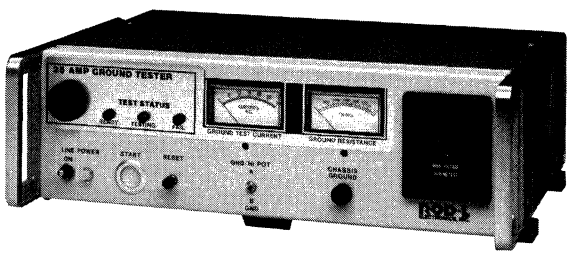
M900 — International Receptacle Adaptor
Unit adapts Rod-L Hipot/Resistance Testers with 7 standard international and special domestic receptacles.

M915 — Remote High Voltage Adaptor
A half-sized unit for remote control of Rod-L Hipot Testers with Hands-Off Operation.

M950 — Hands-Off Controller
A unit that controls the operation of a Rod-L Ground Tester and Hipot Tester with the Operator's hands occupied, i.e., OFF the Device Under Test.

M988C — IEEE 488 Bus Interface Adaptor
A unit that interfaces between computers/controllers and Rod-L Hipot/Resistance Testers.

MODEL M25 GROUND CONTINUITY TEST INSTRUMENT



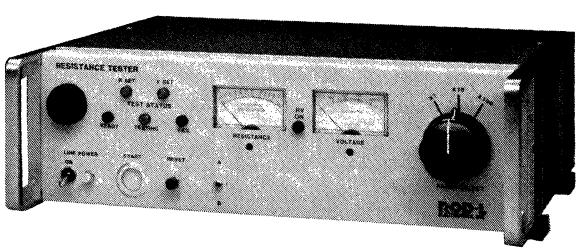
FEATURES:

- Interface enables interconnecting to any ROD-L Hipot Test Instrument to form an automatic test system

SPECIFICATIONS:

Output: 2.5 volts, up to 30 amperes (30 amps full scale ±5%, F.S.)
Voltage Rise: Instant on at first sinusoidal zero crossing — initiated with START button
Test Time: 1 second to 90 seconds (5 to 7 seconds — standard factory setting)
A-C Resistance: 0 to 0.15 ohm, accurate to ±5%, F.S.
Power Requirements: 115/230 vac, 44-66 Hz
Dimensions: 16¾" x 5¼" x 13¼" (43 cm x 14 cm x 34 cm)
Weight: 30 lbs. (13.6 Kg) Net, 35 lbs. (15.9 Kg) Shipping

MODEL M300RT INSULATION RESISTANCE TEST INSTRUMENT



SPECIFICATIONS:

Insulation Resistance Detection: Up to 4000 MEGOHMS
Output Test Voltage: 500 VDC
Voltage Ramp: User adjustable from 50V/Sec to 500V/Sec
Test Cycle: 1 second to 180 seconds, adjustable
Shutdown: 2 milliseconds after any failure
Power Requirements: 115/230 VAC, 44-66 Hz, 300-watts maximum
Dimensions: 16¾" x 5¼" x 13¼" (43 cm x 13 cm x 34 cm)
Weight: 24 lbs. (11 Kg) Net
Color: Mint gray/Olive gray
Option 25 available: Two-voltage switch (250V/500V normal)

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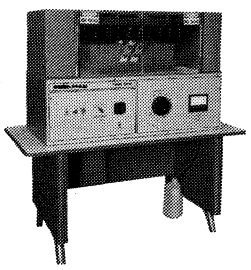
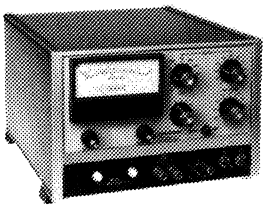
Rosemount Analytical

THE COMPLETE RANGE OF INSULATION TEST EQUIPMENT ONLY FROM ROSEMOUNT ANALYTICAL

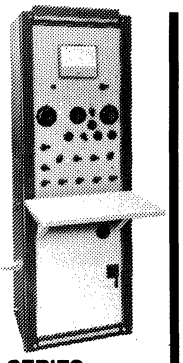
For insulation resistance resistivity...dielectric strength and breakdown...permittivity and dissipation factor...or even tracking and erosion resistance...we have the right instrument for your application. Let Rosemount Analytical go to work for you today.



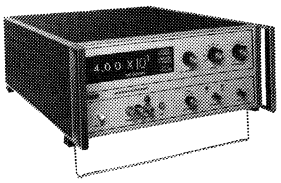
TRACKING AND EROSION RESISTANCE TEST SET...
MODEL TERT 1A-10



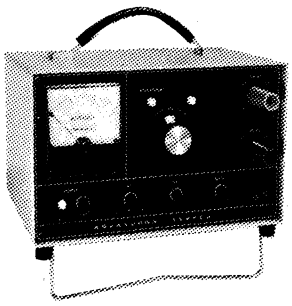
PRECISION WIDE RANGE MEGOHMMETER...
MODEL L-12



HIGH VOLTAGE SCHERING BRIDGE...
MODEL PS SERIES



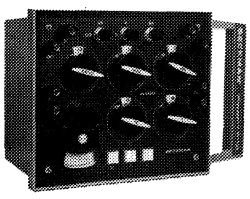
PROGRAMMABLE DIGITAL MEGOHMMETER...
MODEL L-9



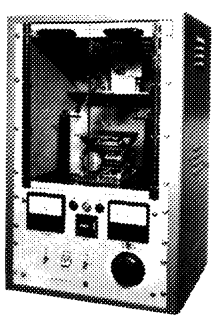
VOLTAGE BREAKDOWN TESTER...
MODEL P-2B

ARC RESISTANCE TESTER...
MODEL ART

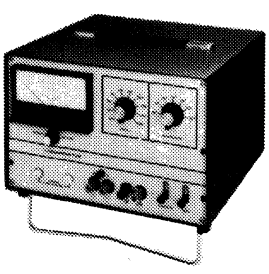
LIQUID POWER FACTOR TESTER...
MODEL PF-2B



WHEATSTONE BRIDGES...
MODEL RN

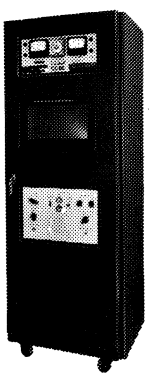


COMPARATIVE TRACKING INDEX TEST SET
MODEL DT-1



BUDGET-PRICED MEGOHMMETER...
MODEL L-10A

DIELECTRIC VOLTAGE WITHSTAND TEST SET...
MODEL P-9A



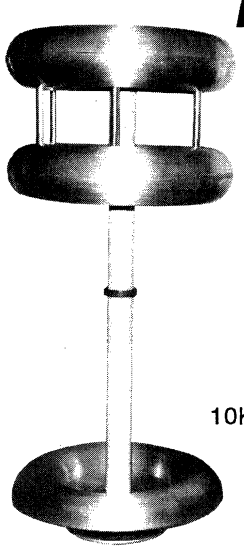
AC BREAKDOWN TESTERS...
PA SERIES

Rosemount Analytical Inc.
89 Commerce Road
Cedar Grove, NJ 07009
Tel (201) 239-6200
Twx (710) 994-5781
Fax (201) 857-9403

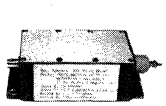
ROSEMOUNT ® Measurement Control Analytical Valves

WIDEBAND HIGH VOLTAGE VOLTAGE DIVIDERS AND PROBES

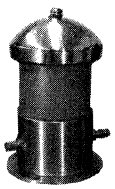
DC-10MHz • 1KV TO 900KV PK



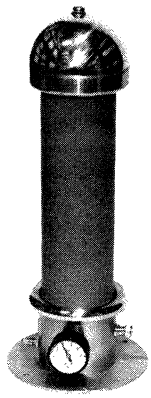
300KV PK-900KV PK



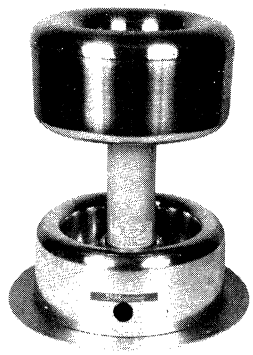
1KV PK-5KV PK



10KV PK-30KV PK

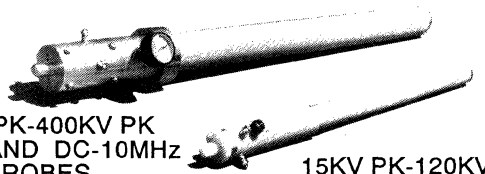


30KV PK-240KV PK



30KV PK-240KV PK SHIELDED

OUTDOOR 15KV PK-900KV PK



15KV PK-400KV PK WIDE BAND DC-10MHz PROBES

15KV PK-120KV PK DC, 50/60 Hz PROBES

DIGITAL MULTIMETER VMD-2

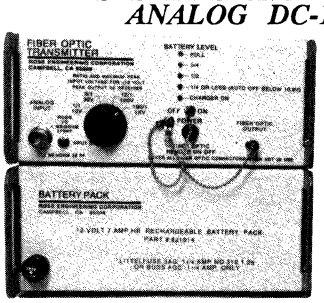
High voltage digital multimeter designed to supplement high voltage probes and HV voltage dividers.

ROSS ENGINEERING CORPORATION'S HV wide-band DC to over 10 megahertz voltage dividers can be made to match most instrument impedances and sensitivities. Most units are hermetically sealed with a low pressure non-toxic insulating gas. They can also be ordered for use in oil. Accuracies 0.01% to 0.2% DC, 0.5% to 1%, 50-400Hz, wide band DC-1MHz 3%, 5-10 MHz 3DB.

Power class dividers and probes are capable of accurate measurement and wide-band transient recording with full Basic Impulse Level withstand capability, 600V to 500KV RMS class to 1300KV PK BIL.
Also available are ***weatherproof outdoor models*** for use up to 900 KV DC or AC PK. They are compensated resistance-capacitance wide-band DC to 10MHz and are balanced to provide safe voltage gradients with less loading capacitance, better high frequency accuracy and low corona.

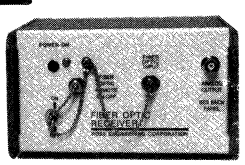
Applications include use with *panel meters, recorders, digital multimeters, oscilloscopes or computers* to measure, view and record DC, AC, transient pulse or pulse train and modulated CW. Also operates with Ross Engineering Corporation's analog fiber-optic amplifiers and transmission systems wide band DC to 10MHz.

FIBER OPTIC TRANSMISSION SYSTEMS AVAILABLE ! ANALOG DC-10MHz



TRANSMITTER

RECEIVER



±0.1V PK TO 1000V PK INPUT ±10V PK OUTPUT
115V/230V AC, 12V DC BATTERY POWERED

ROSS ENGINEERING CORP. 540 WESTCHESTER DRIVE, CAMPBELL, CA 95008
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MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
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Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
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EBCDIC Code **D**•1110
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Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

POWER LINE INTERFERENCE AND ESD SIMULATORS.

Interference on AC or DC power lines and ESD are major causes of downtime on microprocessor-based products. Schaffner EMC provides equipment which enables engineers to simulate interference during product development. Protective devices can then be installed to improve product performance and greatly reduce interference susceptibility.

Schaffner offers a wide variety of equipment for simulating and diagnosing interference and ESD problems. The following is a review of the types of equipment offered. For more information, call 1 (800) 367-5566, or contact your local Schaffner Representative.

A. NSG 200 SYSTEM SIMULATES AC AND DC INTERFERENCE.

A modular system consisting of the NSG 200E Mainframe and any of six different Interference Simulator Plug-Ins. The various Plug-Ins simulate AC interruptions and dropouts, fast rise time pulses up to 2.5 kV, high energy pulses up to 3 kV or burst interference simulation up to 4 kV. DC interruptions can be simulated as well.

B. NSG 600 SYSTEM AUTOMATES CONTROL OF AC AND DC INTERFERENCE SIMULATION.

The NSG 600 Interference Simulator System generates all of the interference simulated by the NSG 200 System described above, utilizing microprocessor control. It can also be computer controlled to allow hands-free operation and report generation. The built-in microprocessor permits precise control of all operations.

C. NSG 500 SERIES OF HIGH VOLTAGE AND HIGH ENERGY GENERATORS.

These units are designed to deliver high energy and high voltage interference pulses to the equipment under test. The NSG 500C (shown) simulates interference commonly found on automobile electrical systems to the latest ISO and SAE specifications. The NSG 587 simulates lightning and high energy switching surges.

D. NSG 430 SERIES OF SIMULATORS.

Schaffner is the world leader in ESD simulation. We developed our first ESD simulator 15 years ago. The NSG 432 (shown) is our latest design. This functional unit has many features which duplicate events causing many field problems.

For more information contact:

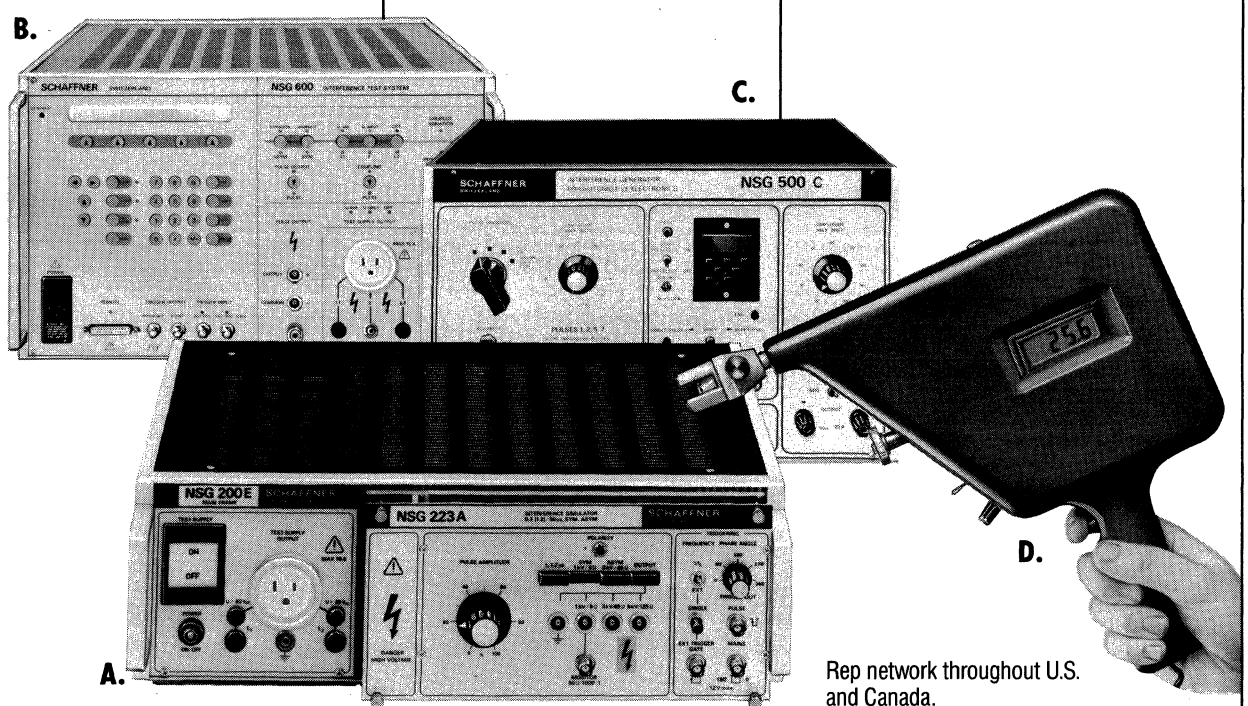
SCHAFFNER

Your ally in electromagnetic compatibility.

Schaffner EMC, Inc., 825 Lehigh Ave., Union, NJ 07083 • 1 (800) 367-5566

• (908) 851-0644 • **1-800-367-5566**
• Telefax (908) 851-0116

• RFI Suppression Filters • EMC Test Equipment • Schwarzbeck EMI/RFI Test Equipment • Test and Application Services



Rep network throughout U.S. and Canada.

Sensitive Research*

*A TRADEMARK OF EIS

ELECTRICAL INSTRUMENT SERVICE, INC.

25 DOCK STREET, MT. VERNON, NY 10550 914-699-9717 FAX 914-699-9410

MULTIRANGE SHUNT

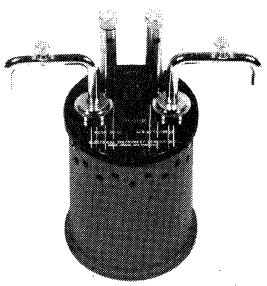
The Model MRS Multirange Shunt is designed for use with and extends the usefulness of "150 MV" potentiometers or precision digital voltmeters in the precise measurement of direct current (up to 15 Amperes) and in the calibration of DC Ammeters and Wattmeters.

The Multirange Shunt has eight ranges which are selected by a range selector switch. Each switch position indicates a multiplying factor and the maximum measurable value.

LOW VALUE RESISTORS

- metal case provides electrostatic shielding
- low power dissipation reduces errors due to self heating
- traceability to NIST (NBS)

SERIES RS REICHSANSTALT-TYPE RESISTANCE STANDARDS



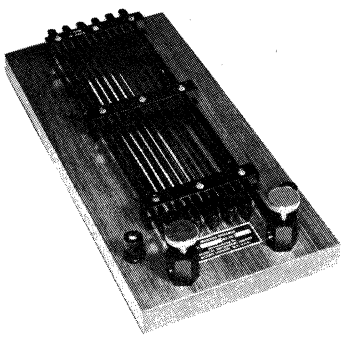
The Model RS Resistance Standard is constructed using a low temperature coefficient material mounted in a metal case through which oil can be circulated to maintain a constant temperature.

The specified value of the resistance standard is taken across a pair of "potential terminals" which are used for measuring the potential drop across the resistor.

LOW VALUE RESISTANCE STANDARD

- precision standard
- calibrate low value resistors such as multi-range shunt
- precision current measurement with potentiometer

SR SERIES SHUNTS



Primarily, these low resistance standards or shunts are used in accurate measurements of large currents by the potentiometric method. They may be used as comparison standards by either the adjustable ratio Kelvin Bridge or the potentiometric method. The nominal resistance is that as measured between the potential contacts.

The shunts have been designed to provide ample radiating surface for operation in air at ordinary room temperature at their rated current carrying capacities. A resistor of this type may be used in place of a Reichsanstalt type if a ±0.04% limit of error is satisfactory.

The SR-15(illustrated), SR-100 and SR-300 resistors consist of a continuous strip of one or more folds of a resistive material held in position by spacers.

LOW VALUE RESISTANCE STANDARD

- precision standard
- calibrate low value resistors such as multi-range shunt
- precision current measurement with potentiometer
- traceability to NBS

SPECIFICATIONS

MULTIRANGE SHUNTS

MODEL	RESISTANCE TOTAL	CURRENT AMPERES	ACCURACY	DIMENSIONS INCHES	WEIGHT
MRS	2 OHMS	0.75, 0.15, 0.3	±0.02% AT 25°C	6.3" x 6.3" x 4.75"	4.25 LBS.
		0.75, 1.5, 3.0, 7.5 AND 15.0			

SERIES RS REICHSANSTALT-TYPE RESISTANCE STANDARDS

MODEL	RESISTANCE TOTAL	CURRENT AMPERES	ACCURACY	DIMENSIONS INCHES	WEIGHT
RS-.01	.01	10	.001%	6.75 X 6 X 3.625	2.25 LBS
		30	.05 %		
RS-.1	.1	3	.001%	6.75 X 6X 3.625	
		10	.05 %		

SR SERIES SHUNTS

MODEL	RESISTANCE TOTAL	CURRENT AMPERES	ACCURACY	DIMENSIONS INCHES	WEIGHT
SR-15	0.1	15	±0.04% WHEN COOLED BY AIR AT ROOM TEMPERATURE	15 X 7 X 3.5	4 LBS.
SR-100	0.01	100		20 X 8 X 7.5	15 LBS.
SR-300	0.001	300		19 X 6.5 X 9.5	13 LBS.

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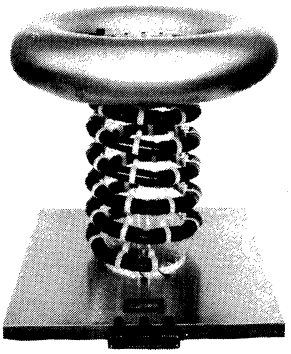
HIGH VOLTAGE MEASUREMENT



PARK

High Voltage Divider

Model PARK Voltage Divider is constructed to a design by J. H. Park. (Ref: "Journal of Research" of National Bureau of Standards, Engineering and Instrumentation Vol. 66C, No. 1, Jan.—Mar., 1962. Reprints available upon request.) It is similar to the NBS standard employed in their calibration of high voltage instruments. Each 100 kv divider consists of 100 individually shielded one-megohm resistors, matched to each other to achieve an approximate temperature coefficient of less than 1 ppm/°C, and connected in series to form a vertical helix between a ground plate and a high voltage electrode. Uniquely shielded, testing indicates that corona, heating and leakage errors are less than 10 ppm at less than 10 ppm at 50 kv and 50 ppm at 100 kv.

The divider's special "hat" is designed to give uniform gradients from the high voltage electrode to ground and allows stacking of additional 100 kv units for higher voltage measurements. Each unit is only 22¼" high! DC Ratio Accuracy: ±.05%, 100 kv to 1 v; ±.5%, 100 kv to 1 kv. AC Ratio Accuracy: ±.5%, 50 kv (max.) to 500 v. (60 cps only). Recommended readout instrument at 1 v output tap is a precision DC potentiometer, at 1 kv tap (.5 kv on AC) recommended instrument is a ±.5% accurate electrostatic voltmeter **(Sensitive Research** Model ESD described below).

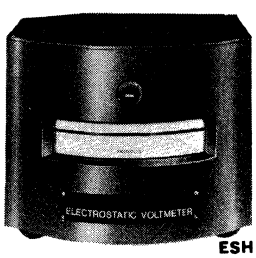
DCHI

Special High Voltage Dividers

Based on experience with the many Park Dividers already manufactured and their proved reliability, special designs have been constructed and proposed. These special dividers are essentially the same as the Park except for such criteria as sensitivity and size. Designs up to 600 KV DC at ±1% accuracy have been constructed and successfully used by our customers. Dividers for use up to 1,000,000 volts are under consideration. Although most designs considered so far have been for single ranges, there is no particular objection to building a divider with several ranges. Present certification by NBS is limited to 100 KV but higher ranges can be calibrated by "bootstrapping" methods.

DC Kilovoltmeter (multirange)

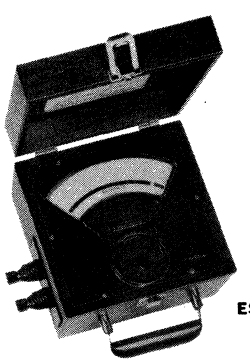
Model DCHI is a multirange permanent magnet moving coil, DC kilovoltmeter. Available at 50,000 ohms/v, ±1% fs accuracy, ranges of 1.5/3/7.5/15 kv or 3/7.5/15/30 kv, and at 75,000 ohms/v, ±.5% fs accuracy, ranges of 2/5/10/20 kv. The indicator is a University Model ±.5% accurate microammeter with a 4" scale length. It is self-contained in a moulded bakelite case and internally bracketed to the instrument panel. Size: 13¾" x 7½" x 8" h.



ESH

Electrostatic Voltmeter (high voltage)

Model ESH AC/DC electrostatic voltmeter is available as a single range instrument up to 100 kv fs (140 kv DC only), or with as many as 4 switch-controlled ranges from 5 to 50 kv fs. DC input resistances to 5 x 10^{15} ohms. Capacitance varies from approx. 30 mmfd on 5 kv range to 10 mmfd on 50-100 kv ranges. Reads true RMS. Accuracy is ±1% fs (±.5% up to 30 kv on special order). 6" scale length. Transit lock and brackets for panel mounting available. Maximum frequency usage is expressed as follows: $f = 2$ fCE, where $f =$ max. allowable operating frequency, $C =$ capacitance of instrument in farads, $E =$ voltage in volts.



ESD

Electrostatic Voltmeter (portable)

Model ESD portable AC/DC electrostatic voltmeter is available as a single or multirange instrument to measure from 120 to 6 kv fs. Insulation resistance is 1 x 10^{15} ohms. Capacitance varies from approx. 225 mmfd for a 120 v range to 20 mmfd for a 6 kv range. Multirange instruments are designed for AC/DC measurements on first range, AC only on higher ranges. ±.5% to 1% fs accuracy (±1.5% for ranges of 150 v and less). 5.2" scale length. Size: 7¾" x 7½" x 6 1/16". Available as edgewise panel instrument with the same performance characteristics except insulation resistance approx. 1 x 10^{13} ohms.

Electrostatic Voltmeter (small portable)

University Model is a smaller, more economical version of the portable Model ESD. Single and multirange instruments available from 300 v to 5 kv fs. ±1% fs accuracy. 4" scale length. Moulded bakelite case. Size 5¼" x 5" x 4⅜".

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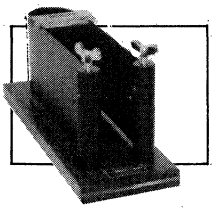
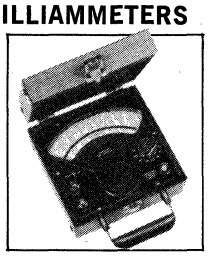
THERMOCOUPLE METERS AC-DC WATTMETERS

Thermocouple instruments offer the user significant advantages in frequency response and sensitivity over other AC types with true rms response. They can be used on DC and AC from 7 cps to 20 Mc/s, and in instances where UHF thermal converters are employed, this frequency range can be extended to over 100 Mc/s. **Sensitive Research** thermoelements have excellent AC/DC transfer characteristics (low reversal). Thermocouple instruments can be calibrated directly on DC and only their AC/DC difference, or frequency influence, has to be checked by AC transfer methods. A thermocouple field replacement feature (TRF) is supplied in the Models A and AU. Automatic or manual "Push to Read" overload protection is available. Automatic temperature compensation from 20° to 30° C is standard (except University Model).



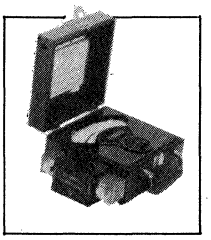
AUDIO FREQUENCY VOLT AND MILLIAMMETERS

Model A series consists of AC/DC multirange milliammeters and single or multirange voltmeters. Accuracy is ±0.5% fs (±0.75% for instruments with fs ranges of 3 ma or less or a sensitivity of 500 ohms/v). Multirange combinations are offered from 1 ma to 1.5 amps; 0.2 v to 1.5 kv. Frequency range is 7 cps to 7 Kc/s on voltage and 7 cps to 15 Kc/s on current. Sensitivity is 100, 200 or 500 ohms/v. 6.3″ scale length. (Single range milliammeters have a frequency response up to 1 Mc/s and are listed under Model RF.) Model AU is identical to the Model A, except frequency range is extended to 35 Kc/s on voltage and 20 Kc/s on current.



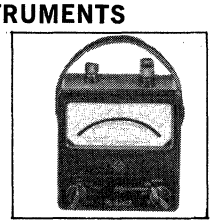
RADIO FREQUENCY VOLT, AMP AND MILLIAMMETERS

Model RF series consists of AC/DC single range and multirange instruments for use up to 20 Mc/s. Model RF multirange voltmeters utilize special switching to increase frequency range considerably beyond normal limits of other instruments containing this operational feature. Frequency influence is negligible over the first 20% of their frequency span. Accuracy is ±0.5% fs + (±0.5% max. frequency influence) on multirange units from 1 v (5 Mc/s) to 300 v (150 Kc/s). Instruments with a single range of 1 v or 3 v have a ±0.5% frequency response to 10 Mc/s. RF ammeters and milliammeters are available with accuracies of ±1% fs from 1 ma to 100 amps. 6.3″ scale length.



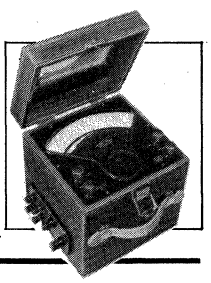
COMPACT THERMOCOUPLE INSTRUMENTS

University Model comprises a series of ±0.75% accurate, low cost, small sized milliammeters and voltmeters for AC/DC measurements up to 7.5 Kc/s (single range milliammeters up to 500 Kc/s). Multirange instruments are switch controlled. Up to 7 fs ranges available from 2 ma to 1 amp or 200 mv to 300 v (100 or 500 ohms/v). 4″ scale length. University Model is comparable in general construction quality to Model A, but has certain limitations in range, frequency response, resolution and the accessory features it can contain (temperature compensation, TRF, etc.), because of relatively small size.



POLYPHASE WATTMETERS

Model PDW is a multirange 2 element AC/DC electrodynamometer wattmeter for the measurement of single and 3 phase power down to 50% PF and up to 800 cps. Can be used in 3 phase 3 wire circuits, single phase 3 wire circuits and 3 phase 4 wire circuits. Indicates 3 phase power for any combination of balanced or unbalanced loads. Accuracy ±0.5% fs. 6.3″ scale length. Model PDLW is a ±0.75% accurate wattmeter for use down to 20% PF and up to 500 cps. 5.2″ scale length. Compensating inductor available for third leg of 3 phase circuits to balance load imposed by wattmeter insertion.



AC-DC WATTMETERS GENERAL PURPOSE INSTRUMENTS

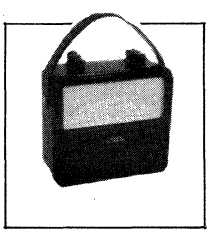
DC REFERENCE STANDARDS

Model C is a rugged ±0.25% fs accurate permanent magnet moving coil electrical indicating instrument. Moving element features an exceptionally high torque to weight ratio. 6.3″ scale length. Up to 9 self contained ranges available in switch controlled multirange combs. from 50 μv and 50 mv DC fs. Millivoltmeter available calibrated for use with external heavy current shunts. Sensitivities to 20,000 ohms/v. Design emphasis is on stability and sturdiness for long term accuracy and reliability.

Model S is a deluxe high sensitivity ±0.5% fs accurate instrument of the same superb quality and physical dimensions as the Model C. Up to 9 switch controlled ranges in various combs. available from 1.5 μa to 1 mv fs. Sensitivities to 500,000 ohms/v (1,000,000 ohms/v when zero center). Constant resistance multirange microammeters available for special applications. Low range multivoltmeters are particularly suited for use with thermal converters for ultra high frequency AC measurements. Model HS is an ultra high sensitivity multirange millivoltmeter designed mainly for use in corrosion and electrolysis measurements. Model J is a ±0.5% accurate instrument made pirmarily to use as a bench mounted, pointer type, high sensitivity galvanometer.

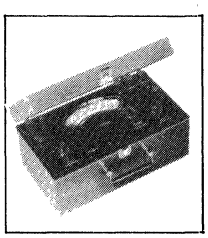
Model N is a low cost permanent magnet moving coil instrument with many features of higher priced indicators. Accuracy is ±0.5% or ±0.25% fs as required. Housed in a rugged plastic case for field use. Up to 5 switch controlled ranges available from 50 μa and 50 μv (up to 50 amps self contained). Sensitivities to 5000 ohms/v. 6.1″ scale length.

University Model is a low cost, compact, ±0.5% accurate version of the Model S, having slightly less sensitivity and resolution. Up to 5 switch controlled, self contained ranges from 2 μa and 2 mv fs. Sensitivities to 5000 ohms/v. 4″ scale length. Model UTS is a portable DC test set with 4 University Model indicating instruments to measure from 50 μa to 60 amps and 20 mv to 1200 v. Contains a Wheatstone Bridge, a decade resistance box and all necessary switching and facilities to make potentiometer voltmeter, zero resistance, DC power and high resistance voltmeter measurements.



VOLT-AMP-WATTMETER

Model VAW, volt-amp-wattmeters, are transformer-coupled electrodynamometers that make 50 to 125 cps or 50 to 800 cps tare-free compensated measurements of AC power down to 50% PF in 12 ranges from 12.5 w to 5 kw fs. Has potential drop ranges of 25/50/100/200/500 v fs; current ranges of 0.5/15/10 amps fs (12.5/25 w and 25/50 v included in 50 to 125 cps model only). Accuracy on current and voltage ranges ±0.5% fs; on watts ±0.75% fs. Switch controlled ranges. Measures all circuit parameters without necessity of changing external connections. Special 10 ma range for current measurements only. 5.2″ scale length. Self-contained in portable case.

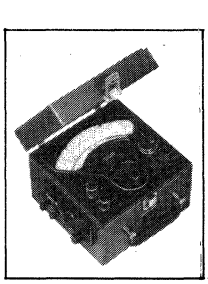


DIFFERENTIAL INSTRUMENTS

Model SD measures the difference between two DC currents or voltages. Inputs are isolated. Accuracy is ±0.5% fs for most ranges between 2 μa and 500 ma. Normally furnished zero center. Uniqueness is ability to withstand sustained overloads of 1000% which results in a 10X increase in comparison accuracy and scale resolution. 5.2″ scale length. Model JD is a differential galvanometer with a 3.25″ scale length that permits higher sensitivity. Suitable for horizontal bench mounting. Model JDJW-4 is an edgewise panel instrument with a 4″ scale length.

SINGLE PHASE WATTMETERS

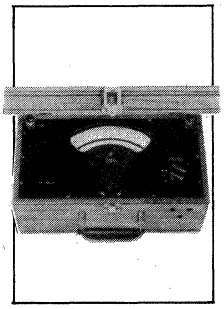
Model DW is a ±0.25% accurate single phase AC/DC electrodynamometer wattmeter for use down to 50% PF and frequencies of 25 to 800 cps (2500 cps on special order). Overall accuracy, ruggedness and stability make it ideally suited for use as either a calibration standard or general purpose testing instrument. 6.3″ scale length. Y Boxes available for measurement of balanced 3 phase power. Model DLW is a single phase ±0.5% accurate wattmeter for use down to 20% PF and up to 500 cps. University Model, having accuracies of ±0.5% fs down to 50% PF and ±0.75% down to 20% PF, is a compact version of the Models DW and DLW. Has the advantage of being more economically priced than these instruments while covering essentially the same wide measuring range. Molded bakelite case. 4″ scale length.



AC AND AC/DC REFERENCE STANDARDS

Model D is a rugged AC/DC ±0.25% fs accurate dynamometer electrical indicating instrument. 6.3″ scale length. Up to 4 self contained ranges available in switch controlled multirange combs. from 1.5 to 1000 v and 5 ma to 20 amps. Frequency response DC, 25 to 2500 cps.

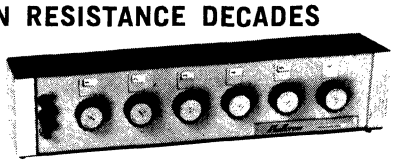
Model MI is a rugged ±0.5% fs accurate moving iron electrical indicating instrument. Up to 3 self contained ranges available from 10 ma to 20 amps and 7.5 to 750v. Frequency response 25 to 500 cps. 6.3″ scale length. Special transformer coupled voltmeter has 8 switch controlled ranges from 3 to 750 v fs. Model NSI is a low cost ±0.5% fs accurate version of the Model MI. Housed in a molded plastic field case. 6″ scale length. University Model is a compact low cost ±0.5% fs accurate version of the Model D. Up to 4 ranges available from 10 ma to 1 amp and 30 to 750 v. Frequency response DC, 25 to 125 cps (500 cps on special order). 4″ scale length.



PRECISION INSTRUMENTS

PRECISION RESISTANCE DECADES

SERIES 6800



SPECIFICATIONS

DC Accuracy at Terminals

±.02% 10 ohms and above

±.003 ohms below 10Ω

Zero Resistance

2 milliohms ±2 milliohms per decade (approximate). Each instrument is supplied with exact reading.

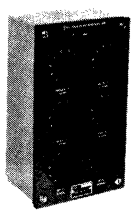
Wattage Rating per Step

½ watt above 1 ohm, ¼ watt for .1 ohm steps, .16 watt for .01 ohm steps.

Maximum Voltage

1500 volts DC where individual resistor ratings are not exceeded.

SERIES 800



SPECIFICATIONS

Resistor DC Accuracy

±.05% 10 ohms and above
±1% .1 ohm to 10 ohms
±5% .01 ohm to .1 ohm

Stability per Year

±.01% when operated within rated wattages over 10°C-40°C range.

Temperature Coefficient

Less than ±20 PPM 20°C-30°C.

Maximum Wattage

½ watt per resistor.

Maximum Voltage

2000 volts DC if wattage rating for resistors is not exceeded.

6800 SERIES BENCH AND RACK MOUNTED DECADE MODELS

Bench Model No.	Rack Model No.	No. Dials	Resistance Step Increments (Ohms)	Total Resistance (Ohms)	Bench Size (Inches)
6840	6840 RM	4	.01	111.1	17⅛ x 5 x 5
6841	6841 RM	4	.1	1,111	17⅛ x 5 x 5
6842	6842 RM	4	1	11,111	17⅛ x 5 x 5
6843	6843 RM	4	10	111,110	17⅛ x 5 x 5
6844	6844 RM	4	100	111,000	17⅛ x 5 x 5
6845	6845 RM	4	1,000	110,000	17⅛ x 5 x 5
6850	6850 RM	5	.01	1,111.1	19½ x 5 x 5
6851	6851 RM	5	.1	11,111	19½ x 5 x 5
6852	6852 RM	5	1	111,110	19½ x 5 x 5
6853	6853 RM	5	10	111,100	19½ x 5 x 5
6854	6854 RM	5	100	111,000	19½ x 5 x 5
6860	6860 RM	6	.01	11,111.1	19½ x 5 x 5
6861	6861 RM	6	.1	111,111	19½ x 5 x 5
6862	6862 RM	6	1	111,110	19½ x 5 x 5
6863	6863 RM	6	10	111,100	19½ x 5 x 5

800 SERIES BENCH AND RACK MOUNTED MODELS

Bench Model No.	Rack Model No.	No. Dials	Resistance Step Increments (Ohms)	Total Resistance (Ohms)	Bench Size (Inches)
817-A	817 ARM	4	.01	111.1	9⅝ x 7¼ x 5¼
819	819 RM	4	.1	1,111	9⅝ x 7¼ x 5¼
825	825 RM	4	1	11,110	9⅝ x 7¼ x 5¼
826	826 RM	4	10	111,100	9⅝ x 7¼ x 5¼
827	827 RM	4	100	1,111,000	9⅝ x 7¼ x 5¼
828	828 RM	4	1,000	11,110,000	9⅝ x 7¼ x 5¼
817-B	817 BRM	5	.01	1,111.1	10⅞ x 6¼ x 5¼
8285	8285 RM	5	.1	11,111	10⅞ x 6¼ x 5¼
829	829 RM	5	1	111,110	10⅞ x 6¼ x 5¼
830	830 RM	5	10	1,111,100	10⅞ x 6¼ x 5¼
831	831 RM	5	100	11,111,000	10⅞ x 6¼ x 5¼
817-C	817 CRM	6	.01	11,111.1	10⅞ x 6¼ x 5¼
8315	8315 RM	6	.1	111,111	10⅞ x 6¼ x 5¼
832	832 RM	6	1	1,111,110	10⅞ x 6¼ x 5¼
833	833 RM	6	10	11,111,100	10⅞ x 6¼ x 5¼

6800 AND 400 SERIES UNMOUNTED DECADES — SPECS EQUAL TO 800 AND 6800 SERIES

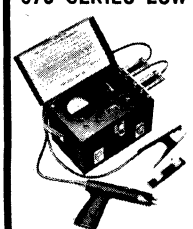
Dials	Ohm Steps	Total (Ohms) Resistance	Weight (Lbs.)	Model No.	Dimensions (Inches)	Model No.	Dimensions (Inches)
1	.01	.1	½	6800	2⅞ x 3	435	3 x 3
1	.1	1	½	6801	2⅞ x 3	436	3 x 3
1	1	10	½	6802	2⅞ x 3	437	3 x 3
1	10	100	½	6803	2⅞ x 3	438	3 x 3
1	100	1,000	½	6804	2⅞ x 3	439	3 x 3
1	1,000	10,000	½	6805	2⅞ x 3	440	3 x 3
1	10,000	100,000	½	6806	2⅞ x 3	441	3 x 3
1	100,000	1,000,000	½	6807	2⅞ x 3	442	3 x 3
1	1,000,000	10,000,000	½	6808	2⅞ x 3		

VALUE IN RESISTANCE MEASUREMENT

GALVANOMETER SYSTEMS WITH INTERNAL MAGNET CONSTRUCTION

Part No.	Sensitivity/ Div. in Microamps	Period Seconds	Coil Resistance	External Critical Damping Resistance
1961-A	1.0	3	250	950
1961-B	0.5	3	1000	2400
1961-C	2.0	3	50	125
1961-D	4.0	3	20	50
1966-B	0.25	4	1000	2000
1966-C	1.0	4	50	100
1964-D	1.5	4	30	40

670 SERIES LOW RESISTANCE TEST SETS

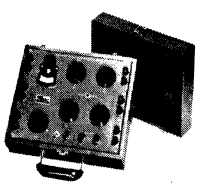


Six portable test sets offering the facility and operating speeds necessary for efficient production line testing of low resistances. Applications include the testing of welding bond resistances, welding cable resistances, switch contact resistances, etc. Six different measurement ranges (see chart below) with accuracies of ±5% of full scale values are available. A pistol grip probe and fixed clamp are standard accessories to facilitate production line tests.

657B pistol grip probe
676 fixed clamp
271 test standard 0.0025 ohm ±2%

Shallcross Type	No. of Ranges	Ranges in Ohms — Reading From 0 to Full Scale Value Indicated
670-A	6	0.001 0.005 0.01 0.05 0.10 0.50
673-D	5	0.005 0.01 0.50 1.0 5.0

638-R KELVIN WHEATSTONE BRIDGE



A portable Kelvin Wheatstone Bridge offering exceptional versatility and practicality. Wide measurement range is afforded by integrated Kelvin (.001 ohm to 10 ohms) and Wheatstone (1 ohm to 11 megohms) circuits. Internal galvanometer and compartment for 3 (1.5 volt) flashlight batteries supply portable operation in 0.1 ohm to 50,000 ohm range. Binding posts to connect external galvanometer (.005MA/MM sensitivity) and power supply (1 to 45 volts) supplied for higher resistance measurements. Limits of error are ±.75% (Kelvin circuit) and ±.2% (Wheatstone circuit). Rheostat arm is brought out to two binding posts to provide resistance decade operation (11,110 ohms on 1 ohm step increments) with ±.1% accuracy above 10 ohms and ±.25% for 1 ohm steps. Separate current and potential terminals are available for low resistance measurements.

6100 WHEATSTONE-FAULT LOCATION BRIDGE

All purpose portable instrument for laboratory and field resistance measurements. Fault location capabilities of wires and cables performed with, Murray, Varley, Hilborn and Fisher loop tests. DC resistance from 1 ohm to 1.011 megohms with ±2% limit of error. Built-in galvanometer and compartment for 3 (1.5 volt) flashlight batteries permit portable measurements to 50,000 ohms — binding posts to connect external galvanometer and power supply available for testing of higher resistances. Rheostat arm of bridge connects to two binding posts for decade resistance operation. Available housed in weatherproof metal case and removable lid or with wooden case and removable lid.

SHALLTRONIX CORPORATION

P.O. BOX 235, SELMA, NORTH CAROLINA 27576
TELEPHONE: (919) 965-6346

SIGNUM SYSTEMS CORPORATION

Universal In - Circuit Emulators

A full line of Microprocessors is now supported by the following models:

USP-51	**8051 family (Intel, Siemens, Signetics/Philips, AMD, OKI)**
USP-Z8	**Zilog Z8 family**
USP-96	**Intel 8096/80C196 family**
USP-25	**Texas Instruments 320C25 DSP (40 & 50 MHz)**
DSP-10	**Texas Instruments 320C10/15/16/17 DSP family**
SDT-X	**Intel 8086/88/186/188, NEC V20/30**
TRACE-32	**Motorola 68000 family, National 32000 family**

USP- ICE Main features

- 115 kBaud serial download
- Wide range of uP pods to emulate all other family members
- HLL debug for C and PL/M
- Real-time transparent emulation
- 32K frames (80 bits) of execution Trace Buffer, with time stamp
- In-line symbolic assembler and disassembler
- Up tp 256K of overlay Program RAM
- Up to 256K of overlay External Data RAM
- Unlimited number of real-time hardware breakpoints
- Complex Events to trigger Breakpoints or Trace logic
- Two 16 bit Pass Counters
- 8 level hardware break Sequencer
- 8 channel user logic state analyzer
- External Trigger input and outputs
- Performance analysis
- Trace display during execution
- Memory display/edit while executing
- Windowing or command driven user interfacer
- RS-232 interface to IBM-PC/XT/AT/386/486 and PS-2
- Made in U.S.A.

IBM-PC support

Model USP was designed to work with the IBM-PC/XT/AT/386 and compatible computers. A special window/menu user interface provides these unique features:

- Pop-up windows for Registers, Program, Data, Stack, and variable Watch
- Source level debugger window for C and PL/M with locals support
- Full screen edit with dialog boxes and mouse support
- On screen help
- Extensive Macro support

Complex Events

Event is a set of conditions that control the operation of complex program breakpoints and trace start/stop logic in real time.

There are 3 complex Events available, each consisting of the combination of the following:

- 256K address breakpoints or ranges
- 8 bit Data pattern with less than, greater than, equal, not equal, and don't care combinations
- RD, WR, INT, instruction fetch, operand read as qualifiers
- External input with programmable trigger polarity

In addition Events can be counted/delayed by the use of two 16 bit Pass Counters. An eight level hardware sequencer is available to sequentially trigger from/to any Event or Pass Counter.

Breakpoints

Breakpoints are used to stop user program execution preserving the current program status. Breakpoints can be triggered from a combination of:

- Address or range of addresses
- Complex Events
- Register value match
- External input
- Pass Counters
- Sequencer
- Trace full condition

Trace buffer

Trace buffer is a high speed RAM used to capture in real time all activity on the microprocessor internal bus and pins. A dedicated start/stop logic allows for filtering unwanted information from the trace buffer. Buffer will remember the selected 32K samples (frames) comprised of the following:

- Address Bus
- Data Bus
- Control signals
- All I/O pins
- Real Time Clock Stamp
- User logic inputs (8 bits)

Trace can be started/stopped by the combination of:

- GO command
- Complex Events
- Pass Counters
- Sequencer
- Trace Full condition

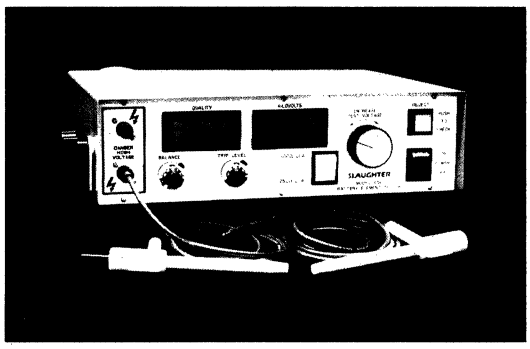
Additionally Trace Buffer is equipped with a special internal counter to allow tracing to stop after a specified number of frames. This feature allows Trace to catch as much as 32K of small fragments (snapshots) of executed program at full running speed.

The Trace contents can be examined during program execution without slowing down the microcontroller.

SIGNUM SYSTEMS, 171 E. Thousand Oaks Blvd, # 202, Thousand Oaks, CA 91360
tel. (805) 371- 4608 fax (805) 371- 4610

For repetitive production/inspection applications

Go, No-Go Masterless Operations Do Not Depend on Operator Judgement



Battery Element Testers

Models Available For Both Moist and Dry Charged Cells

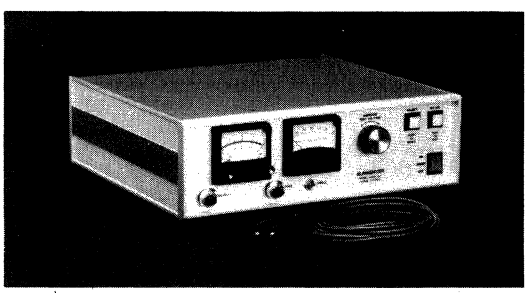
Briefly, these testers subject the battery elements to a high voltage which appears between all plates and across all separators. If everything is normal — that is, if there are no defects in the separators, no runs, no trees, etc. — the battery element will withstand the test voltage and only a normal amount of leakage current will be registered by the test instrument.

Proper test voltage for any particular battery element must be established by the user. Generally this will be in the range of 1,000 to 1,500 volts for elements with separators of less than .045", unless some marginal defects can be tolerated. For separators in the range of .045" to .065", a voltage in the range of 2,000 to 3,000 is normally required.

"Fail-Safe" 120 K Insulation Testers

The Series 1300 Testers are specifically engineered to conform with regulations first instituted in 1983 which are commonly referred to as "120 K Requirements".

Test voltage is continuously variable and monitored by a single built-in voltmeter. Sensitivity may be adjusted over a load current range. The 120-K ohm resistor terminals on the front panel allow the operator to check instrument calibration quickly and easily at any time. Audible and visual signals are locked in upon reject and must be manually reset before testing can be resumed. In the unlikely event that the Reject/HV Cut-off Circuit should fail, the instrument will go into the reject mode on the next bad part and will not reset. This protects the operator from shock hazard and from passing bad parts while unaware the Reject/HV Cut-off Circuit is inoperative.

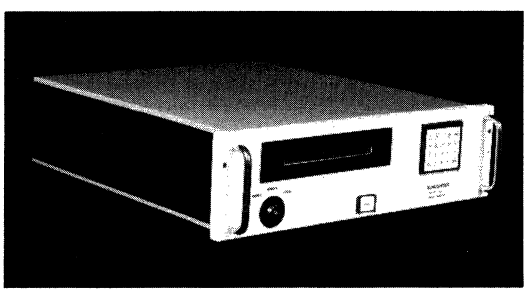


Coil & Winding Testers

- Tests Solenoids, Chokes, Transformers, Stators, Armatures, Etc.
- Exposes Shorted Turns as Well as Opens and Grounds

The surge test is without question the most comprehensive single test used to check coils and windings. In addition to shorts, opens, and grounds, the surge test can also expose latent defects such as shorted turns which will not show up on other types of tests. From simple solenoids through chokes, transformers, stators, and armatures, the surge test is a necessary step in the manufacture of all high quality wound products.

Though the instantaneous energy is high, average energy levels are low. Therefore, the high voltage stresses required to conduct a good test are produced without damaging good parts.



Programmable Testers

IEEE-488

- AC INSULATION TESTER
- DC INSULATION TESTER
- MEGOHMMETER
- SWITCHING MATRIX

The basic purpose of the Series 1727 testers is to provide a fully programmable high voltage source with current sensing capabilities for use in a computer controlled system. Additionally, most are programmable from the front panel.

- PROGRAMMABLE FOR
  - Voltage Amplitude
  - Voltage Rate Rise/Fall
  - Reject Threshold
  - Dwell Time
  - Real/Total Current
  - Charge Time

P.O. Box 1805 **Ardmore, OK 73402**

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SLAUGHTER
The ProTesters

EEM COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

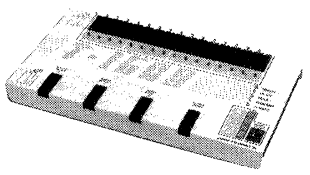
Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

SOLUTIONS FOR EVERY PROGRAMMING NEED

OVER 20 MODELS TO CHOOSE FROM ■ CONTACT FACTORY FOR DETAILS

T-1600 GANG/SET PROGRAMMER



EPROM

- 24, 28 and 32 pin EPROMS
- Program 16 at once, same or set
- Intelligent identifier, automatic set up
- Stand alone or PC driven
- Fastest available algorithms
- Up to 8 megabit devices
- Single key operation
- Device updates on disk or BBS

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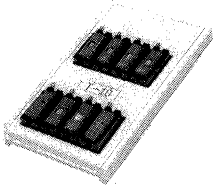
T-10/8G LOW COST GANG/SET PROGRAMMER



EPROM ■ EPLD

- 24/28/32 pin device support
- Gang or set programming
- Point and shoot menus with mouse support
- Device updates on disk & BBS
- Built-in margin testing
- Auto detect bad devices
- Device isolation
- User definable test parameters
- Intelligent identifier, auto set up

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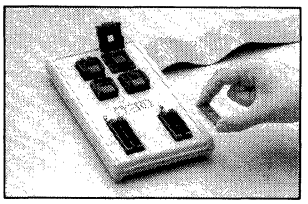
T-10 UNIVERSAL PROGRAMMER



EPROM ■ PLD ■ Bipolar PROM

- Built-in LCC & SMT ZIF sockets to 44 pins
- Individual pin driving
- Point & shoot menus, with MOUSE support
- Device updates on disk & BBS
- Built-in margin testing
- Vector testing
- User definable test parameters
- Full screen editing in 21 formats
- Intelligent identifier

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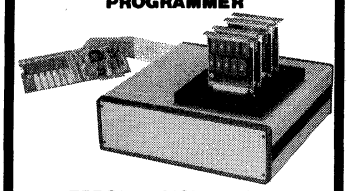
T-4000 BENCH TOP IN-CIRCUIT PROGRAMMER



EPROM ■ MCU ■ EPLD

- Up to 32 cards at a time
- User supplied personal computer
- Complete turnkey system or
- **QUICK MAP** user definable menu driven software
- **QUICK WRAP** user definable interface adapter
- Upward compatible with T-5000 and T-8000
- Built in margin testing
- User definable test parameters

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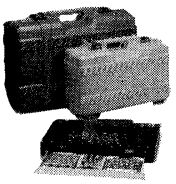
EXPERIENCE SINCE 1977

In-circuit programming is easy. All you have to do is plug your circuit card into one of our in-circuit programmers and program the entire circuit card as if it were one large device. Reprogramming is easy. Simply drop your circuit card into our board size eraser and then into the programmer. Component handling is reduced. Sockets and labels are eliminated and the quality of your product improves.

Let us do the engineering, design, software, fabrication and testing for you. We can provide a complete turnkey in-circuit programming solution at a price lower in cost than what you ever thought possible.

Sunrise has been producing memory board programmers since 1977. All of our programmers are designed and built to military standards and field proven in the desert and at sea.

UV6000 AND UV7000 UV BOARD SIZE ERASERS



FIELD PROVEN IN DESERT SANDS AND AT SEA

- Two sizes to choose from
- Brief case portable
- Erase whole circuit cards
- 25,000, W/cm2
- Eraser rides in case on shock mounts
- Bulbs shock mounted in case
- Exceeds MIL-T-28810
- Built-in timer

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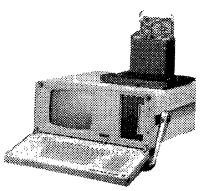
T-5000 TRANSPORTABLE IN-CIRCUIT PROGRAMMER



EPROM ■ MCU ■ EPLD

- Up to 32 cards at a time
- Built-in MS-DOS computer
- 105 MB fixed hard disk, 3.5 inch floppy
- Exceeds MIL-T-28800
- Complete turnkey or
- **QUICK MAP** user definable software and
- **QUICK WRAP** user definable interface adapter
- User definable test parameters

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T-6000 AND T-7000 PORTABLE IN-CIRCUIT PROGRAMMERS

FIELD PROVEN IN DESERT SANDS AND AT SEA

- Two sizes to choose from
- Brief case portability
- Optional built-in UV eraser
- Shock mounted, exceeds MIL-T-28800
- MS-DOS compatible 3.5 inch floppy
- Program 1 to 8 circuit cards in one pass
- Built-in margin testing

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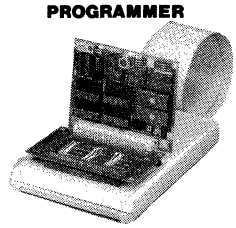
T-2000 LOW COST IN-CIRCUIT PROGRAMMER



EPROM ■ MCU ■ EPLD

- User supplied MS-DOS personal computer
- Complete turnkey system or
- **QUICK MAP** menu driven software
- **QUICK WRAP II** interface adapter
- Interface upward compatible with T-4000, T-5000 and T-8000
- Software compatible with other Sunrise in-circuit programmers

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TOROTRON CORP. DEPT. EM, 519 SOUTH FIFTH AVE., MOUNT VERNON, NY 10550, (914) 664-2050

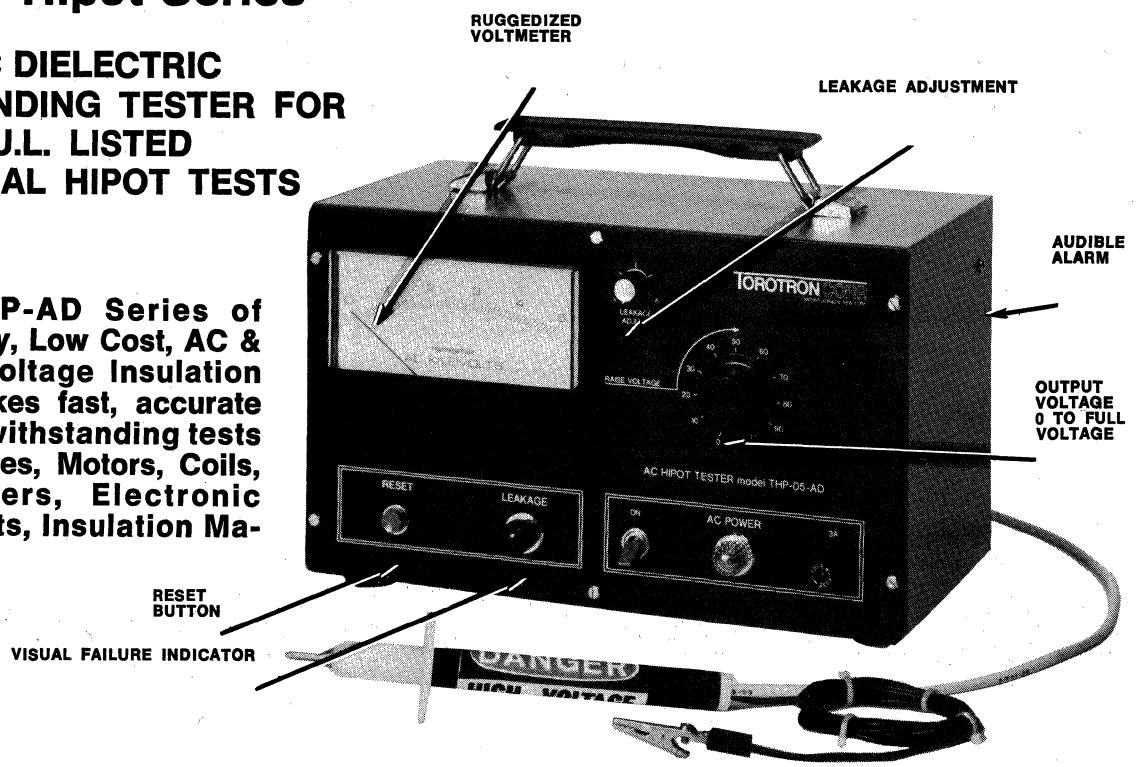
AC & DC Hipot Insulation Testers

Application: • Production testing for insulation resistance. Dielectric withstand, etc. • Motors • High Voltage Capacitor • Wire & Cable • Dielectric Materials • Transformers & Coils • Bushing & Insulators • High Voltage Rectifiers • **UL Listed Electrical Hi Pot Tests.**

THP-AD Hipot Series

AC OR DC DIELECTRIC WITHSTANDING TESTER FOR MAKING U.L. LISTED ELECTRICAL HIPOT TESTS

Model THP-AD Series of High Quality, Low Cost, AC & DC High Voltage Insulation Tester. Makes fast, accurate dielectric withstanding tests of Appliances, Motors, Coils, Transformers, Electronic Components, Insulation Materials, etc.



FEATURES:

- **High Voltage Output Control**
  Continuously variable from zero to full voltage.
- **Solid State Visual and Audible Alarm**
  Adjustable from 500 μA to 5 mA breakdown current.
- **Latching Relay**
  Shuts off power when breakdown current exceeds preset limit: keeps audible alarm on until defective part is removed and tester reset.
- **Voltage Monitoring**
  Actual output voltage monitored by rugged, 4½", mirror scale taut band kilovoltmeter.
- **Output Cable**
  Cable insulated for three times rated voltage with attached High Voltage Probe; separate ground leads.
- **Polarity**
  DC models: Probe output voltage negative with respect to ground.

SPECIFICATIONS:

Input	115 Vac, 60 Hz, 3A Max., 120W at full load
Size and Weight	7"H x 12"W x 6"D. Approx. 18 lb
Meter	Accuracy ±2% of full scale
Output Voltage	0 to full voltage, see table
Short Circuit Current	Transformer output capability 18 mA at full voltage

AC SERIES

Model	Output Voltage	Price 1 to 5
THP-03-AD	0-3 KVAC	$425.00
THP-05-AD	0-5 KVAC	$450.00
THP-10-AD	0-10 KVAC	$900.00

DC SERIES

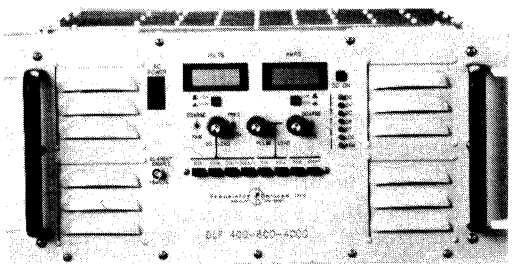
Model	Output Voltage	Price 1 to 5
THP-03D-AD	0-3 KVDC	$425.00
THP-04D-AD	0-4 KVDC	$450.00
THP-07D-AD	0-7 KVDC	$750.00
THP-12D-AD	0-12 KVDC	$950.00

Note: Discount 5% 6 to 10. For larger quantities request quote.

ALSO AVAILABLE FROM TOROTRON: A Complete Line of Custom High Voltage Power Supplies, Regulated or Unregulated. CONTACT FACTORY DIRECT FOR INFORMATION.

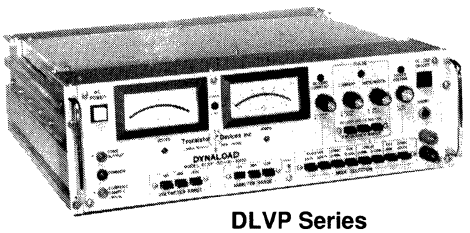
Specifications and price subject to change without notice.

POWER SUPPLY TEST SOLUTIONS
DYNAMIC LOADS

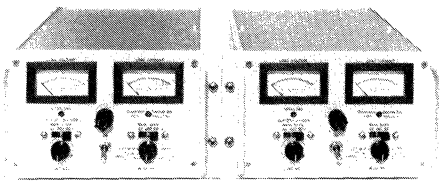


DLF Series
FET Dynaload models vary from 250 to 4000W and offer high speed pulse, high current, and wide voltage range.

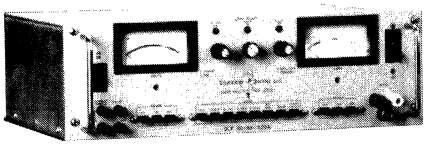
- POWER: Up to 4000 Watts
- CONSANT CURRENT: Up to 600 Amps
- CONSTANT VOLTAGE: Up to 400 Volts
- CONSTANT RESISTANCE: .008 Ohms Min Resistance
- DYNAMIC TRANSIENT: 20Hz to 20KHz Pulse Rate
- SHORT CIRCUIT LOADING: Widest Range Of Test Modes
- REMOTE AND DIGITAL PROGRAMMING: For Automated Testing
- FAULT/ALARM REPORTING: Diagnostic & Pass/Fail Testing
- ERGOMONIC DESIGN: User Friendly
- CALIBRATED PER MIL-STD-45662: Assured Accuracy



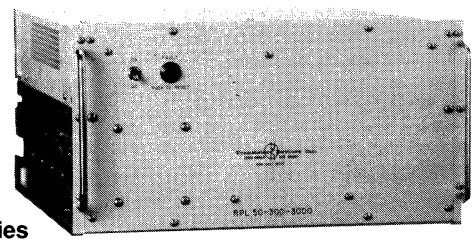
DLVP Series
High Power, variable pulse width.



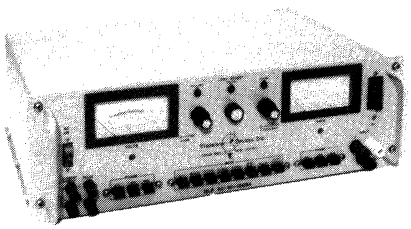
DLR Series
Low power, basic testing.



DLP Series
Intermediate power, variable pulse.

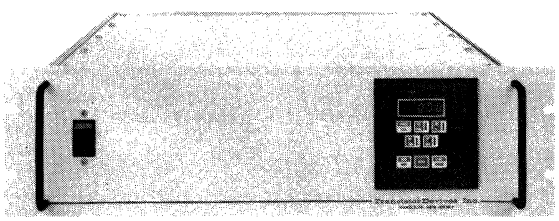


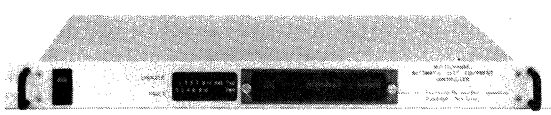
RPL Series
Remote programming or ATE systems.

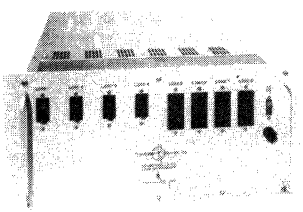


DLM Series
Low cost modules for burn-in.

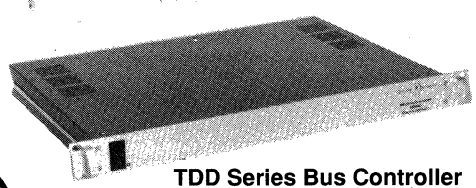
Programmable Power Supplies and Dynaloads
TDD12 Series
IEEE-488 interface for computer controlled testing







Custom Series
Custom configured, space saving, multiple loads.



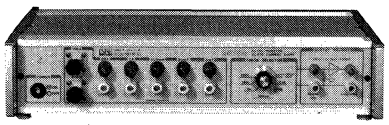
TDD Series Bus Controller
IEEE-488 compatible with all TDI Dynaloads.

Transistor Devices Inc.

85 Horsehill Rd., Cedar Knolls, N.J. 07927
Phone: (201) 267-1900 FAX: (201) 267-2047

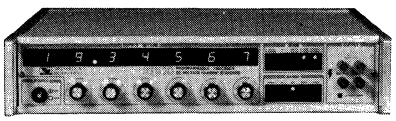
274 S. Salem St., Randolph, N.J. 07869-1698
Phone: (201) 361-6622 FAX: (201) 361-7665

VALHALLA SCIENTIFIC
9955 Mesa Rim Road, San Diego, CA 92121
Phone: 619-457-5576 Fax: 619-457-0127



2575 AC-DC CURRENT SHUNT STANDARD

The unit is a working standard providing six ranges of internal shunts covering from 2mA (10nA) through 100 amperes, the unit features a built in gain of 10, chopper stabilized DC-wideband amplifier capable of driving thermal transfer standards.

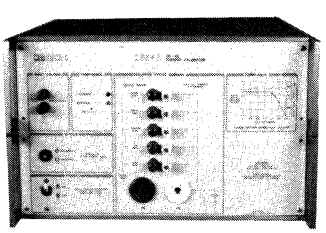


2701C PRECISION DIRECT VOLTAGE CURRENT STANDARD

The Valhalla 2701C DC Voltage Standard is ideally suited for 7½ digit DMM calibration, thermocouple simulation, digital convertor linearity tests, and virtually any direct voltage application.
The 2701C can be calibrated manually "covers on" via a microprocessor NOVRAM routine or over the optional GPIB in under 15 minutes. It also maintains 1.5 ppm/24 hour stability and 8 ppm/24 hour accuracy. An optional "High Stability Reference" enhances the 2701C to 5 ppm DC annual stability.
The Valhalla 2701C features 2- or 4- wire remote sensing available at the touch of a button for automatic sense correction of lead resistance.
For ultra-low noise applications, (i.e. A to D convertors) option "LNF" provides an extremely quiet output level (this option limits output to 40 VDC maximum.)

- Automatic Bi-Polar Output
- 0.5 ppm Resolution
- 120mA Option Card Calibrator
- Two/Four Terminal Output
- "Covers On" Automatic Calibration
- Microprocessor Enhanced Design

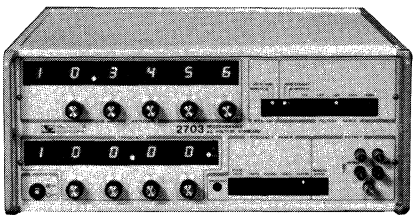
Ranges: 200mV, 2V, 20V, 120V, 1200V
Accuracy: (23°C ± 5°C) 8 ppm ± 20µV, 20V range/30 days
Stability: 1.5 ppm/24 hrs. ± 1°C ambient change



2555A 100 AMP AC-DC CURRENT CALIBRATOR

Capable of delivering 1mA to 100A DC or RMS AC precise, constant current with 4 volts compliance to 1kHz for direct calibration of ammeters, wattmeters, DMM's, shunts, current transformers and Hall effect devices.

Features include output compliance and standy/operate mode indicators.
DC Accuracy: ± .03% output ± .03% range
AC Accuracy: ± .15% output ± .1% range

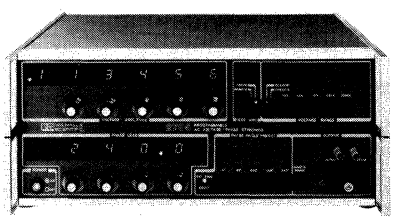


2703 PROGRAMMABLE AC VOLTAGE STANDARD

The 2703 AC Voltage Standard is an AC voltage source whose frequency and amplitude can be varied, either manually or remotely, to produce precision sinewaves for demanding calibration situations.

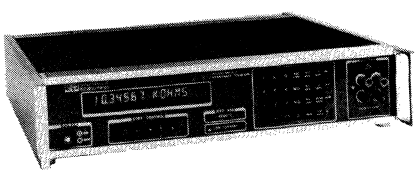
- Built-in Kilovolt Amplifier
- Microprocessor design
- IEEE-488 GPIB Compatible
- Remote 4 terminal sensing
- Crystal controlled frequency
- Digitally synthesized sinewave

Ranges RMS (full scale): *1.2mV, *12mV, 120mV, 1.2V, 12V, 120V, 1200V
Accuracy: 0.03% to 20KHz, 0.08% to 0.1% to 100KHz
Stability: 15 ppm low to midband to 50 ppm @ 100KHz
Frequency: Accuracy: ±0.01%
*Divider optional



2705 PROGRAMMABLE AC VOLTAGE/PHASE STANDARD

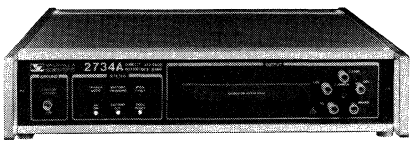
The 2705 combines with a 2703 AC voltage source and a Valhalla current source to provide phase controllable voltage/current system for wattmeter calibration. Increments of 0.1° to 360° with current up to 100 amps is available.



2724A FULLY VARIABLE PROGRAMMABLE RESISTANCE STANDARD

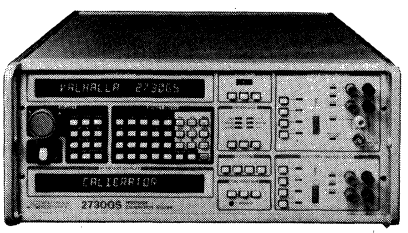
This unique GPIB controllable resistance standard provides over 10 million resistance values ranging from 100 micro-ohms to 11 gigohms.

- Basic Accuracy to 7 ppm
- Resistive Thermal Device (RTD) Simulator with superb accuracy
- Short term stability to 2 ppm (10 ppm/yr)
- IEEE-488 compatible



2734 DIRECT VOLTAGE REFERENCE

Four ovened, ultra stable reference zeners, operating in parallel, offer a NIST traceable DC volt to an absolute uncertainty of 1.0 ppm. Unit may be shipped with optional 72 hour battery case. Outputs of 1V, 1.018V, 7V and 10V are provided.
Stability: 0.4 ppm/mo 1.5 ppm/yr



2730GS MULTIFUNCTION CALIBRATOR

This high performance DMM calibrator features DC/AC Voltage, DC/AC current (self-contained 12 Amps) and resistance. The AC Voltage function with internal thermal convertor provides midband (20kHz) performance with 65 ppm uncertainty. Basic AC capability extends to 1.25 MHz, with wideband expansion options (WB-50) to 50 MHz. The DC Voltage capability (8 1/2 Digits) provides 2 ppm 90 day stability, 5 ppm per year performance.

The modular design of the Valhalla 2730GS provides expansion capabilities which include option "RMS" AC/DC Thermal measurement, option "WATTS" 2 channels AC Voltage and phase controlled AC Current, and option "PHASE" 2 channels of phase controlled voltage, also self-contained 12 Amp AC/DC current capability (no expansion booster amplifier needed), which is ideal for calibrating the 10 Amp range commonly found on handheld DMMS.

The standard resistance capability is a short, 1 ohm, 10 ohms and decade cardinal points to 100 Mohms. An option x 1.9 ohms resistance capability to 19 Mohms may also be installed in the Valhalla 2730GS Calibrator.

- Built-in Kilovolt Amplifier
- IEEE-488 and optional RS232C capabilities
- Wide band outputs (WB-20, WB-30, and WB-50)
- Digital Synthesized sinewave - AC thermal amplitude accurate
- Self-contained 12 Amps AC/DC current
- Non-Volatile memory 500 step DMM calibration
- Options include "WATTS" and "PHASE" calibration
- Built-in printer interface for calibration results
- Optional (R19A) x 1.9 ohms cardinal point resistance capability (to 19 ohms)

DIAL TOLL FREE FOR VALHALLA'S INSTRUMENT CATALOG AND APPLICATION INFORMATION

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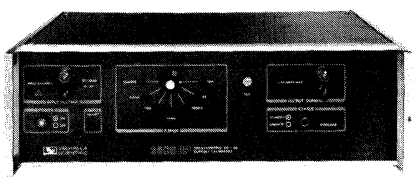
VALHALLA SCIENTIFIC
9955 Mesa Rim Road, San Diego, CA 92121
Phone: 619-457-5576 Fax: 619-457-0127

2500 SERIES PRECISION AC-DC CALIBRATORS

This series of constant current source instruments provides precision levels, of both AC and DC current, up to 100 amperes, for calibration of DMMs, shunts, wattmeters, and current transformers. The 2500 series current modules may be added to existing laboratory voltage standards to create precision, NBS traceable current from 100pA to 100 amperes.

SPECIFICATIONS

Model	Range
2500	7 Ranges 2uA-2A/DC to 10KHz
2500EP	6 Ranges 200uA-1QA/DC to 5KHz
2555A	6 Ranges 2mA-100A/DC to 1KHz
DC Accuracy	±.02% approx.
AC Accuracy	±0.2% approx.
2500	3½" Retma x 9" D
2500EP	5½" Retma x 15" D
2555A	10½" Retma x 17" D



4300B DIGITAL MICRO-OHMMETER

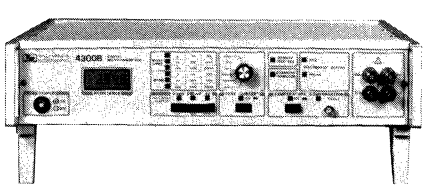
Utility type distribution transformers of the 400MVA capacity can now be tested in minutes rather than hours. The operator may select 24 different combinations of load test currents and full scale preamp voltages to establish optimum test conditions for specific applications. The 4300B is ideally suited for testing motors, transformers, fuses, and many other low level applications.

FEATURES INCLUDE:

- IEEE-488 GPIB Interface

SPECIFICATIONS

Test Current: Selectable from 10A to 100uA



MODEL 4014 WIDE RANGE DIGITAL OHMMETER

The Model 4014 contains nine ranges covering from 100uΩ resolution on the 2Ω range to 200MΩ on the highest range.

The "BCD" output option, combined with a Valhalla 1248 Dual Limit Comparator, makes the 4014 a powerful receiving inspection tool for screening incoming resistive components.

MODEL 4020 DIGITAL OHMMETER

This model is Valhalla's most economical digital ohmmeter. The meter offers four terminal measurement capability designed around a low noise high resolution A/D converter driving a 4½ digit display.

As an added convenience in field applications, the 4020 is available with an optional heavy-duty 6 VDC rechargeable battery pack.

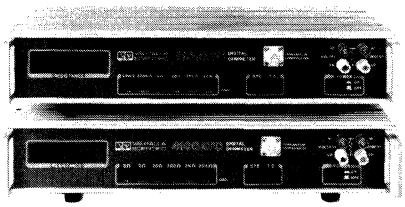
Ranges: 20Ω, 200Ω, 2KΩ, 20KΩ, 200KΩ, 2MΩ.
Test Currents: 10mA, 1mA, 100μA, 10μA, 1μA, 100nA

MODEL 4100 DIGITAL OHMMETER

Valhalla's Model 4100ATC combines 10uΩ resolution with Automatic Temperature Compensation (ATC) to create an economical low level ohmmeter to help determine temperature rise or base line resistance in motors, transformers and copper wire. This ATC feature has been pioneered by Valhalla, resulting in savings for customers who manufacture inductive based products using copper items.

4150ATC DIGITAL OHMMETER

This model is ideal for testing thermistors, RTD's, strain gages, Balco sensors and other transducers where minimizing self-heating is critical during calibration.



4165 AND 4165-1344 CONTACT RESISTANCE DIGITAL MICRO-OHMMETER

Special features and considerations have been designed into the basic Model 4165 to satisfy MIL-S-83504, MIL-S-22710 and MIL-STD-1344 for measuring contact resistance for connectors and relays.

DIGITAL OHMMETER ACCESSORIES

There are seven different four lead cable sets available, including miniature, spring loaded microprobes and gold-plated component clips.

Temperature compensation for the ATC models are available for Copper (Option CU) 3931 ppm/°C and for Aluminum (Option AL) 4030 ppm/°C referenced to 20°C.

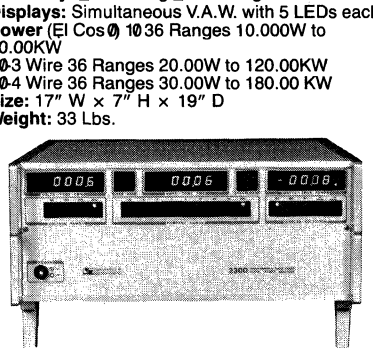
2300 SERIES 10 & 30 DIGITAL POWER ANALYZERS/WATTMETERS

Three simultaneous displays of Watts, TRMS Voltage and TRMS Current on large, easy to read LEDs for each individual phase. Each phase contains 3 wideband current shunts 100A, 10A, and 1A with 3 preamp gains to provide a total of 9 current ranges from 10uA resolution to 100 Amps full scale. The 2300 will accommodate 3Ø 3-wire delta, 3Ø 4-wire Wye, or 3 simultaneous channels of 1Ø power measurements.

The unit has an IEEE-48 interface option available which automates data connection.

SPECIFICATIONS

TRMS CURRENT:
(9 Ranges).2A, .5A, 1A, 2A, 5A, 10A, 20A, 50A, 100A
Bandwidth: 20Hz to 10KHz (lower ranges) (optional DC response)
Accuracy: ±.25%Rdg ±.25%Rng. 20Hz to 10KHz
Displays: Simultaneous V.A.W. with 5 LEDs each
Power (EI Cos Ø) 1Ø 36 Ranges 10.000W to 60.00KW
3Ø 3 Wire 36 Ranges 20.00W to 120.00KW
3Ø 4 Wire 36 Ranges 30.00W to 180.00 KW
Size: 17" W x 7" H x 19" D
Weight: 33 Lbs.



DIGITAL WATTMETERS/POWER ANALYZERS MODELS 2100 AND 2101

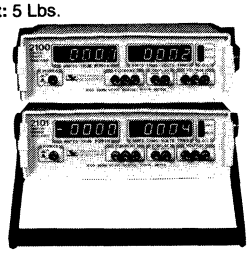
Valhalla's 2100 series Digital Power Analyzers are designed to measure the instantaneous power EI Cos Ø, the true RMS voltage and current associated with the load power measurement.

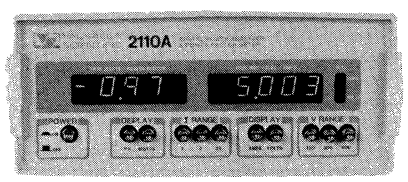
The 2100 offers DC to 20KHz wide band performance with 20 amperes of TRMS current capability which is ideal for measuring power consumption of switching mode power supplies, SCR controls, pulsed DC devices, lamp ballasts.

SPECIFICATIONS

Model	Volts	Current	Watts
2100	150, 300, 600	.2, 2, 20A	30 to 12000
2101	30, 150, 300	.2, 2, 20A	6 to 6000

Accuracy: DC to 5KHz: ± 25% ± 6 digits
5KHz to 10KHz ± .5% ± 10 digits
10KHz to 20 KHz ± 1% ± 1% of rng.
Display: Watts and Volts/Amps 4½ digit LEDs
Size: 8.5" W x 2.5" H x 9.25" D
Weight: 5 Lbs.





DIGITAL POWER FACTOR METER 2110 AND 2111 WATTMETERS

Valhalla's newest addition to our Digital Power Analyzer product line is the 2110 series which directly measures and displays Power Factor, True Watts, True RMS current, and True RMS Voltage.

The 2110 series (4 1/2 digits 20000 counts) high accuracy circuitry provides 0.1% ± 6 digits basic accuracy. True RMS Voltage and RMS current capability provides DC, plus AAC to 50 KHz frequency response. This unit is ideal for power measurements on motors, transformers or switching power supplies with distorted harmonic waveforms.

Model	Volts	Current	Watts
2110	150, 300, 600	.2 2 20A	30 to 12000
2111	30, 150, 300	.2 2 20A	6 to 6000

Power Factor (PF): 0 to 1 - 0.001 PF resolution PF leading and lagging indication.

- **DC, 40 Hz to 100 Hz:** 0.1% ± 6 digits
- **100 Hz to 5 KHz:** 0.25% ± 6 digits
- **5 KHz to 10 KHz:** 0.5% rdg 0.5% range
- **10 KHz to 50 KHz:** 1% rdg 1% range (2A)

27000 AUTOMATED METER/OSCILLOSCOPE CALIBRATION SYSTEM

Valhalla Scientific offers a fully integrated, ultra-precision calibration system for DVM's, oscilloscopes, wattmeters, current meters, shunts, power supplies, etc.

The widest variety of controllers are available to power the Valhalla 27000. These controllers include the IBM/XT, IBM PC/AT, HP 200 series (HP9816 and HP9836), HP 300 series (HP310 and HP320), touch CRT, mouse with color graphics, HP Vectra and Compaq.

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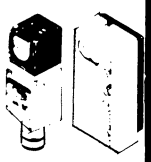
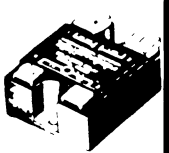
TOGGLE SWITCHES

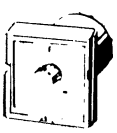

PHOTOELECTRICS

RELAYS

LIQUID LEVEL CONTROLS


SOLID STATE RELAYS

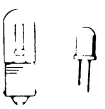
TERMINAL BLOCKS

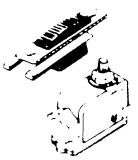

TEMPERATURE CONTROLS

TIMERS

CIRCUIT BREAKERS FUSES & FUSEHOLDERS

KNOBS


LAMPS & LEDS


SWITCHES

RELAYS

INDICATOR LIGHTS

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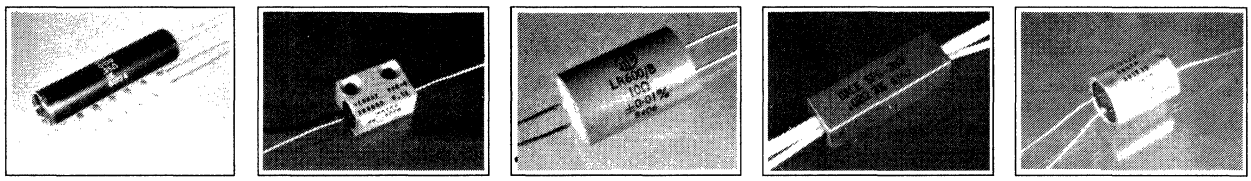
Precision Current Shunts

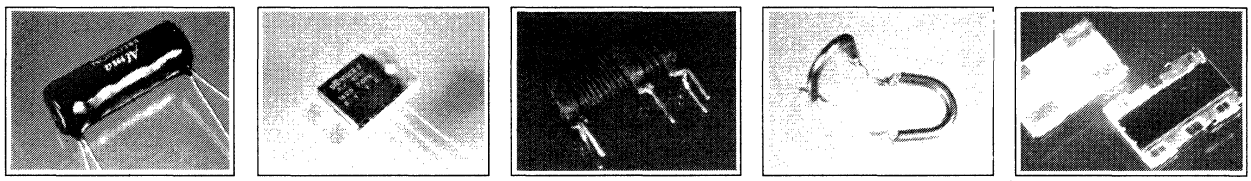
Tight Tolerance — Low TCR

VISHAY

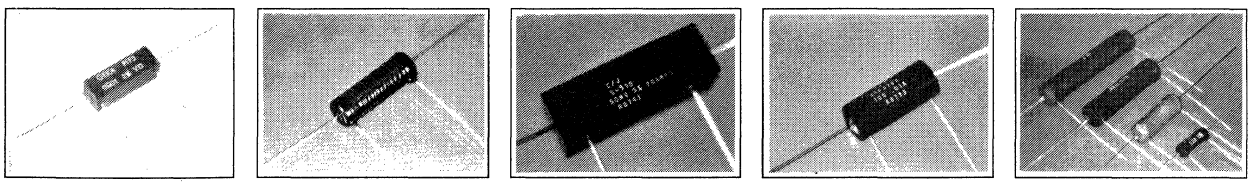
Axial Leaded Current Sensors



Radial Leaded Current Sensors



Axial/Radial Leaded Current Sensors



Precision Current Sensors are not normally considered high current devices. For high current and power devices, refer to EEM section 4700, Precision Current Shunts, VISHAY Electronic Components Group.

From the various VISHAY Electronic Components Group's facilities around the world, comes a range of products based on resistive foil, wire, thin film and thick film technologies. Precision current sensors from 0.005 Ω to "K" range values are available in a variety of four terminal configurations. Tolerances of ±0.001% are available, depending upon the device and resistance values. TCR as low as ±1 ppm/°C is available over limited temperature ranges.

Both thin film and thick film technologies are available in chip form with sub-ohmic values and four terminal wrap-around terminations.

FAX your requirements to (619) 690-2632,
or call our Shunt Coordinator at (619) 690-1432 for assistance.

VISHAY INTERTECHNOLOGY, INC. ■ 63 Lincoln Highway ■ Malvern, PA 19355
Phone (215) 644-1300 ■ Fax (215) 296-0657 ■ Sales Fax (215) 640-9081 ■ TWX 510-668-8944

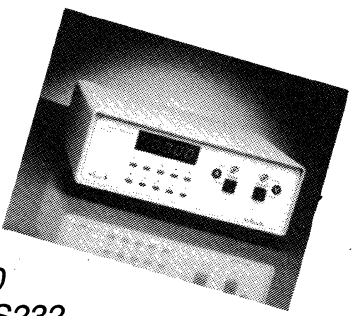
Power Analyzers

Gain Phase Analyzer

Voltech

200 Butterfield Drive • Ashland, MA 01721
TEL: 508/881-7329 • FAX: 508/879-8669

Power Analyzer : PM1000/PM3000

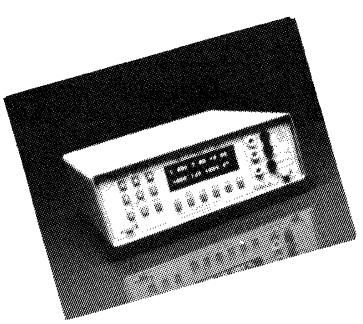


The PM series of Power Analyzers are state-of-the-art microprocessor based instruments. The PM1000 is a compact single-phase unit while the PM3000 is an extremely sophisticated instrument capable of single phase/2 wire through three phase/4 wire analysis. The PM3000 also has a variety of interfaces including IEEE, RS232, centronics printer, and 8-isolated analog outputs. The units employ sophisticated digital signal processing which enables accurate analysis of both sinusoidal and distorted waveforms.

With a push of a button you get an accurate digital readout of:

- *Real Power (up to 30 kW)*
- *Apparent Power (up to 30 kW)*
- *RMS-Volts/Amps (1000 V/30 A)*
- *Crest Factor V/I (1-20)*
- *PK Inrush Current*
- *Frequency (DC to 200 kHz)*
- *Harmonic Analysis (up to 50 th)*
- *3 Phase (PM 3000)*
- *IEEE Interface (PM3000)*
- *Integration Function (PM 3000)*

Options:
PM 1000-001 — Increases peak current measurement capability to 110 A
CT1000 — Increases current measurement capability to 1200 A
CL1000 — Clamp on 1000:1 current transformer
PS1000 — Allows controlled turn on for peak inrush current



Gain Phase Analyzer : TF2000

The TF2000 is built for precision gain-phase measurements in electrical and mechanical systems. By combining the best of digital and analog technology, Voltech has produced another unique instrument offering outstanding value, performance and ease of use.

In less than ten minutes of set-up time Design Engineers can print out detailed Bode plots of their circuits.

- *Frequency Range (up to 100 kHz)*
- *Harmonic Analysis (up to 39 th)*
- *True Fourier Analysis*
- *Autoranging (3 μV-300 V_{rms})*
- *Internal Sine Generator*
- *Serial/Parallel Output Ports*

WALKER MAGNETICS GROUP

Magnetic Measuring Instrumentation
Laboratory Magnet Systems
Magnetic Charging & Conditioning Equipment
Nondestructive Test (NDT) Equipment

RESUMÉ

Walker Scientific Inc. is part of the Walker Magnetics Group which has been in magnetics since the late 1800's.

Our dedication to the science of magnetics has enabled us to develop product lines which have advanced the state-of-the-art in many disciplines: Magnetic Measuring Instrumentation for analyzing magnetic fields and Laboratory Magnet Systems for producing magnetic fields, have made us a leader in magnetic systems and instrumentation throughout the world.

In addition, two new product lines have been added to further broaden our instrumentation base; Magnetic Charging and Conditioning equipment and instrumentation to meet the ever increasing demands of quality for Nondestructive Testing (NDT) of materials

Our products are also finding application in the growing field of biomagnetics. NMR technology is being used in an advanced technique of diagnostic body scanning that offers many advantages over conventional X-ray Tomography. Methods for magnetically controlling gastric bleeding without surgery and for stretching the esophagus in infants born with a congenital malformation known as esophageal artresia have also produced encouraging results.

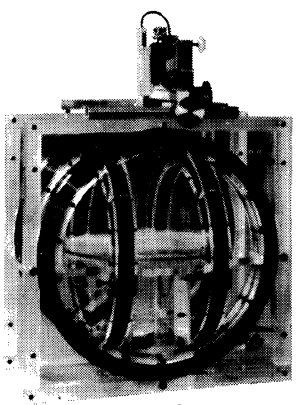
MAGNETIC MEASURING INSTRUMENTATION
- Gaussmeters
- Fluxmeters
- Coercivity Meters
- Hysteresisgraphs
- Reference Magnets
- Custom Measuring Systems

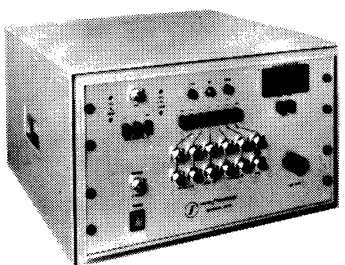
LABORATORY MAGNET SYSTEMS
- Electromagnets 4"-15"
- Solenoid Systems
- Computer Designed Coil Systems
- Power Supplies:
  - Current Regulated
  - Field Regulated
- Field Control Systems
- Custom Electromagnet Systems

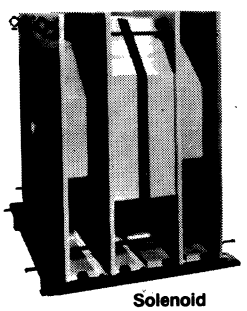
MAGNETIC CHARGING & CONDITIONING EQUIPMENT

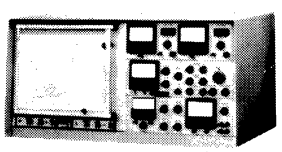
NONDESTRUCTIVE TEST (NDT) EQUIPMENT
- Eddy Current Metal Comparator
- Alloy Identification & Classification
- Ultrasonic Thickness Gauge
- Material Inspection Microscope

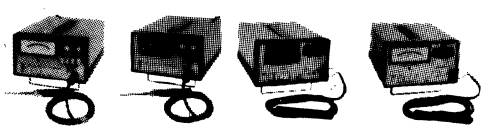
TYPICAL SYSTEMS

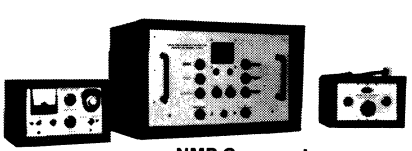

Computer Designed Coils

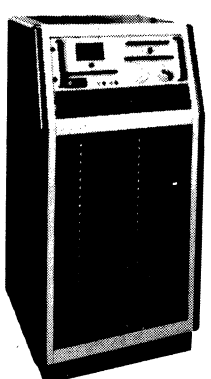

Coercivity Meter

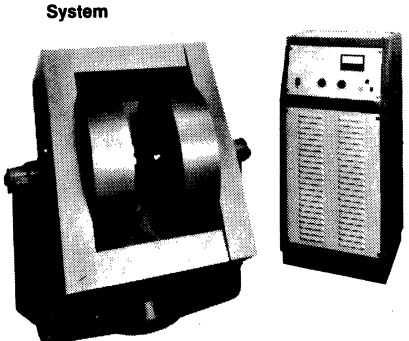

Solenoid System


Hysteresisgraph


Hall Gaussmeter/Fluxmeters


NMR Gaussmeter


Field Controlled Power Supply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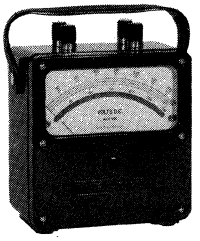
Portable High-Precision Analog Test Equipment
0.25%–0.75% Accuracy

SERIES 931 DC PORTABLES
0.5% Accuracy



Scale length: 4.04″ (103mm) Self-shielded permanent-magnet moving-coil mechanism—a magnetic field created by a conductor carrying 7000 amperes at a distance of three feet from the instrument would cause a temporary error of less than 0.5%. Size: 5¼″ × 5″ × 3¼″ (133 × 127 × 83mm). Approx. weight, 2 lbs. (0.9 kg.).

CATALOG NO.	RANGE	SCALE DIVISION	PRICE
DC VOLTMETERS 1000 OHMS/VOLT			
931-1911004	3	150	
931-1911005	15	150	
931-1911006	300	150	
931-1915003	30/7.5/3	150	
931-1915002	75/30/7.5	150	
931-1915001	150/15/3	150	
931-1915005	300/150/3	150	
931-1915004	500/100/10	150	
931-1915006	750/300/150	150	
DC VOLTMETERS 5000 OHMS/VOLT			
931-1912002	3	150	
931-1912003	15	150	
931-1912004	30	150	
931-1912001	50	150	
931-1912005	150	150	
931-1912006	300	150	
931-1916002	75/30/7.5	150	
931-1916004	150/15/3	150	
931-1916006	300/150/3	150	
931-1916005	500/100/10	150	
931-1916001	750/300/150	150	

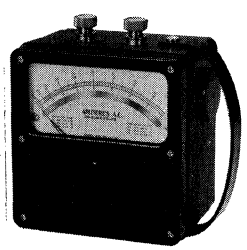
CATALOG NO.	RANGE	OHMS	SCALE DIVISION	PRICE
DC MILLIAMMETERS				
931-4911002	1	93Ω	100	
931-4911001	15	1.2Ω	150	
931-4912001	150*	0.333Ω	150	
931-4914005	3/0.3/0.03	166.6/1540/2800Ω	150	
931-4914003	150/15/1.5	.332/3.24/24.47Ω	150	
931-4914002	1500/150/1.5	.032/.32/2.22Ω	150	
931-4914001	3000/300/30	.16/.16/1.4Ω	150	
DC MICROAMMETERS				
931-5912002	30	490	150	
931-5911002	30	2300	150	
931-5912001	200	16	100	
931-5911001	200	575	100	

DC AMMETERS (SELF-CONTAINED TO 50 AMPS)
Scale Division: 100 (150 for ranges of 1.5, 3A and their multiples).

CATALOG NO.	RANGE (AMPS)	OHMS	PRICE	CATALOG NO. 931	RANGE (AMPS)	OHMS	PRICE
100DIV	50mV			2912008	5/2.5/0.5	.01/.02/.1Ω	
150DIV	50mV			2912006	10/1/0.1	.005/.05/.5Ω	
931-2911005	1	.05Ω		2912009	10/5/1	.005/.01/.05Ω	
931-2911004	1.5	.033Ω		2912010	15/3/0.15	.0033/.017/.333Ω	
931-2911002	3	.017Ω		2912003	15/3/1.5	.0033/.017/.033Ω	
931-2911001	5	.01Ω		2912011	25/2.5/0.5	.002/.02/.1Ω	
931-2911006	7.5	.007Ω		2912012	25/10/2.5	.002/.005/.02Ω	
931-2911003	15	.0033Ω		2912013	50/5/0.5	.001/.01/.1Ω	
931-2911007	30	.0017Ω		2912002	50/10/2	.001/.005/.025Ω	
931-2911008	50	.001Ω		2912001	50/20/5	.001/.0025/.01Ω	

*Single range milliammeters with ranges above 20mA are shunted and have a drop of 50 mV ±5%.

SERIES 433 AC PORTABLE
0.75% Accuracy



Scale length: 4.04″ (103mm) Iron-vane movement, shielded from external magnetic fields. Well-compensated for temperature changes. Power consumption: 150V range at 115V, 60Hz, 2.5 watts, 2.5 voltamperes.

Self-contained ranges: single, double, and triple up to 750 volts. Higher ranges obtainable with multipliers, or by using Model 311 Potential Transformer in connection with 150-volt range. Size: 5¼″ × 5″ × 3¼″ (133 × 127 × 83mm). Approx. weight: 2½ lbs. (1.1 kg.).

CATALOG NO. 433-	RANGE	APPROXIMATE RESIS., OHMS	SCALE DIVISIONS	PRICE
AC VOLTMETERS 25–125 Hz				
1911008	250	18,200	125	
1911012	125	4,400	125	
1913007	150/75	5300/2680	150	
1913009	300/150	22,000/11,000	150	
1915001 •	450/300/150	33,000/22,000/11,000	150	
1916002 •	600/300/150	44,000/22,000/11,000	150	
1916003 •	750/300/150	55,000/22,000/11,000	150	
AC VOLTMETERS 25–1000 Hz				
1913008	150/75	3410/1705	150	
1913010	300/150	13640/6820	150	
1916001 •	600/300/150	27280/13640/6820	150	

• Has extension on case for additional resistance.

AC AMMETERS

Power Consumption: 5 amps range at 5 amps, 60 Hz, 0.50 watt, 0.52 VA. Single, double and triple ranges cover frequencies 25–500 Hz. Higher frequency coverage available. Triple range instruments have internal current transformer. All have two binding posts, double and triple range instruments have range selector switch. For ranges above 50 amps, Model 461 Current Transformer, Type 2 with 5 amps instrument is recommended.

CATALOG NO. 433-	RANGE	APPROXIMATE RESIS., OHMS	SCALE DIVISIONS	PRICE
AC AMMETERS 25–500 Hz				
2911001	1	0.48	100	
2911002	5	0.020	100	
2913004	2/1	0.12/0.48	100	
2913001	5/2.5	0.02/0.08	100	
2913005	10/5	0.0083/0.028	100	
2916002	3/1.5/0.75	0.18/0.43/0.59	150	
2916001	5/2.5/1	0.13/0.26/0.37	100	
2916005	10/5/1	0.030/0.070/0.37	100	
2916006	10/5/2.5	0.030/0.060/0.075	100	
2916007	15/7.5/1.5	0.023/0.044/0.19	150	
2917001	20/5/2	0.040/0.19/0.30	100	
2913006	20/10	0.004/0.0108	100	
2918001	30/7.5/3	0.0090/.036/.040	150	
2919001	50/20/5	0.0084/0.0011/0.20	100	
2919002	50/20/10	0.0073/0.0080/0.010	100	
AC AMMETERS 25–1000 Hz				
2916003	5/2.5/1	.13/.26/.37	100	
2916004	10/5/1	.03/.07/.37	100	

AC MILLIAMMETERS

Double ranges cover 25–1000 Hz. Double range instruments have range selector switch. Frequency span to 2500 Hz within ¼% accuracy possible.

CATALOG NO. 433-	RANGE	APPROXIMATE RESIS., OHMS	SCALE DIVISIONS	PRICE
AC MILLIAMMETERS 25–500 Hz				
4913005	150/75	30/120	150	
4913002	300/150	6.4/26	150	
4913006	500/250	1.6/6.6	100	
4911001	15	1850	150	
4911002	30	460	150	
4911012	750	0.74	150	
4913004	100/50	74/296	100	
AC MILLIAMMETERS 25–1000 Hz				
4913001	100/50	74/296	100	
4913003	500/250	1.6/6.6	100	

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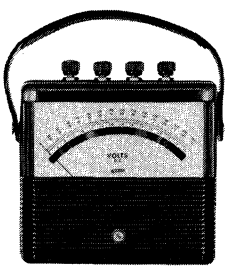
ELECTRICAL INSTRUMENT SERVICE, INC.

25 DOCK STREET, MT. VERNON, NY 10550 914-699-9717

Portable High-Precision Analog Test Equipment—Con't.
0.25%–0.75% Accuracy

SERIES 901/904 WIDE-SCALE MULTI-RANGE PORTABLES
0.25%/0.5% Accuracy



A matched group of high-precision portable instruments with 5½″ (140mm) hand-calibrated, mirror-backed scales; wide-angle, non-breakable windows; high magnetic shielding against external fields. Size: 7½″ × 7¼″ × 3⅝″ (190 × 184 × 92mm). Approx. weight: DC models, 3¾ lbs. (1.7 kg.); AC models, 4¾–7⅓ lbs. (2.1–3.3 kb.).

Series 901 DC Instruments. Self-shielded, permanent-magnet moving-coil operation. Rated accuracy: 0.25–.5% F.S.

Series 904 AC Instruments. Iron-vane movement, designed to withstand large overloads and abuse without damage or change in accuracy. Rated accuracy: 0.5% F.S.

CATALOG NO. 901	RANGE	SCALE DIVISIONS	PRICE
DC VOLTMETERS 1000 OHMS/VOLT			
1901001	0.2-0-2.8	150	
1901002	1.5	150	
1901003	150	150	
1903002	150/15/3	150	
1903003	150/75/15	150	
1903004	300/150/3	150	
1903001	500/100/10	100	
1903005	1000/500/200	100	
DC VOLTMETERS 5000 OHMS/VOLT			
1904007	0.2-0-2.8	150	
1904008	1.5	150	
1904009	150	150	
1904002	150/15/3	150	
1904005	150/75/15	150	
1904001	300/150/3	150	
1904004	500/100/10	100	
1904006	750/300/150	150	
*1905001	750/300/150/75/30/15/3	150	

CATALOG NO. 901-	RANGE	Approximate Resistance in Ohms	SCALE DIVISIONS	PRICE
DC AMMETERS				
2901001	5	.01	100	
2901002	50	.001	100	
2903004	2/1/0.5	.025/.05/.1	100	
2903005	5/2/1	.01/.025/.05	100	
2903003	10/5/1	.005/.01/.05	100	
2903007	15/7.5/3	.0034/.0067/.017	150	
2903006	20/10/2	.0025/.005/.025	100	
2903001	30/7.5/1.5	.0017/.0067/.034	150	
2903002	50/25/10	.001/.002/.005	100	
*2904001	50mV/20/5/2A	5/.0025/.01/.025	100	

CATALOG NO. 901-	RANGE	Approximate Resistance in Ohms	SCALE DIVISIONS	PRICE
DC MILLIAMMETERS				
5901002	100μA	978	100	
5901003	200μA	866	100	
5901001	500μA	476	100	
4901001	1mA	93.2	100	
4902002	100	.48	100	
4902001	300	.164	150	
4903001	30/7.5/1.5	3.33/12/23	150	
*4905002	100/50/20/10/5/2/1	1.49/2.97/7.28/14.1/26.4/52.1/60.0	100	
4904003	150/15/1.5	.667/6.26/22.5	150	
4904002	750/300/30	.067/.164/1.39	150	
*4905001	1K/500/200/100/50/20/10	.05/.1/.244/.48/.9/1.88/.25	100	
4904001	1500/150/15	.033/.322/2.22	150	

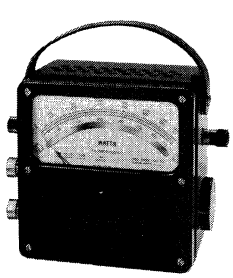
*1/4% Accuracy.

CATALOG NO. 901	RANGE	SCALE DIVISIONS	PRICE
AC VOLTMETERS, 1000 OHMS/VOLT (Rectifier-Type)			
1902001	300/150/75	150	

CATALOG NO. 904-	RANGE	Approximate Impedance @ 60Hz	SCALE DIVISIONS	PRICE
AC VOLTMETERS				
1903001	300/150	13,760/6880	150	
•1904001	300/150/75	6840/3420/1710	150	
•1904003	600/300/150	27,520/13,760/6880	150	
•1904005	750/300/150	34,400/13,760/6880	150	
1906001	750/300/150/75/30/15/7.5/3	117,500/18,400/5,180/1145/182/46/11.1/1.76 Use with 0.026 ohm leads.	150	
AC AMMETERS				
2901001	5	.0126	100	
2902002	5/2.5	.0105/.030	100	
2905002	50/20/10/5/2/1	.0014/.0055/.014/.058/.28/1.1	100	
2905001	200/100/50/20/10/5/2	.00019/.00025/.00044/.0058/.019/.076/.47	100	
AC MILLIAMMETERS				
4901003	15	2210	150	
4901004	30	582	150	
4901005	50	142	100	
4901001	150	16.1	150	
4902003	300/150	4/16	150	
4901002	500	1.1	100	
4901006	750	0.52	150	

*Non-locking key on high range, which is for intermittent duty only.

SERIES 432 DC AND SINGLE-PHASE AC WATTMETERS
0.5% Accuracy



Electrodynamometer types, accurate within ±0.5% at 60 Hz; true-RMS indication. Power consumption: Potential circuit at 115V, 60 Hz, 1.2 watts, 1.2 volt-amperes. Current circuit at 5 amperes, 60 Hz, 0.65 watt, 0.68 volt-amperes. Scale length: 4.04″ (103mm); scale divisions: 75 unless otherwise noted. Size: 5¼″ × 5″ × 3¼″ (133 × 127 × 83mm). Approx. weight: 3¼ lbs. (1.5 kg.).

CATALOG NO. 432-	Volts		Amps		Watts		Price
	Nor.	Max.	Nor.	Max.	High	Low	
DC AND SINGLE PHASE 25–125 Hz GENERAL USE							
9911001	150/75	200/100	1	1.5	150	75	
9911005	150/75	200/100	5	7.5	750	375	
9911002	300/150	400/200	1	1.5	300	150	
9911006	300/150	400/200	5	7.5	1.5kw	.75kw	
9911008	300/150	400/200	10	15	3kw	1.5kw	
9911010	300/150	400/200	20	30	6kw	3kw	
9911011	300/150	400/200	50	75	15kw	7.5kw	
9911041	150/75	200/100	.1	.15	15	7.5	
9911042	150/75	200/100	.2	.3	30	15	

DC AND SINGLE PHASE 25–125 Hz GENERAL USE—Con't.

CATALOG NO. 432-	Volts		Amps		Watts		Price
	Nor.	Max.	Nor.	Max.	High	Low	
9911054	300/150	400/200	.1	.15	30	15	
9911055	300/150	400/200	.2	.3	60	30	
9911056	300/150	400/200	.5	.75	150	75	
9912005	150/75	200/100	10/5	15/7.5	1500/750	750/375	
9912003	200/100	260/130	5/2.5	7.5/3.75	1000/500	500/250	
9912004	300/150	400/200	5/2.5	7.5/3.75	1500/750	750/375	
9912007	300/150	400/200	10/5	15/7.5	3/1.5kw	1.5/7.5kw	
9912026	200/100	260/130	1/.5	1.5/7.5	200/100	100/50	
DC AND SINGLE PHASE 25–1000 Hz							
9912013	300/150	400/200	5/2.5	7.5/3.75	1500/750	750/375	
9911015	300/150	400/200	5	7.5	1.5kw	.75kw	
9901014	150/75	200/100	5	7.5	750	375	
9901057	200/100	260/130	50	7.5	10kw	5kw	

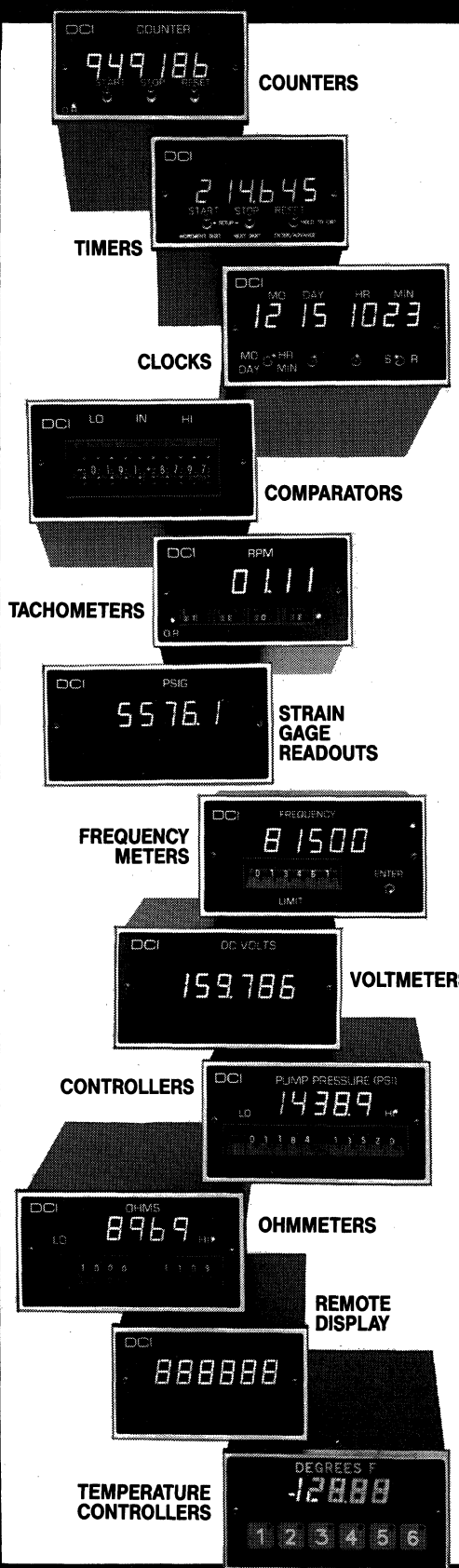
CATALOG NO. 432-	Volts		Amps		Watts		Price
	Nor.	Max.	Nor.	Max.	High	Low	
FOR LOW POWER FACTOR 25–125 Hz 20% P.F.							
9912009	—	300/150	—	5/2.5	300/150	150/75	
9912010	—	300/150	—	10/5	600/300	300/150	
9912014	—	150/75	—	1/.5	30/15	15/7.5	
9912015	—	150/75	—	2/1	60/30	30/15	
9912016	—	150/75	—	5/2.5	150/75	75/37.5	
9912022	—	300/150	—	.5/.25	30/15	15/7.5	
9912024	—	300/150	—	2/1	120/60	60/30	

DIGITAL PANEL METERS

Manufacturer	Starting EEM Page No.	Series/ Model	Number of Digits (Number of Counts)						Function							Type of Display	Power Requirements		
			3 (999)	3 1/2 (1999)	3 3/4 (3999-5999)	4 (9999)	4 1/2 (19999)	4 3/4 (39999-59999)	Gen. Purpose	Temperature	Pressure	Weight	RPM	Process Control	Other		AC Line	+5 VDC	BCD Output
DCI Inc.	D•1342			√		√	√	√	√	√	√	√	√	√	√	LED	√	√	√
D1 International	D•1343	DPM301,302, 303,304		√					√							LED	√		
Electro-Numerics Inc.	D•1344	All DPMs		√			√	√	√	√	√	√	√	√		LED, LCD, GD	√	√	√
Fox Meter	D•1345	F110		√					√	√				√	√	LED	√	√	
		F120					√		√	√				√	√	LED	√	√	
		F130				√			√				√		√	LED	√	√	
		F140				√			√						√	LED	√	√	
		F160		√					√	√				√	√	LED	√	√	
		F310							√						√	LED	√	√	
		F320							√						√		√	√	
		F340							√						√	LED	√	√	
		F350							√				√		√	LED	√	√	
		F370							√						√	LED	√	√	
		F380							√						√		√	√	
		F390							√						√	LED	√	√	
		F410							√						√	LED	√	√	
		F440							√						√	LED	√	√	
		F450							√				√		√	LED	√	√	
		F470							√						√	LED	√	√	
		F480							√						√	LED	√	√	
Gralex Ind.	D•1348			√	√		√		√					√		LED/LCD	√	√	√
International Microtronics Corp.	D•1352			√					√	√	√	√		√		AC Volts, LCD	√	√	
									√			√		√		AC Volts, LCD	√	√	
				√					√			√		√		LCD		√	
		500		√					√	√	√	√		√		LCD			
		400						√					√			LED	√	√	√
		350		√			√		√	√				√	√	RMS, LED	√	√	√
		OJ2000		√					√	√	√	√		√		RMS, Large .8" LED, 5" LCD	√	√	√
		100 MIL-SPEC		√			√		√				√	√	√	RMS Dot Matrix LED		√	√
		Ultima 200		√			√		√	√	√	√	√	√	√	RMS, Resistance LED & LCD	√	√	√
		700					√		√	√		√		√	√	RMS, LED	√	√	√
		Flat Pack		√		√	√		√	√	√	√	√	√	√	AMP-Hour LED & LCD		√	
		6000		√			√		√	√	√	√		√	√	RMS, LED & LCD		√	
Laurel Electronics	D•1359	Laureate		√	√	√	√	√	√	√	√	√		√		LED	√		√
Newport Electronics	D•1363	L2Q		√		√			√	√	√	√	√	√	√	2 1/4" LED Red or Green	√		
		L4Q		√		√			√	√	√	√	√	√	√	4" LED Red or Green	√		
		P6000						6dig.			√		√	√		LED Red or Green	√		√
		P7000						6dig.			√		√	√	√	LED Red	√		√
		Q2000X		√					√	√	√	√	√	√		LED or LCD	√	√	√
		Q9000X				√			√	√	√	√	√	√	√	LED	√	√	√
		81 PID				√				√						LED Green	√		
		205		√						√	√	√		√		LED Red or Green	√	√	
		269				√				√						LED Red	√		
		Infinity						6dig.	√	√	√	√		√	√	LED Red	√		√
Omega	D•1368	Omega		√	√	√	√	√	√	√	√	√	√	√	√	pH, Flow Rate, Totalizer, LED, Flourescent, LCD	√	√	√
Selco Products	D•1370			√		√	√		√										
Texmate Inc.	D•1374	DU-Series		√		√			√		√		√			LED & LCD	√		
		Intelligent-Meter Relays		√			√		√	√	√	√	√	√		LED & LCD	√		
		SM-Series		√					√							LED & LCD		√	
		Professional Series					√		√						√	LED & LCD		√	
		Texmate Classics		√			√		√							LED & LCD	√	√	
		UM-Series		√		√			√	√	√		√	√		LED	√		
		PC-Series		√			√								√	LED & LCD	√		
		Process Meters		√										√		LED & LCD			
		Temperature		√			√			√						LED & LCD	√	√	
		Virtual Panel Meters & Data Acquisition		√					√							Terminal			
Weschler Instruments	D•1389	Weschler, NES, and Bowmar	√	√		√	√	√	√	√	√	√	√	√	√	LED	√	√	√

ANALOG PANEL METERS

Manufacturer	Starting EEM Page No.	Series/ Model	Type			Size (Inches)												
			Moving Coil	Moving Iron	Taut Band	<1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	>5	Edge-wise	Illumi-nated	Cus-tom	Bar-graph
D1 International	D•1343		√	√	√	√	√	√	√	√	√	√	√	√		√	√	
International Instruments	D•1350	Full line	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√
International Microtronics Corp.	D•1352	580 570 560										√ √		√	√	√ √ √	√ √	√ √ √
Omega Engineering	D•1368			√						√		√		√				
Selco Products	D•1370				√	√	√		√		√		√			√	√	
Shurite Meters	D•1373		√	√											√		√	
Texmate	D•1374	Bargraphs Square/ Edgewise Square/ Edgewise	√ √	√ √	√ √										√ √	√ √	 √	√
Weschler Instruments	D•1389	Weschler, NES, Bowmar							√			√		√	√		√	√



MEASURE, COMPARE, CONTROL, ...and COMMUNICATE.

AVAILABLE OPTIONS:

- Communication Interface
  - RS232
  - RS422
- Driver Outputs
  - BCD
  - ASCII Printer
- Analog Outputs
  - 4-20 mA
  - up to ±10V
- Excitation Outputs
  - +10 VDC
  - ±15VDC
  - +25VDC
- Logic Outputs
  - limits
  - end of conversion
- Relay Outputs
  - form C relay closure
- Up to 8 Digits of Display
- Special Scaling
- Sunlight Readable LED Displays
- DC Input Power
- High Speed Sampling
- Power Loss Protection

STANDARD FEATURES:

- Heavy Duty Aluminum Case
- Gold Plated I/O Contacts
- Non Glare Lens
- .56" High Efficiency LED Display
- 115VAC Power Input
- Direct Replacement for ERC/ITC Units

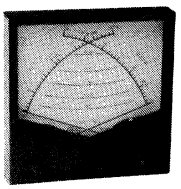
For more information or application assistance, call Larry Shelton or Bill Cook 913-782-5672

DIGITAL PANEL INSTRUMENTATION FOR INDUSTRY

14812 WEST 117TH STREET / OLATHE, KANSAS 66062 / (913) 782-5672 • FAX (913) 782-5766

DCI

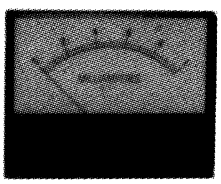
APM70W Series 3-in-1 Meter



Meter contains two independent meter movements to measure DC Volts and DC Amps. Watts are read from scale where the two needles intersect. Meter allows compact packaging. Custom scales to read other parameters and ranges can be supplied.

Model	Voltage Range	Current Range	Wattage
APM70W/80	0-30VDC	0-5ADC	80
APM70W/250	0-30VDC	0-15ADC	250
APM70W/500	0-30VDC	0-30ADC	500

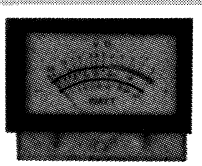
Master Series



Popular front mounted meters known for their rugged applications. Custom scales can be supplied.

Voltage Ranges: Up to 1000 Volts DC or 500 Volts AC
Current Ranges: 50 uAmps DC to 50 Amps DC
50 mAmps AC to 50 Amps AC

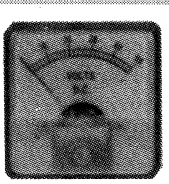
Champion Series



Excellent for applications where quality and appearance are major considerations. Behind the panel meter mounting is enhanced by the front mounted bezel. Most meters can be supplied with optional built-in pilot lights. Custom scales can be supplied.

Voltage Ranges: Up to 1000 Volts DC or 500 Volts AC
Current Ranges: Up to 50 Amps DC

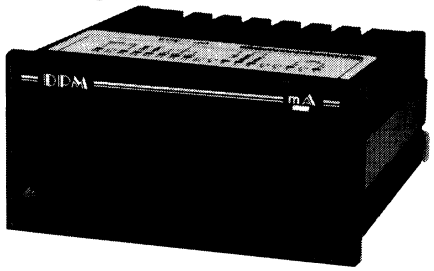
Challenger Series



Extremely versatile square faced meters used to measure AC/DC voltages and currents in a wide variety of applications. Custom scales can be supplied.

Voltage Ranges: Up to 1000 Volts DC or 500 Volts AC
Current Ranges: 50 uAmps DC to 50 Amps DC
50 mAmps AC to 50 Amps DC

Digital Panel Meters



- Low Cost
- Compact
- Accurate
- Dual Slope A/D Conversion
- Red LED Display (0.56"H)
- Start/Hold Function
- Automatic Polarity
- Overrange Indication
- 110/120VAC Power
- Connector & Bracket Included

DC Voltage Ranges:

DPM301-1	±199.9mVDC
DPM301-2	±1.999VDC
DPM301-3	±19.99VDC
DPM301-4	±199.9VDC
DPM301-5	±600VDC

DC Current Ranges:

DPM302-1	±199.9uADC
DPM302-2	±1.999mADC
DPM302-3	±19.99mADC
DPM302-4	±199.9mADC
DPM302-5	±1.999ADC

AC Voltage Ranges:

DPM303-1	±199.9mV
DPM303-2	±1.999V
DPM303-3	±19.99V
DPM303-4	±199.9V
DPM303-5	±600V

AC Current Ranges:

DPM304-1	±199.9uA
DPM304-2	±1.999mA
DPM304-3	±19.99mA
DPM304-4	±199.9mA
DPM304-5	±1.99A

Model 1000 Wide Range Clamp-On Meter

Features a rotary scale that displays one current or voltage scale at a time to minimize reading errors. Tear drop shaped jaws makes it easier to reach wires, up to 2" diameter, in cramped locations. Needle lock is provided to hold meter reading.

- 5 Current Ranges: 10, 30, 100, 300, and 1000 Amps AC
- 3 Voltage Ranges: 150, 300, and 750 Volts AC
- Resistance: 200 Ohms. 20 Ohms center scale.
- Accessories: Manual, voltage and resistance test probes, spare fuse, carrying case.

JUST ASK US—

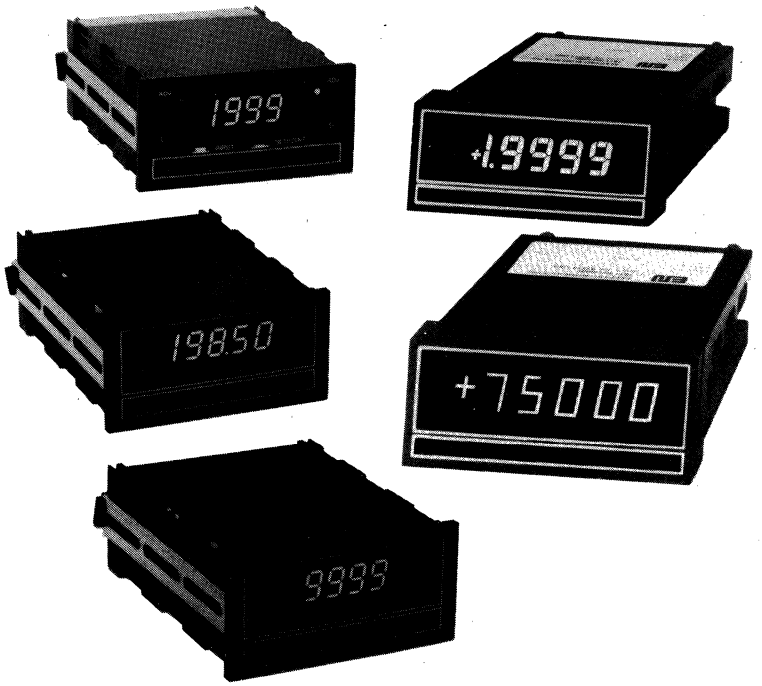
Other meters can be supplied. Send us your specifications. Our low prices may surprise you. Our quality and service will please you.

PANEL METERS

D1 International Inc.

95 EAST MAIN ST., HUNTINGTON, NY 11743
(516) 673-6866 **FAX (516) 673-6893**

DIGITAL DISPLAY INDICATORS



DIGITAL PANEL METERS

- 1999 to 75,000 Counts
- LED, LCD, GAS DISCHARGE Displays
- 1/8 DIN & NEMA Sized Cases
- AC, DC & Current loop Powered
- Voltmeter, Ammeter (DC & AC)
- Strain Gauge inputs
- Current & Voltage loop inputs
- RTD & Thermocouple inputs
- Frequency/Rate inputs
- Analog & Digital (BCD) outputs
- Single & Dual Setpoints
- Excitation outputs
- User Scalable
- Newport Direct Replacements
- Remote Displays (BCD input)
- Counters
- Digital Comparators
- TWO YEAR WARRANTY

2¼ INCH LED INDICATOR

- 19999 Counts (4 ½ digits)
- Current & Voltage loop inputs
- 2 ¼" Tall LED Digits
- User Scalable
- Excitation & Analog outputs
- Sealed Enclosure
- TWO YEAR WARRANTY

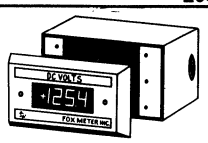
BIG DIGIT INDICATORS

- 9999 Counts (4 Digit)
- 4" & 6" Tall Digits
- Microprocessor Design
- DC Voltage & Current inputs
- Current Loop inputs
- RS232 & 20mA Serial inputs
- User Scalable
- Counters, Timers
- Rugged, Weather Resistant Case
- Optional NEMA 4 Case
- 18 MONTH WARRANTY

FOR APPLICATIONS ASSISTANCE
OR ADDITIONAL INFORMATION ON
STANDARD OR SPECIAL MODELS CONTACT

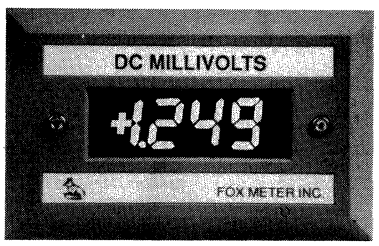
ELECTRO-NUMERICS, INC.
1811 Reynolds St., Irvine, CA 92714
(714) 250-1501 • FAX # 714/250-0958

FOX METER INC.

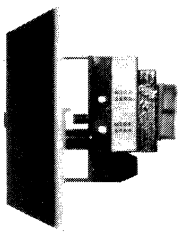


FOX METER INC., in business to design and manufacture industrial instrumentation and components that address the problems of industrial applications. Problem areas such as corrosive atmosphere, wash down, vibration, bright ambient viewability, conductive powder and salt spray have all been successfully tamed by FOX panel meter installations.

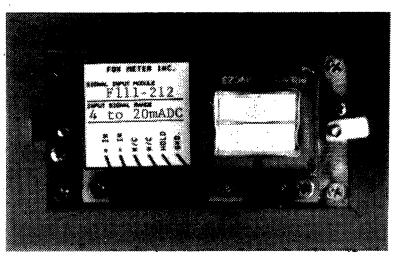
DIGITAL PANEL METERS FOR INDUSTRY



- TESTED TO NEMA 4 STANDARDS
- HIGH IMPACT ABS NEUTRAL GRAY BEZEL
- LARGE, RECESSED LABEL AREAS
- STAINLESS STEEL HARDWARE

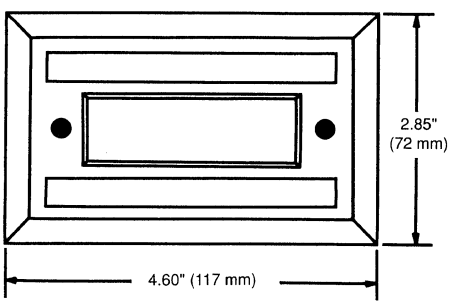


- TAPERED SNAG FREE FRONT FACE
- CONTROLS AND ADJUSTMENTS LOCATED ON SIDE FOR EASY ACCESS
- 1.5" BEHIND PANEL DEPTH



- EXTRA LARGE GASKET SURFACE
- SCREW TERMINAL CONNECTIONS
- PC BOARDS FULLY SUPPORTED FOR EXCEPTIONAL RUGGEDNESS

PHYSICAL DIMENSION SPECIFICATIONS



MOUNTING FLEXIBILITY

FOX panel meters mount from the front in standard 1/8th DIN cutouts. The front panel mounting hardware is easily removed to provide direct mounting into most standard single gang electrical enclosures, such as cast outdoor boxes, PVC molded boxes, standard knock-out boxes with a 1/2" plaster ring and masonry boxes. The 1.5" behind panel depth allows for mounting where other 1/8" DIN units cause interference problems due to their depth.

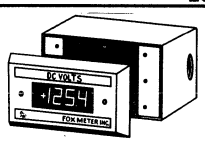
FEATURES

- 2 YEAR WARRANTY
- EASILY CUSTOMIZED
- EXCEEDS NEMA 4X
- 140 DEGREE F BURN-IN
- DOCUMENTED QA PROGRAM
- QUICK EASY INSTALLATION
- RUGGED COMPACT DESIGN
- SUPER BRIGHT LED DISPLAYS
- 3 FULL ELECTRICAL TESTS
- SCREW TERMINAL WIRING
- MOUNTS IN SINGLE GANG ELECTRICAL BOX
- MADE IN THE U.S.A.

SEE FOLLOWING PAGES FOR PRODUCT LISTINGS

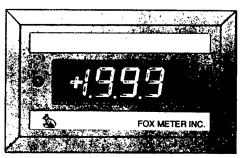
P.O. BOX 1115 • 525 MAIN ST. (RT. 47) • ELBURN, IL 60119-1115 • PHONE 708-365-2422 • FAX 708-365-2898

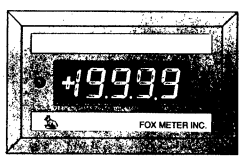
FOX METER INC.



The listings on these two pages represent a capsule summary of the products manufactured by FOX METER INC. Complete product listings and specifications are available. Request product data sheets.

ANALOG INPUT — VOLTS — AMPS — OHMS — AC — DC — TRMS — TEMPERATURE — 1 TO 5 SETPOINTS — FORM C RELAY OUTPUTS — SCALEABLE IN ENGINEERING UNITS





F | 1 | X | X

			SERIES BASE METER .....$ 180.00
		1	3 1/2 DIG .6" LED (+/-1.9.9.9) .....N/C
		2	4 1/2 DIG .6" LED (+/-1.9.9.99) .....ADD 40.00 _____
		6	3 1/2 DIG .6" LED FOR SETPOINTS ...ADD 10.00 _____
	1		120 VAC POWER .....ADD 4.00 _____
	2		6-10 VAC POWER .....N/C
	5		12-5 VDC POWER .....N/C
	7		10-30 VDC POWER .....ADD 25.00 _____
			INPUT MODULE CODE .....LISTED BELOW _____
			SETPOINT MODULE(S) .....68.00 EACH _____
			TOTAL _____

F □ □ □ — □ □ □

INPUT RANGE		CODE	ADD
DC VOLTAGE			
+/-200	mVDC	100	$13
+/-2	VDC	101	13
+/-20	VDC	102	5
+/-200	VDC	103	5
DC VOLTAGE/SCALEABLE			
+/-100	mVDC	110	$13
+/-5	VDC	113	5
+/-10	VDC	114	5
+/-20	VDC	115	5
+/-100	VDC	116	5
DC VOLTAGE/ZERO TRIM			
+/-200	mVDC	120	$19
+/-2	VDC	121	19
+/-20	VDC	122	11
+/-200	VDC	123	11
DC VOLTAGE/SCALEABLE/ZERO TRIM			
+/-100	mVDC	130	$19
+/-5	VDC	133	11
+/-10	VDC	134	11
+/-20	VDC	135	11
+/-100	VDC	136	11
PROCESS/VOLTAGE INPUT			
+/-100	mVDC	140	$19
1 to 5	VDC	143	11
+/-10	VDC	144	11
+/-20	VDC	145	11
+/-100	VDC	146	11
DC CURRENT			
+/-2	mADC	170	$19
+/-20	mADC	171	19
+/-200	mADC	172	19
+/-2	ADC	173	21
DC CURRENT/SCALEABLE			
+/-1	mADC	180	$19
+/-10	mADC	181	19
+/-20	mADC	182	19
+/-50	mADC	183	19
+/-100	mADC	184	19
DC CURRENT/ZERO TRIM			
+/-2	mADC	190	$25
+/-20	mADC	191	25
+/-200	mADC	192	25
+/-2	ADC	193	27

INPUT RANGE		CODE	ADD
DC CURRENT/SCALEABLE/ZERO TRIM			
+/-1	mADC	200	$25
+/-10	mADC	201	25
+/-20	mADC	202	25
+/-50	mADC	203	25
+/-100	mADC	204	25
PROCESS/CURRENT INPUT			
+/-1	mADC	210	$25
+/-10	mADC	211	25
4 to 20	mADC	212	25
10 to 50	mADC	213	25
+/-100	mADC	214	25
DC CURRENT/EXTERNAL SHUNT			
2	AMPS	234	$45
20	AMPS	235	45
200	AMPS	236	50
OHMMETERS/ZERO TRIM			
20	OHMS	242	$71
200	OHMS	243	71
2	K OHMS	244	71
20	K OHMS	245	71
200	K OHMS	246	71
OHMMETERS/SCALEABLE/ZERO TRIM			
20	OHMS	252	$71
200	OHMS	253	71
2	K OHMS	254	71
20	K OHMS	255	71
200	K OHMS	256	71
PROCESS/RESISTANCE			
20	OHMS	262	$75
200	OHMS	263	75
2	K OHMS	264	75
20	K OHMS	265	75
200	K OHMS	266	75
AC VOLTAGE			
200	mVAC	303	$28
2	VAC	304	28
20	VAC	305	28
200	VAC	306	28
600	VAC	307	38
AC VOLTAGE/SCALEABLE			
200	mVAC	313	$43
2	VAC	314	43
20	VAC	315	43
200	VAC	316	43

INPUT RANGE		CODE	ADD
TRMS VOLTAGE			
200	mVAC	333	$43
2	VAC	334	43
20	VAC	335	43
200	VAC	336	43
AC CURRENT			
200	mA	353	$68
2	A	354	68
20	A	356	68
200	A	357	93
AC CURRENT/SCALEABLE			
200	mA	363	$68
2	A	364	68
5	A	365	68
20	A	366	68
TRMS CURRENT			
200	mA	383	$93
2	A	384	93
20	A	386	93
200	A	387	108
TEMPERATURE/PAT IC SENSOR			
-55.0/+150.0	C	410	$60
-60.0/+200.0	F	413	60
-60/+300	F	414	60
TEMPERATURE/100 OHM Pt RTD			
-50.0/+200.0	C	440	$45
-50/+600	C	441	45
-55.0/+200.0	F	443	45
-55/+1110	F	444	45

SETPOINT MODULES
MOUNT EXTERNAL TO THE METER
EACH MODULE INCLUDES A TWO COLOR STATUS LED. A 25 TURN SETTING POT AND A MOMENTARY VIEWING/SETTING SWITCH.
AN INTERFACE CABLE SIZED FOR THE NUMBER OF MODULES PER METER IS INCLUDED AT NO CHARGE.

FORM C RELAY OUTPUT		
-2000 to +2000	F000-900	$68
-100 to +2000	F000-901	68
-2000 to +100	F000-902	68

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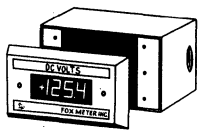
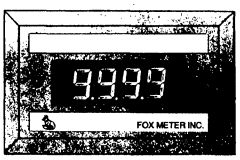
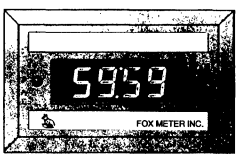
FOX METER INC.



COUNTING — TIMING — RATEMETER — FREQUENCY — TACHOMETER — SCALEABLE IN ENGINEERING UNITS





F | 1 | X | X

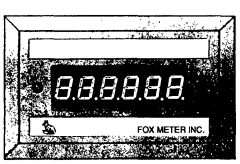
			SERIES BASE METER ..... $ 180.00
		3	4 DIG .6" LED (9.9.9.9) ..... N/C
		4	4 DIG .6" LED (59:59) ..... N/C
	1		120 VAC POWER ..... ADD 4.00 _____
	2		6-10 VAC POWER ..... N/C
	5		5-12 VDC POWER ..... N/C
	7		10-30 VDC POWER ..... ADD 25.00 _____
			INPUT MODULE-CODE ..... LISTED BELOW _____
			TOTAL _____

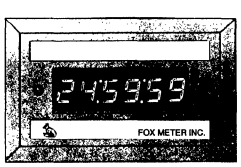
F ☐ ☐ ☐ – ☐ ☐ ☐

INPUT RANGE		CODE	ADD
COUNTER INPUT			
2-30 V PULSE		500	$14
5 V SOURCING	FROM PNP OUTPUT	501	14
5 V SINKING	FROM NPN OUTPUT	502	14
DRY CONTACT		503	14
DIVIDE-BY 1-255 COUNTER INPUT			
2-30 V PULSE		510	$27
5 V SOURCING	FROM PNP OUTPUT	511	27
5 V SINKING	FROM NPN OUTPUT	512	27
DRY CONTACT		513	27

INPUT RANGE		CODE	ADD
TIMER INPUT/LINE SYNC			
1 PULSE/SEC		540	$23
10 PULSES/SEC		541	23
100 PULSES/MIN		542	23
RATE/FREQ/TACH			
2-30 V PULSE		580	$27
5 V SOURCING	FROM PNP OUTPUT	581	27
5 V SINKING	FROM NPN OUTPUT	582	27
DRY CONTACT		583	27

COUNTING — UP/DOWN — QUADRATURE — TIMING — RATE — PERIOD — REMOTE DISPLAY — MASTER/SLAVE CLOCK — FORM C RELAY OUTPUTS — SERIAL ASCII — USER PROGRAMMABLE — 6 DIGIT .4" LED DISPLAY





F | 3 | X | X
F | 4 | X | X

			SERIES BASE METER $240.00
			SERIES BASE METER FOR SETPOINTS $295.00
		1	REMOTE DISPLAY (9.9.9.9.9.9) ..... N/C
		2	REMOTE DISPLAY (99:99:99) ..... N/C
		4	COUNTER UP/DOWN (999.9.9.9) ..... ADD 65.00 _____
		5	RATE/FREQ/PERIOD (999.9.9.9) ..... ADD 55.00 _____
		7	TIMER (999999) ..... ADD 20.00 _____
		8	TIMER (99:59:59) ..... ADD 20.00 _____
		9	MASTER CLOCK (99:59:59) ..... ADD 65.00 _____
	1		120 VAC POWER ..... ADD 20.00 _____
	2		6-10 VAC POWER ..... N/C
	5		5-12 VDC POWER ..... N/C
	7		10-30 VDC POWER ..... ADD 25.00 _____
			INPUT/OUTPUT CODE ..... LISTED BELOW _____
			MASTER SETPOINT MODULE ..... ADD 105.00 _____
			SLAVE SETPOINTS ..... 75.00 EACH _____
			SLAVE LATCHING MODULE ..... 80.00 EACH _____
			TOTAL _____

F ☐ ☐ ☐ – ☐ ☐ ☐

INPUT/OUTPUT TYPE	CODE	ADD
RS232C RECEIVE/RETRANSMIT	650	$29
RS232C RECEIVE/TRANSMIT	651	29
RS422/RS485 RECEIVE/TRANSMIT	652	20
CURRENT LOOP RECEIVE	654	40
CURRENT LOOP RECEIVE/TRANSMIT	655	60
NO SERIAL DATA	659	5

MASTER/SLAVE SETPOINT MODULES MOUNT EXTERNAL TO THE METER. INCLUDE A TWO COLOR STATUS LED AND A VIEW/PROGRAM SWITCH. THE MASTER MODULE ALSO HAS STEP/ENTER AND SET SWITCHES. INCLUDES INTERFACE CABLE.

MASTER SETPOINT MODULE	— ORDER F000-920	$105
SLAVE SETPOINT MODULE	— ORDER F000-924	75
SLAVE LATCHING MODULE	— ORDER F000-925	80

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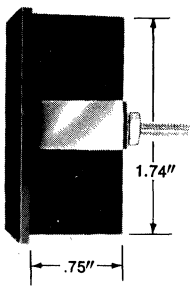
GRALEX

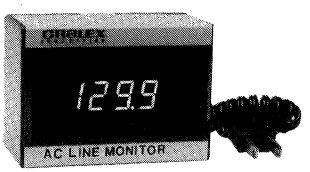
DIGITAL PANEL METERS

VOLTS DC / VOLTS AC / VOLTS RMS
MICROVOLTS / CURRENT LOOPS
RATE / FREQUENCY / RPM / TIME
INTEGRATION / AMPERE-HOUR
COUNTING / CALIBRATORS / RATIO

MODEL 50/51 3½ Digit Vacuum—Fluorescent Display 5 VDC Power
MODEL 25/26 4 Digit Event Counter with BCD Output 5 VDC Power
MODEL 10 Low Cost Plug In Line Monitor 80-150 VAC
SERIES 2000 mV or TC Type Process Controller with Programmable High and Low Setpoints

MODEL 50





MODEL 10

AVAILABLE FROM STOCK
MODELS 25/30/32/40/50

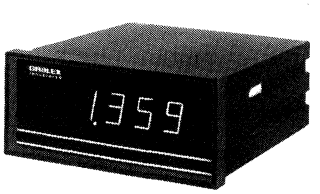
1 YEAR WARRANTY

MODEL	12/13	30/31	32/33	35	38	40/41	435	48	50/51
F.S. Range	1.999 V ac	±1.999 V dc	±.1999 V dc	±1.999 V dc	±1.999 V dc	±1.9999 V dc	±1.9999 V dc	19.99 mV RMS	±1.999 V dc
Input Imp. (megohms)	1	1000	1000	1000	1000	1000	1000	1	1000
Conv. rate (nom.)	3/sec.	3/sec.	3/sec.	3/sec.	3/sec.	3/sec.	3/sec.	3/sec.	3/sec.
Autozero	yes	yes	yes	yes	yes	yes	yes	yes	yes
Ext. hold	yes	yes	yes	yes	yes	yes	yes	yes	yes
Ext. blanking	yes	yes	yes	yes	yes	yes	yes	yes	yes
Pwr. requirement (V)	5 DC	5 DC	5 DC	117 AC	117 AC	5 DC	117 AC	117 AC	5 DC
Display type	LED	LED	LED	LED	LED	LED	LED	LED	Vac. Fl.
Case dimensions	I	I	I	II	III	I	II	III	I
BCD Option	no	no	no	no	yes	yes	yes	yes*	no

*Tristate, isolated.

SERIES 2000 PROCESS CONTROLLER

The series 2000 meter/controllers are the GRALEX Industries new generation, microprocessor based digital panel instruments. The model 2000 is the basic 400 mV or 4 Vdc full scale meter. The model 2020 is a Thermocouple type temperature controller with front panel selectable Celsius or Farenheit indication. The model 2050 measures and performs Ampere/Time integration, accumulating or decrementing the total count, depending on input polarity. All 2000 series meters have programmable HIGH and LOW setpoints. Programming is maintained during power interruptions.



MODEL 37/38/48

7 SEGMENT PLANAR GAS DISCHARGE, 0.55", 3½ AND 3¼ DIGIT.

MODEL	36-3	36-4	37SC( )A2	37SD( )A2
F.S. Range (±V)	.1999-19.99	.1999-199.9	.1999-199.9	.3999-399.9
Input Imp. (megohms)	>1000	1000	>100/>1	>100/>1
Conv. rate (nom.)	var. to 100	3	6	6
Autozero	no	no	no	no
Ext. hold	yes	yes	yes	yes
Ext. blanking	yes	yes	yes	yes
Pwr. requirements (V AC)	117-237	117-237	117-237	117-237
BCD output	standard	standard	optional	optional
Case dimensions	IV	IV	III	III

CASE	HEIGHT	WIDTH	DEPTH
I (DIN)	1.74"	3.59"	0.75"
II (DIN)	1.65"	3.58"	3.30"
III (NEMA)	1.68"	4.00"	4.04"
IV (PROP)	2.03"	3.53"	2.82"

GRALEX INDUSTRIES INC
P.O. Box 416, Norwood, NJ 07648
1-800-486-4499 • FAX 201-767-7015

GRALEX

DIGITAL PANEL METERS

NEW PRODUCT PREVIEW

NO WIRES

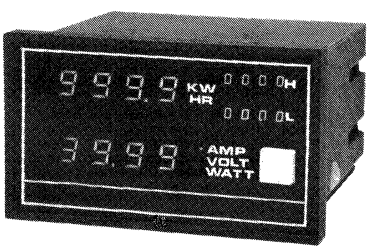
DESCRIPTION

Isi elapsed time indicator (ETI) is totally encapsulated, wireless, self-contained and maintenance free. Model MA-1055 requires no electrical connection, provided mechanical coupling is possible. Where electrical coupling is required use model VA-1055. Both units are rugged and suitable for hostile environments.

MODEL MA-1055 (shown)
MODEL VA-1055 (wired version)

APPLICATIONS	ADVANTAGES	SPECIFICATIONS
• Internal combustion engines • Aircraft maintenance • Farm equipment • Compressors • Rental equipment • Pumps etc.	• Tamper resistant • Self powered • Simple installation • Wide operating temperature • Wireless activated (MA-1055) • Long service life (10 years) • 2 year warranty	• Ten year battery life • -0 to +50C operating temperature • Waterproof • Oil and solvent resistant • Shock resistant • 1/10 hour resolution • 5 1/2 digit LCD display • Panel or surface mountable • Extended temperature range available

SERIES 2200



DESCRIPTION

Microprocessor based AC/DC powered two A/D input channels with process indicator/control functions. The 2200 series indicator/controller includes two spdt relays for high and low limit set point programmable by the user. Multiple display modes include set point, program, read ch1, read ch2, elapsed time, combined-under software control and may be transformed to read directly in standard units.

SPECIFICATIONS

Same as 2000 series but with 2 A-D inputs.

APPLICATIONS

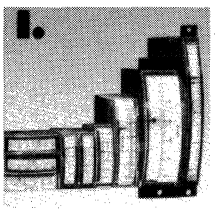
- Watt/watt-hour indicator/controller
- Degree-day indicator
- Efficiency indicator ie. A-B•Factor
- Unit transformation of non-linear functions

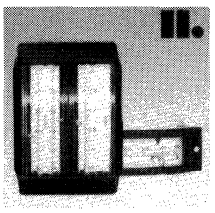
Note:
Custom software available for minimal charge.

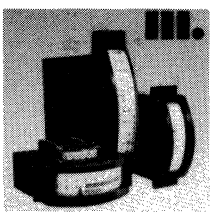
GRALEX INDUSTRIES INC
P.O. Box 416, Norwood, NJ 07648
1-800-486-4499 • FAX 201-767-7015

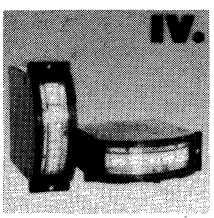
INTERNATIONAL INSTRUMENTS

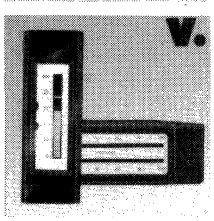
Panel Meters, Controllers and Indicators for OEM & Industry.

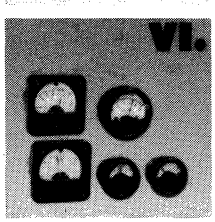


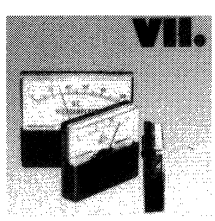












A comprehensive line of precision instruments from the pioneer of edgewise engineering.

International Instruments offers a complete edgewise family of military and industrial analog indicators, alarm/control devices and electronic display instruments. These are supplemented by a line of ruggedized miniature meters and the innovative Flat-Pak® line of "space-saver" meters. Applications assistance is immediately available from the factory or a comprehensive network of distributors, representatives and agents strategically located throughout the world.

I. **STANDARD MODELS** offering all of the advantages of edgewise design, including compact installation, superior readability, magnetic shielding and reliable performance.

II. **SINGLE/DUAL SCALE AND SWITCHBOARD MODELS**
III. **MIL. SPEC. SWITCHBOARD MODELS**
IV. **ALARM/CONTROL MODELS**

SEE FACING PAGE ▶

V. **ELECTRONIC CONTROLLERS AND INDICATORS** for brighter, bolder, super-readable VFD and gas-discharge displays.

VI. **SQUARE AND ROUND (RUGGEDIZED/MIL) MODELS** designed for heavy duty service in commercial, industrial, military and OEM applications.

VII. **EXCLUSIVE FLAT-PAK** extra-slim, no-barrel meters designed to save money by saving space.

AS WELL AS CUSTOM METERS AND MOVEMENTS designed to meet your specific requirements.

SEE BOX AT RIGHT. CALL AND ASK FOR THE BULLETIN THAT WILL ANSWER YOUR QUESTIONS.

Product Data Bulletins available from

Order by Bulletin Number:

I — Edgewise Meters: Standard Models.
II — Edgewise Meters: Single/Dual Models.
III — Edgewise Meters: Mil. Spec. Models.
IV — Edgewise Meters: Alarm/Control Models.
V — Electronic Controllers and Indicators.
VI — Square & Rounds (Ruggedized/Mil.)
VII — Flat-Pak® Meters.
VIII — Full Line (Short Form) Catalog.

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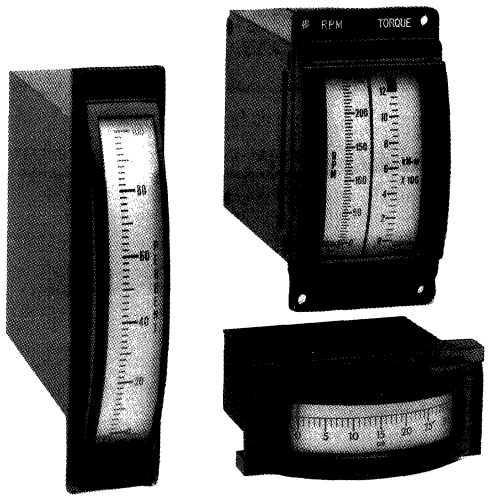
FEATURES AND SPECIFICATIONS ON A FEW SELECTED PRODUCTS

INTERNATIONAL INSTRUMENTS



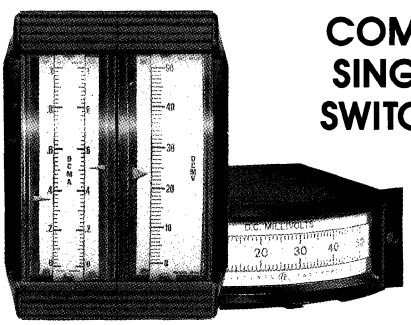
MILITARY SINGLE / DUAL SWITCHBOARD MODELS

All ⁘ military-type meters are suited to applications such as missile control, checkout equipment, and airborne, shipboard, or land-based monitoring installations. In industrial applications, their rugged reliable performance make them a good choice for production and processing equipment operating in environments of shock, vibration, or moisture.

MODELS 2150/2152 meet the applicable requirements of MIL-M-10304 and MIL-M-16034.

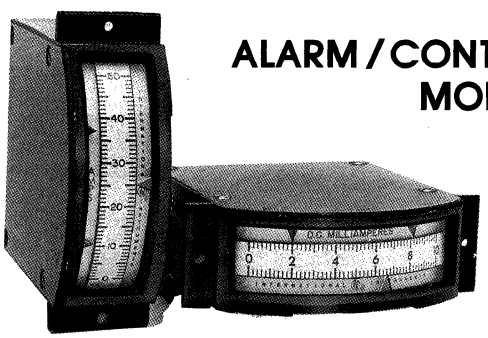
MODELS 1147/1149 also perform well as position indicators on remote control panels, or, with center zero movements, as null indicators.

MODEL 1247 is in family with the Model 1147 / 1149 meters but is a dual meter, designed to permit grouping of two important parameters in a single unit for instant analysis.



COMMERCIAL SINGLE / DUAL SWITCHBOARD MODELS

MODELS 1151/1251 and 1146/1246 were initially developed to meet the demanding specifications of the Atomic Energy Commission with respect to seismic qualifications, long-life and high accuracy. The resulting product line is the most rugged and reliable available. Models 1146 and 1246 are 3½-inch meters, 1151 and 1251 6-inch models, both series of instruments manufactured of modern black plastic with a design compatibility that makes them perfectly suited for use together on the same panel board. Windows are tough clear Lexan®.



ALARM / CONTROL MODELS

MODEL 1139 is an internally illuminated meter that does away with the need for auxiliary visible alarm circuitry.

MODEL 2547/2548 meters offer a wide choice of voltage and current-sensing ranges, as well as optional plug-in or built-in output modifiers to change the mode of control. With a choice of slope or trigger output, ⁘ Control Meters are inherently adaptable to both smooth proportional and straight on-off control. The resulting line of indicating controllers is well qualified to answer the needs of the aerospace, manufacturing, process, and utility industries.

MODELS 2602/2603 indicate, alarm, or provide on/off control for virtually *any* measurable variable that can be represented by an electronic signal.

CONDENSED SPECIFICATIONS

	1146/1246	1151/1251	1139	2547/2548	2602/2603	1147/1149/1247	2150/2152
Accuracy (% of FS)	DC:2, AC:3	DC:1.5, AC:2.5	DC:2	← DC:2, AC:3 →		← DC:2, AC:3 →	
Response time (sec max)	3.0	2.5	← 2.5 →			← 2 →	
Overshoot (max)	40%	20%	← 50% →			40%	40%
Scale length-In. (mm)	2.7 (68.6)	4.5 (114.3)	2.0 (50.8)	2.7 (68.6)	2.4 (61.0)	2.7 (68.6)	5.0 (127.0)
Zero adjustment	Yes	Yes	Yes	Yes	Yes	No / No / Yes	Yes
Weight (oz.)	8 / 10	25 / 30	8	18	16 / 21	15 / 16 / 32	38

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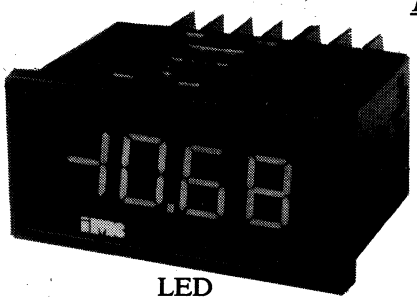
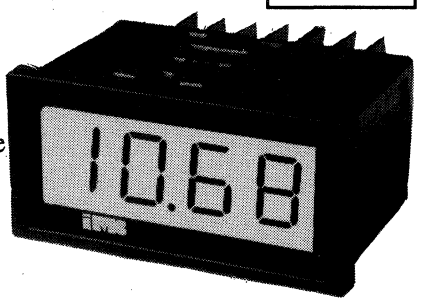
VDC/mADC-STRAIN GAGE CURRENT LOOP-THERMOCOUPLE RTD-TRUE RMS-MULTIRANGE DPM

Series OJ2000 ⅛ DIN



LED

Features:
- 0.8" Red or Green LED
- .5" Bicolor Lighted LCD
- Screw Connector
- ⅛ DIN • NEMA 4/NEMA 12 Case
- Only 3" Deep
- Low Cost
- High Reliability
- Display Hold
- 5-32VDC & 120/240VAC Power

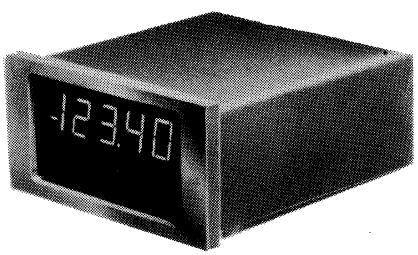


LCD

Function	Model	Features
VDC/mADC	OJ-2000	50mV-500VFS, 200μA-10A Ranges, 0.05% Accuracy
Thermocouple	OJ-2001	TC Types: J, K, R, S, T & B, Open TC Detection
MultiRange VDC	OJ-2002	Built-in Attenuator with 4 Independent Adjustments
Strain-Gage	OJ-2006	Built-in 5VDC Excitation, Wide Zero & Span, 0.1% Accuracy
Current Loop	OJ-2007	1-5,4-20,10-50 mA; 0-5,1-5,±10VDC, Wide Zero & Span
True RMS	OJ-2008	50mV-500VFS, 200μA-10A, DC-20KHz, 0.1% Accuracy (1% > 20KHz)
RTD	OJ-2009	100μA Excitation, Linearized, 2 or 4 Wire, 0.1% Accuracy

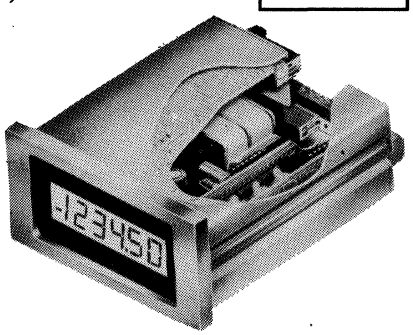
THE ULTIMATE DPM 13 INPUT FUNCTIONS, 6 DIFFERENT DISPLAYS, 8 INTELLIGENT OUTPUT FUNCTIONS INCLUDING RS-232C, 422 & 485, 6 POWER INPUTS, EXCITATION & COMPLIANCE POWER OUTPUTS, METAL OR PLASTIC CASE, 3½ & 4½ DIGITS W/DUMMY ZERO LED OR LCD DPM

Series Ultima 200 ⅛ DIN



LED

Features:
- RS232C/RS422/RS485 Output
- MUX/Parallel BCD Optoisolated
- Peak & Hold
- Digital Limit w/Relays
- Metal/Plastic ⅛ DIN/NEMA Case
- Plug-in Screw Connector
- Built-in Excitation/Compliance & 4-20mA/0-5VDC Output



LCD

Function	Model	Features
mV/mADC	200	50mV-500VDC & mADC, 1-20 Samples/Sec., 0.005% Accuracy
Resistance	201	2 or 4 Wire, 0.01Ω Resolution, 20MΩF.S., 0.1% Accuracy
Auto Range VDC	202	2-500VDC Auto Range & Auto Decimal Point, 0.1% Accuracy
Integration	205	Up & Down (±) Integration, Flow Totalizer, 0.5% Accuracy
Strain-Gage	206	Built-in High Stability Excitation, Wide Zero & Span, 0.1% Accuracy
Current Loop	207	Detects Open/Shorted XMTR, 1-5,4-20,10-50mA; 1-5 & ±10V, 0.05% Accuracy
True RMS	208	DC-20KHz, Sine, Triangular, Square, Pulsed SCR, 0.1% Accuracy
RTD	209	PT100, ANSI & Copper RTD Inputs, 2 or 3 Wire, Detects Open/Short RTD
Frequency	210	200, 2K, 20K & 200KHz Ranges, F-V for Easy Scaling, 0.1% Accuracy
Thermocouple	211	TC Types: J, K, R, S, T & B, Burn-up Detection
Track & Hold	212	Low Droop Rate, DC-100KHz, Fast Response 5μS for F.S., 0.1% Accuracy
Watts/Multiplier	213	RMS Watts Scaled or Uncommitted Inputs for AC-DC Multiplier

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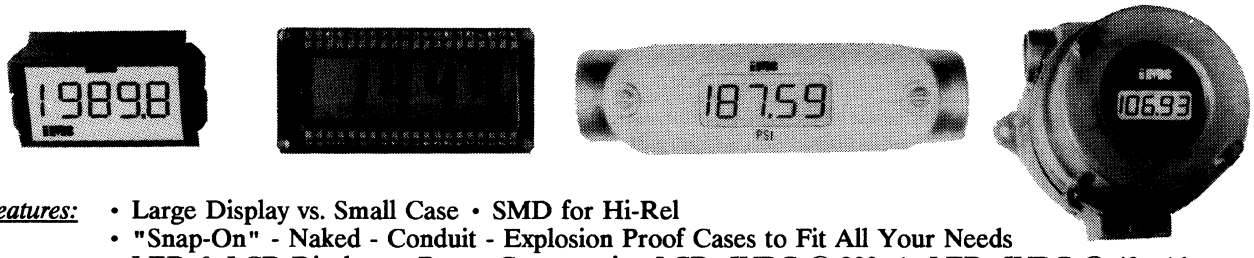
LARGEST DISPLAY/SMALLEST PACKAGE ALL SMD 3½ & 4½ DIGITS, LOWEST COST, HIGH RELIABILITY VDC/mADC, STRAIN-GAGE, CURRENT LOOP, TC, RTD & MORE

DPM

Snap-On Series 6000

SNAP-ON NAKED CONDUIT EXPLOSION PROOF



Features:
- Large Display vs. Small Case • SMD for Hi-Rel
- "Snap-On" - Naked - Conduit - Explosion Proof Cases to Fit All Your Needs
- LED & LCD Displays • Power Consumption LCD: 5VDC @ 200μA; LED: 5VDC @ 40mA!

Function	Model	Features
mV/mADC	6000	3½ LED Display, 50mV-500VDC & mADC "Generic" Low Cost 0.05% Accuracy
mV/mADC	6001	3½ LCD Backlighted Version of "6000" 0.05% Accuracy
Thermocouple	6010	3½ LED, TC Types: J, K, R, S, T, & B, Open TC Detection, 0.1% Accuracy
Thermocouple	6011	3½ LCD Version of 6010
Strain-Gage	6060	3½ LED, Built-in Excitation for >300 Ω Bridges, 0.1% Accuracy
Strain-Gage	6061	3½ LCD Version of 6010
Current Loop	6070	3½ LED, Only 40mA @ 5VDC, ±0.05% Accuracy, Wide Zero & Span
Current Loop	6071	3½ LCD Version of 6070
True RMS	6080	3½ LED, 50mV-200V, DC-20KHz, ±0.1% Accuracy (1% ≥ 20KHz)
True RMS	6081	3½ LCD Version of 6080
RTD	6090	3½ LED PT100, High Stability Isource, Linearizer, ±0.1% Accuracy
RTD	6091	3½ LCD Version of 6090
mV/mADC	6101	4½ LCD Smallest 4½ Digit DPM! 200mV-500V, ±0.005% Accuracy with Zero Adjust
Current Loop	6171	4½ LCD POWERLESS DPM® Loop Powered & Backlighted! 0.005% Accuracy

"SNAP-ON" No tools required, just snap it on your panel. Flat ribbon connector or solder to pins, flush panel mount, only 0.8" behind the panel, 1.5"x2.5"x0.9"

"CONDUIT" Another first! NEMA 4 and explosion proof conduit enclosure, 1.5" x 1.7" x 5" with 1" NPT

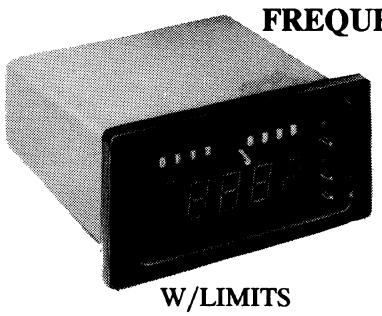
"NAKED" Use your bezel or ours to customize your panel, only 1.2" x 2.4" x 0.5", flat ribbon connector.

"EXPLOSION PROOF" Meets Class I, Div. 1&2, Groups B,C,D; Class II, Div. 1&2, Groups E,F,G; Class III; NEMA 3,4,7,9; FM; CSA; Cenelec and Baseefa.

COUNTERS

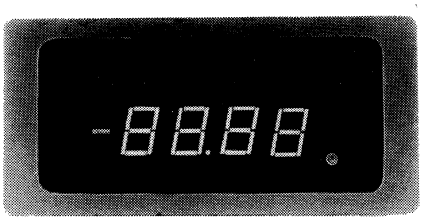
UNIVERSAL COUNTER ALL PLUG IN OPTIONS FOR FREQUENCY, EVENT, TIME, QUADRATURE, CLOCK

Series 270 ⅛ DIN



W/LIMITS

Features:
- Quadrature Input • Digital Limit
- RS232C/RS422/RS485 Output
- Spare Isolated Power Source
- Programmable Time Base
- Tristate BCD Optoisolated
- 5-32VDC, 120/240VAC Power Input
- Binary Divider 2-4096
- Function Programmable • Presetable Up/Down



W/O LIMITS

Function	Model	Features
Up/Down Counter	27000	DC-2MHz, TTL/CMOS Compatible, Zero Detect
Quadrature Input	27001	Automatic Direction Detection (Quadrature) & Datum Zero
Frequency	27004	DC-1MHz, 0.1-400VDC/AC Signal Ranges
Timer Up/Down	27009	0.005% 1MHz Crystal Prog. Time Base 1μS-120 Seconds

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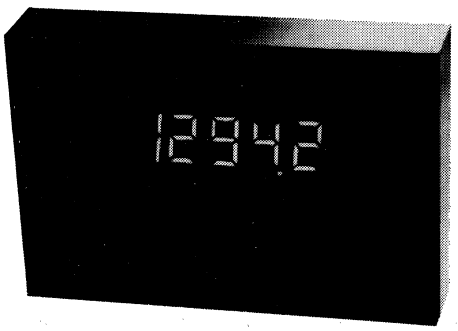
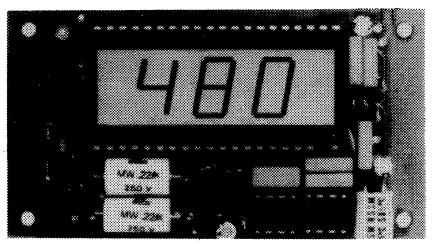
EASY TO MOUNT, LARGE DISPLAY VDC/mADC FREQUENCY/SPEED TIMER - COUNTER - CLOCK - INTEGRATION - CURRENT LOOP - STRAIN-GAGE RTD & THERMOCOUPLE INPUTS, NEMA 12 OR NEMA 4

Flat Pack Naked Series



Features:
- No Panel Cutout Required
- No Connector Needed
- Only ½" Deep
- Just Stick It To Your Panel
- Large .56" High Efficiency LED Display or LED
- NEMA 12 & NEMA 4 Case



FLAT PACK (523)

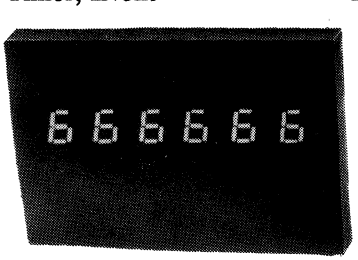
NAKED PANEL MOUNT (538)

DPMs

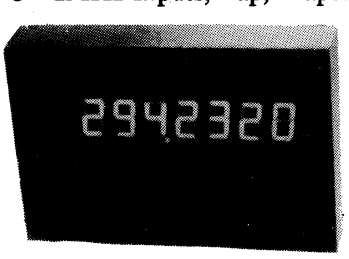
Function	Model	Features
mV/mADC	516	50mV-500VDC, 200μA-200mADC, Low Cost "Generic" DPM, 3½ LED
mV/mADC	518	50mV-500VDC F.S. & mA Too! Low Cost Generic DPM ±0.05% Accuracy, 3½ LCD
Frequency-Speed	519	200 to 20KHz F.S., 0.4" LED, F-V/A-D System No Time Base Req'd, 3½ LED
Current Loop	521	POWERLESS DPM® The Orignal "Loop Powered DPM" ±0.05% Accuracy, 3½ LCD
mV/mADC	523	4½ LED, High Accuracy of 0.005% of F.S., 200mV-500VDC & 200μA-2ADC
mV/mADC	524	4½ LCD, High Accuracy of 0.005% of F.S., 200mV-500VDC & 200μA-2ADC
Current Loop	525	1-5,4-20 & 10-50mA or 1-5VDC Inputs Wide Zero & Span, 3½ LED
RTD	526	2 or 3 Wire High Accuracy Low Cost Thermometer, 3½ LED
RTD	527	PT100 2 or 3 Wire Input, High Accuracy to 0.1%, 3½ LCD
Amps AC	528	POWERLESS DPM® 12-500VAC Range, Uses Standard 5A C.T., 3½ LCD
Thermocouple	535	Accepts "J" or "K" TC, 0.4" LED High Accuracy for Specified Range, 3½ LED
Thermocouple	536	For "J" or "K" Types, Low Cost, Low Power, High Accuracy, 3½ LCD
Volts AC	538	POWERLESS DPM® 12-500VAC Range, ±0.05% Accuracy, 3½ LCD
MHO/Strain-Gage	543	S-G or μV Signals, Wide Zero & Span Adjustment, 3 Arms Built In, 3½ LED
Hertz	568	POWERLESS DPM® 12-500VAC Range, 0.1Hz Accuracy, 3½ LCD

COUNTERS

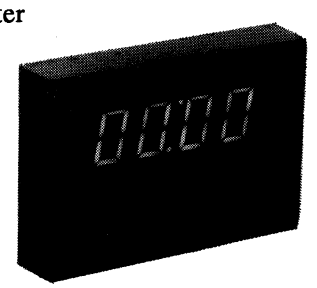
Up/Down Counter	411	LED 6 Digits, 12V Logic for High Noise Immunity, Presetable, Zero Detect, Alarm, Debouncer
Universal Counter	412	LED 8 Digits, Frequency to 10MHz, Interval Timer, Event Counter, Freq. Ratio, Period, TTL Inputs
Up/Down Counter	413	LED 4 Large 0.56" Digits, Timer, Clock, Elapse Time, Lap, DC - 1 MHz & TTL to 150VDC/AC Inputs, Programmable Time Base of 1MHz to 0.0833Hz
Integrator/ Flow Totalizer	520	LCD 4 Digits, High Accy., No Droop V-F Technique, 4-20mA Input & VDC, Use It for Amp-Hr, Flow Totalizer, Integrator
Freq. Counter/ Timer, Event	522	LCD 4 Digits, Programmable Time Base of 1MHz-0.0833Hz, 1-150VDC or DC Input Range & DC - 1MHz Inputs, Lap, Elapsed, Counter



MODEL 411



MODEL 412



MODEL 413

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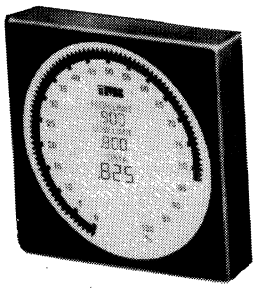
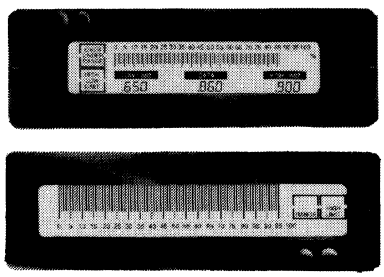
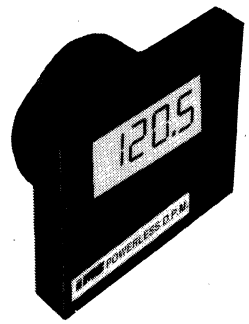
POWERLESS DPM FOR V/A AC ? DC, CURRENT LOOP WATTS, Hz, RTD, TC, OHMS, S-G & μV INPUTS SWITCHBOARD - EDGEWISE - EXPLOSION PROOF - ANALOG METER CASES

Powerless DPM®



SWITCHBOARD (580) EDGEWISE (560 & 570) EXPLOSION PROOF (500) ANALOG METER (590)

Function	Model	Features
mVDC/mADC	560	50mV-500VDC & 0.1mA-1ADC Ranges, Low Power 5VDC @ 3mA
VDC/mADC	561	POWERLESS Version of 560, 4-140VDC & 3-100mADC
Current Loop	563	LOOP POWERED 4-20 & 10-50mA & Backlighted, Wide Zero & Span
mVDC/mADC	570	50mV-500VDC & 0.1mA-1ADC Ranges, Low Power 5VDC @ 2mA
VDC/mADC	571	POWERLESS Version of 570, Signal Powered, 4-140VDC & 3-100mADC
AC Frequency	572	POWERLESS Frequency Meter Signal Powered, 1Hz Resolution
Current Loop	573	LOOP POWERED & Backlighted, Wide Zero & Span Adjustment
Thermocouple	574	TC Types: J, K, R, S, T & B, Open TC Detection, Low Cost
RTD PT100	575	Linearized, 2 or 3 Wire, 100μA Excitation, 1% Accuracy
Strain-Gage	576	Built-in 5V Excitation, Wide Zero & Span, 1% Accuracy
AC Amps	577	Backlighted AC Ammeter, 1% Accuracy, Low Cost
AC Watts	578	Powerless AC Wattmeter, Backlighted, 1% Accuracy
AC Volts	579	Powerless AC Voltmeter, Low Burden, 1% Accuracy
mV/mADC	580	Very Low Power, 3mA @ 5VDC, 50mV-500VDC F.S. & mA Ranges
mV/mADC	A580	Dual A-D (Split Display) Version of Model 580
V/mADC	581	POWERLESS Version of 580, Signal Powered 4-140VDC & 3-100mA
AC Frequency	582	POWERLESS Signal Powered Line Frequency, 0.1Hz Accuracy
Current Loop	583	POWERLESS Loop Powered & Backlighted, Wide Zero & Span
Thermocouple	584	For TC Types: J, K, R, S, T & B; Open TC Detection, Wide Range
RTD, PT100	585	Linearized, 2 or 3 Wire, 0.1% Accuracy, Low Cost
Strain-Gage	586	Built-in 5VDC Excitation, High Regulation, Wide Zero & Span
AC Amps	587	POWERLESS AC Ammeter, STD, 5 Amp C.T. Input, 0.1% Accuracy
AC Watts	588	POWERLESS AC Watts or Powered Multiplier, 1% Accuracy
AC Volts	589	POWERLESS AC Volts, 0.1% Accuracy, Low Burden, 12-500VAC
mV/mADC	590	VDC Powered, Only 200μA @ 5VDC, 50mV-500VDC & 200μA-2A Ranges
V/mADC	591	POWERLESS Version of 590, 4-140VDC and 1-200mA Ranges, Low Cost
AC Frequency	592	POWERLESS AC Line Powered, 0.1Hz Accuracy & Resolution, Low Cost
Current Loop	593	POWERLESS (Loop Powered & Backlighted) Wide Span Adjustment
Thermocouple	594	For TC Types: J, K, R, S, T & B; Open TC Detection, Low Cost
RTD	595	Linearized, 2 Wire Input, PT100 Calibration, Low Cost
AC Line Phase	596	Measures I vs E Lead/Lag Directly in Degrees, 0.1° Resolution
AC Amps	597	Inputs for Std. 5 Amp CT, 0.1% Accuracy, Easy to Scale
AC Watts	598	POWERLESS Wattmeter True RMS, 1% Accuracy, Low Cost
AC Volts	599	POWERLESS AC Volts, 0.1% Accuracy, Low Cost, 12-500VAC Range
Transmitter	50	Hockey Puck 4-20mA Output, mV, S-G, RTD, Resistance, Thermocouple Inputs
Receiver	500	4-20 & 10-50mA Input, Loop Powered & Backlighted, 101 Segments & 3½ Digits
Receiver	6171	4-20 & 10-50mA Input, 4½ Large 0.5" LCD Digits Backlighted, ±0.005% Accuracy
Trans-ceivers	500	4-20mA Output with Inputs for mV, RTD, S-G & TC; 101 Segments & 3½ Digits
Trans-ceivers	530	Same as "500" but 4½ Digit 0.5" LCD Display, High Accuracy

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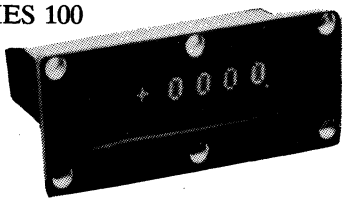
DPMS FOR VDC/RMS/FREQUENCY/CURRENT LOOP SLAVE DISPLAYS WITH RS232/422/INPUTS ANTILOG DPMS WITH CURRENT LOOP/VDC/INPUTS

Hi-Rel and Mil-Spec Products

SERIES 100

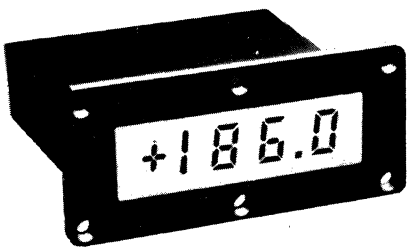


Features:
- 3½ & 4½ Dot Matrix LED Display • Sub "D" Connector
- EMI/RFI Shield • Conductive Paint
- NAVSEA DRWG: 5499620-1C & Hi-Rel Industrial Versions
- Multiplex BCD Output • RS-232C/422 Planned
- All Machined Parts • NEMA 4
- FSCM No. 57861 • NSN No. 711-1220-01-144-3867

Function	Model	Features
VDC/mADC	100	To Full Mil-Spec Including 883B Rev. C, Request NAVSEA Specifications
VDC/mADC	101	Hi-Rel Industrial Version ±0.005% Accuracy & Linearity
VDC/mADC	102	To NAVSEA Drwg. #5499620-1, Request NAVSEA Specifications
VDC MultiRange	10X-0	MultiRange 2-20, 200 & 500 VDC, Externally Selectable, ±0.1% Accuracy
VDC Single Range	10X-1	2VDC F.S. Single Range (Others on Request) ±0.005% Accuracy
True RMS	10X-2	DC-20KHz, Sine, Square, Triangular, SCR, Etc. ±0.1% Accuracy
Current Loop	10X-3	4-20mA (Others on Request) Wide Zero & Span Adjust, 0.05% Accuracy
Frequency	10X-4	DC-200KHz (2KHz Std.) F.S., 1-400 V RMS Input, Easy to Scale, No Timebase, 0.1%
MultiFunction	10X-5	Functions 1, 2, 3, & 4 Included All in One Small Package!

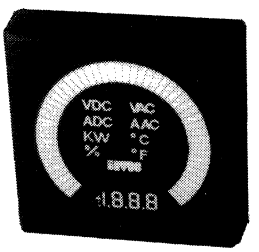
SLAVE DISPLAY WITH RS232/422/SERIAL INPUT

SERIES 110



Features:
- Standard Switchboard Case but Only 1" Deep
- EMI/RFI Shield
- Metal or Plastic Case
- 51 Segments and ±3½ Digits Backlighted LCD
- Sub "D" Connector
- 150-19,200 Baud Rates
- 64 Device Address • NEMA 4

SERIES 120



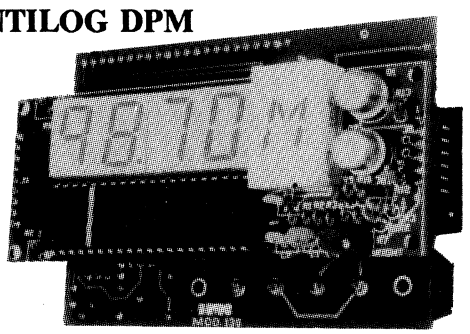
Description: "110" available in 2 versions: Hi-Rel/Industrial & to Mil-Specs per applicable drawings (NSN pending). 3 addressing modes available: RS-232C/RS-422 (485 on request) & serial input, RS-232 & 422 comply w/std ASCII characters. Both baud rate & device address are selectable via dip switches on rear of instrument.

Applications: Very low power remote (slave) display for computerized process control of pressure, RPM, flow, volume, speed, temperature, power, voltage, weight, etc.

Description: "120" is a bar-digital computer remote display designed to accept RS-232C/RS-422/RS-485 or serial input from A μC or μP based system to locally display process variable freeing computer for more important tasks. "120" accepts standard ASCII characters & its baud rate & address can be programmed via dip switches on the rear.

Applications: Computer based slave display for any process control: i.e., pressure, flow, RPM, volume, speed, temp., etc. Just connect your XDCR to your computer, let the computer do all scaling, linearization, offsetting and transmit data to the "120" to be displayed "at the site."

ANTILOG DPM



Features: • 10^0 TO 10^7 Antilog Function
- Designed to Replace Electromechanical "RAD" Counters
- "Naked" Package w/Bezel & Filter to Give That Proprietary Look

Description: "130" was designed to interface with "RAD" detectors of 4-20mA output (others on request) where a 4-20mA signal needs to be expanded over several decades to indicate total "count" in nuclear hazardous environments. "130" antilogarithmic program expands 4-20mA signal to 5,6&7 decades with its alpha multiplier.

Applications: Nuclear RAD meters, flow totalizer, analog counter, integrator, etc.

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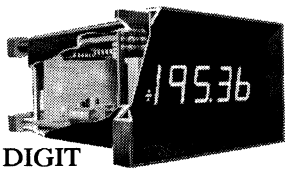
INTERNATIONAL MICROTRONICS CORP.
EXCELLENCE THRU DESIGN SINCE 1974

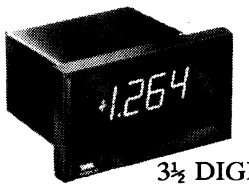
SUBMINIATURE CASE, VDC/mADC, TRUE RMS CURRENT LOOPS AND SLAVE DISPLAY WITH BCD, DIGITAL LIMIT & DIGITAL PEAK & HOLD

DPMS — Standard Case DPMS



4½ DIGIT

Features:
- 3½ and 4½ 0.56" LED • Small Case
- Line or Logic Powered
- Separate Connector for Power Input
- Case Replacement for Datel's & Texmate's Meters • Display Hold

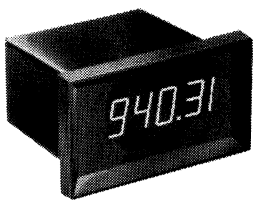


3½ DIGIT

Function	Model	Features
VDC/mADC	350	3½ or 4½ Digits, BCD, Peak & Hold, Digital Limit, 200mV-500V
Current Loop	357	Same as "350" but with 1-5, 4-10, 10-50mA Inputs & Trip Alarm
True RMS	358	Sames as "350" but DC-50KHz Freq. Response, 200mV-500V & mA
VDC/mADC	517	3½ Digit Low Cost Version of "350" 5-15VDC & 120/240VAC Power
Slave Display	329	3½ or 4½ Digit, Parallel or MUX BCD Input, Digit Select & Blanking

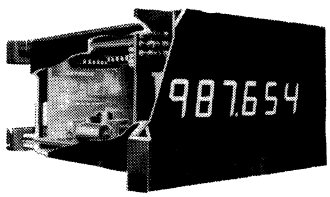
HIGH NOISE IMMUNITY LOGIC (12V) UP/DOWN COUNTER/TIMER, QUADRATURE INPUT, FREQUENCY, CLOCK

COUNTERS — Standard Case Counters



5 DIGITS (0.56")

Features:
- High Noise Immunity Logic
- Digital Limit • Presetable
- Parallel or MUX BCD Output
- 12VDC/120/240VAC Powered
- Separate Connector for Power Input
- Case Replacement for Datel's & Texmate's Counters



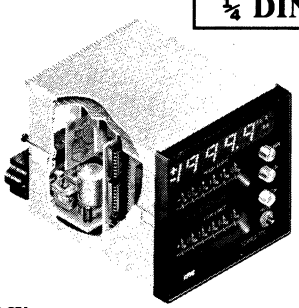
6 DIGITS (0.4")

Function	Model	Features
Up/Down Counter	400	6 Decades, LZB, Zero Detect, Auto Stop, Carry Out, DC-1MHz
Quadrature Input	410	Same as "400" but Accepts A & B Channels Plus Datum Zero Inputs
Frequency	414	Same as "400" with Programmable Time Base of 1MHz to 0.083Hz
Timer	414	Same as "414" with Auto Stop/Start/Reset, 1MHz to 0.083Hz Time Base
Clock	414	100 Hour (99:59:59) or 60 Minute (59:59.99) Version of "414"

PROCESS CONTROLLER WITH BUILT IN DUAL DIGITAL LIMITS & RELAY OUTPUT, BCD & PEAK & HOLD

CONTROLLERS — Series 700 ¼ DIN

Features:
- 4½ Digits
- Built-in Dual Digital Alarms
- Relay Outputs
- Peak & Hold • Tristate BCD
- 5, 12VDC or 120/240 VAC Power with Separate Connectors
- Display Hold • Metal Case



Function	Model	Features
VDC/mADC	700	2-500VDC & 0.2-200mADC Ranges, ±0.008% Accuracy
Strain-Gage	706	20mV & 200mVDC F.S. Range, Built-in High Stability Excitation V or I
Current Loop	707	1-5, 4-20, 10-50mA & Voltage Inputs, Wide Zero, Gain & Span Adjustments
True RMS	708	DC-50KHz Freq. Response, AC or DC Couple, 50mV-500V & mA Ranges
RTD	709	PT100 or 10Ω Copper RTD Inputs; 2, 3 or 4 Lead Connection for Compensation
Track & Hold	730	DC-100KHz Freq. Response, 0.01% Accuracy & Linearity Plus Digital Hold

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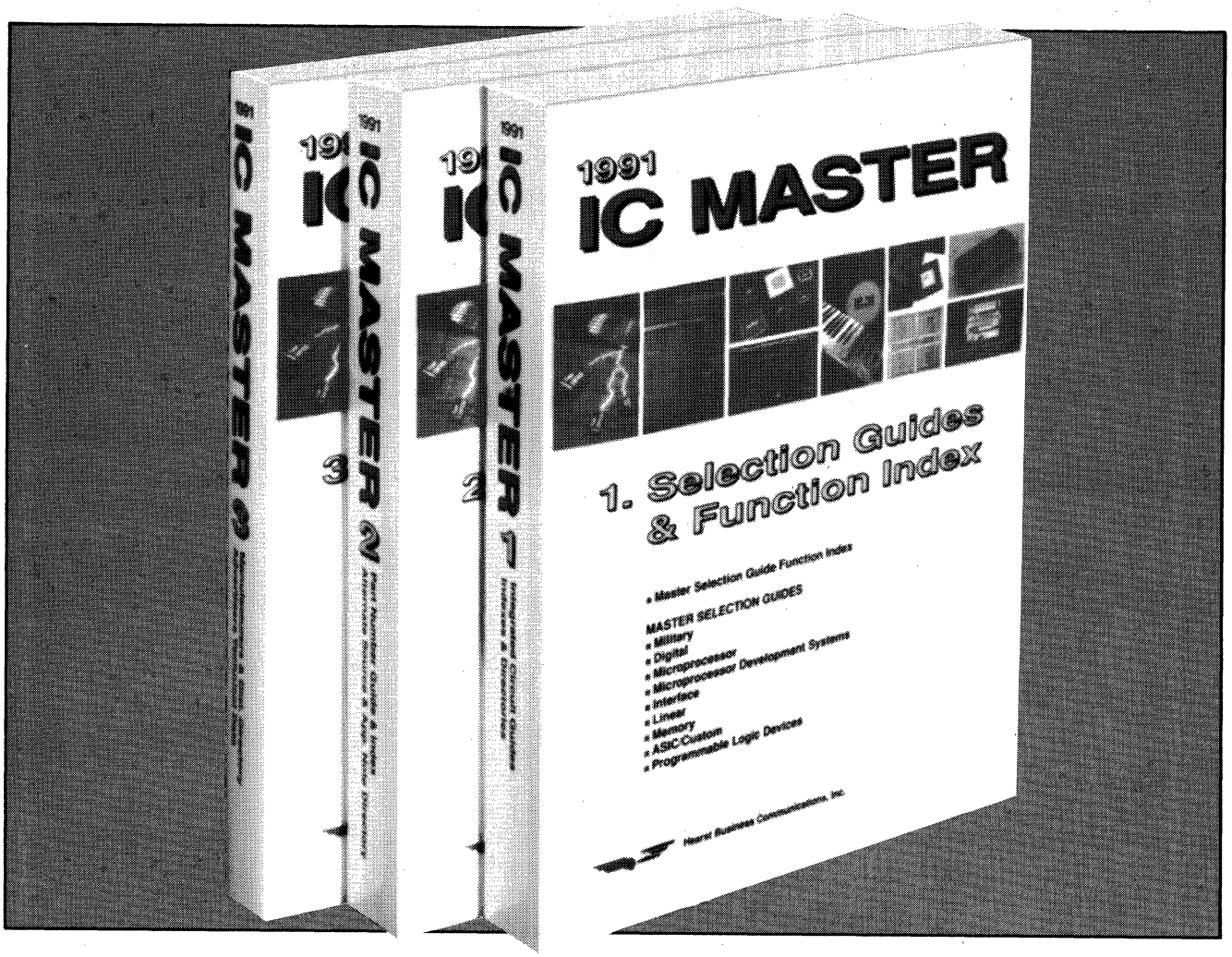
SUPER TIME SAVER!



Do you work with ICs? Do you have trouble finding the IC you need? Are you sick and tired of sifting through dozens of manufacturers' data books? Do you have trouble comparing one set of specs to another? Are you sick and tired of wasting time?

Do we have good news for you! Get your hands on the latest annual copy of the IC Master. The Master will save you both time and money. Here's how.

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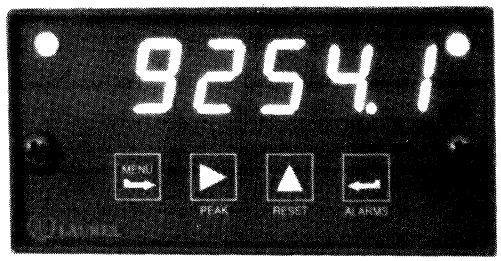
4 1/2 DIGIT RESOLUTION AT 3 1/2 DIGIT PRICE STARTING AT $195



BENEFITS

- Simple meter setup by pushbuttons or computer
- 4 1/2 Digit Resolution at 3 1/2 Digit price
- High read rate for fast control response and true peak display
- Adaptive filter eliminates digit bounce yet rapidly responds to signal changes
- Isolated 12 and 24 VDC excitation eliminate the need for external supplies
- Wide range of input power for worldwide use
- Line filtering for noisy electrical environments
- Auto tare for weighing applications
- Standard 1/8 DIN case allows easy replacement of existing meters
- Can be washed down with high pressure when mounted in panel
- Quick hookup with safety rated connectors

INPUTS

- DC Volts and Millivolts
- DC Amps and Milliamps
- AC Volts and Millivolts
- AC Amps and Milliamps
- Process Signal - Voltage and Current
- Thermocouples
- RTD's
- Strain Gauges
- Load Cells
- True RMS Volts
- True RMS Amps

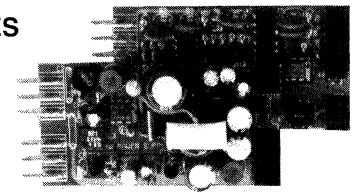
OPTIONS

- Dual Relay or Isolated Open Collector Output for Alarm and Control
- Isolated. Linearized Analog Output of 0 to 10V and 4 to 20 mA
- Isolated Multipoint RS-485, RS-232-C or Parallel BCD Output
- Low Voltage Power Supply –8 to 28 VAC and 9 to 32 VDC
- Screw Terminal Plug-in Connectors for Power and Signals

THE LAUREATE SERIES

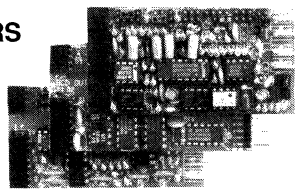
The Laureate is a modular design consisting of a main board plug-in power supplies, signal conditioners, dual setpoint controllers, analog output and digital interfaces. This allows the Laureate to be customized for a broad range of applications from simple monitoring functions to control and computer interface.

POWER SUPPLIES



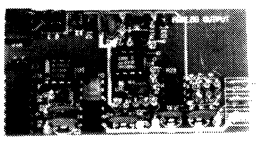
Input Power of 85 to 264 VAC and 90 to 370 VDC or 8 to 28 VAC and 9 to 32 VDC

SIGNAL CONDITIONERS



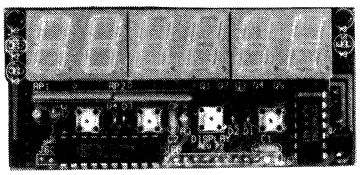
3 Input Boards: 1. DC, AC, Strain, Process, Thermocouple, RTD
2. True RMS 3. Load Cells

ANALOG OUTPUT



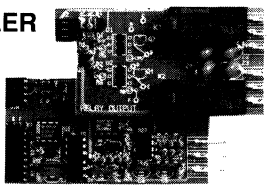
Isolated Outputs of 4 to 20 mA and 0 to 10V

MAIN BOARDS



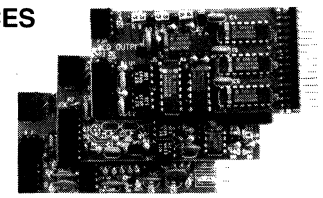
5 Digit Display with Red or Green 14.2MM (.56 IN) LED's

SETPOINT CONTROLLER



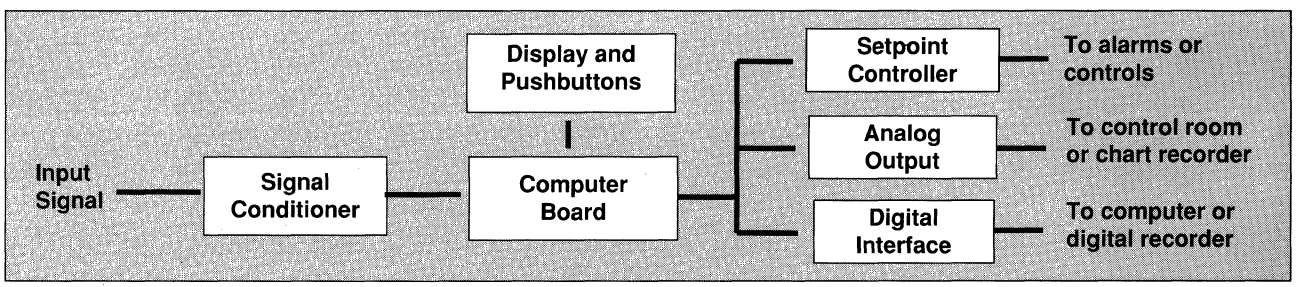
Dual 10A Relays or Optically Isolated Open Collector Outputs

DIGITAL INTERFACES



Isolated RS-232-C or RS-485 Computer Interfaces or Parallel BCD Output

LAUREATE CONFIGURATION



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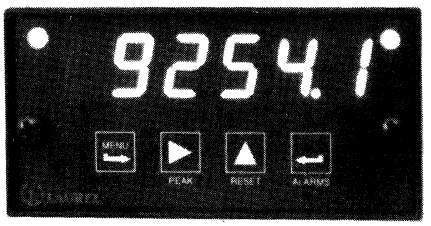

The Laureate series provides accurate display and control of analog signals such as DC and AC voltage and current, thermocouples, RTD's, process signals, strain gauges and load cells. Input type and scaling of the input signal to display directly in engineering units to 99,999 counts may be selected by the front panel pushbuttons or via RS-232-C or RS485. The patented method of analog-to-digital conversion allows the meter to make up to 60 conversions per second for fast response in control applications and true peak reading capability. Adaptive filtering provides high noise rejection while responding rapidly to step inputs. Outputs may operate from either the filtered or nonfiltered signal. The meter operates from 85 to 264 Vac and 90 to 370 Vdc to allow use worldwide. Optional alarm outputs, analog output and digital interface convert the Laureate from indicator to system control and interface.

AC VOLTS AND AMPS

AC VOLTS

VOLTAGE RANGE	RESOLUTION	INPUT R	ERROR AT 25° C
200.00mV	10uV	1M	.02% R
2.0000V	100uV	1.1M	+/-1Ct
20.000V	1 mV	1M	from 47
200.00V	10 mV	1M	to 440 Hz
660.0V	100 mV	10M	

AC AMPERES

CURRENT RANGE	RESOLUTION	INPUT R	ERROR AT 25° C
2.0000mA	0.1uA	100 Ohms	.02% R
20.000mA	1.0uA	10 Ohms	+/-1Ct
200.00mA	10uA	1 Ohms	from 47
5.000A	.25mA	10 mOhms	to 440 Hz

DC VOLTS AND DC AMPS PROCESS, STRAIN GAUGES

DC VOLTS

VOLTAGE RANGE	RESOLUTION	INPUT R	ERROR AT 25° C
200.00mV	10uV	1G	.01% of
2.0000V	100uV	1.1M	reading
20.000V	1mV	1M	+/-1Ct.
200.00V	10mV	1M	
660.0V	100mV	10M	

DC AMPERES

CURRENT RANGE	RESOLUTION	INPUT R	ERROR AT 25° C
2.0000mA	0.1uA	100 Ohms	.01% of
20.000mA	1.0uA	10 Ohms	reading
200.00mA	10uA	1 Ohms	+/-1Ct.
5.000A	.25mA	10 mOhms	

TRUE RMS VOLTS AND AMPS

VOLTS

VOLTAGE RANGE	RESOLUTION	INPUT R	ERROR AT 25° C
50.00mV	2.5uV	100M	.05% of
200.00mV	10uV	100M	reading
2.0000V	100uV	1M	+/-2ct.
20.000V	1mV	1M	from 10Hz
200.00V	10mV	1M	to 10kHz
660.0V	100mV	10M	

AMPERES

CURRENT RANGE	RESOLUTION	INPUT R	ERROR AT 25° C
2.0000mA	0.1uA	100 Ohms	.05% of
200.000mA	1.0uA	10 Ohms	reading
200.00mA	10uA	1 Ohm	+/-2ct.
2.0000A	100uA	0.1 Ohms	from 10Hz
5.000A	.25mA	10 mOhms	to 10kHz

THERMOCOUPLE PT 100 OHM RTD

THERMOCOIUPLES

TC TYPE	RANGE	CONFORMITY ERROR
J	-210°C to +760°C -247°F to +1400°F	0.09°C 0.16°F
K	-244.0°C to +1372°C -408°F to +2501°F	0.1°C 0.17°F
T	0°C to +400°C -257°C to 0°C +32°F to 752°F -430°F to +32°F	0.03°C 0.2°C 0.05°F 0.36°F
E	-270°C to +1000°C -450°F to +1830°F	0.18°C 0.32°F
S	-46°C to +1768°C -51°F to +3213°F	0.12°C 0.22°F
R	-45°C to +1768°C -49°F to +3214°F	0.17°C 0.31°F

RTD'S

TC TYPE	RANGE	CONFORMITY ERROR
DIN 0.00385	-202°C to +850°C -331°F to +1562°F	0.09°C 0.16°F
ANSI 0.003925	-202°C to +850°C -331°F to +1562°F	0.1°C 0.17°F

LOAD CELL METER / MICROVOLT METER

LOAD CELL INPUTS

INPUT RANGE	RESOLUTION	OUTPUT ZERO RANGE	OUTPUT SPAN RANGE	ERROR AT 25°C
20.000mV	1uV	-99,999	0	.01%R
50.000mV	2.5uV	to	to	+/-1Ct.
100.00mV	5uV	+99,999	+/-99,999	
250.00mV	12.5uV			
500.00mV	25uV			

STANDARD SPECIFICATIONS

Display

Type . . . . . 5 LED, 7-segment, 14.2mm (.56") high digits & LED indicators
Color . . . . . .Red or Green
Range . . . . . –99,999 to +99,999 and –99,990 to +99,990

A to D Conversion

Technique(pat. Pend) . . . . . .Concurrent Slope™
Rate . . . . . 60/sec. for 60 Hz NMR
50/sec. for 50 Hz NMR
Output Update Rate . . . . . 56/sec. at 60 Hz
47/sec. at 50 Hz
Display Update Rate . . . . . .3.5/sec. at 60 Hz
3/sec. at 50 Hz

Accuracy

Span Tempco . . . . . .0.003% of span/°C
Zero Tempco . . . . . 0.2 uV/°C

Noise Rejection

CMV from DC to 60 Hz . . . . . .1500 Vp
CMR from DC to 60 Hz 130dB
Filtering (Rectified Output) . . . . . .90 dB at 50/60 Hz with minimum filtering

Environmental

Operating Temperature . . . . . .0°C to 55°C
Storage Temperature . . . . . –40°C to 85°C
Relative Humidity . . . . . .95% at 40°C, noncondensing

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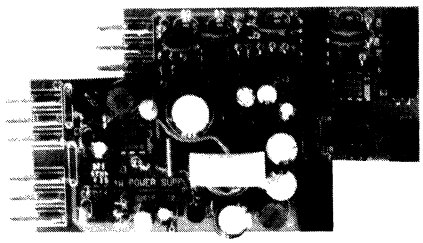
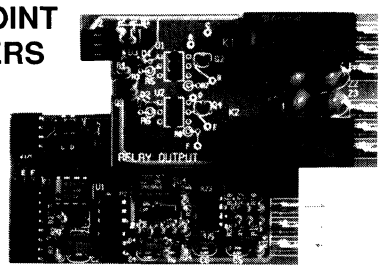
POWER SUPPLIES



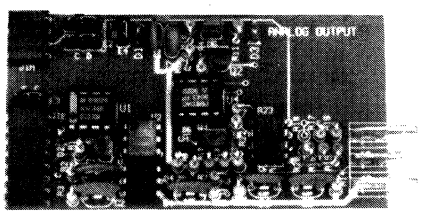
The Laureate series uses high frequency, switching power supplies to provide stable, isolated power for meter operation. Switching power supplies substantially reduce weight of the meter while providing outputs over a broad range of input voltage and frequency. +5 Vdc and –5 Vdc outputs and two isolated excitation power sources are available. The standard power supply operates on power inputs from 85 to 264 Vac, 47 to 440 Hz and from 90 to 370 Vdc. Hence, units may be operated worldwide with the same power supply. The optional low voltage power supply operates from 8 to 28 Vac, 47 to 440 Hz and 9 to 32 Vdc. This allows Laureate to be operated from a variety of batteries or 28 Vac, 400 Hz aircraft power. The isolated excitation supplies provide 12 Vdc at 120 mA and 24 Vdc at 30 mA. These supplies may be used to power the analog output and RS-232-C options or external transmitters and strain gauges. The Load Cell meter converts the 12 V output to a highly stable, accurate 10 Vdc excitation for up to 4 350 Ohm load cells. The supplies are designed to meet UL/VDE safety standards and FCC/VDE EMI requirements.

DUAL SETPOINT CONTROLLERS



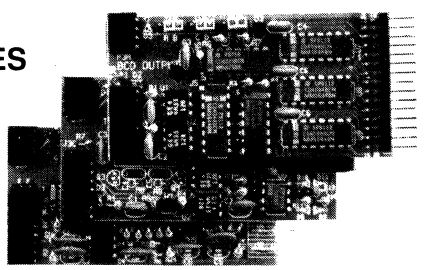
The setpoint control option adds control and alarm capabilities to the Laureate. Two versions are available; the relay board has two Form C, 10 A @ 250 Vac relays and the optically isolated board provides two open collector outputs rated at 30 Vdc and capable of sourcing 30 mA. Outputs may be set to operate above or below the setpoint or disabled. Open collector or relays may be individually programmed to operate in a latching or automatic mode. In the latching mode, when an alarm or shutdown condition is reached, the output remains in the alarm condition until it is manually reset by the front panel pushbuttons or through the rear connector. The output is automatically reset in the nonlatching mode when the alarm condition no longer exists. When operating from the unfiltered input, output response to an alarm occurs within 20 milliseconds. The filtered input reduces the chance of alarms triggering due to noise. Setup selection of 2 to 128 readings prior to updating the output provides a time delay and reduces relay chatter. Setpoint values are entered by front panel pushbuttons or serial interface.

ANALOG OUTPUT



The analog output produces an isolated signal of 4 to 20 mA and 0 to 10 Vdc for chart recorders, computers or transmission to a central control room. The output for thermocouples and RTD's is linearized with the same accuracy as the basic meter. A 12-bit D-to-A converter updates the output 57 times per second with a resolution of .025%. Accuracy of the analog output is .05%. The high update rate allows the output to closely track the input signal. The output may be operated from either the filtered or nonfiltered input. Power is provided by the meter 12 or 24 Vdc excitation supply. Using the 12 V supply, the 4 to 20 mA output can drive loads up to 400 Ohms and up to 1000 Ohms with 24 V. The output is isolated to 500Vp from signal ground and 1500 Vp to power ground, eliminating errors due to ground loops. Scaling of hte output is easily entered by the front panel pushbuttons or RS-232-C or RS-485 interface. The low and high output signals may be set to equal any value from –99,999 to +99,999. This allows the low output to be set to a displayed value either above or below the high output.

DIGITAL INTERFACES



The Laureate offers isolated full duplex RS-232-C or RS-485 communications or 3-state, stored, parallel BCD to interface with computers, PLC's or other digital devices. Laurel provides IBM compatible software with the RS-232-C and RS-485 interfaces to allow simple menu-driven setup of the meter. The information transmitted via RS-232-C and RS-485 includes present signal value, peak signal value and alarm values and status. The RS-485 allows transmission over long distances in noisy electrical environments and is addressable, allowing multiplexing with up to 30 other devices. Baud rates are selectable from 300 Hz to 19,200 Hz. The Laureate may be used as a remote display vai the digital interface; no signal conditioner is required. The parallel BCD has 3-state outputs to allow multiplexing with other meters for data logging. A single line enable is used to address each meter. BCD Hold and Data Ready output simplify interface. Outputs are isolated to 500 Vp from signal ground and 1500 Vp to power ground. The BCD board may be powered by the meter 5 Vdc if no isolation is required.

ORDERING GUIDE

THE COMPLETE LAUREATE

SERIES
LC Crimp-on terminals
LS Screw terminals

Display Color
1 Green LED
2 Red LED

Power
0 85 to 264 Vac
90 to 370 Vdc
1 9 to 32 Vdc
8 to 28 Vac

Setpoint Output
0 None
1 Dual 10 A relays

Analog Output
0 none
1 4 to 20 mA, 0 to 10V

Digital Interface
0 None
1 RS-232-C
2 RS-485
3 BCD

Input Type

DC Volts
DCV1 200.00mV
DCV2 2.0000V
DCV3 20.000V
DCV3 20.000V
DCV4 200.00V
DCV5 660.0V

DC Amperes
DCA1 2.0000mA
DCA2 20.000mA
DCA3 200.00mA
DCA4 5.000A

AC Volts
ACV1 200.00mV
ACV2 2.0000V
ACV3 20.000V
ACV4 200.00V
ACV5 660.0V

AC Amperes
ACA1 2.0000mA
ACA2 20.000mA
ACA3 200.00mA
ACA4 5.000A

RMS Volts
RMV1 50.000mV
RMV2 200.00mV
RMV3 2.0000V
RMV4 20.000V
RMV5 200.00V
RMV6 660.0V

RMS Amperes
RMA1 2.000mA
RMA2 20.000mA
RMA3 200.00mA
RMA4 2.000A
RMA5 5.000A

Process Signals (4 to 20 mA, 0 to 5 V, etc.)
P1 -99,999 to +99,999

Load Cells
SG1 -99,999 to +99,999

Thermocouples
JC -210 to 760°C
JF -347 to 1400°F
KC -244 to 1372°C
KF -408 to 2501°F
TC -257 to 400°C
TF -430 to 752°F
EC -270 to 1000°C
EF -450 to 1830°F
RC -45 to 1768°C
RF -49 to 3213°F
SC -46 to 1768°C
SF -51 to 3214°F

100 Ohm Platinum RTD's
DIN -202 to 850°C
DIN -331 to 1562°F
ANSI -202 to 850°C
ANSI -331 to 1562°F

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MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
Encapsulation, Miniglossary **C**•1126
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **C**•1601
Fiber Optics, Miniglossary **B**•1224
Fiber Optics, Product Selection Guide **B**•1214
Filters, Power, Product Selection Guide **A**•1609
Filters, Signal, Product Selection Guide **A**•1651
Instruments, Test & Measuring, Product Selection Guide **D**•1207
Interconnection Systems, Product Selection Guide **C**•1678
Keyboards & Keypads, Product Selection Guide **B**•1794
Lamps, Lights, & Indicators, Product Selection Guide **B**•1135
Logofinder & Trademark Directories **C**•901
Microwave Components, Product Selection Guide **A**•1746
Military Qualified Products List **B**•1002
Motors, Drives, & Rotating Components, Product Selection Guide **B**•1233
Opto Semiconductors, Miniglossary **B**•1334
Oscilloscopes, Product Selection Guide **D**•1406
Panel Hardware, Product Selection Guide **C**•1582
Panel Meters, Analog & Digital, Product Selection Guide **D**•1340
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **A**•2013
Power Supplies, Miniglossary **D**•1522, **D**•2184
Power Supplies, AC, Product Selection Guide **D**•2146
Power Supplies, DC, Product Selection Guide **D**•1501
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **B**•1347
Relay Contact Forms **B**•1550
Relays, Electromechanical, Miniglossary **B**•1449
Relays, Product Selection Guide **B**•1397
Resistor Color Codes **A**•1924
Resistors, Product Selection Guide **A**•1835
Servo Components, Miniglossary **B**•1270, **D**•2244
SI Units, Basic Guide To, **A**•2080, **B**•1666, **C**•1362, **D**•2246
Solenoids, Product Selection Guide **B**•1614
Switches, Product Selection Guide **B**•1639
Symbols—International Authorities **A**•1139, **B**•1024, **C**•1156, **D**•1090
Thermal Components, Product Selection Guide **B**•1831
Thermal Conductivity of Dielectrics at Room Temperature **C**•1709
Thyristors/High Power Diodes, Miniglossary **A**•1728, **A**•2084
Timers, Miniglossary **B**•1409, **D**•1149
Trademark & Logofinder Directories **C**•901
Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

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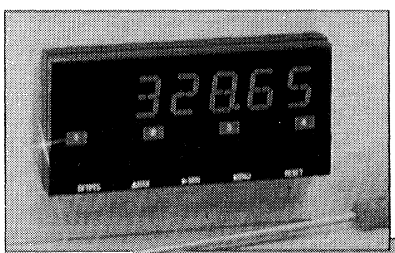
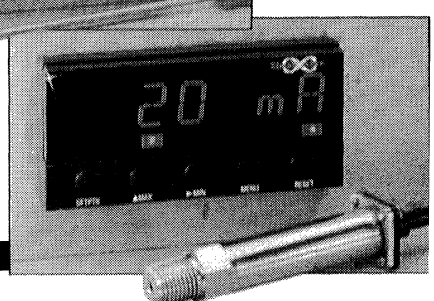


- ◀ Temperature
- ◀ Pressure
- ◀ Flow
- ◀ Frequency
- ◀ Voltage
- ◀ Current
- ◀ Strain



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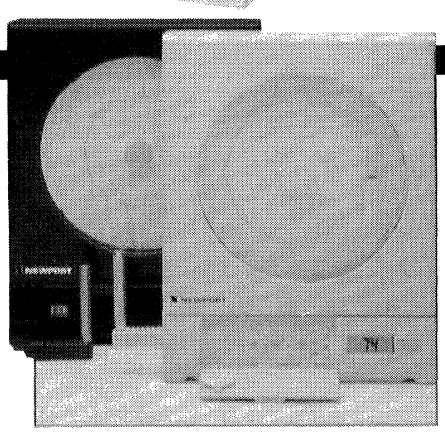

CT485 Temperature/Humidity Recorder

1/8 DIN Meters and Large Scale Displays up to 4" High

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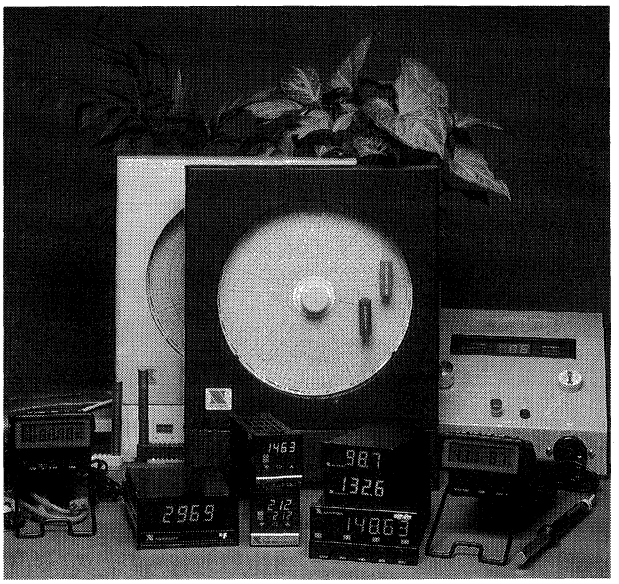


DC VOLTS

MODEL NUMBER	DISPLAY RANGE	FULL-SCALE VOLTAGE RANGES	SPECIAL FEATURES
INFP-DC	999,999	±500 mV to 100 V	a, d, e, h, j, l, m, p, s, t
215	±1,999	±199.9 mV to ±199.9 V	p, u
201AN	±1,999	±199.9 mV to ±199.9 V	m, p, t, v
203A	±1,999	±199.9 mV to ±199.9 V	a, m, p, t, u, v
205-A	±1,999	±199.9 mV to ±199.9 V	p, t, u, v, x
L2Q-A	±1,999	±199.9 mV to ±199.9 V	d, e, t, z, bb
Q2000A	±1,999	±199.9 mV to ±199.9 V	a, d, e, g, h, i, j, m, p, q, t, u, v
204B	±5,999	±399.9 mV to ±399.9 V	a, b, d, f, k, m, o, p, r, t, u, v
L4Q-A	±9,999	±99.99 mV to ±99.99 V	d, e, t, aa, bb
Q9000A	±9,999	±99.99 mV to ±99.99 V	a, d, e, g, h, i, j, m, p, t, u, v
2520	±19,999	±199.99 mV to ±199.99 V	a, c, p, u
2001A	±19,999	±199.99 mV to ±199.99 V	c, m, p, t, v
2003B	±19,999	±199.99 mV to ±199.99 V	a, b, d, f, k, m, o, p, t, u

The models listed feature a bright 0.56" (14.2 mm) LED display or a 0.50" (12.7 mm) LC display which can be read in bright ambient light. Newport also manufactures additional models with a planar gas discharge (PGD) display. Ammeter operation is achieved by adding a current shunt resistor to the base voltmeter.

PROCESS

MODEL NUMBER	DISPLAY RANGE	EXCITATION OUTPUT	SPECIAL FEATURES	TYPICAL INPUTS
INFP-C	999,999	10 or 24 V dc	a, d, e, h, j, l, m, p, s, t	
508A	±19,990	-	n, q, r, w	
509	±19,990	-	n, q, r, w	
558A	±19,990	-	m, q, r, w	
202A-P	±1,999	-	d, m, p, t, v	
202A-E	±1,999	10-24 V dc	d, m, p, t, v	
205-P	±1,999	-	p, t, u, v, x	
205-E	±1,999	24 V dc	p, t, u, v, x	
L2Q-P	±1,999	-	d, e, t, z, bb	4-20 mA
L2Q-E	±1,999	10, 15 V dc	d, e, t, z, bb	10-50 mA
Q2000P	±1,999	-	a, d, e, g, h, i, j, m, p, q, t, u, v	0-5 V
Q2000E	±1,999	10, 15 V dc	a, d, e, g, h, i, j, m, p, q, t, u, v	1-5 V
204B-FS	±5,999	-	a, d, e, m, o, p, r, t	0-10 V
L4Q-P	±9,999	-	d, e, t, aa, bb	
L4Q-E	±9,999	10, 15 V dc	d, e, t, aa, bb	
Q9000P	±9,999	-	a, d, e, g, h, i, j, m, p, t, u, v	
Q9000E	±9,999	10, 15 V dc	a, d, e, g, h, i, j, m, p, t, u, v	
2002A-P	±19,999	-	c, d, m, p, t, v	
2002A-E	±19,999	10-24 V dc	c, d, m, p, t, v	
P6004	999,999	-	a, d, e, h, l, m, p, s, t, v, y	

These meters provide zero and span adjustment for direct readout in engineering units for signals with zero offset, such as 4-20 mA. Four of the models provide a built-in excitation supply to power a two-wire transmitter or active transducer, thus eliminating the need for an external supply. The 508A, 509 and 558A are loop-powered, with no need for external power.

AC & TRUE-RMS

MODEL NUMBER	MAX DISPLAY	INPUT TYPE	FULL-SCALE VOLTAGE RANGES	SPECIAL FEATURES
201AN-AC	1,999	AC	199.9 V to 650 V	m, p, t, v
L2Q-C,F	1,999	AC, RMS, 5A CT	199.9 mV to 650 V	d, e, t, z, bb
Q2000C,F	1,999	AC, RMS, 5A CT	199.9 mV to 650 V	a, d, e, g, h, i, j, m, p, q, t, u, v
204B	5,999	AC, RMS, 5A CT	59.99 mV to 599.9 V	a, b, d, e, f, k, m, p, r, t, u v
L4Q-C,F	9,999	AC, RMS, 5A CT	99.99 mV to 650.0 V	d, e, t, aa, bb
Q9000C,F	9,999	AC, RMS, 5A CT	99.99 mV to 650.0 V	a, d, g, h, i, j, m, p, t, u, v
2003B	19,999	AC, RMS, 5A CT	199.99 mV to 650.0 V	a, b, d, f, k, m, p, t, u
2004	39,999	AC, RMS, 5A CT	399.99 mV to 650.0 V	a, b, d, f, k, m, p, t, u

The true-RMS versions are designed for complex waveforms, such as square waves and rectified or chopped sine waves. The AC-average versions are lower in cost, and display the true-RMS voltage of sinusoidal signals. Both versions allow direct connection and scaling for a 5A current transformer, with no need for an intermediate step-down transformer.

STRAIN / LOAD / PRESSURE

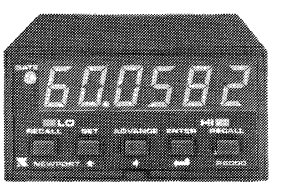
MODEL NUMBER	DISPLAY RANGE	RESO-LUTION	EXCITATION OUTPUT	PEAK HOLD	SPECIAL FEATURES
INFP-DC	999,999	0.1 µV	10 or 24 V dc	Std	a, d, e, h, j, l, m, p, s, t
202A-S	±1,999	10 µV	10-24 V dc	-	d, m, p, t, v
L2Q-S	±1,999	1.0 µV	1-10 V dc	-	d, e, t, z, bb
Q2000S	±1,999	1.0 µV	1-10 V dc	-	a, d, e, g, h, i, j, m, p, q, t, u, v
204B-LA2	+3,999	1.2 µV	5,10,15 V dc	-	a, d, e, m, p, r, t
204B-LP2	+3,999	1.2 µV	5,10,15 V dc	Std	a, d, e, m, p, r, t
L4Q-S	±9,999	1.0 µV	1-10 V dc	-	d, e, t, aa, bb
Q9000S	±9,999	1.0 µV	1-10 V dc	-	a, d, e, g, h, i, j, m, p, t, u, v
2520-PA	±19,999	1.0 µV	5 V dc	-	c, p, u
2002A-S	±19,999	1.0 µV	10-24 V dc	-	c, d, m, p, t, v
2003-LA1	+19,999	1.0 µV	5,10,15 V dc	-	a, d, m, p, t
2003-LP1	+19,999	1.0 µV	5,10,15 V dc	Std	a, d, m, p, t
2004-LA1	+39,999	1.0 µV	5,10,15 V dc	-	a, d, m, p, t
2004-LP1	+39,999	1.0 µV	5,10,15 V dc	Std	a, d, m, p, t

These bridge-input meters provide a bridge-excitation supply, a microvolt preamplifier with differential input, and zero and span adjustment for direct readout in engineering units. They can also be used as DC microvoltmeters. Three of the models provide peak-hold for dynamic testing.

FREQUENCY / RPM / RATE

MODEL NUMBER	MAX DISPLAY	FREQUENCY RANGE	SCALING METHOD	SPECIAL FEATURES
L2Q-H	1,999	5 Hz - 20 kHz	Pot adjustment	d, e, t, z, bb
Q2000H	1,999	5 Hz - 20 kHz	Pot adjustment	a, d, e, g, h, i, j, m, p, q, t, u, v
L4Q-H	9,999	5 Hz - 20 kHz	Pot adjustment	d, e, t, aa, bb
Q9000H	9,999	5 Hz - 20 kHz	Pot adjustment	a, d, e, g, h, i, j, m, p, t, u, v
6161A-HY	9,999	DC - 50 kHz	Pot adjustment	a, f, m, p, t, u, v
6161A-HW	9,999	DC - 50 kHz	Time-base jumpers	a, f, m, p, t, u, v
6130A	99,999	DC - 8 MHz	Time-base jumpers	a, m, p, t
P6000	999,999	DC - 7 MHz	Software multiplier	a, l, h, m, p, s, t, u, v
P7000	999,999	0.2 - 20 kHz	Software multiplier	a, d, e, h, j, l, m, p, s, t, y

These meters can display in Hz, or can be scaled to engineering units for flow or speed. Versatile signal conditioning can accommodate power-level voltages as well as passive magnetic pick-ups, contact closures and active sensors of with NPN, PNP or Namur output. Most of the meters provide sensor excitation. The P6000 provides exceptional accuracy at low frequency.



Model P6000

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TEMPERATURE

MODEL NUMBER	MAX DISPLAY	SENSOR TYPE	RESOL °C or °F	REC. OUT	SPECIAL FEATURES
INFT-TC	999,999	J,K,E,T,B,R,S,N	0.001°	Opt	a, d, e, h, j, l, m, p, s, t
INFT-RTD	999,999	10 Ω copper or 100 Ω platinum	0.001°	Opt	a, d, e, h, j, l, m, p, s, t
202A-J,K,T	1,999	J, K, T	1°, 0.1°	Std	d, m, p, t, v
202A-M,-R	1,999	RTD	1°, 0.1°	Std	d, m, p, t, v
205-J,K,T,E	1,999	J, K, T, E	1°, 0.1°	Std	d, p, t, u, x, 9-26 V dc
205-M,-R	1,999	RTD	1°, 0.1°	Std	d, p, t, u, x, 9-26 V dc
L2Q-J,K,T	1,999	J, K, T	1°	Std	d, e, t, z, bb
L2Q-M,R	1,999	RTD	1°, 0.1°	Std	d, e, t, z, bb
Q2000J,K,T	1,999	J, K, T	1°	Std	a, d, e, g, h, i, j, m, p, q, t, u, v
Q2000M,R	1,999	RTD	1°, 0.1°	Std	a, d, e, g, h, i, j, m, p, q, t, u, v
269	8,000	J, K, T, E, R, S	1°, 0.1°	-	m, p, t, u, v
L4Q-J,K,T	9,999	J, K, T	0.1°	Std	d, e, t, aa, bb
L4Q-M	9,999	RTD	0.1°	Std	d, e, t, aa, bb
Q9000J,K,T	9,999	J, K, T	0.1°	Std	a, d, e, g, h, i, j, m, p, t, u, v
Q9000M	9,999	RTD	0.1°	Std	a, d, e, g, h, i, j, m, p, t, u, v
2002A-J,-K,-T	19,999	J, K, T	0.1°	Std	c, d, m, p, t, v
2002A-M	19,999	RTD	0.1°	Std	c, d, m, p, t, v
82	9,999	J, K, E, T, B, R, S, L, C, RTD or linear 4-20 mA	0.1°	-	f, m, p, t

These meters provide a direct reading in °C or °F and are complete with cold-junction compensation (thermocouple input) or current excitation (Pt 100 RTD input). Most models provide a linearized recorder output. Model 269 is microcomputer-based and allows six T/C types to be jumper-selected from the front-panel.

OHMMETERS

MODEL NUMBER	MAX DISPLAY	RESISTANCE RANGES	SPECIAL FEATURES
202A-O	1,999	20 Ω, 200 Ω, 2 kΩ, 20 kΩ	m, p, t, v
L2Q-O	1,999	20 Ω, 200 Ω, 2 kΩ, 20 kΩ	d, e, t, z, bb
Q2000O	1,999	20 Ω, 200 Ω, 2 kΩ, 20 kΩ	a, d, e, g, h, i, j, m, p, q, t, u, v
L4Q-O	9,999	10 Ω, 100 Ω, 1 kΩ, 10 kΩ	d, e, t, aa, bb
Q9000O	9,999	10 Ω, 100 Ω, 1 kΩ, 10 kΩ	a, d, e, g, h, i, j, m, p, t, u, v
2002A-O	19,999	20 Ω, 200 Ω, 2 kΩ, 20 kΩ	c, d, m, p, t, v

Newport's four ohmmeters feature built-in current excitation and direct display in ohms or kOhms for use in materials and component testing applications. All provide an analog output as a standard feature to drive a strip-chart recorder.

COUNTERS/TIMERS

MODEL NUMBER	MAX DISPLAY	COUNTING MODES	SCALING METHOD	SPECIAL FEATURES
6130A	99,999	Up only	Jumpers	a, m, p, t
6162A	999,999	Up-down	Jumpers	a, m, p, t, u, v
6163A	999,999	Quadrature	Jumpers	a, m, p, t, u, v
P6000	999,999	Up or down	Software multiplier	a, l, h, m, p, s, t, u, v
P7000	999,999	Up or down	Software multiplier	a, d, e, h, j, l, m, p, s, t, y
L2T/L4T	999,999	Up or down	Jumpers	f, t, z, aa, bb
L2R/L4R	9999	Rate	Jumpers	f, t, z, aa, bb

These meters can display direct counts or be scaled to display totalized rate in engineering units, for instance in gallons. Versatile signal conditioning can accommodate power-level voltages as well as passive magnetic pickups, contact closures (with debounce) and active sensors of with NPN, PNP or Namur output. Most of the meters provide sensor excitation. Model 6163A is a quadrature meter for use with shaft encoders.

CONTROLLERS

MODEL NUMBER	# OF RELAYS	# OF CHANNELS	SETPOINT CONTROL CONFIGURATIONS
872A	1	1	HI-LO on/off control with hysteresis
	2	1	HI-GO-LO on/off control
	2	2	HI-LO and HI-LO on/off control
QUANTA	1	1	HI-LO on/off control with hysteresis
	2	1	HI-GO-LO on/off control
	2	2	HI-LO and HI-LO on/off control
	1	1	Time-proportional on/off control
	0	1	4-20 mA proportional control
	1	1	Time-proportional on/off control plus 4-20 mA proportional control

Model 872A compares the BCD output from a digital panel meter or other instrument to control one or two 5A Form C relays. Large 5-digit thumbwheel switches are used for input and display of setpoints. The QUANTA series of panel meters provides built-in control options.

RECORDERS/MULTIMETERS

MODEL NUMBER	DESCRIPTION	INPUT	SPECIAL FEATURES
CT485RS	Recorder/ controller	Temperature/ humidity	1, 7, 32 day operation, operates from "D" batteries or 115 V ac. Available in gray or white. Optional dual relay output.
HHM1	Talking multimeter	AC voltage or current, resistance, temperature.	True-RMS AC voltage & current inputs, type "K" T/C input with differential measurement. English or German voice modules.
RH411	Multimeter	Temperature/ humidity	Dual-display for simultaneous display of temperature and humidity. 115 V ac or 9 V powered. MIN/MAX storage. Analog output.

REMOTE DISPLAYS

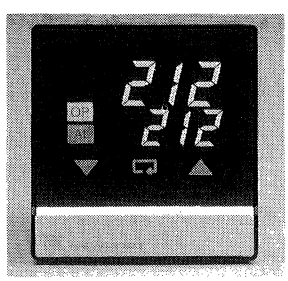
MODEL NUMBER	DATA INTERFACE	NUMBER OF DIGITS	PANEL CUTOUT	SPECIAL FEATURES
6152A	Parallel BCD	5	1/8 DIN	m, p, t, u
6153	Parallel BCD	5	1/16 DIN	p, u

These displays accept the BCD output from a programmable controller, digital panel meter or other instrument and provide a bright 0.56" (14.2 mm) LED numeric readout, which matches the appearance of a digital panel meter.

PID CONTROLLER

MODEL	THERMOCOUPLES TYPE	MATERIAL COMPOSITION	RANGE °F MIN.	°F MAX.	°C MIN.	°C MAX.	RES. °F or °C
81	J	Iron vs. SAMA Constantan (Cu-45% Ni)	32	1472	0	800	1
	K	Chromel (Ni-10% Cr) vs. Alumel (Ni-2% Al-2% Mn-1% Si)	32	2372	0	1300	1
	L	Iron vs. DIN Constantan	32	1472	0	800	1
	N	NiCroSil vs. NiSil	32	2372	0	1300	1
	R	Platinum-13% Rhodium vs. Platinum	32	2912	0	1600	1
	S	Platinum-10% Rhodium vs. Platinum	32	2912	0	1600	1
	RTD1	RTD (Pt 100) 3 wire Alpha – 0.00385	–148	752	–100	400	1
	RTD2	RTD (Pt 100) 3 wire Alpha – 0.00385	–99.9	752.0	–99.9	400.0	0.1

The Model 81 has two 4-digit LED displays, so you can see the setpoint and measured value at a single glance. Six thermocouple types and two 100 Ω platinum RTD inputs are standard. Self-tuning or ON/OFF control, along with three outputs are standard. No options required! Front-panel gasket for NEMA-3 (IP-54) splash-proof rating, relay control snubber, rear safety cover and all connectors are included. Model 81 is less than 2" square to fit a 1/16 DIN panel cutout.



Model 81

SPECIAL FEATURES

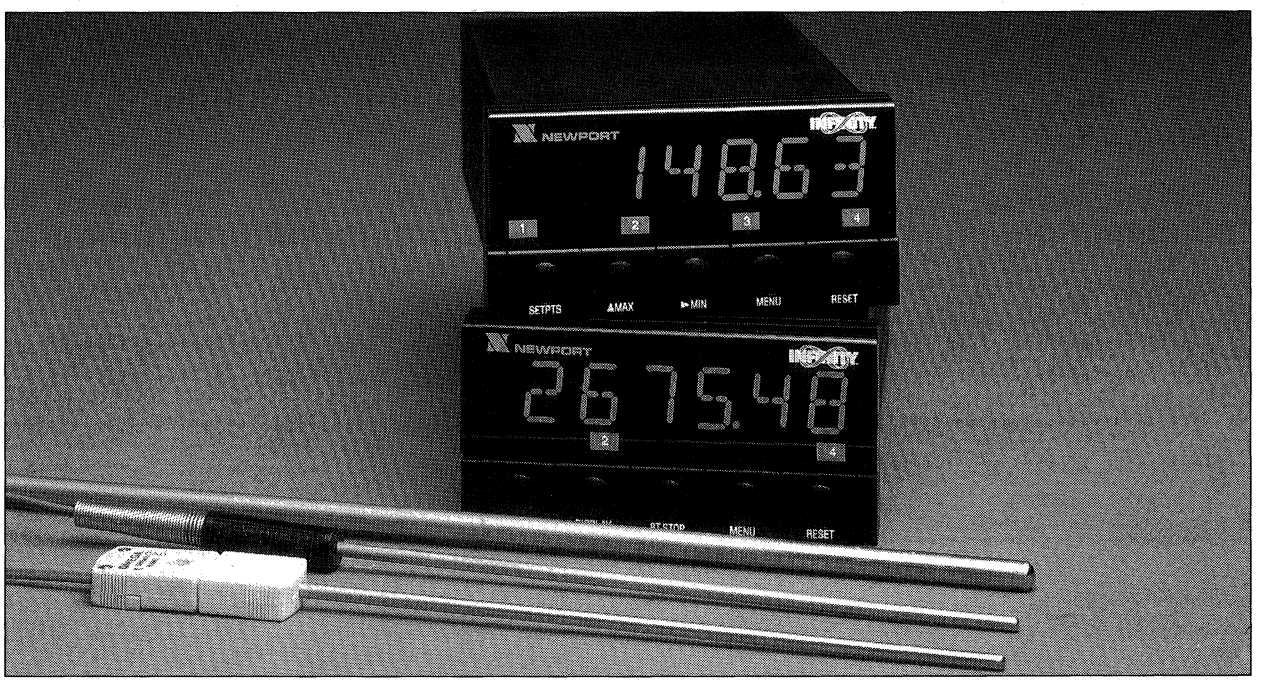
ITEM NO.	METER OUTPUTS: DATA, ANALOG, CONTROL	ITEM NO.	MECHANICAL, DISPLAY & POWER
a	Parallel BCD output	o	Available in NEMA or 1/8 DIN size
b	Parallel BCD output with peak hold	p	LED display, 0.56 " (14.2 mm)
c	Serial BCD output	q	LCD display, 0.50" (12.7 mm)
d	Analog output, 0-1 V, 0-2 V, 0-10 V	r	Dummy right-hand zero
e	Analog output, 4-20 mA	s	Front-panel programmable
f	Single-setpoint reed relay or logic out	t	115/230 V ac power
g	Single-setpoint 10 A relay	u	5 V dc power, non-isolated
h	Dual-setpoint 10 A relay	v	9-32 or 25-56 V dc power
i	Time-proportional 2 A solid-state relay	w	Loop-powered
j	4-20 mA proportional control	x	Miniature 3/64 DIN size
k	IEEE-488 plus 12 digital I/O lines	y	Rate or integrating totalizer modes
l	RS-232 output	z	2 1/4 inch LED display
m	NEMA-4 splash-proof lens cover	aa	4 inch LED display
n	External explosion-proof housing	bb	NEMA-4 enclosure

This table defines the special-feature codes shown for the individual meters. The features may be standard or optional, depending on model. Please refer to Newport's Data Book or price list for detailed ordering guides, or contact your local Newport rep or distributor.

Newport Electronics, Inc. 2229 S. Yale Street
Santa Ana, CA 92704-4426 • (714) 540-4914
1-800-NEWPORT • FAX: (714) 546-3022

INFINITY – P7000

Newport Electronics, Inc.



The **INFINITY** meter is a microprocessor based indicator/ controller with enhanced programming features that allow the end-user to easily configure the unit for their demanding requirements.

- Microprocessor based design
- Programmable via front pushbuttons or via RS-232 or RS-485
- Enhanced programming features allow easy setup and calibration
- Wide selection of current ranges, DC voltage ranges, RTD and thermocouple ranges
- High accuracy
- Programmable decimal point selection
- Peak and valley detection and memory
- Large digital offset capabilities enabling easy scaling in engineering units
- Smart filtering that detects the difference between a spike or process change (patent applied for)
- Programmable display updates of up to 13 readings/second
- Four isolated open-collector outputs
- NEMA-4 front-panel

OPTIONS

- Isolated dual 7 amp, form C, relays
- Isolated parallel BCD output
- Isolated analog output of 0-10 V dc, 0-5 V dc, 1-5 V dc, 0-20 mAdc and 4-20 mAdc
- Isolated serial RS-232
- Isolated RS-485 – addressable up to 199 units
- Green displays

The **P7000** is a multifunctional, single input, combination counter and rate meter, batch controller or real-time clock. With the addition of the optional analog input board, the P7000 can be configured as a rate meter and totalizer with integral square root extraction for your flow applications. A 24 hour (HH:MM:SS) process timer is a standard feature for all configurations (except in the clock mode).

- Microprocessor based, with non-volatile memory – no battery back-up required
- Programmable via the front-panel pushbuttons and/or via RS-232 or RS-485
- High-accuracy
- Large digital offset enabling easy scaling in engineering units
- Five (5) open-collector outputs for rate, totalize and time
- NEMA-4 front-panel
- Programmable decimal point selection
- Read rates up to 25 per second

OPTIONS

- Isolated pulse input board
- Isolated analog input board
- Isolated dual 7 amp, form C, relay outputs
- Isolated parallel BCD output
- Isolated analog output 0-5 V dc, 1-5 V dc, 0-10 V dc, 0-20 mAdc, and 4-20 mAdc
- Isolated serial RS-232
- Isolated serial RS-485 – addressable up to 199 units
- Green display

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COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

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Selco/Asahi Digital Panel Meters

DC VOLTMETERS AND AMMETERS

AP-101

FEATURES
- Low Cost
- Bright LED 14.2mm (Red)
- AC180 ~ 264V, 90 ~ 132V, DC5V, DC24V

AP-101

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-101-11	±199.9mV	100µV	100MΩ	±250V
AP-101-12	±1.999V	1mV	100MΩ	±250V
AP-101-13	±19.99V	10mV	10MΩ	±250V
AP-101-14	±199.9V	100mV	10MΩ	±500V

Accuracy: ±0.1% rdg ±1 digit (23°C±5°C)

Model	Range	Maximum Resolution	Internal Resistance	Input Protection
AP-101-21	±199.9µA	100nA	1KΩ	±10mA
AP-101-22	±1.999mA	1µA	100Ω	±50mA
AP-101-23	±19.99mA	10µA	10Ω	±150mA
AP-101-24	±199.9mA	100µA	1Ω	±500mA
AP-101-25	±1.999A	1mA	0.1Ω	±3A

Accuracy: ±0.2% rdg. ±1 digit (23°C±5°C)
±0.3% rdg. ±1 digit only for AP-101-25

AP-141

FEATURES
- Low Cost
- Bright LED 14.2mm (Red)
- AC180 ~ 264V, 90 ~ 132V, DC5V

AP-142

FEATURES
- BCD option
- Bright LED 14.2mm (Red)
- AC180 ~ 264V, 90 ~ 132V, DC5V

AP-141

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-141-12	±1.9999V	100µV	100MΩ	±100V
AP-141-13	±19.999V	1mV	1MΩ	±250V
AP-141-14	±199.99V	10mV	1MΩ	±500V

Accuracy: ±0.03% rdg ±1 digit (23°C±5°C)

AP-142

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-142-11	±199.99mV	10µV	100MΩ	±250V
AP-142-12	±1.9999V	100µV	100MΩ	±250V
AP-142-13	±19.999V	1mV	1MΩ	±250V
AP-142-14	±199.99V	10mV	1MΩ	±500V

Accuracy: ±0.03% rdg. ±1 digit (23°C±5°C)

AP-202

FEATURES
- BCD option
- DC5V (Isolated)
- Bright LED 10.2mm (Red)
- Conversion Rate 2.5/sec or 12.5/sec (50Hz), 15/sec (60Hz)
- 200mV ~ 200V Measurement

AP-202

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-202-11	±199.9mV	100µV	100MΩ	±100V
AP-202-12	±1.999V	1mV	100MΩ	±100V
AP-202-13	±19.99V	10mV	10MΩ	±250V
AP-202-14	±199.9V	100mV	10MΩ	±500V

Accuracy: ±0.1% rdg ±1 digit (23°C±5°C)

Model	Range	Maximum Resolution	Internal Resistance	Input Protection
AP-202-21	±199.9µA	100nA	1KΩ	±10mA
AP-202-22	±1.999mA	1µA	100KΩ	±50mA
AP-202-23	±19.99mA	10µA	10Ω	±150mA
AP-202-24	±199.9mA	100µA	*1Ω	±500mA
AP-202-25	±1.999A	1mA	*0.1Ω	±3A

Accuracy: ±0.2% rdg. ±1 digit (23°C±5°C)
±0.3% rdg. ±1 digit only for AP-202-25

*These resistors are connected to the outside of the unit.

AP-502

FEATURES
- Low Cost
- Bright LED 14.2mm (Red)
- Serial Data Output
- Thin Case (Depth 32mm)
- DC5V (Isolated)
- 200mV ~ 200V, 200µA ~ 2A Measurement

AP-502

Model	Range	Maximum Resolution	Input Impedance	Input Protection
AP-502-11	±199.9mV	100µV	100MΩ	±250V
AP-502-12	±1.999V	1mV	100MΩ	±250V
AP-502-13	±19.99V	10mV	10MΩ	±250V
AP-502-14	±199.9V	100mV	10MΩ	±500V

Accuracy: ±0.1% rdg ±1 digit (23°C±5°C)

Model	Range	Maximum Resolution	Internal Resistance	Input Protection
AP-502-21	±199.9µA	100nA	1KΩ	±10mA
AP-502-22	±1.999mA	1µA	100Ω	±50mA
AP-502-23	±19.99mA	10µA	10Ω	±150mA
AP-502-24	±199.9mA	100µA	1Ω	±500mA
AP-502-25	±1.999A	1mA	0.1Ω	±3A

Accuracy: ±0.2% rdg. ±1 digit (23°C±5°C)
±0.3% rdg. ±1 digit only for AP-502-25

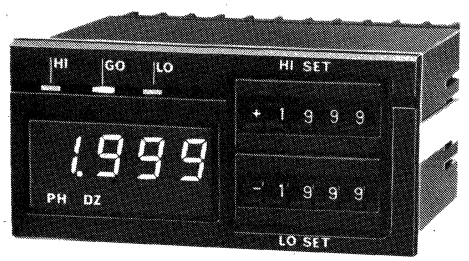
SET POINT COMPARATOR

AM-122

FEATURES
- Loading Zero Suppression • Digital zero
- Peak Valley Hold
- Easily adjustable offset and full scale
- Bright LED 10mm (Red)

AVAILABLE INPUTS
±199.9mVDC – ±199.9VDC
1-5VDC
4-20mADC
Accuracy: ±0.1% rdg ±2 digit (23°C±5°C)

±199.9uADC – ±1.999 ADC
Accuracy: ±0.2% rdg ±1 digit (23°C±5°C)
±0.3% rdg ±1 digit only for Model AM-122-25



AC VOLTIMETERS AND AMMETERS

AP-106

FEATURES
- Average type
- Display, 3999 (3¾- digit) (Red)
- With hold
- Screw terminal

Model	Range	Frequency Range	Input Impedance	Input Protection
AP-106-11	399.9mV	40Hz ~ 10KHz	10MΩ	100V
AP-106-12	3.999V	40Hz ~ 10KHz	10MΩ	100V
AP-106-13	39.99V	40Hz ~ 4KHz	10MΩ	300V
AP-106-14	399.9V	40Hz ~ 1KHz	10MΩ	700V

Accuracy: ±0.3% rdg. ±3 digits (23°C±5°C)

Model	Range	Frequency Range	Internal Resistance	Input Protection
AP-106-21	399.9µA	40Hz ~ 1KHz	1KΩ	10mA
AP-106-22	3.999mA	40Hz ~ 1KHz	100KΩ	50mA
AP-106-23	39.99mA	40Hz ~ 1KHz	10Ω	200mA
AP-106-24	399.9mA	40Hz ~ 1KHz	1Ω	1A

Accuracy: ±0.5% rdg. ±3 digits (23°C±5°C)

PROCESS MONITORS

AS-103

FEATURES
- Easily adjustable for offset-fullscale from the front (Span 2000 counts)
- Bright LED, 14.2mm (Red)
- Screw terminals for input and power supply
- DIN size 48(H) x 96(W)mm
- Parallel BCD output (Open collector)
- Analog output (0.1mV/digit)
- Variable conversion rate (option) 0.5sec ~ 3sec

AVAILABLE INPUTS
±199.9mV – ±199.9VDC
1-5V
4-20mA
Accuracy: ±0.1% rdg. ±2 digits (23°C±5°C)

±199.9µA–±1.999ADC
Accuracy: ±0.2% rdg ±2 digits (23°C±5°C)

11 different ranges available

AS-203

FEATURES
- Easily adjustable for offset-fullscale from the front (Span 2000 counts)
- Bright LED, 8mm (Red)
- DIN size 24(H) x 48(W)mm
- Power supply DC5V or DC24V (Isolated)

AVAILABLE INPUTS
±199.9mv – ±199.9VDC
1-5V
4-20mA
Accuracy: ±0.1% rdg. ±2 digits (23°C±5°C)

±199.9µA – ±1.999ADC
Accuracy: ±0.2% rdg ±2 digits (23°C±5°C)
±0.3% rdg ±1 digit only for Model AS-203-25

11 different ranges available

Many Other Models Available • For More Information Contact Selco/Asahi at 800-257-3526

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"PRESENTOR" Range of Analog Meters

There are four sizes in the Sifam 'Presentor' range, designated types 19, 29, 39, and 49. The uniquely versatile design enables each size to be displayed in four different modes:

Style 'W' is for back-of-panel mounting with only the scale and pointer visible (types 19W, 29W, 39W and 49W)

Style 'WF' is also for back-of-panel mounting but with a clip-on black bezel (types 19WF, 29WF, 39WF and 49WF)

Style 'M' is for front-of-panel mounting with a snap-on mask in black (types 19M, 29M, 39M and 49M)

Style 'B' is also for front-of-panel mounting but with a snap-on bezel in black (types 19B, 29B, 39B and 49B)

Effective illumination can be provided by back-lighting through the translucent body on types 29, 39 and 49.

APPLICATION

The Presentor Range of meters is suitable for both DC and AC with self contained ranges as follows:

VDC	VAC
50μA — 2A	60μA — 100mA
50mV — 250V	1V — 250V

A NEW SMALL-SPACE MOVEMENT

The taut-band (ligament suspended) movement has a powerful all-new core-magnet incorporating advance materials chosen for high technical performance. The design insures that the calibration of the meters is unaffected when mounted on a steel (ferrous) panel.

The movement is contained within a barrel of minimal volume to reduce the amount of space required behind the panel (please see dimensional drawings).

CONSTRUCTION

The body (or base) is molded from translucent high impact polystyrene with a transparent acrylic front. Mask and bezels are in A.B.S.

SCALES

Standard dial markings are as shown on the meter photographs but special markings can be supplied to customers' requirements.

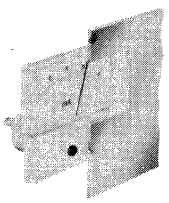
The meters can be supplied with left-hand, center or right-hand zero. Mirror dials are available on types 29, 39 and 49. The zero adjuster, normally located on the front face, can be located at the rear if required.

ACCURACY

Sifam 'Presentor' meters are supplied in accordance with ANSI C39.1 and BS89: 1977, IEC51.

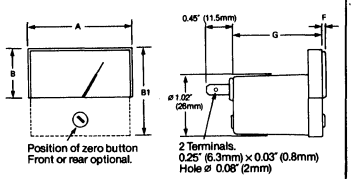
TYPE	DC	AC RECTIFIER
19	±2.5%	±2.5%
29	±1.5%	±2.5%
39	±1.5%	±2.5%
49	±1.5%	±1.5%

STYLE W: BACK OF PANEL

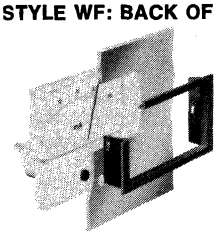


Types 19W, 29W, 39W and 49W

Types 19W, 29W, 39W and 49W
(Back of panel mounting)

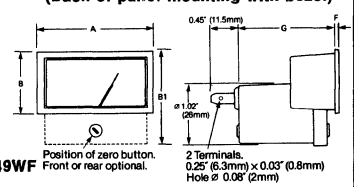


STYLE WF: BACK OF PANEL, WITH BEZEL

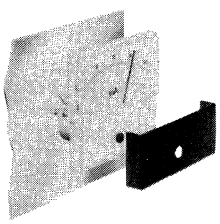


Types 19WF, 29WF, 39WF and 49WF

Types 19WF, 29WF, 39WF and 49WF
0.16" (4mm) Max. Panel
(Back of panel mounting with bezel)

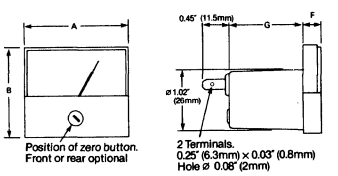


STYLE M: FRONT OF PANEL, WITH MASK

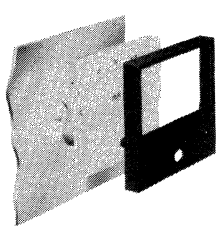


Types 19M, 29M, 39M and 49M

Types 19M, 29M, 39M and 49M
0.24" (6mm) Max. Panel
(Front of panel mounting with mask)

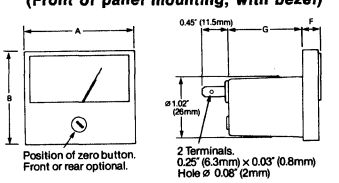


STYLE B: FRONT OF PANEL, WITH BEZEL



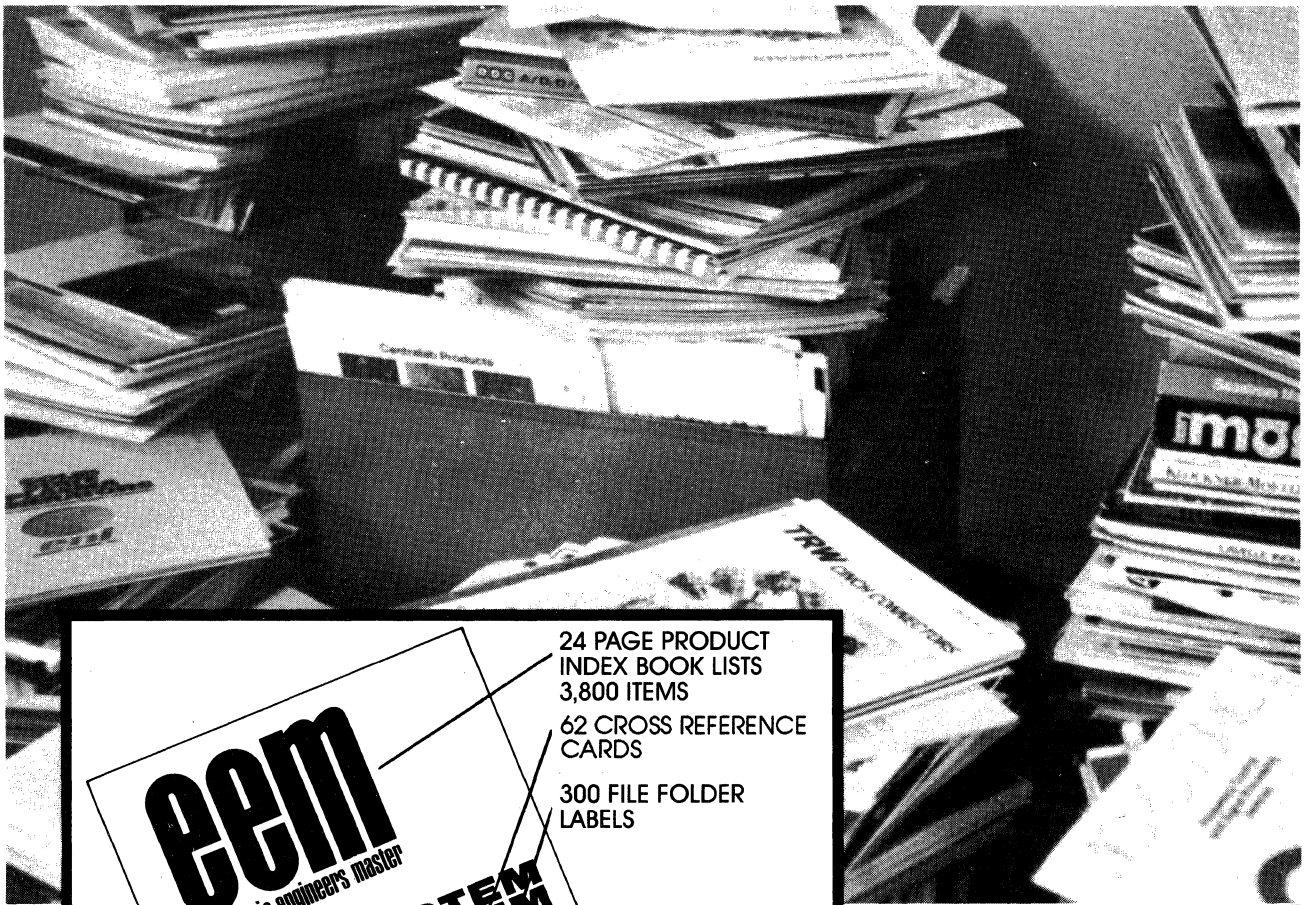
Types 19B, 29B, 39B and 49B

Types 19B, 29B, 39B and 49B
0.24" (6mm) Max. Panel
(Front of panel mounting, with bezel)



NOTE: Do not solder to appliance type terminals. If required screw terminals are available.

	BACK-OF-PANEL MOUNTING				BACK-OF-PANEL MOUNTING, WITH BEZEL				FRONT-OF-PANEL MOUNTING, WITH MASK				FRONT-OF-PANEL MOUNTING, WITH BEZEL			
	19W	29W	39W	49W	19WF	29WF	39WF	49WF	19M	29M	39M	49M	19B	29B	39B	49B
WIDTH 'A'	1.73" (44)	3.00" (76)	3.70" (94)	4.88" (124)	1.93" (49)	3.26" (83)	3.97" (101)	5.15" (131)	1.73" (44)	3.00" (76)	3.70" (94)	4.88" (124)	1.81" (46)	3.13" (79.5)	3.83" (97.5)	5.03" (128)
HEIGHT 'B'	0.82" (21)	1.32" (33.5)	1.65" (42)	2.24" (57)	1.06" (27)	1.63" (41.5)	1.98" (50.5)	2.57 (66.5)	1.53" (39)	2.38" 60.5)	2.91" (74)	3.73" (95)	1.57" (40)	2.44" (62)	3.01" (76.5)	3.81" (97)
HEIGHT 'B1'	1.49" (38)	2.32" (59)	2.85" (72.5)	3.66" (93)	1.59" (40.5)	2.44" (62)	3.00" (76)	3.80" (96.5)	—	—	—	—	—	—	—	—
FRONT 'F'	0.06" (1.5)	0.08" (2)	0.08" (2)	0.08" (2)	0.06" (1.5)	0.06" (1.5)	0.06" (1.6)	0.07" (1.7)	0.29" (7.5)	0.39" (10)	0.43" (11)	0.47" (12)	0.29" (7.5)	0.39" 10)	0.43" (11)	0.47" (12)
BODY DEPTH 'G'	1.46" (37)	1.53" (39)	1.53" (39)	1.59" (40.5)	1.61" (41)	1.69" (43)	1.71" (43.5)	1.75" (44.5)	1.22" (31)	1.22" (31)	1.22" (31)	1.22" (31)	1.22" (31)	1.22" (31)	1.22" (31)	1.22" (31)
SCALE LENGTH	1.34" (34)	2.36" (60)	3.07" (78)	3.94" (100)	1.34" (34)	2.36" (60)	3.07" (78)	3.94" (100)	1.34" (34)	2.36" (60)	3.07" (78)	3.94" (100)	1.34" (34)	2.36" (60)	3.07" (78)	3.94" (100)
MAX PANEL THICKNESS	—	—	—	—	0.16" (4)	0.16" (4)	0.16" (4)	0.16" (4)	0.24" (6)	0.24" (6)	0.24" (6)	0.24" (6)	0.24" (6)	0.24" (6)	0.24" (6)	0.24" (6)



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Rugged, Low-Cost Indicating Meters and Testers...since 1904

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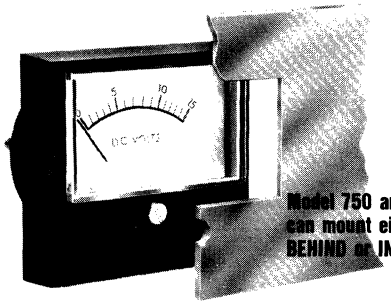
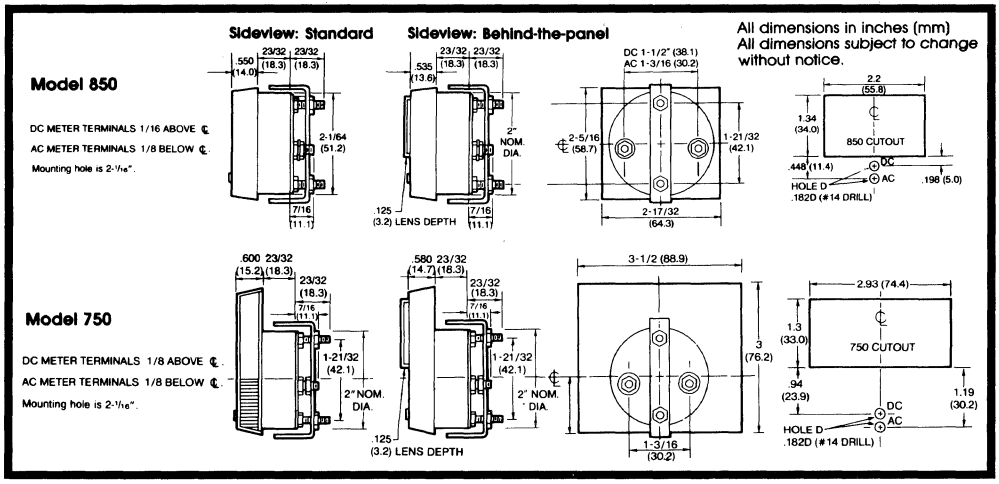
SHURITE WINDOW MOUNT PANEL METERS



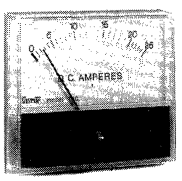
Model 750 and Model 850 Meters can mount either way — BEHIND or IN FRONT of the panel!

These fine meters provide the same reliable performance for which Shurite has been known since 1904... *plus* new mounting flexibility... *plus* that new "textured black" look. Both models are, of course, still available with standard case fronts. Order the "new look" meters as Model 750BP and Model 850BP.

- The redesigned case front provides mounting flexibility and smart "textured black" finish.
- Two sizes — 3½" (Model 750BP) and 2½" (Model 850BP).
- Available either with or without front-access zero adjuster.



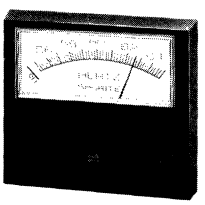
Models 750 and 850 also in Standard Case



Designed with black polystyrene back and clear polystyrene front.

FREQUENCY METER SERIES 7000/8000

Ruggedly designed for lasting performance and engineered for mounting flexibility — either in-front-of-the panel or behind-the-panel



- Expanded scale, lance pointer, zero adjust.
- Off-scale zero position.
- Two convenient sizes — 3½" and 2½".
- High reliability at low cost.
- DIMENSIONS: Refer to engineering drawings of Model 750/850 meters immediately above. Dimensions are identical except for barrel depth which measures 1-13/16" (46.0mm) for both Series 7000 and 8000 instead of 23/32" (18.3mm).

This new low cost approach to frequency measurement employs solid state components ...thereby completely eliminating problems caused by waveform distortion. Line frequencies are monitored and displayed on an expanded scale analog panel meter. Complete system monitoring, of course, requires an appropriate voltmeter and ammeter as companion instruments. Both instruments can be ordered from Shurite and are available from stock.

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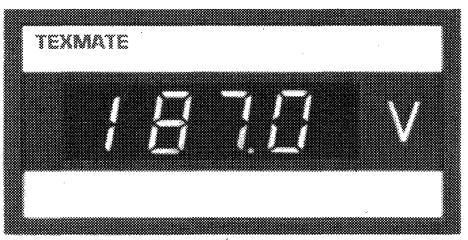
TEXMATE DU-Series: International DIN 96x48 Cases, Switchboard and Process Indication

MADE IN USA

NEW!

DU-Series of Multi-Use LED meters



Features:

- 20mV to 700V header-selectable multiple ranges
- Easy scaling to most engineering units of read-out
- Quick disconnects or screw terminal inputs
- 110/220/240 VAC Powered
- 3½ digits, 0.56" LEDs (except DU-40AC = 4 digit)
- Red LED's standard, add $20 for green
- International DIN 43 700 Metal Sheathed Cases

AC Line Voltages 199.9V/700VAC $129.00

DU-35AC: AC power line voltage measuring meter • Two header selectable ranges of 199.9VAC and 700VAC F.S. • Unique input circuit allows safe phase-to-phase voltage measurement in 3 phase circuits • DIN 96x48 case • Accuracy ±0.05% + 2 digits • Max. resolution 100mVAC over 1999 counts • 20 sec warm up time to specified accuracy • -10°C to +50°C operating temperature.

True RMS Power Line 199.9V/700VAVoltages $189

DU-35ACRMS: Same as DU-35AC but measures true RMS.

AC Line Voltages 4-digit 700.0VAC $169.00

DU-40AC: 4-digit AC power line voltage measuring meter • Measures up to 700.0VAC full scale with 0.1V resolution • • Unique input circuit allows safe phase-to-phase voltage measurement in 3 phase circuits • DIN 96x48 case • Accuracy ±0.05% + 2 digits • 0.56" LED's • Max. resolution 100mVAC over ±7000 counts • One min warm up time to specified accuracy • 10°C to 50°C operating temperature.

AC Current from 1A/5A CTs $139.00

DU-35ACI: AC current measuring meter • Designed to be used with 1 Amp or 5 Amp Current transformers • Infinitely scaleable with Span Pot to match the CT Primary current • DIN 96x48 case • Accuracy ±0.05% + 2 digits • 20 sec warm-up time to specified accuracy • -10°C to +50°C operating temperature

True RMS AC Current from 1A/5A CTs $199

DU-35ACIRMS: Same as DU-35ACI but measures true RMS.

AC Line Frequency 40.0 to 199.9Hz $145.00

DU-35HZ: Power line frequency measuring meter • Designed for input voltages from 80VAC to 700VAC • One range of 199.9Hz F.S. is provided. If only 1Hz resolution is required, then the last digit can be disabled by cutting a jumper on the display board • Optional factory configured range of 500Hz fs available • DIN 96x48 case • 20 sec warm up time to specified accuracy • -10°C to +50°C operating temperature.

DC Millivolts 50/100/200mVDC $109.00

DU-35MV: DC low voltage measuring meter designed to be compatible with most popular DC shunts • Three header selectable ranges of 50mV,100mV & 200mV F.S. • Scaleable from 0 to F.S. for 50/200mV input • Direct connection to popular current shunts • DIN 96x48 case • Accuracy ±0.05% + 2 digits • Max. resolution 100µV over ±1999 counts • 20 sec. warm up time to specified accuracy • -10°C to +50°C operating temperature.

DC Voltages 2V/20V/200V $89.00

DU-35: DC voltage measuring meter • Three header selectable ranges of 2V, 20V and 200V full scale • Scaleable from 0 to F.S. for 2V, 20V, or 200V input • DIN 96x48 Case • Accuracy ±0.05% + 2 digit • 1mV over ±1999 counts max. resolution • 20 sec warm up time to specified accuracy • -10°C to +50°C operating temperature.

Current Loop 4-20mA Signals $105.00

DU-35CL: 4 to 20mA current loop meter • 4 to 20mA input is user-scaleable to read in engineering units directly without component changes • Zero and Span adjust potentiometers • DIN 96x48 case • Accuracy ±0.05% + 2 digits • Max. readout ±1999 counts • One min. warm up time to specified accuracy • -10°C to +50°C operating temperature.

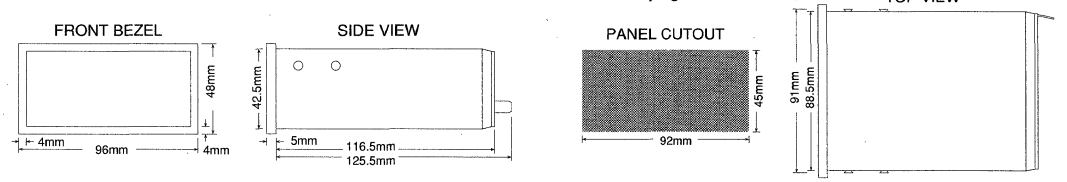
Pressure Meter 2mV to 20mV/V $169.00

DU-35P: Pressure transducer input compatible meter • Provides transducer excitation voltage • Accepts inputs from transducers with 2mV to 20mV per volt output • Scaleable to display most engineering units • DIN 96x48 Case • -10°C to +50°C operating temperature • Available with optional all-welded, titanium pressure transducer • Flush or port mounted • Standard ranges: 50-2000psi

PRESSURE TRANSDUCERS TO SUIT DU-35P • RANGES 50-2000PSIG
MP-40A, flush mount $129 or MP-50A, 10-32 port $149.

DIN 96x48 Case Dimensions

Panel Punch Cutout available from Texmate. See last page for details.



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TEXMATE NEW! DIN 96x48 Intelligent Meter Relays, Process, Temperature and Pressure Meters

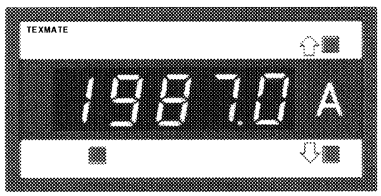
Intelligent Microprocessor Meters

with plug-in signal conditioning modules

Modular design makes it easy to custom configure these meters to almost any desired combination of input signals, control outputs, power supplies and display formats.

DI-45C from $280.00

See input/output boards at lower right!



4½ digit LED, microprocessor controlled, DPM for precision measurements of input signals • Modular, plug in signal conditioning boards available: AC/DC voltage and current, resistance, & temperature w/ T/C or RTD sensor • Long term stability by internal digital calibration • Trend indication, auto-taring, last digit rounding off, avging, conversion spd, set point/actual comparison, offsetting zero, variable scale factor, display brightness adjust & saving MAX/MIN values, are programmable by front panel keys • Power:110VAC 50/60Hz, or 220VAC or 18V-36VDC/24VAC • Green LEDs optional • Connect 32 units to your PC w/ RS-485. See Data Acquisition page for software • DIN 96x48 Case.

DH-45C from $250.00

See input boards at lower right!

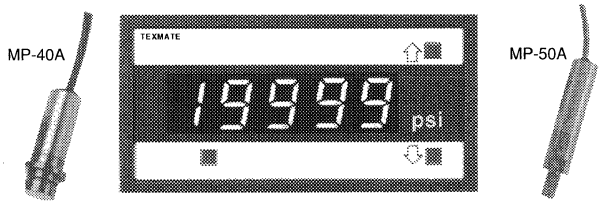
96x24 Case

4½ Digit LED micro processor controlled meter with all the front panel key programmability and input signal flexibility of the DI-45C but in a half height case without the availability of output options • Powered from 110VAC 50/60Hz, or 220VAC or 18V to 36VDC/24VAC • Green LEDs optional • DIN 96x24x112 Case.

5VDC powered version, **DS-45D**, available in short depth case 96x24x56 but only with dedicated inputs 2/200VDC, 4-20mA DC & 200µA/2A DC.

Superior Strain Gauge Pressure Meter

DI-45P from $395.00



0.5% accuracy with 4½ digit (19999 counts or PSI) of resolution and selectable 5 or 10VDC excitation • DIN metal case (96Wx48Hx117 mm deep) • Standard input 200mV • Red or green LEDs • Standard power 110VAC, 50/60Hz • Standard chart recorder output 0-1 or 0-2VDC • Optional printer/computer interface BCD or RS-232C.

PRESSURE TRANSDUCERS TO SUIT DI-45P • RANGES 50-10,000PSIG MP-40A, flush mount $129 or MP-50A, 10-32 port $149.

Meter Relay Controller

monitors, scales, records, communicates and alarms

DI-45R from $380.00

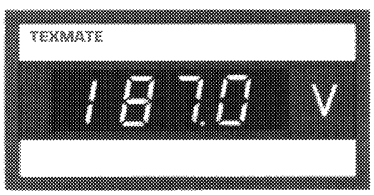
4½ digit, red or green LEDs, pre-configured intelligent meter with choice of one or two 5 amp relays • Alarm points are front panel configurable by user • Inputs are 4-20mA for all process signals and platinum RTDs or thermocouples J, K, R, S for temperature • Outputs are 4-20mA or 0-1, 0-2VDC for chart recorder • Standard power 110VAC, 50/60Hz • DIN 96x48 Case

Standard Modular Meters

DN-35B from $135.00

DN-35BX from $145.00

See input/output boards below!



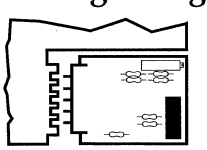
3½ digit LED or LCD modular panel meter • Accepts most of the optional plug in signal conditioning modules but is more economical for those applications that only require 3½ digit resolution and no programmability • Green LEDs optional • DIN 96x48 Case.

DL-35B from $150.00

See input boards below!

3½ digit LED modular panel meter in half height case • Accepts most plug in signal conditioning modules • Power 110 or 220VAC 50/60Hz or 18V-36VDC/24VAC • DIN 96x24x112 Case

Plug-In Signal Conditioning Modules



Plug-in signal conditioning modules to suit almost any input signal, control, or data output, can be easily inserted through the rear of the meter without disassembling the case or removal from panel.

Input Board Options = DC standard: 2/20/200V $15.00 • DC Universal Volts/Amps: 2-500V/5-500mA $50.00 • DC mV: ±200, ±400, ±2000mV $55.00 • AC Volts/Amps Avg.: 2-700V/2µ-2A $75.00 • AC Volts/Amps RMS: 200mA-700V/200mA-2A $145.00; 5A $155 • T/C types: J,K,R,S $75.00 • RTD: Pt100 $75.00 • RPM/Frequency: 5-200Hz, 5-200kHz $90.00• 4-20mA $45.00 • Peak Value Hold $65 • Resistance 2-4 wire $85 • AC Line Frequency $80

Output Board Options = Control Output 5A Relays: Single $80.00; Dual $95.00 • Analog Outputs $60 to $190 • Logic $90.00 • BCD $135.00 • Dual OPTO Relay Drives plus RS-232C/RS-485 $135.00.

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TEXMATE

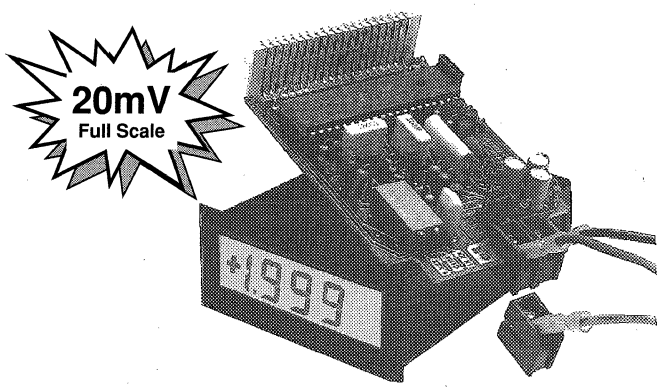
SM-Series: Easy-to-Scale, 5VDC Power, Digital Panel Meters

3½ Digit LCD and LED Meters with Screw Terminals

20mV to 200V header-selectable multiple ranges • Easy scaling to most engineering unit of read-out • Screw terminals or edge connector inputs • Quick installation with unique three point interconnects • All SM-Series meters are pin-out compatible.

SM-Series LCD Meters

SM-35XMV $79.00



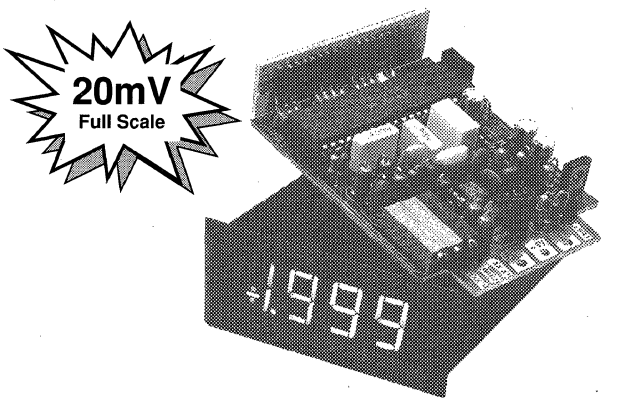
New multi-purpose 3½ digit LCD meter • 0.48" LCD display • Fine and coarse scaling adjust controls • 20mV, 200mV, 2V header-selectable ranges • Single-ended input • Suitable for most current shunt applications • Reading offset capability • Auto-polarity with header-selectable polarity disable & reversal • Programmable decimals & non-active trailing zero • Reading Hold • Edge connector or screw terminal connections • TC 100 ppm typical • +5VDC power @ 15mA • Available in stackable Slim Bezel case.

SM-35X $59.00

New multi-purpose 3½ digit LCD meter • 0.48" LCD display • Fine and coarse scaling adjust controls • 2V, 20V, 200V header-selectable ranges • Single-ended input • Offset option for most 4-20mA or 1-5V scalings • Auto-zero• Auto-polarity with header-selectable polarity disable & reversal • Programmable decimals & non-active trailing zero • Reading Hold • Edge connector or screw terminal connections • TC 100 ppm typ • +5VDC power @ 5mA. • Available in stackable Slim Bezel case.

SM-Series LED Meters

SM-35MV $69.00



New multi-purpose 3½ digit LED meter • 0.56" high-efficiency LED's • Fine and coarse scaling adjust controls • 20mV, 200mV, 2V header-selectable ranges • Single-ended input • Suitable for most DC current shunt applications • Reading offset capability • Auto-polarity with header-selectable polarity disable & reversal • Programmable decimals • Reading Hold • Edge connector or screw terminal connections • TC 100 ppm typical • +5VDC power @ 225mA • Available in stackable Slim Bezel case.

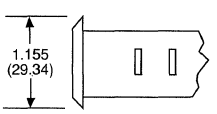
SM-35 $49.00

New multi-purpose 3½ digit LED meter • 0.56" high-efficiency LED's • Fine and coarse scaling adjust controls • 2V, 20V, 200V header-selectable ranges • Single-ended input • Offset option for most 4-20mA or 1-5V scalings • Auto-zero • Auto-polarity with header-selectable polarity disable & reversal • Programmable decimals • Reading Hold • Edge connector or screw terminal connections • TC 100 ppm typical • +5VDC power @ 200mA.• Available in stackable Slim Bezel case.

Optional Slim Bezel Cases

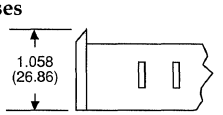
Standard Slim Bezel Low Profile Case

SLIM BEZEL CASE
Standard black ABS case with matte finish bezel for single unit mounting.
Part No. **SL-CASERED** for LED's
SL-CASECLR for LCD's

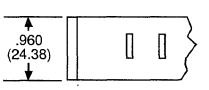


Optional Twin Mounting or Multiple Array Cases

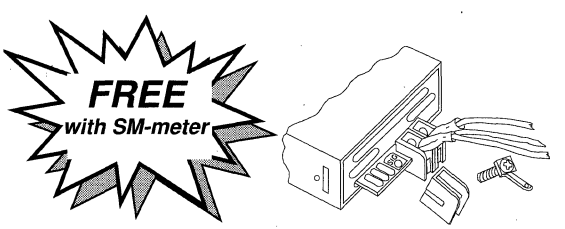
END MOUNT CASE
Same styling as Slim Bezel case but with bottom edge of bezel removed. Two End Mount cases can be twin mounted in a single cutout.
Part No. **EM-CASERED** for LED's
EM-CASECLR for LCD's



CENTER MOUNT CASE
Any number of Center Mount cases may be fitted between two End Mount cases for multiple arrays.
Part No. **CM-CASERED** for LED's
CM-CASECLR for LCD's



TB-Kit Screw Terminal Blocks



Texmate's individual screw terminal blocks offer a convenient alternative to edge connectors for many applications, allowing complete installation, configuration and calibration without the need for soldering. Slide each terminal block over the PCB until the hole aligns. Insert the retaining screw to secure.

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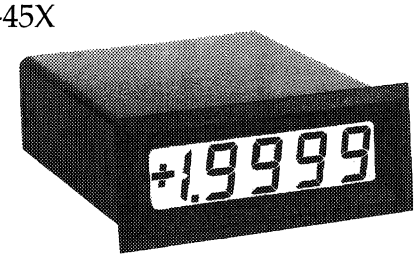
TEXMATE

Professional Instrumentation Meters: Data Outputs, Set Points, Slave Displays, Power Supplies

Also see Gossen/Texmate ad in Power Supplies: Lab, EEM Vol. D

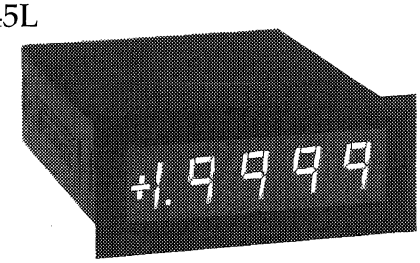
4½ Digit LCD & LED Meters with Multiplexed/Parallel BCD Output

PM-45X $125.00



4½ digit 0.48" LCD DPM • Super-stable temperature-compensated reference • Accuracy 0.01% of reading + 1 digit • True differential & single-ended inputs • 200KHz quartz crystal-controlled clock for 120dB 50/60Hz NMRR • 80dB CMRR • Ranges: 200mV, 2V, 20V,200V, and 1200V • Programmable decimals • Scaling in engineering units with offset capability • Over-range/under-range output • Busy output • Clock output • Run/Hold • Ultra-low power requirements 3-5mA at +4.5V to +5.5VDC (25mW) • Low Temperature Coefficient of 20 ppm/°C • Available with optional parallel BCD output in model **PM-45XBCD** which is compatible with comparator CP-45 • Optional MUX BCD output available in model **PM-45XMUXBCD** which is compatible with the RD-Series of remote slave displays. • Available in stackable Slim Bezel case

PM-45L $110.00



High accuracy LED meter with 10µV resolution • Accuracy 0.01% of reading + 1 digit • True differential & single-ended inputs • 100KHz quartz crystal-controlled clock for 120dB 50/60Hz NMRR • 80dB CMRR • Ranges: 200mV, 2V, 20V,200V, and 1200V • Programmable decimals • Scaling in engineering units with offset capability • Over-range/under-range output • Busy output • Clock output • Run/Hold • Ultra-low power requirements 225mA at +4.5V to +5.5VDC • Low Temperature Coefficient of 20 ppm/°C • 0.4" LED's • Current consumption = 250mA • Available with optional parallel BCD output in model **PM-45LBCD** which is compatible with comparator CP-45 • Optional MUX BCD output available in model **PM-45LMUXBCD** which is compatible with the RD-Series of remote slave displays. • Available in stackable Slim Bezel case.

PM-45XU $105.00

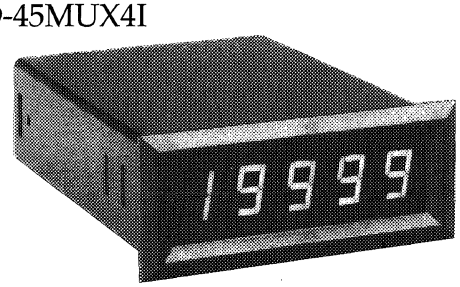
Low cost 0.48" LCD 4½ digit meter • Single-ended and differential inputs • Ranges: 200mV, 2V, 20V, 200V, and 1200V • Offset option for custom scalings • Accuracy ±0.015% of reading + 2 digits • Current consumption = 5mA • Temperature Coefficient of 50 ppm/°C • Optional parallel BCD output available in model **PM-45XUBCD** which is compatible with comparator CP-45 • Optional MUX BCD output available in model **PM-45XUMUXBCD** which is compatible with the RD-Series of remote slave displays.• Available in stackable Slim Bezel case.

PM-45LU $90.00

Utility 4½ digit meter • Single-ended and differential inputs • Ranges: 200mV, 2V, 20V, 200V, and1200V • Offset option for custom scalings • Temperature Coefficient of 50 ppm/°C • 0.4" LED's • Current consumption = 250mA • Accuracy ±0.015%of reading + 2 digits • Available with optional parallel BCD output in model **PM-45LUBCD** which is compatible with comparator CP-45 • Optional MUX BCD output available in model **PM-45LUMUXBCD** which is compatible with the RD-Series of remote slave displays.• Available in stackable Slim Bezel case.

Remote Slave Displays

RD-45MUX4I $45.00



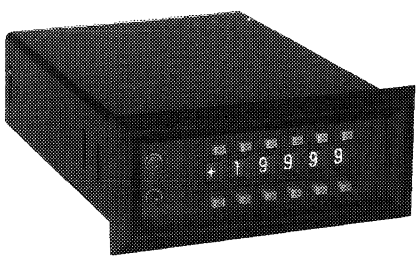
4½ digit, 0.4" high LED remote slave display • Directly connects to the PM-45LMUXBCD, PM-45LUMUXBCD, PM-45XMUXBCD, PM-45XUMUXBCD meters • Available in stackable Slim Bezel case. • 5V DC powered at 200mA

RD-45XMUX4I $54.00

4½ digit, 0.48" high LCD remote slave display • Directly connects to the PM-45LMUXBCD, PM-45LUMUXBCD, PM-45XMUXBCD, PM-45XUMUXBCD meters• Available in stackable Slim Bezel case. • 5V DC powered at 3mA

BCD Comparator Controller

CP-45 $95.00



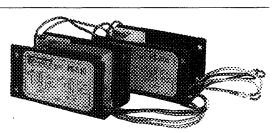
Single set point, 4½ digit BCD comparator controller • Up to 4 units may be connected to the parallel BCD outputs of the PM-45XBCD/XUBCD and PM-45LBCD/LUBCD meters to create any contro! configuration desired • Relay with 1 form C changeover contacts has five selectable modes to activate when signal is: greater than, equal to, less than, greater than or equal to, less than or equal to, the set point • Adjustable activation delay to prevent relay chatter for noisy input signals • Relay can also be operated in latched mode with manual Reset • Available in stackable Slim Bezel case for multiple set points • 5V DC powered • Current consumption = 150mA.

120/240VAC to 5VDC Power Supplies

Also see our ad in Power Supplies: Lab EEM, Vol. D

PS-505 $22.00
PS-510 $25.00

The PS-505 with a 500mA output and the PS-510 with a 1 amp output are general purpose low ripple regulated power supplies suited for +5VDC powered DPM's • Both units provide user selectability for 110VAC or 220VAC operation.



Texmate also has many other power supplies some of which are UL/CSA/VDE approved. Please call for details.

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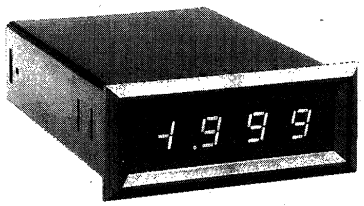
Texmate Classics: Established, Time-Proven, Multi-functional General Purpose Meters

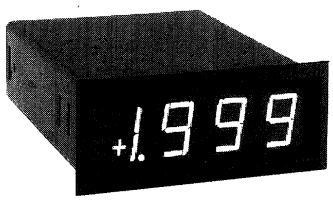
5V DC Powered Digital Panel Meters

PM-35U 39.00



Low cost, quality 3½ digit DPM • Bright 0.3" LED's • Differential inputs • Bipolar • Auto-zero • Ratiometric • Ohms • Current • Programmable decimals • 200mV, 2V, 20V, 200V, & 1200V ranges • TC 100 ppm typical 200 max. • +5VDC power • Available in stackable Slim Bezel case.

PM-35A $65.00

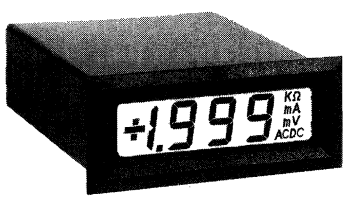


Popular, general purpose 3½ digit instrument • 0.56" high LED's • Differential inputs • Programmable current & ohmmeter capability • Ratiometric • 200mV, 2V, 20V, 200V & 1200V ranges • Scaling in engineering units • Display test • Low TC 50 ppm typical • Auto-zero • Bipolar • Programmable decimals • +5VDC power at 200mA • Available in stackable Slim Bezel case.

PM-35AR $92.00

Autoranging DPM • Has all the features of the PM-35A except ratiometric and ohms measurement • Autoranges between any two adjacent ranges from 200mV-2V,2V-20V, 20V-200V, or 200V-1200V • 1000MΩ input impedance on 200mV-2V range, 10MΩ on others • +5VDC power• Available in stackable Slim Bezel case.

PM-35X $79.00



Versatile 3½ digit low power LCD meter • Can be configured to work at a particular voltage in the range of 3.5V to 40VDC with external resistors • Differential inputs • Programmable current & ohmmeter capablility • Ratiometric • 200mV, 2V, 20V, 200V & 1200V ranges • Scaling in engineering units with offset • Available in stackable Slim Bezel case.

PM-35XAC $94.00

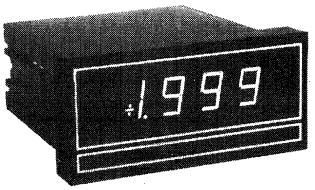
115/230VAC line operated DPM, fully isolated with internal transformer • PM-35XAC has all the features of the PM-35X but with AC power • Can also operate from DC voltages of 9VDC to 50VDC.

PM-45 $85.00

Popular economical 4½ digit DPM • Single ended input • 0.3" LEDs • 200mV, 2V, 20V, 200V, 1200V ranges • Max. resolution 10μV over ±19999 counts • Overrange and underrange outputs available • Ratiometric • Available in stackable Slim Bezel Case.

LED 115/230VAC Powered DPM's

RP-35A $79.00



Versatile full-feature 3½ digit 115/230V AC line operated DPM • Single ended and differential inputs • User- programmable current and ohmmeter capability • 4-20mA • Scaling in engineering units with offset • DC outputs available • Display test • 200mV full scale to 1200V range • Precision meter, very stable readings • Warm up time = 10 seconds • Accuracy ±0.05% of reading +1 digit • Replacer-Series case

RP-35U $69.00

Low price 115/230VAC line operated DPM • 3½ digits • True differential inputs • 200mV to 1200V full scale • Accuracy ±0.05% of reading +1digit • Warm up time = 2 min. • TC 100 ppm typical • Replacer-Series case

RP-35AR $110.00

Low cost 2-decade autoranging AC powered DPM • Has all the features of the RP-35A except ratiometric ohms measurement • Auto-ranges between any two adjacent ranges from 200mV -2V to 200V -1200V •Replacer-Series case

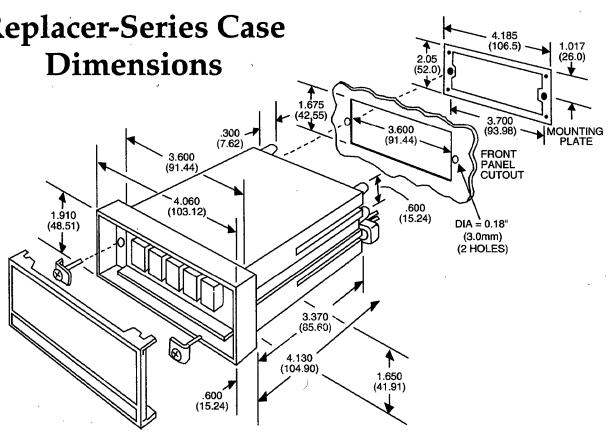
RP-3500 $105.00
RP-4500 $125.00

RP-3500 3½ digit and RP-4500 4½ digit are low cost 115/230V AC line operated DPM's • Single-ended inputs • MUX BCD • Remote control sample/hold feature • Display blanking • Leading zero blanking • Autorange outputs • Display test • Auto-zero • Bipolar • Flashing overload • 200mV full scale to 1200V • 0.56" LED's • Accuracy ±0.05% of reading +1digit • Replacer-Series case • Tri-state parallel BCD output available in RP-3500BCD & RP-4500BCD.

RP-3500D $135.00
RP-4500D $165.00

RP-3500D 3½ digit and RP-4500D 4½ digit are top 115/230AC power instrumentation DPM's • Hi normal mode noise rejection at 50/60 Hz of120dB w/ internal 200kHz quartz clock • Single ended & differential inputs • 200mV fs to 1200V range • 0.56" extra bright LED's • Accuracy ±0.05% of reading +1digit • Ultra stable readings • Scaling in engineering units with offset • Replacer-Series case • Tri-state parallel BCD output available in RP-3500DBCD & RP-4500DBCD.

Replacer-Series Case Dimensions



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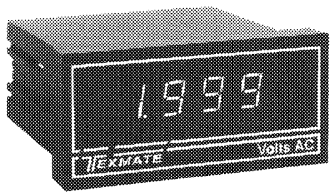
Low Cost AC Switchboard Utility Meters, Panel Printers RS-232 Alphanumeric

UM-Series: 110/220/240VAC Powered Utility LED Meters

UM-35AC $79.00



AC power line voltage measuring meter • Two header selectable ranges of 199.9VAC and 500V AC full scale • Pin-out compatible with other UM-series meters • Edge connector or screw terminals • Replacer-Series case • Accuracy ±0.05% + 2 digits • 0.56" LED's • Max. resolution 100mVAC over 1999 counts • 20 Seconds warm up time to specified accuracy • -10°C to +50°C operating temperature.

UM-35ACI $85.00

AC current measuring meter • Designed to be used with 1 Amp or 5 Amp Current transformers • Pin-out compatible with other UM-series meters • Edge connector or screw terminals • Replacer-Series case • Accuracy ±0.05% + 2 digits • 0.56" LED's • 20 seconds warm-up time to specified accuracy • -10°C to +50°C operating temperature

UM-35HZ $89.00

Power line frequency measuring meter • Designed for input voltages from 80V AC to 300V AC •Pin-out compatible with other UM-series meters • Edge connector or screw terminals • Replacer-Series case • 0.56" LED's

UM-35MV $75.00

DC low voltage measuring meter • Two header selectable ranges of 50mV and 100mV full scale • Scalable from 0 to full scale for a 50/100mV input, for direct connection to popular current shunts • Pin-out compatible with other UM-series meters • Edge connector or screw terminals • Replacer-Series case • Accuracy ±0.05% + 2 digits • 0.56" LED's • Max. resolution 100µV over ±1999 counts • 20 Seconds warm up time to specified accuracy • -10°C to +50°C operating temperature.

UM-35 $64.00

DC voltage measuring meter • Two header selectable ranges of 2V and 20V full scale • Scalable from 0 to full scale for a 2V or 20V input • Pin-out compatible w/ UM-series meters • Edge connector or screw terminals •Replacer-Series case

UM-35CL $72.00

4 to 20 mA current loop meter • 4 to 20mA input is user-scaleable to read engineering units directly without component changes • Zero and Span adjust potentiometers • Pin-out compatible with other UM-series meters• Edge connector or screw terminals • Replacer-Series case

UM-40AC $109.00

NEW!

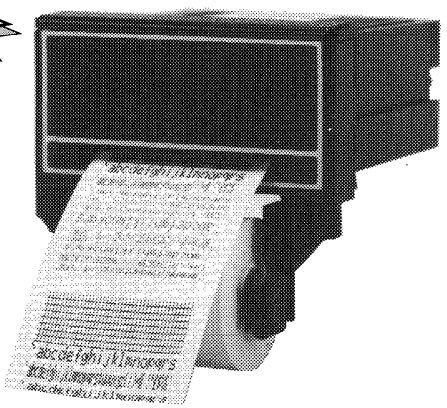
Measures power line voltages up to 500.0VAC with 0.1V resolution • 4 digits, 0.56" high efficiency LED's • Single ended • Infinitely adjustable span potentiometer • Display Hold • Pin-out compatible with other UM-series meters• Edge connector or screw terminals • Replacer-Series case

RS-232C Alphanumeric Printer

PR-240 (24 column) $495.00
PR-440 (40 column) $495.00

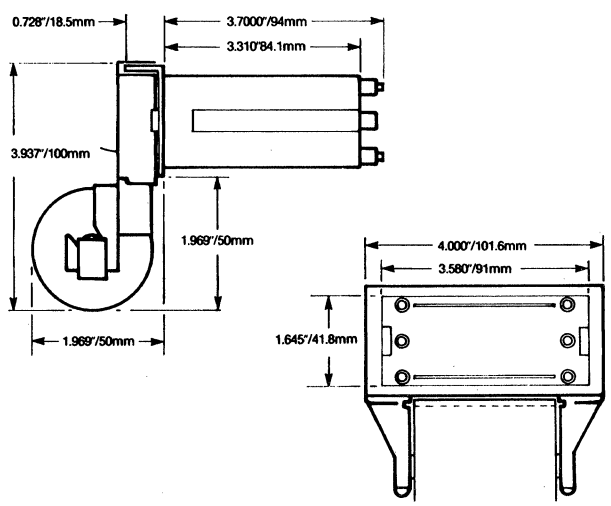
Both models include connectors, paper roll, ribbon cartridge, and manual.

NEW!



Compact, panel mounted dot matrix printer with serial or parallel printing • 96 character ASCII with upper and lower case, extended height and inverted printing • Uses plain paper roll 2.25" (58mm) wide • 24 column prints 42 lines per minute, 40 column prints 24 lines per minute • 72 byte buffer mode so data can be stored before printing • Manual or push button paper feed • Ink ribbon easily changeable • Selectable baud rate: 110, 300, 1200, 2400 • Graphics mode • Self-test • Power: 95-130VAC or optionally 190-260VAC or 5VDC @ 100mA • Additional print fonts available • Mounted in Replacer-Series case with. cutout = 3.58" wide X 1.645" high • Overall height including paper = 4" (100mm) • Depth = 3.7" (94mm).
Compatible Texmate meters : For BCD = PM-45X/XU, PM-45L/LU, RP-3500/DBCD, RP-4500/DBCD,RP-35RMSBCD. For RS-232C = DI-45C, DI-45R.
Or the printers can be interfaced with Texmate's pc data aquisition boards.

Models PR-240 & PR-440 Case Dimensions



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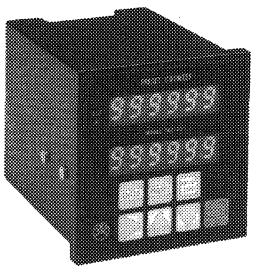
TEXMATE Programmable Counters, Event Counters/Totalizers, Linespeed/Tachometers, and Message Displays

Programmable Counters

Texmate offers a diversified line of preset counters with totalizers, relays and plug-in screw terminals. Following are two representatives of the many models available. Call for data sheets or fast fax information.

PC-60 $169.00

NEW!



6 digit, 1 or 2 preset counters or one counter/one totalizer • 72mm x 72mm case • 16 modes of operation • Count input: CP1 count up, CP2 count down; CP1 count, CP2 HI-up, LOW-down • Power: 110/220VAC, 50/60Hz • Screw terminals included

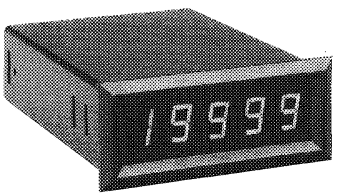
LT-50 $149.00

NEW!

5 digit, Linespeed meter or tachometer • Display 0.56" LEDs • Input level TTL/Hi - 3.5V, Lo - 1V • CMOS/Hi - 7.5V, Lo - 4.0V for NPN/PNP sensor • Scale factor, decimal set by DIP switch • Power 110/220 VAC, 50/60Hz or AC/DC 24V • 3 and 4 digit also available.

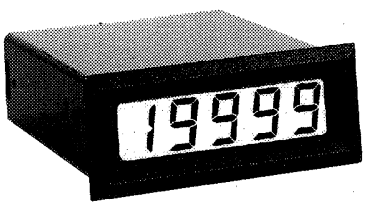
Event Counters/Totalizers

PC-45 $49.00



A versatile event counter/totalizer featuring 19999 counts with over-range indication or 9999 counts with cascade output • Contact closure, AC or logic signal inputs • High brightness 0.4" LED display • +5VDC power • Outputs for user supplied Ni-Cad battery back-up • Internal debouncing circuit • Functions include count reset, count inhibit and display hold • 4 user-programmable decimal points • Overload indication • Available in stackable Slim Bezel case.

PC-45X $59.00

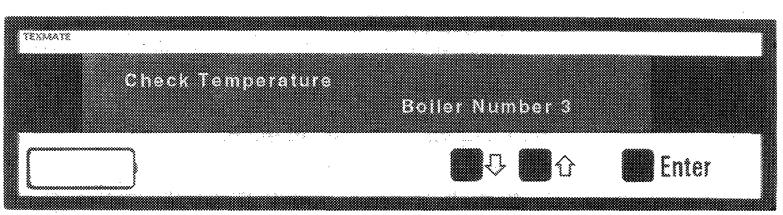


A versatile event counter/totalizer featuring 19999 counts with over-range indication, or 9999 counts with cascade output • Contact closure, AC or logic signal inputs • High contrast 0.48" LCD • 4-6VDC power with outputs for user supplied Ni-Cad battery backup • Capable of signal-powered operation • Internal debouncing circuit • Functions include count reset, count inhibit and display hold • 4 user-programmable decimal points • Overload indication • AC powered version model PC-45XAC • Available in stackable Slim Bezel case.

Intelligent Message Center/Annunciator

AN-01 $695.00

NEW!



Dimensions 288mm W x 72mm H x 123.5mm D (11.3" W x 2.83" H x 5" D)
Vacuum fluorescent display green 2 x 40 signs in ASCII code with English signs.

- Alpha-numeric displays (dual messages)
- RS-232C interface (also parallel)
- Stores mulitple messages (up to 255)
- Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19.2k
- Power: 115VAC or 230VAC or 18-36VAC
- Operationg temp 0-50°C, Storage -20 to +70°C
- Dimensions 288mm W x 72mm H x 123.5mm D
- 31 units on same bus (RS-485)
- Each display 5mm high
- 32k text memory
- User selectable messages, micro-processor based
- Optional printer output - RS-232C
- Optional relays (2) for alarm
- Remote display terminal - RS-232C

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7

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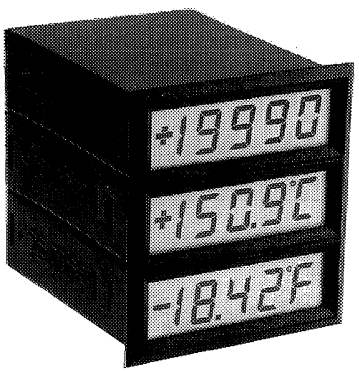
Loop Powered Process meters, Signal Powered meters, and Mini-meters™

4-20mA Loop Powered Process LCD Meters

CM-35XT $86.00

Normally shipped in standard Slim Bezel Cases but may be ordered in any combination of End Mount and Center Mount cases as pictured. See case details on next page.



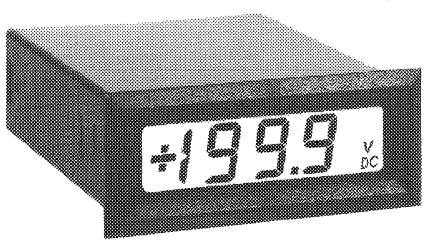
Powered by 4 to 20mA signal loop power •3½ digit LCD meter • 0.48" LCD display • No additional power supply required • 4 to 20mA input user-scaleable to read engineering units directly • Auto-polarity with header selectable polarity disable & reversal •Programmable decimals• Header-programmable for non active trailing '0' digit or 'F' and 'C' descriptors • Reading/Hold • Edge connecto or screw terminal connections • TC 100 ppm typical • Available in stackable cases as shown • Insertion drop 6.5V.

CM-35XTL $110.00

Powered by 4 to 20mA signal loop power • Low insertion drop 2.5V • 3½ digit LCD meter • 0.48" LCD display • No additional power supply required • 4 to 20mA input user-scaleable to read engineering units directly • Auto-polarity with header-selectable polarity disable & reversal • Programmable decimals • Header-programmable for non-active trailing '0' digit or '°F' and '°C' descriptors • Reading/Hold • Edge connector or screw terminal connections • TC 100 ppm typical.• Available in stackable Slim Bezel case.

LCD Signal Powered Meters

SP-35X $89.00 and SP-35XRMS $105.00



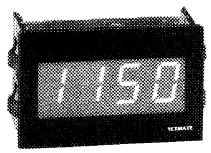
The SP-35X and SP-35XRMS are two-wire signal powered meters • SP-35XRMS measures RMS volts in two ranges of 15.0V to 199.9V and 15V to 250V AC/DC • SP-35X measures DC volts 3.5VDC to 199.9VDC • 0.48" high contrast LCD display • Screw terminal or PCB edge connector termination • Available in stackable Slim Bezel case. • Easy connections • Requires no power supply other than signal input

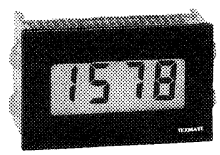
Snap-In Flush Mounting DPMs

This new series of LED and LCD panel meters are designed to mount nearly flush with the panel and be installed with an easy snap fit into the international standard 60mm x 36mm panel cutout. These meters are 5VDC powered with various DC voltage and current input ranges available.

SI-35 *LED version* $80.00

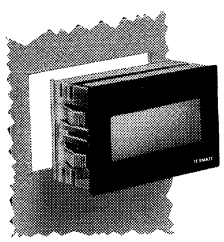
SI-35X *LCD version* $90.00



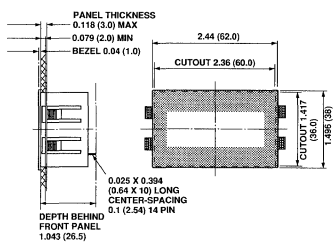


3½ digit LED or LCD Standard/Backlit Snap-In meter • Bezel size 62 x 38 mm • Depth 26.5mm • Powered by 5VDC • Optional 115VAC power supply doubles the depth to approx. 2 inches • Current consumption less than 3 watts on LCD version• Operating temperature 32° to 122°F • Isolated to 500 volts • Connectors are 14-pin rear connector or via screw terminals • Zero Offset and full scale adjustment.

The above two meters are available in 4½ digit versions, the SI-45 (LED) and the SI-45X (LCD). Call for pricing information.



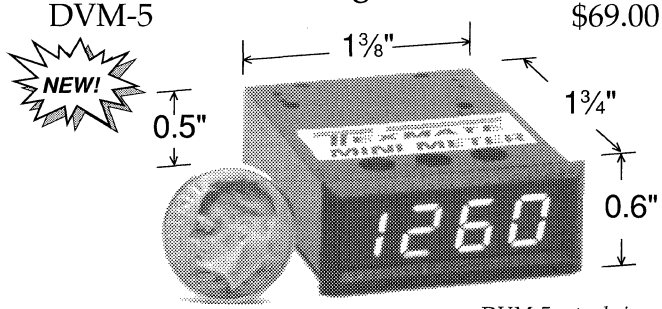
Snap In Panel Mounting
60mm x 36mm Cutout



Dimensions of Cutout
Only 1 inch behind panel!

Mini-Meter™ Digital Panel Meter

DVM-5 $69.00



DVM-5 actual size
LEDs 0.29" high

One of the world's smallest voltmeters • Offered in two ranges 200mV and 2V full scale • Designed for OEM's in the medical and scientific instrument field where small size and exceptional performance are important • Powered from 5VDC/70mA over the range of -30 to +85°C • Dimensions are 1.378" x 0.5" x 1.77" (D) • The front bezel is 37 x 15mm • 4-digit, 7mm (0.29") high, adjustable brightness LED display • Unit weights 0.64 oz.

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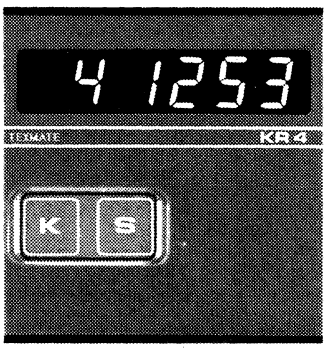
Temperature and Process Controllers

GOSSEN

See Gossen/Texmate ad in Power Supplies: Lab, EEM Vol. D

Temperature Controllers in DIN Case

Pantatherm KR4 $1,100.00



The Pantatherm KR4 is a 4-channel, microprocessor controlled, 2- or 3-term PID temperature controller • The KR4 controller is designed for system where ON/OFF switching of the heating or cooling phases is possible.

Operator control unit and display integrated in a single front panel • Thermocouple or resistance thermometer type sensor • Adaptive control to the controlled system adjustable when starting up • Controller outputs and MAX/MIN values • Adjustable MAX/MIN or MAX/MIN band • Adjustable setpoint limit • Adjustable measurement ranges• Inputs and outputs DC decoupled • Non-volatile memory without battery backup • Data interface either 20mA current loop or RS 485 • Local and remote modes available • Controller front-withdrawable • Line voltage 110 to 240VAC/DC or 24VAC/DC • DIN Case 96x96 • A special version, the KR4-PS, provides feedback interloop cascade control with PC/AT program download/upload capability via the serial link. Multiple units can be cascaded for special 8-12-16-32 loop requirements.

Pantatherm D1 $499.00

The PANTATHERM DI is a microprocessor controlled single channel controller • The D1 is a 2- or 3-term PID temperature controller for systems where ON/OFF switching of the heating or cooling phases is possible. The D1 can be used with thermocouples or RTD sensors • Relay or logic control outputs provided • Adjustable setpoints • Ramp function start-up adjustable • May also be operated with P,PI, or PD control actions• Auto/manual operating modes • Local or remote operation • Optional data interface with RS485 or 20mA half duplex • Non-volatile EEPROM to retain stored values without back-up battery • DIN Case 48x96.

Pantatherm S1 $865.00

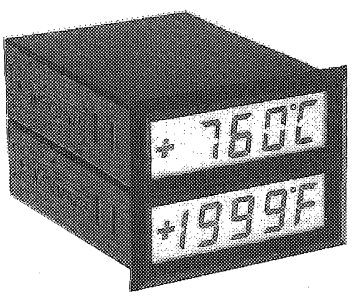
The PANTATHERM S1 is a microprocessor controlled single channel controller • The S1 is a 3-term stepper controller with PI action, for stepping electric motor actuated control elements, such as motorized valves, dampers and auto transformers. • Accepts DC 0 to 20mA, 4 to 20mA inputs or thermocouple or RTD sensors • Adjustable measuring ranges • Input for position feedback potentiometer.• Auto/manual operating modes • Local or remote operation • Optional data interface with RS485 or 20mA half duplex • Non-volatile EEPROM to retain stored values without back-up battery • DIN Case 48x96.

'J' or 'K' Thermocouple Temperature Measuring Meters

TM-35X *LCD version* $104.00

TM-35 *LED version* $94.00

Normally shipped in standard Slim Bezel Cases but may be ordered in any combination of End Mount and Center Mount cases as pictured.



Low cost LCD (TM-35X) or LED (TM-35) meter for 'J' or 'K' thermocouples • +5VDC powered • User-selectable °C/°F descriptor • Thermocouple break detection and indication • Display Hold • Display Test • Auto-Polarity indication • Edge connector or screw terminal connections • Differential Input which facilitates operation with both grounded and ungrounded probes • Available in Slim Bezel stackable cases as shown.

Mini-Controller™ TC-48 (temperature) $199.00

Mini-Controller™ PC-48 (process) $249.00

Mini-controller™ 48x48mm case • PID auto-tune temperature and process controller • Accuracy ±0.5% of full scale • Multiple user selected ranges from 0-999°C/°F • Sensors RTD, thermocouples J or K • PV and SP are displayed simultaneously • Alarms • Output options 3 amp or SSR driver • ON/Off control for heating or cooling • Power 100-240VAC, 50/60Hz • Also available the PC-48, a proportional controller with thermocouple or 4-20mA input • Setpoint is via 3-digit thumbwheel and process variable read on 3-digit LED display • Output relay, 4-20mA or 1-5V signal to control Valves, positioners or motors.

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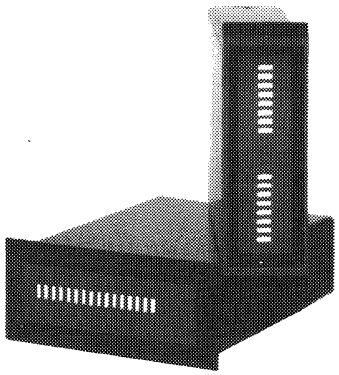
TEXMATE

Bargraphs, Digital/Bargraphs and Meter Relays

LED 20-Segment Bargraph Meters

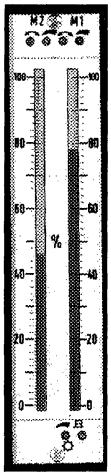
AM-20 $49.00



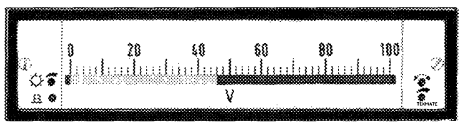
Rugged versatile solid state analog DPM • 20-segment LED bargraph • Single-ended positive inputs only • Ranges 200mV, 2V, 20V, 200V and 1200V • Selectable Dot or Bar mode and scale indicators • Custom scaling available • Operates as a center-zero meter with isolated 5V power supply • 0.15" segments • Current consumption = 20mA in Dot mode; 240mA in Bar mode • 5V DC powered • Available in Slim Bezel stackable cases.

LED 101-Segment Bargraph Meters

AM-100 $560 (dual) or $530 (single)
AM-100-R Dual relay version $695.00

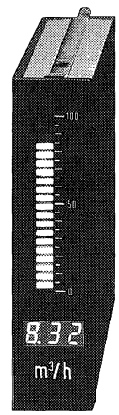


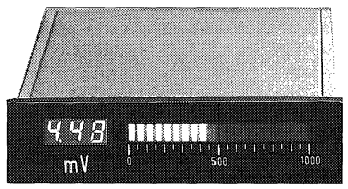
The AM-100 is a single or dual, microprocessor controlled, 101 segment LED 4" bargraph • Adjustable brightness with front panel control • 1200 baud serial output is standard Powered from 110/240VAC 50/60Hz or optional 18 to 36VDC/24VAC power • Measures DC voltage and current with 1% resolution • Optional vernier for increased 0.1% resolution • Each bar may be individually set up for left hand or center zero operation • The AM-100 can be ordered as a dual bargraph with optional dual setpoints and changeover relay contacts • Horizontal or vertical mounting formats available • Optional green LEDs $40.00 • Case size is DIN 144x36.
Dedicated Inputs: 4-20mA or 0-1VDC standard. Also available 0-60mV or 0-100VDC scaled to read 0-99.9 or 0-999.



Dual Digital/Bargraph Meters

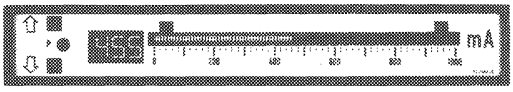
AM-20D $265.00

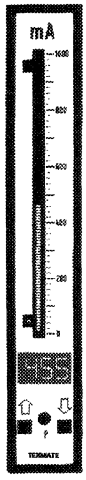




110~240V AC or optional 18 to 36VDC/24VAC power • 20-segment 2" LED bargraph with 3 digit numerical display • Input ranges from 150mV to 250VDC and 4-20mA DC • Separate inputs so bargraph and DPM can be read separately • Analog zero isolated from power supply voltage • Available in vertical or horizontal formats • Optional green LEDs $40.00 • Case size is DIN 96x24.

AM-100D $525 (grn) or $485 (red)





The AM-100D is a 101-segment, microprocessor controlled, adjustable brightness, 1% resolution, LED 3.35" bargraph with 3 digit numerical display • Powered from 110/240VAC 50/60Hz or optional 18 to 36VDC/24VAC power • Modular plug-in input signal conditioning boards are available to measure AC/DC voltage and current, resistance, frequency and temperature with 100 ohms RTD or with thermocouples • Maximum and minimum values can be saved and displayed • Bar display zero may be left hand, right hand, center or offset • Auto-tare function • Logarithmic scale available • Horizontal or vertical mounting formats available • Bar display zoom for 10 times magnification • The AM-100D can be ordered with optional dual set points and changeover relay contacts • Adjustable averaging for noisy input signals • Case size is DIN 144x24.

Input/Output Modules for AM-100D

Input Board Options = DC standard: 2/20/200V $15.00 • DC Universal Volts/Amps: 2-500V/5-500mA $50.00 • DC mV: ±200, ±400, ±2000mV $55.00 • AC Volts/Amps Avg.: 2-700V/2μ-2A $75.00 • AC Volts/Amps RMS: 200mA-700V/200mA-2A $145.00; 5A $155 • T/C types: J,K,R,S $75.00 • RTD: Pt100 $75.00 • RPM/Frequency: 5-200Hz, 5-200kHz $90.00• 4-20mA $45.00 • Resistance 2-4 wire $85 • AC Line Frequency $80

Control Output Options = 5A Relays: Single $60.00; Dual $75.00

Call Texmate for more detailed information.

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TEXMATE NEW! PC Based Data Acquisition & Control for PC/XT/AT Compatibles

Serial Communications Boards

to Interface Texmate's Serial Output Panel Meters, Temperature Controllers and Bargraphs

For example: The dual independent port RS-485 PC-48AT will support up to 64 external devices such as Texmate's DI-45C smart meter.Prices include board and manual only. All boards are half length (except PC-31AT).

Dual port RS-232C/422	**PC-41AT** $245.00
Dual port RS-485/422	**PC-45AT** $245.00
Dual port RS-232C/485	**PC-46AT** $245.00
Dual independent port RS-232C	**PC-47AT** $245.00
Dual independent port RS-485	**PC-48AT** $245.00
Dual independent port RS-422	**PC-49AT** $245.00
Eight RS-232 ports	***PC-31AT** $675.00

Optional Supporting Software

COMBIOS™ RS-232C/422/485 Communication Software $225.00
Manual included and both 3.5" & 5.25" disks. One software supports unlimited ports.

PC-42 Communication Software $105.00
Manual included and both 3.5" & 5.25" disks. One software supports one serial board above.

*** PC-32AT Communication Software/Documentation $105.00**
Required for PC-31AT serial board (eight RS-232 ports)

IoCalc ™ $545.00

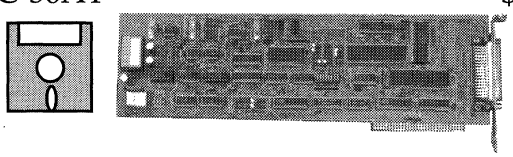
Real-time Spreadsheet Data Acquisition Software

IoCalc™ is a powerful real-time, multi-tasking data acquisition and data processing software package that is compatible with Microsoft Windows™. User friendly menus allow Texmate's intelligent meters to be used as smart transmitters communicating in real-time with up to 32 or 64 channels. Designed for engineering or scientific applications, IoCalc™ is equally at home in either the lab or pilot plant. Uses include: energy management, tank inventory, test and monitoring, especially where data save and multi-tasking are required. IoCalc™ drivers with source code are available for all Texmate serial output meters, controllers and pc boards including VPM 1. IoCalc's easy to use high level development environment allows user modification of existing drivers to suit virtually any register based pc boards.

DMA Data Acquisition & Control Board

The PC-30AT is IBM PC/XT/AT 286, 386 compatible and will function correctly in any true compatible. It has an A/D & D/A card with digital I/O, counter timers and DMA capability, manual and sampling software in callable Turbo Pascal and Quick BASIC libraries and 'C' drivers.

PC-30AT $699.00



16 channels of 12 bit A/D and 2 channels of 12 bit D/A • DMA capability on A/D, throughput 90kHz maximum and D/A 200kHz maximum • Typical conversion time 10 micro seconds • Unipolar and bipolar operation with selectable input ranges • 20 TTL compatible CMOS digital input/output lines • Triple 16 bit counter timer with on board crystal oscillator • Turbo Pascal and Quick BASIC callable libraries included • Suitable for any IBM PC/XT/AT 286, 386 or true compatibles • Applications include: process control, high performance data acquisition, accurate waveform generation, experimental and teaching tool • Options include screw terminal assembly (50 pin), connecting cable, connector and applications notebook.

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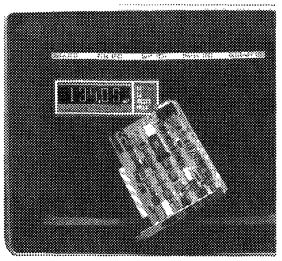
Microsoft Windows is a registered trademark of Microsoft Corp.

Virtual Digital Panel Meter



VPM 1 or Virtual Panel Meter 1 is a new concept in industrial measurement, it combines the simplicity of a panel meter with the performance and flexibility of a personal computer. It includes over 20 functions available on standard panel meters. Software is supplied with every board that presents a picture of a familiar panel meter on the screen of the computer and allows it to be configured just as you would any other panel meter.

VPM 1 (includes software, board & manual) $545.00
Demonstration Software Disk (5.25") $10.00

16 bit A/D converter • Opto isolated input • 2.5, 3.5, 4.5 and 5 digit scale lengths • Integrated hardware and software instrument • Menu driven, no programming • Context sensitive on line help • No jumpers or trimmers after installation • Peak/Valley hold available • Two flexible set points • Variable bandwidth and display update rate • Selectable display color • Easy bezel engraving • Easy range change or special scaling • Applications include: process control panels, weighing, any single range voltmeter, flow metering and level monitoring, lab instrumentation.

Economical Analog Data Acquisition

The PC-27 is a low cost A/D board that incorporates features normally only found on more expensive boards. It has 16 channel 12 bit A/D with counter/timer circuit .

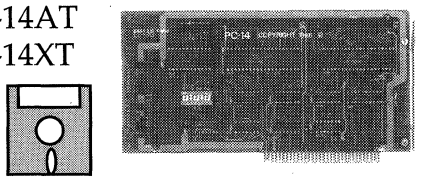
PC-27 A/D Board $265.00

Full function16 channel 12 bit A/D • Very low price • Typical conversion time 10 micro seconds • On board 4MHz frequency reference • Two 16 bit counters available • Three conversion trigger options • Flexible base address • Suitable for any IBM PC/XT/AT 286, 386 or true compatibles • Demonstration software available • Applications include: Quality control, low cost data acquisition, educational establishments, production testing, data logging • 40-pin screw terminal assembly $115 • Connecting cable $35 • DASH 27 Software $85

Digital I/O with Counter Timer

The PC-14AT board has two 82C55 programmable peripheral interface chips and an 82C53 counter timer chip, along with a 4MHz oscillator. This combination provides a very flexible general purpose interface board for all kinds of digital input and outputs. Demonstration software is provided written in BASIC and Turbo Pascal covering most of the possible functions of the board, source code is included and both 5.25 and 3.5 inch formats are supplied.

PC-14AT $175.00
PC-14XT $135.00



48 programmable I/O lines • 3 independent 16 bit counter/timers • On-board 4MHz oscillator • Count rate up to 5MHz • Software or hardware triggered counting • Low power version available for 'Captops' • Fully PC/XT/AT 286 & 386 compatible • Digital I/O and counter chips are socketed to allow easy replacement if they become damaged by faulty inputs • Demonstration software supplied free • Applications include: event counter and timer, machine control interface, frequency measurement, pulse or timebase generation.

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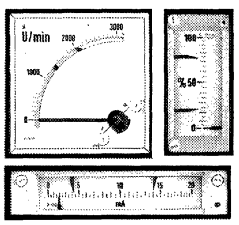
TEXMATE **Analog Panel Meters** **GOSSEN**

See Gossen/Texmate ad in Power Supplies:Lab, EEM Vol. D

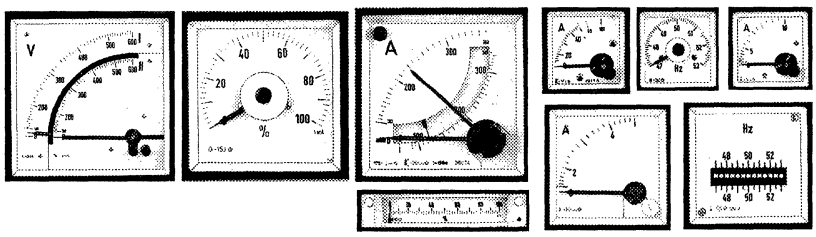
DIN Standard International Series Analog Meters and Meter Relays

As a result of an affiliation and collaboration agreement with Gossen, the leading German and European meter manufacturer, Texmate now offers an extensive range of finely crafted analog meters and meter relays in square and edgewise configurations, all of which meet the international DIN 43 700 standard. This world class range of analog meters includes moving-coil, moving iron, power factor meters, bimetal ammeters, frequency meters as well as special-application meters. Write or call now for pricing information and the latest literature on these and other quality instrumentation products from Texmate.

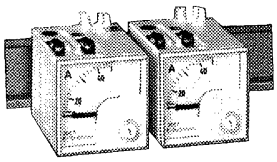
Meter Relays



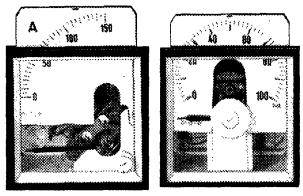
Switchboard Meters



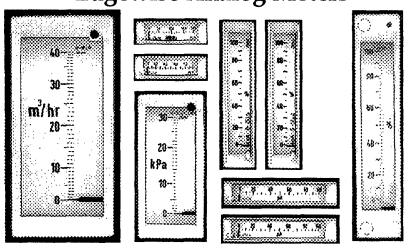
DIN Rail Mounting Analog Meters



Analog Panel Meters with Changable Scales



Edgewise Analog Meters



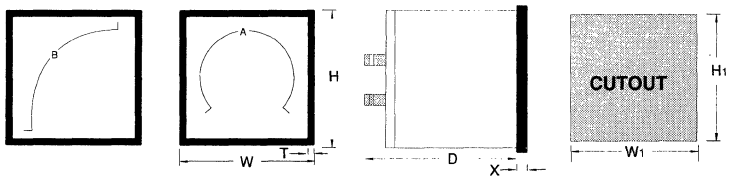
Ordering Information

To order an analog panel meter, please specify meter type, case size, and required range desired. See meter descriptions on next page for more information. A detailed illustrative brochure is available upon request.

Square Case (S)

Sizes 48mm, 72mm, 96mm, and 144mm. Dimension 'D' varies with meter type.

Quadrant Scale 90° (Q) Circular Scale 240° (CS)

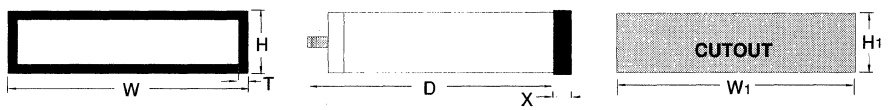


Square Case Dimensions (mm)

	S48	S72	S96	S144
H & W	48	72	96	144
T	3	4	4	5
X	5	5	5	8
H_1 & W_1	≈45	≈68	≈92	≈138

Edgewise Case (ES)

Sizes 72mm, 96mm, and 144mm. Horizontal or vertical formats available.



Edgewise Case Dimensions(mm)

	ES72	ES96	ES144
W	72	96	144
H	36	48	72
T	4.0	4.0	5.0
D	95	120	175
X	5.0	5.0	8.0
W_1	≈68	≈92	≈138
H_1	≈33	≈45	≈68

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TEXMATE Analog Panel Meter Types GOSSEN

See Gossen/Texmate ad in Power Supplies:Lab, EEM Vol. D

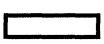
Accuracy of 1.5% full scale unless otherwise stated. All meters have substantial overrange capability.

AC Ammeters

Direct reading and 5A CT operated

Square case, quadrant scale = S48Q, S72Q, S96Q, S144Q
Ranges: 40mA to 25A

Direct reading, 5A CT operated, and rectified rms output.

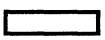


Edgewise Case = ES72, ES96, ES144
Ranges: 40mA to 60A

AC Voltmeters

Direct reading moving coil or moving iron and rectified, moving coil or moving iron. Square case, quadrant scale = S48Q, S72Q, S96Q, S144Q. Ranges: Direct reading=6V to 600V; Rectified=10V to 600V. Potential transformer inputs = S48Q, S72Q, S96Q, S144Q; PT secondary voltage = 110V

Square case, circular scale = S48CS, S72CS, S96CS, S144CS
Ranges: Direct reading=6V to 600V; Rectified=10V to 600V



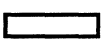
Edgewise case = ES72, ES96, ES144
Ranges: Direct reading=6V to 600V; Rectified=10V to 600V

DC Ammeters

Direct reading moving coil or moving iron

Square case, quadrant scale = S48Q, S72Q, S96Q, S144Q
Ranges: 10μA to 60A; 4 to 20mA

Square case, circular scale = S48CS, S72CS, S96CS, S144CS
Ranges: 10μA to 60A; 4 to 20mA



Edgewise Case = ES72, ES96, ES144
Ranges: 10μA to 60A; 4 to 20mA

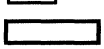
Shunt operated DC ammeters also available in square quadrant or circular scale cases. Specify full scale reading (amps) with either 50mV or 100mV shunt.

DC Voltmeters

Direct reading moving coil or moving iron

Square case, quadrant scale = S48Q, S72Q, S96Q, S144Q.
Range: 0 to 600mV, 0 to 600V

Square case, circular scale = S48CS, S72CS, S96CS, S144CS. Range: 0-150 mV to 0-600V



Edgewise case = ES72, ES96, ES144.
Range: 0-100mV to 0-600V.

Synchroscopes

Accuracy 2° at synchronous point. Color coded scales. Electrodynamic ratio measuring/comparing of single or 3ø circuits. Scale: "slow-fast"

Square case, quadrant scale = S96Q, S144Q
Input ranges: 110/220/380/500VAC

Frequency Meters

Accuracy (±0.5% @60Hz; ±1% ≥70Hz)
Moving Coil

Square case, quadrant scale = S48Q, S72Q, S96Q, S144Q
Frequencies: 45-50-55Hz; 55-60-65Hz; 360-400-440Hz

Square case, circular scale = S48CS, S72CS, S96CS, S144CS
Frequencies: 45-50-55Hz; 55-60-65Hz; 360-400-440Hz

Vibrating Reed
Reeds: 21 reeds, side by side
Square case, vibrating reed scale = S96, S144
Frequency: 45-50-55Hz, 55-60-65Hz

Maximum Demand Meters

Accuracy 3% of full scale
Bi-metallic, Thermal lag (15 min.), 20% overscale

Square case, quadrant scale = S48Q, S72Q, S96Q, S144Q
Input: 1 amp or 5 amps

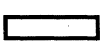
Ammeter with combined bi-metallic/moving iron movement

Square case, quadrant scale = S72Q, S96Q, S144Q
Input: 1 amp or 5 amps

Meter Relays

Adjustable controller contacts for voltage, current, temperature, frequency, and power

Square case, quadrant scale = S96Q, S144Q
Range: Depending on input



Edgewise case = ES72, ES96, ES144.
Also available in smaller edgewise cases.
Range: Depending on input

Power Factor Meters

Iron cored wattmeters that convert power factor ratios into direct mechanical displacement. Single or 3 phase.

Square case, quadrant scale = S96Q, S144Q
Ranges: Frequency from 59.5 to 60.0 to 60.5Hz. Scale: 0.5-1.0-0.5. Current from 1A to 10A; Voltage from 50V to 500VAC

Wattmeters and Varmeter

Single and 3-Phase units

Square case, quadrant scale = S96Q
Ranges: 1 to 10A, 110/220/380/500VAC

Square case, circular scale = S96CS
Ranges: 1 to 10A, 110/220/380/500VAC

Edgewise case format also available. Call for information.

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TEXMATE

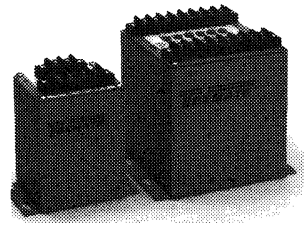
Power Transducers and Hydraulic Panel Punch Driver

Power Transducers

Texmate offers a versatile, low cost, line of power transducers to suit most requirements. Accuracy ranges from 0.25% to 0.5%. The circuitry provides highly accurate and stable output, allowing precison measurement of distorted waveforms, thyristors, fluorescent lamps, motors, transformers, magnetic circuits, etc.

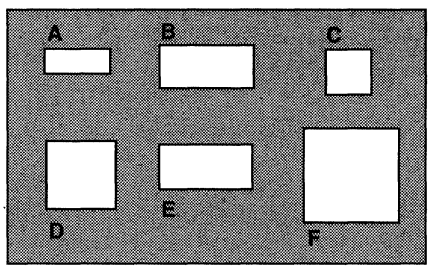
Transducer types available:

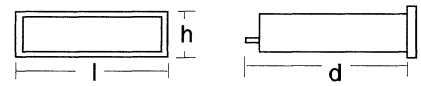
- DC voltage/Current
- AC Voltage
- AC Current - single or 3-phase
- Watt/Var - single or 3-phase
- Watt hour - single or 3-phase
- Watt (active power) single or 3-phase
- VAR (reactive power) - single or 3-phase
- Phase angle - single or 3-phase
- Frequency
- VAR hour - single or 3-phase
- Power factor - single or 3-phase
- RTD or Thermocouple
- Frequency to DC/DC to frequency
- Position & match function transmitters

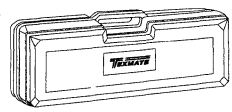


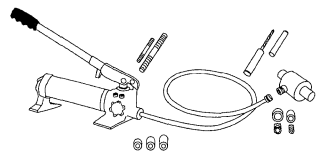
Hydraulic Punch Driver Kit and Panel Cutout Punches

Panel Cutout Comparisons









The ram-type Texmate Hydraulic Punch Driver Kit and Panel Punches save time in making accurate, clean, panel cuts without any sawing or additional filing required. The automatic two-speed operation of the hand pump allows the user to position the die accurately and smoothly. The hydraulic punch driver's ease-of-use design enables it to operate in a vertical or horizontal position. The pump comes equipped with a 6'6" (2m) high pressure hose and industry standard removable couplers. The powerful 12-ton ram type hydraulic punch driver is made of heavy-duty, heat-treated tool steel to give maximum strength and durability. Accessory panel punches are available to punch cutout sizes for Texmate's Slim Bezel and Replacer Series cases, as well as four different sizes of DIN panel cutouts. A sturdy reinforced plastic case is supplied with each hydraulic punch driver kit and panel punch.

Product	Order Part No.	Price
Hydraulic Punch Driver Kit	PT-DRIVER	$425.00

Case Reference	Panel Cutout Size	Bezel Dimensions l x h	Min. Depth Req. 'd' (without connector)	Punch Tool Part No.	Price
A. Slim Bezel Case	64.8mm x 24.6mm	69.6mm x 29.3mm	89.4mm	PT-SLIMCASE	$315.00
B. RP-Series Case	91.4mm x 42.5mm	103.1mm x 48.5mm	104.9mm	PT-RPCASE	$475.00
C. DIN 48X48 Case	45mm x 45mm	48mm x 48mm	See specific meter	PT-DIN48X48	$335.00
D. DIN 72X72 Case	68mm x 68mm	72mm x 72mm	See specific meter	PT-DIN72X72	$385.00
E. DIN 96X48 Case	92mm x 45mm	96mm x 48mm	See specific meter	PT-DIN96X48	$525.00
F. DIN 96X96 Case	92mm x 92mm	96mm x 96mm	See specific meter	PT-DIN96X96	$575.00

Conduit punches are also available in diameters from 1/2" to 4". Call for pricing.

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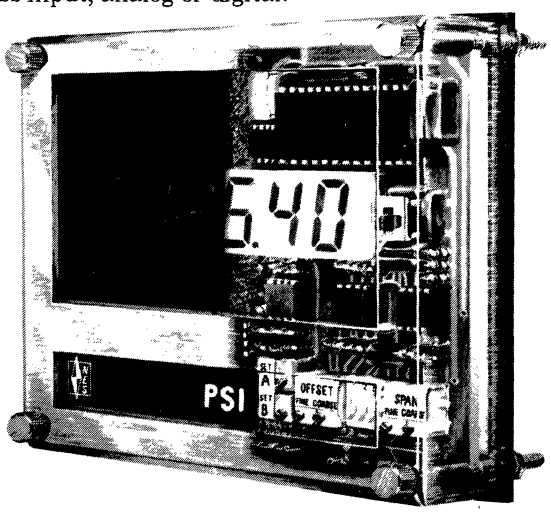
DIGITAL PANEL METERS

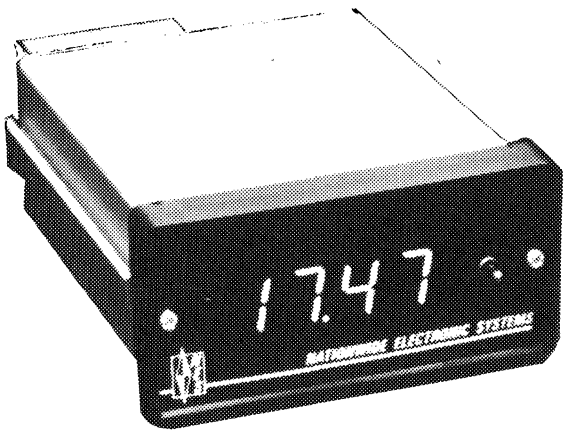
SLIMLINE

Surface Mount digital panel instruments designed to access nearly any process input, analog or digital.

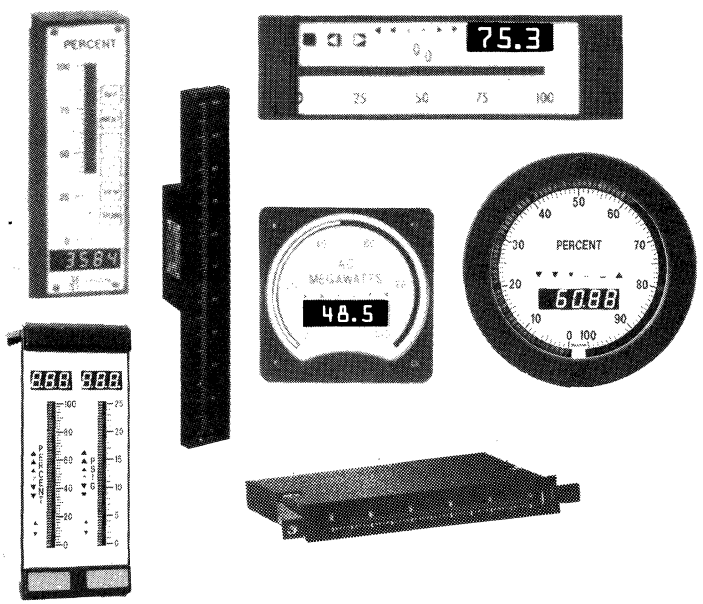


SLIM VIEW

1/8 DIN digital panel meters for direct retrofit, with the highest degree of reliability.



BARGRAPH METERS



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- Full military specified bargraphs.
- Nuclear qualified 1L and 1E.
- Measure, display and control: voltage, current, temperature, flow, frequency, power and process signals.
- AC & DC powered with restransmit and communication.

Weschler Instruments purchased and now manufactures the BOWMAR and NES meter lines.

Replacements for Bailey, YEW, Ashcroft, International Instruments, G.E. and others.

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SLIMLINE INSTRUMENTS

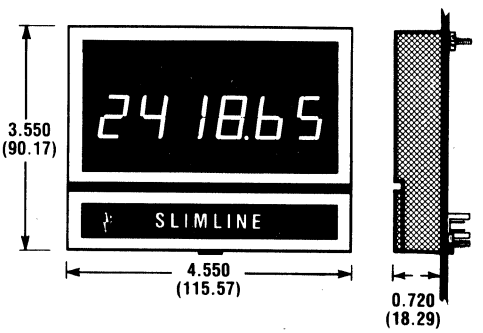
Slimline Surface Mount Panel Instruments

Quality

Since ACCURACY and LONGEVITY are our primary concerns, we have backed all of our products with a 3 YEAR WARRANTY since 1968.

Flexibility

- Surface mount package: 4.62"W x 3.64"H x 0.79"D
- Front panel access to controls
- Switchable noise filtering for use in noisy environments
- Quick and easy set-up
- Plug-in resistors for signal input range changing on process inputs
- Set points, relay outputs, open collector outputs and transducer excitation available
- Red LED display 0.56" high
- Optional stainless steel NEMA 4-X Bezel, for the toughest environments
- Standard low voltage power at 7-10 Vac, 5 Vdc, 7-12 Vdc or 24 Vdc
- 120 Vac, power with plug-in transformer or optional support module
- Available 12 Vdc isolated automotive powering



Surface Mount Slimline Meter **Rear Mount Optional Support Module**

Communication

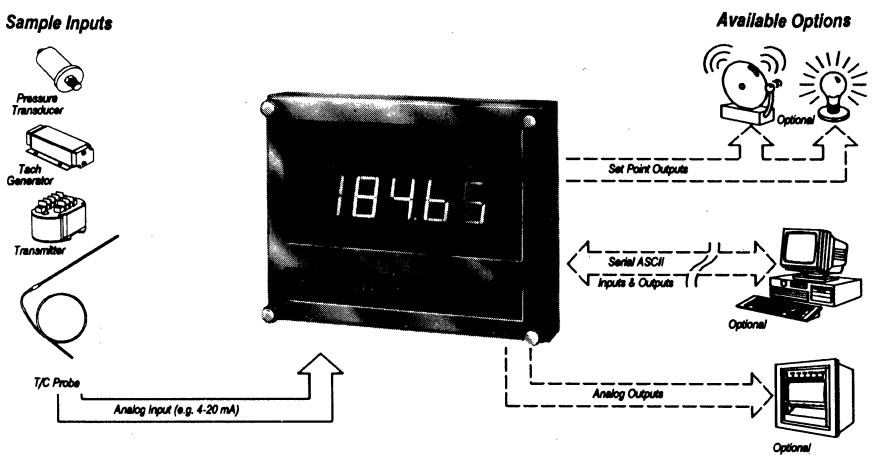
Serial ASCII:

- RS232, RS422 or 20/60 mA current loop
- Interface to computers, PLCs, robots or any processor based device with a serial port
- User programmable character string
- Addressable to 100 units

Parallel BCD:

- Individual digit or meter enable capability allows multiplexing of several meters on the same data bus.
- Open collector BCD data permits interfacing with high voltage logic (up to +48 Vdc).
- Internal socketed pull-up resistors mean no external components and mounting problems.
- Optional optical isolation provides better noise immunity and communication over longer distances.

Metering Systems Flexibility



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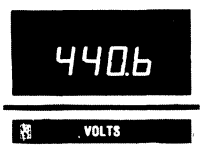
SLIMLINE INSTRUMENTS

Process/Transducer Meters

These meters take most standard DC process signals such as 4-20 mA, 0.5 V, 0-1 mA, etc. and displays them in any desired process units, i.e. a 4-20 mA loop can be read in PSI, gal/min, °F, %, etc. Models with set point outputs. Outputs; BCD to 48 V, RS232C, etc.

- 3½ & 4½ digit models
- Open collector or tri-state BCD data
- DC voltage or current inputs
- Plug-in range changing resistor
- Multi-turn coarse & fine pots
- Serial ASCII, RS232, RS422 or current loop
- Price from $233.00



Voltmeters

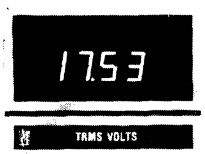
Measure AC or DC volts from 0-300mV dc to 0-300 Vdc. Units are available with 2 or 3 set points and open collector set point outputs. Serial ASCII units have peak and valley storage and an ASCII controllable latching output.

- 3½ & 4½ digit models
- Auto zero & high stability circuitry
- Switchable response time & noise filtering
- High input impedance
- Open collector & tri-state BCD data
- Serial ASCII, RS232, RS422 or current loop
- Switch selectable decimal point position
- Priced from $196.00

Ammeters

AC or DC current measurement from microamps to kiloamps. 5 A scaleable units allow fast and easy custom field scaling. Two or four set point output units allow system control. Serial ASCII units have peak and valley storage and an ASCII controllable latching output.

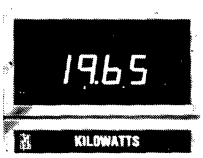
- 3½ & 4½ digit models
- Auto zero & high stability circuitry
- Bi-polar, auto polarity operation
- Low input impedance
- High common mode rejection
- Serial or parallel BCD communication available
- Priced from $196.00



TRMs Ammeters & Voltmeters

Allows proper reading of non-uniform waveforms, such as circuits with coils, capacitors and SCR's. Great for motor controller circuitry, Fluorescent lighting circuits, etc. Switch selection of the DC components allows reading TRMs or DC.

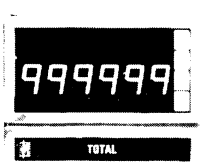
- 3½ & 4½ digit models
- Frequency response - 30 Hz to 5 kHz
- Auto zero & high stability circuitry
- Switchable response time & noise filtering
- High common mode rejection
- Crest factor to 6
- Priced from $196.00



Power Measurement Meters

Reads True AC Watts directly, available in either single or 3-phase models. Either Delta or Wye connections available for 3-phase. Also VAR, Power Factor and Watthour Meters to cover most any range. Models are available with set points, BCD, ASCII, etc.

- Serial ASCII or parallel BCD communication available
- 3½ & 4½ digits
- Auto zero & high stability circuitry
- Minimum circuit loading
- Compensates for power factor
- Two or four set point outputs available
- Priced from $196.00



Counters & Totalizers

Units are available to: (1) count up, (2) count up and down, (3) count up or down to or from a preset limit, and (4) to divide the count by any 4-digit switch-selected number. Available with permanent count store and scaling for watthour transducers.

- Serial or parallel BCD communication available
- 2, 3, 4, 5 or 6 digit models
- Manual or remote control
- Differential 0.2 to 80 Vdc
- Variable switch-selectable noise filtering
- Easy direct connection onto rotary encoder
- Prescaling, Divide-by-N & preset units
- Priced from $160.00

Ratemeters

Field scaleable to measure machine rate directly in any desired unit. For example, one pulse per bottle can be read out in six packs/minute, cases/hour, etc. Powerful microprocessor-based circuitry allows flexibility.

- 4, 4½ or 6 digit models
- TTL parallel BCD data
- 2.9 to 41 Vdc variable threshold input
- Variable switch-selectable noise filtering
- Four pulses per hour minimum
- Remote control capability
- Priced from $260.00

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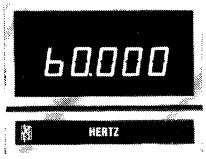
SLIMLINE INSTRUMENTS

Tachometers

Scaleable to monitor RPM from a wide range of gears and input signals. Units can accept external time base signals for ratio measurements. Microprocessor-based unit does not require 60-tooth gears. Serial ASCII meter displays English prompts for easy set-up.

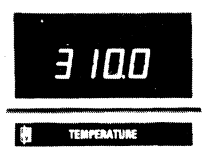
- 4, 4½ or 6 digit models
- 2.9 to 41 Vdc, switch input standard
- Four pulses per hour minimum
- Remote control capability
- High accuracy crystal time base
- Serial ASCII or parallel BCD communication available
- Priced from $260.00



Frequency Meters

Measures from 0.001 to 30 kHz by gated counter or calculation mode techniques. Selectable input averaging. Can be easily scaled to monitor frequency, ratio, deviation, percentage or period. Serial ASCII meter displays English prompts for easy set-up.

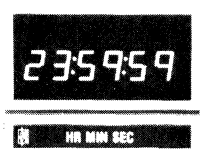
- Serial ASCII or parallel BCD communication available
- 4 or 6 digit models
- Two or four set point outputs
- Switchable input filtering
- High accuracy crystal time base
- Digital preset scaling
- Digitally scaled time bases



Thermometers

Thermocouple types J, K, T, R, S, E to cover from -328° to 3092°F (-200° to 1700°C). Platinum 100Ω RTD from -58° to 1112°F (-50°F to 600°C). Thermistor from +32.0° to 212.0°F (0.0° to 100.0°C). Available with serial ASCII, parallel BCD or set point outputs.

- Open collector or tri-state BCD data
- Dual range models to display °C or °F
- 0.1° resolution available
- Long lead length compensation circuitry
- Ideal junction sensing
- Continuous linearization over entire range
- Priced from $230.00



Clocks

Give accurate day and time-of-day for control panels, clock systems, programmable controllers, computers, etc. Can be expanded into battery back-up, master-slave and variable time zone clock systems. Available with serial ASCII, parallel BCD or set point outputs.

- 12/24 hr, hr/min, hr/min/sec & time zone formats
- 10/50/60 Hz or 0.005% crystal time base
- Remote control capability standard
- Day-of-year or automatic month/day
- Automatic leap year
- Priced from $179.00

Timers & Stopwatches

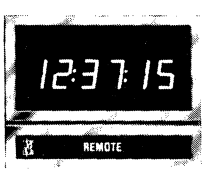
Manually or automatically time events. Control events after a countdown, countup or at regularly recurring cycles. For timing events from 1 microsecond up to 99:59:59 hr/min/sec. We offer the widest variety of ranges anywhere. Available with serial ASCII, parallel BCD or set point outputs.

- High noise immunity filtering
- Range 999999 microsecond to 999.999 hours
- Continuously updated or single cycle timing
- 2, 4 or 6 digit models
- 50/60 Hz or 0.005% crystal time base
- Remote control standard
- Start, stop, run, hold inputs
- Priced from $204.00

Interval Meters

Use Interval meters to measure on-time, off-time, time between pulses or duration. These fully automatic timers resolve to 0.001 seconds. Connects directly to AC or DC control circuits. Easy 2-wire hook-up. Available with serial ASCII, parallel BCD or set point outputs.

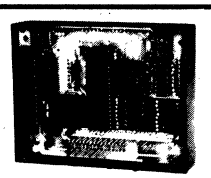
- No external control needed
- 0.005% accuracy
- Holds last interval reading until next reading
- 2.9 to 41 Vdc; 120, 240 Vac or switch input
- High electrical noise immunity
- Priced from $251.00



Remote Displays

Provide a large, bright readout from BCD, octal or hexadecimal data. Flexible addressing capabilities. Optional latches for use with programmable controllers, computers, etc. Units available to accept serial ASCII input and provide open collector outputs for control.

- 3, 4, 5 or 6 digit models
- Parallel, strobe, RS232, RS422/423/485, 20/60 mA loop modes
- Normal or inverted strobe capability
- Data input operate from 5 to 48 Vdc
- LCD units available
- Priced from $183.00



Data Converters

Meter interface via serial ASCII port of programmable controllers, computers, printers, etc. Excellent for transmitting contact status. User specific protocol up to 31 characters. Works with Slimline meters or other BCD source.

- RS232, RS422 or 20/60 mA
- Selectable baud rate - 110 to 9600
- High electrical noise immunity
- Receiver & transmitter models
- Selectable ID to address 100 units
- Priced from $150.00

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SLIMVIEW 1/8 DIN PANEL METERS

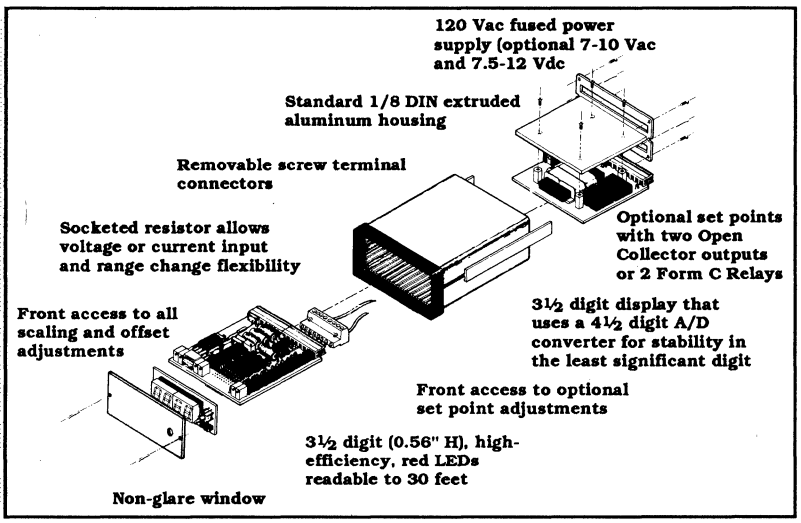
Process Meters (Scaleable DC Volts/Amps)

Description

Process meters take voltage or current signals and display them directly in any engineering unit. For example, a 4-20 mA unit can be scaled to read 0 to 1000 PSI, 0.0 to 6.80 ATMOSPHERES or 0 to 204 INCHES OF MERCURY.

Quality

Since accuracy and longevity are our primary concerns, we have backed all of our products with a 3 YEAR WARRANTY since 1968.



Features

- ❑ 3½ digit red LED display 0.56" high
- ❑ Display scalability: Minimum = 0 to 199, Maximum = 0 to 1999
- ❑ Power: 120 Vac @ 180 mA, 50/60 Hz
- ❑ Accuracy: ±0.05% of full scale
- ❑ Display Update Rate: 2½ times per second
- ❑ Stability: ±0.005% of full scale per °C

Current Input

SIGNAL RANGE	DISPLAY RESOLUTION	SCALING RESISTOR	PRICE	MODEL NUMBER
1-5 mA dc	3½ Digits	50 Ω	$250	IPM 6100
4-20 mA dc		13 Ω		IPM 6101
10-50 mA dc		5 Ω		IPM 6102
0-2 mA dc		124 Ω		IPM 6103
0-1 mA dc		249 Ω		IPM 6104
0-20 mA dc		10 Ω		IPM 6105
0-10 mA dc		20 Ω		IPM 6106
0-100 mA dc		2 Ω		IPM 6107
For measuring currents greater than the ranges shown above, use an IPM 6111 with an external shunt (Consult factory).				

Voltage Input

SIGNAL RANGE	DISPLAY RESOLUTION	SCALING RESISTOR	PRICE	MODEL NUMBER
1-5 Vdc	3½ Digits	52.3 kΩ	$250	IPM 6110
0-200 mV dc		None		IPM 6111
0-500 mV dc		634 kΩ		IPM 6112
0-1 Vdc		249 kΩ		IPM 6113
0-2 Vdc		110 kΩ		IPM 6114
0-5 Vdc		41.2 kΩ		IPM 6115
0-10 Vdc		20 kΩ		IPM 6116
0-100 Vdc		2 kΩ		IPM 6117
0-200 Vdc		1 kΩ		IPM 6118

Optional Features

DESCRIPTION	PRICE	OPTION NUMBER
Low voltage power input, 7 to 10 Vac or 7.5 to 12 Vdc	$25	- 64
Set points with two Form C Relay outputs	$65	- 41
Set points with two Open Collector outputs	$50	- 46

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TRENDLINE TRI-COLOR BARGRAPHS

Why you need color . . .

Color-changing bargraph calls your attention!

Green* = SAFE
Indicates normal operating conditions.

Yellow* = CAUTION
Indicates that a problem is developing.

Red* = WARNING
Indicates that a problem exists.

The ENTIRE bar changes color!

*NOTE: WARNING, CAUTION and SAFE zone colors are user selectable as red, yellow or green.

The complexity of modern control rooms can hide problems that occur during a process. The quickest way to spot a problem is to have instrumentation that calls it to your attention. **Color** is the best way to do this. Color has always been used to convey information, such as color coded wires, signal corp flags, stoplights, maps, etc.

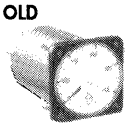
Trendlines are the first meters to offer a color-changing bargraph for immediate problem recognition. Whether you have 2 meters or 2000, the color-changing bargraph allows your operators to spot developing or existing problems immediately.

The time saved through immediate recognition will help prevent equipment damage, reduce down-time and maintenance overhead, and help improve operational safety.

DIRECT REPLACEMENT
Form, Fit and Function

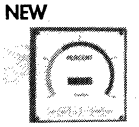
Trendline Meters are designed for direct retrofit to existing edgewise and switchboard meters.

OLD



Circular Switchboard

NEW



Circular Trendline

OLD

6" Edgewise

NEW

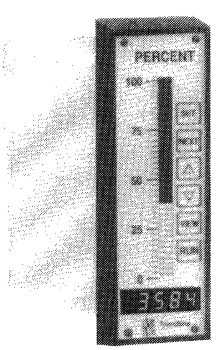
6" Trendline

The perfect fit for your applications . . .

Trendline's optional features offer expandability to meet your growing needs.

- Serial ASCII communication
- Two form C relay outputs
- Four open collector outputs
- 0-5 Vdc scaleable analog output
- 4-20 mA scaleable analog output
- Control inputs
- NEMA rated stainless steel bezel

Made to order faceplates allow selection of legend and bar scale to fit your process.



Scaleable digital display from -9999 to 29999 counts in large, bright 7-segment LED's.

Selectable bottom or center zero bargraph reduces your inventory needs.

Capability to zoom-in on a specific portion of the entire scaled range.

Set point indicators may be continually displayed or push-button activated.

Adjustable light intensity for the bar display.

Operator access to both peak and valley values and clear peak/valley.

Verbal prompts for easy set-up.

Lock-out feature limits access to all set-up parameters with a four digit code selectable by you.

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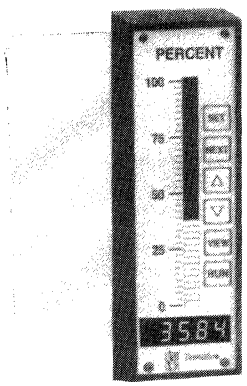
TRENDLINE TRI-COLOR BARGRAPHS

6" EDGEWISE



Features

- ❑ 115 Vac powered
- ❑ Front panel access to set-up controls
- ❑ Bar display is 3.7" (high) x 0.20" (wide)
- ❑ Digital display has 5 green, 7-segment LED characters, 0.30" in height
- ❑ 3 user-selectable bar colors, 4 user-selectable color-change set points
- ❑ User-selectable bar display intensity level, decimal point location, center/bottom zero format
- ❑ Fully scaleable digital display and bar display
- ❑ A socketed scaling resistor can be used to convert a 4-20 mA meter to nearly any analog input
- ❑ Various levels of input signal filtering are selectable
- ❑ Accuracy: ±0.01% of full scale ±0.3°F (Thermocouple Inputs)
- ❑ Stability: ±0.005% of full scale/°C
- ❑ Display Update Rate: 2½ times per second

Process Inputs

Process meters take voltage or current signals and display them directly in any engineering unit. For example, a 4-20 mA unit can be scaled to read 0 to 1000 PSI, 0.0 to 68.0 ATMOSPHERES or 0 to 2036 INCHES OF MERCURY. The bargraph can be set up to show any portion of the digital display. The color-change points can be placed anywhere within the bargraph range.

Current Input — $595.00

SIGNAL RANGE	MODEL NUMBER	SIGNAL RANGE	MODEL NUMBER
1-5 mA dc	TPM 5100	0-1 mA dc	TPM 5104
4-20 mA dc	TPM 5101	0-20 mA dc	TPM 5105
10-50 mA dc	TPM 5102	0-10 mA dc	TPM 5106
0-2 mA dc	TPM 5103	0-100 mA dc	TPM 5107

For measuring currents greater than the ranges shown above, a TPM 5109 is used with an external shunt (Consult factory).

Voltage Input — $595.00

SIGNAL RANGE	MODEL NUMBER	SIGNAL RANGE	MODEL NUMBER
1-5 Vdc	TPM 5108	0-5 Vdc	TPM 5113
0-200 mV dc	TPM 5109	0-10 Vdc	TPM 5114
10-50 mV dc	TPM 5110	0-100 Vdc	TPM 5115
0-1 Vdc	TPM 5111	0-200 Vdc	TPM 5116
0-2 Vdc	TPM 5112		

Thermocouple Inputs

The Trendline Thermocouple Thermometer is a highly accurate, completely linearized, reference compensated unit. Any portion of the temperature range can be set on the bargraph. For example, a type K unit with -90°F to 2282°F digital display range can have a bargraph that is "zoomed" in on a smaller region, i.e. 600°F to 700°F. The color change points can be placed anywhere within the bargraph range.

Thermocouple Type Input — $645.00

ANSI CODE	TEMPERATURE RANGE	MODEL NUMBER	ANSI CODE	TEMPERATURE RANGE	MODEL NUMBER
Type J	32°F to 1382°F 0°C to 750°C	TDT 5166	Type E	-328°F to 1652°F -200°C to 900°C	TDT 5169
Type R	32°F to 2642°F 0°C to 1450°C	TDT 5167	Type K	-90°F to 2282°F -68°C to 1250°C	TDT 5170
Type T	-328°F to 662°F -200°C to 350°C	TDT 5168	Type S	32°F to 2642°F 0°C to 1450°C	TDT 5171

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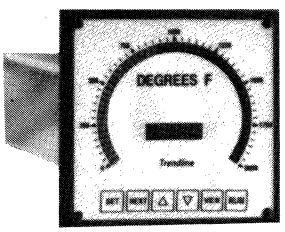
TRENDLINE TRI-COLOR BARGRAPHS

4½"

SWITCHBOARD



Features

- ❑ 115 Vac powered
- ❑ Front panel access to set-up controls
- ❑ Bar display is 6.85" (long) x 0.20" (wide) 270° arc
- ❑ Digital display has 5 green, 7-segment LED characters, 0.30" in height
- ❑ 3 user-selectable bar colors, 4 user-selectable color-change set points
- ❑ User-selectable bar display intensity level
- ❑ Fully scaleable bar display
- ❑ Digital display can read degrees C or F with 1 degree or 0.1 degree resolution
- ❑ Accuracy: ±0.01% of full scale ±0.3°F (Thermocouple Inputs)
- ❑ Stability: ±0.005% of full scale/°C
- ❑ Display Update Rate: 2½ times per second

Process Inputs

Process meters take voltage or current signals and display them directly in any engineering unit. For example, a 4-20 mA unit can be scaled to read 0 to 1000 PSI, 0.0 to 68.0 ATMOSPHERES or 0 to 2036 INCHES OF MERCURY. The bargraph can be set up to show any portion of the digital display. The color-change points can be placed anywhere within the bargraph range.

Current Input — $695.00

SIGNAL RANGE	MODEL NUMBER	SIGNAL RANGE	MODEL NUMBER
1-5 mA dc	TPM 5700	0-1 mA dc	TPM 5704
4-20 mA dc	TPM 5701	0-20 mA dc	TPM 5705
10-50 mA dc	TPM 5702	0-10 mA dc	TPM 5706
0-2 mA dc	TPM 5703	0-100 mA dc	TPM 5707

For measuring currents greater than the ranges shown above, a TPM 5709 is used with an external shunt (Consult factory).

Voltage Input — $695.00

SIGNAL RANGE	MODEL NUMBER	SIGNAL RANGE	MODEL NUMBER
1-5 Vdc	TPM 5708	0-5 Vdc	TPM 5713
0-200 mV dc	TPM 5709	0-10 Vdc	TPM 5714
0-500 mV dc	TPM 5710	0-100 Vdc	TPM 5715
0-1 Vdc	TPM 5711	0-200 Vdc	TPM 5716
0-2 Vdc	TPM 5712		

Thermocouple Inputs

The Trendline Thermocouple Thermometer is a highly accurate, completely linearized, reference compensated unit. Any portion of the temperature range can be set on the bargraph. For example, a type K unit with -90°F to 2282°F digital display range can have a bargraph that is "zoomed" in on a smaller region, i.e. 600°F to 700°F. The color change points can be placed anywhere within the bargraph range.

Thermocouple Type Input — $745.00

ANSI CODE	TEMPERATURE RANGE	MODEL NUMBER	ANSI CODE	TEMPERATURE RANGE	MODEL NUMBER
Type J	32°F to 1382°F 0°C to 750°C	TDT 5766	Type E	-328°F to 1652°F -200°C to 900°C	TDT 5769
Type R	32°F to 2642°F 0°C to 1450°C	TDT 5767	Type K	-90°F to 2282°F -68°C to 1250°C	TDT 5770
Type T	-328°F to 662°F -200°C to 350°C	TDT 5768	Type S	32°F to 2642°F 0°C to 1450°C	TDT 5771

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TRENDLINE OPTION GUIDE

Serial ASCII Communication

Option #34, 35, 36 ..... $75.00

- ❑ Baud rate is selectable from 300 to 9600
- ❑ Limitless individual meter addressability
- ❑ Two-way (I/O) serial capability
  - Transmit: Display, ID, polarity, and up to a 17 character message
  - Receive: Set point data; commands to send display, set points, peak, valley, clear peak and valley
- ❑ Available serial formats:
  - RS422 (option #34)
  - 20/60 mA Current loop (option #35)
  - RS232 (option #36)

Two Relay Outputs

Option #41 ..... $65.00

- ❑ 2 form C relays (which can be wired normally open or normally closed) with switching currents of:

0.6 Amps	125 Vac
0.6 Amps	110 Vdc
2.0 Amps	30 Vdc

- ❑ Digital set points
- ❑ The operation of the two relays is independent
- ❑ Update rate is 2½ times per second
- ❑ 1500 volt isolation from signal ground
- ❑ Removable screw terminal connector

Four Open Collector Outputs

(Non-isolated)

Option #45 ..... $50.00

- ❑ Maximum switching current is 100 mA resistive load (50 volts)
- ❑ Digital set points
- ❑ The operation of the four outputs is independent
- ❑ Update rate is 2½ times per second
- ❑ Removable screw terminal connector

0-5 Vdc Scaleable Analog Output

(Non-isolated)

Option #50 ..... $150.00

- ❑ 12 bit resolution
- ❑ Internal voltage source
- ❑ Rear access to output calibration adjustment
- ❑ Removable screw terminal connector
- ❑ Update rate is 2½ times per second

4-20 mA Scaleable Analog Output

(Non-isolated)

Option #51 ..... $150.00

- ❑ 12 bit resolution
- ❑ Rear access to output calibration adjustment
- ❑ Removable screw terminal connector
- ❑ Update rate is 2½ times per second

Note: External current source required

Control Inputs

Option #53 ..... $65.00

- ❑ 7 individual logic level inputs compatible with CMOS or TTL
- ❑ External control to flash bar, tare* and bar color override
- ❑ Removable screw terminal connector

*Example: Weighing the contents of a container. Place the empty container on the scale and tare the meter; the display will read 0. Now, only the material placed in the container will be weighed.

Tamper-proof Panel

Option #74 ..... No charge

- ❑ Set up parameters only accessible with remote programming unit

Note: Remote programming unit required (part # PG 95200), $105.00

Stainless Steel Bezel

Option #93 ..... $75.00

- ❑ NEMA 1, 2, 3, 4 and 12
- ❑ 316 stainless steel housing

Note: 1) Adds approximately 0.25" to height and width of the meter

2) Requires remote programming unit (part # PG 95200), $105.00

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WESCHLER BARGRAPHS™

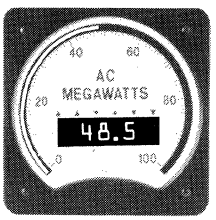
NEW!

Switchboard BarGraph™ Meters

Measure
Display
Control

- Temperature
- Watts
- Flow
- Current
- Pressure
- Phase Angle
- Voltage
- Frequency
- Power Factor
- VARS
- Strain Gauge
- Process Signals

BH252



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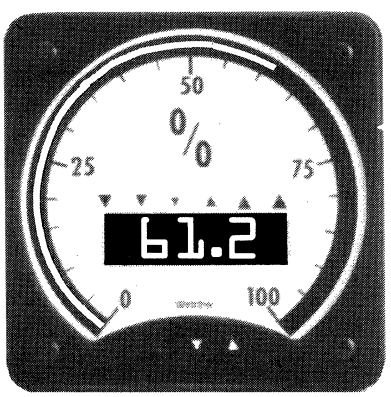

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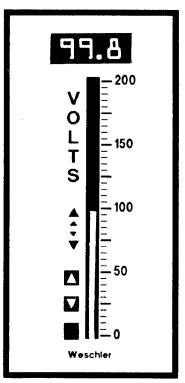
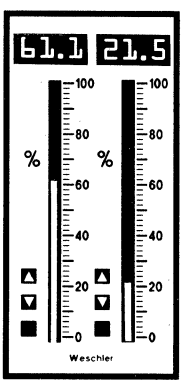
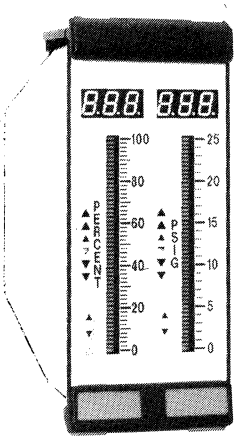


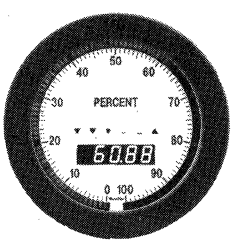
PC101



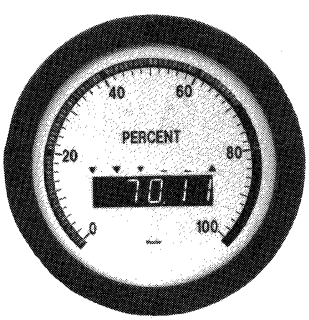
PC202



PG202



BG281



BG251

* Features

- 101 Segment LED BarGraph
- 3½ or 4½ Digital Display
- Retransmit: 4-20 mA, 1-5 V, 0-1 mA, BCD
- Communication: RS232, 422 and 485
- True Peak Hold
- Programmable Hysteresis
- Visual Trend Indicator
- Power: 120/240 Vac or 5, 12, 24, 48, 125 Vdc
- Set Points: Two or Four Programmable
- Red, Green or Amber LED's
- Pricing starts at $295.00

***Features and applications apply to all meters on pages D•1398 to D•1401**

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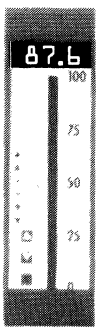
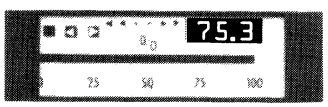
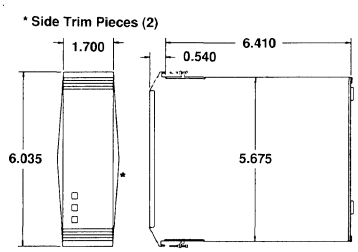
WESCHLER BARGRAPHS™

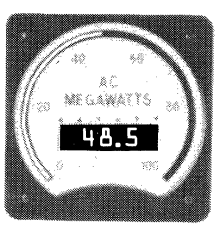
BG252 6" Vertical
BH252 6" Horizontal BarGraph

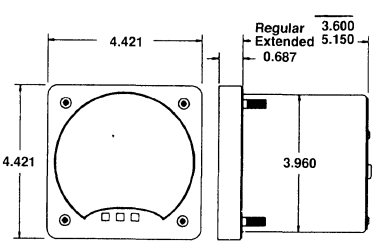






BG 241 4½" Square BarGraph





*Features . . .

- **High Resolution** 101 segment LED BarGraph™ displays 1% resolution.
- **4½ or 3½ Digit Digital Display** scaled to match the BAR process or other related engineering units. All digital displays have a negative sign.
- **Versatile Two or Four Set Points** are available all having form C relay outputs for use as a simple on/off or differential gap controller. Set point levels are easily programmed from the front of the instrument as HI-HI, HI, LO and LO-LO to the exact numeric value required. Set points have selectable hysteresis 0.5%, 1% or 2% of FS. Two fail safe set points.
- **Bar Form** meter bar start position (zero point) can be set anywhere on or off the BarGraph scale.
- **Real-time Visual Trend Indication** of measured signal for easy recognition of system status.
- **True Peak Hold** stored in memory of the highest value of the process signal.
- **Thermocouples** J, K, T, R, S & E and input signals that are non-linear are linearized through a **50 point or greater** algorithm. **Square root extraction** for flow and **strapping tables** for tank applications are available.

***Features and applications apply to all meters on pages D•1398 to D•1401**

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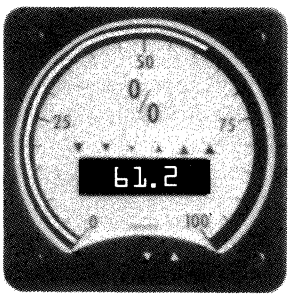
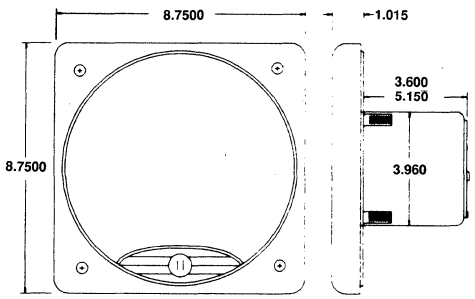
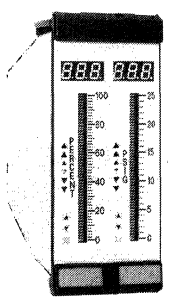
WESCHLER BARGRAPHS™

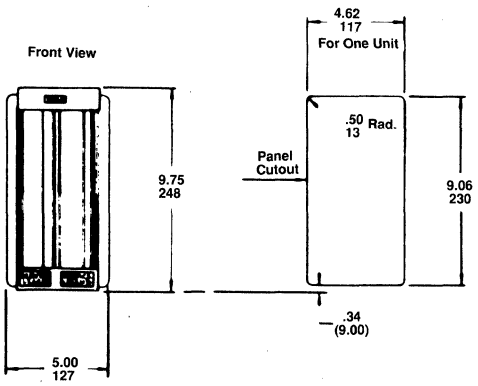
BG261 8 1/2" Square BarGraph





PG101 & 202 9" BarGraph (Bailey PG Replacement)





* Features . . .

- BarGraph is **powered** directly from 120 Vac/240 Vac or 5 Vdc, 12 Vdc, 24 Vdc, 28 Vdc, 48 Vdc or 125 Vdc.
- **Communication** on RS232, RS422 and bi-directional on RS485. RS485 can operate as a two wire LAN with up to 32 other units and is capable of addressable polling of multiple units and high throughput at 9600 baud.
- The measured parameter can be **retransmitted** as a standard process signal (4-20 mA, 0-1 mA, 1-5 volts or BCD). The signals are input isolated at an accuracy of 0.3%.
- **Connection** to each instrument is easily accomplished via **Terminal Block** style connectors. The connectors will accept up to a 14 gauge wire.
- **Easy Set-up** of system parameters from the front panel. Features such as zero adjust, gain, set points and meter scaling are all set with a touch of a button.
- AC current and AC voltage measurements are **true RMS** readings to the 7th harmonic.
- Visual safety **overrange** indication is provided whenever the measured signal exceeds the bar full scale value. In this condition, the full scale LED will flash, the **digital display** will flash and continue to read to the full meter count.
- **Colored LED Displays:** standard is red, optional - green and amber.
- The BarGraph's inherent solid state circuitry provides excellent **high shock** and **vibration** characteristics.

*** Features and applications apply to all meters on pages D•1398 to D•1401**

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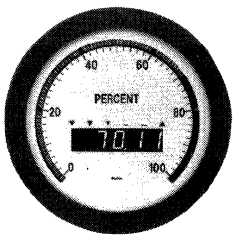
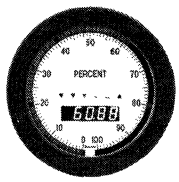
WESCHLER BARGRAPHS™

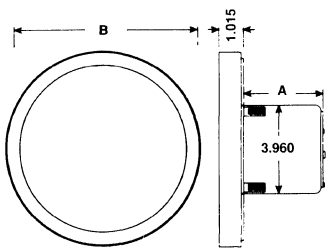
BG281 8" Circular BarGraph
BG251 6" Circular BarGraph



BG281



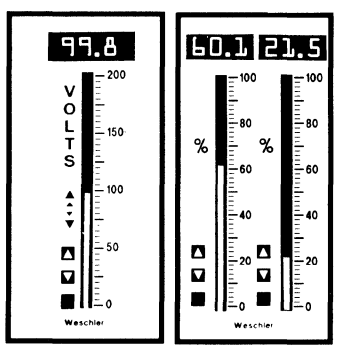
BG251



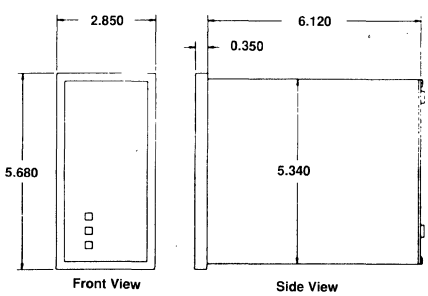
Front View Side View

	B
BG 281 –	10.062″
BG 251 –	7.562″

PC 101/202 (72 x 144mm) Vertical Bar Graph



PC101 PC202



Front View Side View

* APPLICATIONS

- DC Voltage measurements from 50 mV dc to 250 Vdc directly. Higher voltages can be measured and displayed with an external divider network.
- DC current from 50 µA dc to 5 Adc can be measured directly. Higher ranges are measured with an external current shunt.
- AC Voltage measurements are true RMS readings up to 250 Vac directly. Frequently response is from DC to 25 kHz. Accuracy is maintained for AC voltages with crest factors up to 3:1.
- AC Current are true RMS readings up to 5.0 A directly. Current transformers are employed for higher readings.
- Thermocouple - J, K, T, R S & E are accepted. Ice point reference and cold-junction compensation is internal. Linearization tables are pre-programmed and stored for each thermocouple type. The BarGraph can be calibrated and scaled in degrees C or F.
- 100 ohm platinum RTD with DIN 43760 standard temperature coefficient alpha = 0.00385/°C is linearized within the instrument. The meter can be configured for a 2 or 3 wire system and can be calibrated in C or F. Linearity for other RTD's can be compensated.
- Frequency or rate indication from Magnetic Pickups, mechanical counters or optical sensors. The BarGraph accepts signals from 5 to 250 V over the frequency range of 10 Hz or 20 kHz directly. AC signals are optically isolated at the meter input for reliability.
- Power-watts for single phase, three-phase three wire and four wire sinusoidal signals are directly measured (no external transducer required). Transformer input isolation. Power is calculated EI cos Θ and displayed on the bar and digital display or can be retransmitted as a standard process signal.
- Reactive power is measured and displayed (VARS) for single phase and three phase, three and four wire systems. No external transducer required; input from CT's (5 A) and PT's (120 V or 240 V) directly to meter. Reactive power is calculated EI sin Θ.
- Power factor is measured and displayed on a center zero scale with center scale equal to 1.0 power factor. Meter input is transformer isolated. Power factor is calculated:
  $\cos \Theta = P \text{ (watts)} / \sqrt{P^2 + Q^2 \text{ (VARS)}}$
- Phase angle of sinusoidal voltage and the start of sinusoidal current. The BarGraph is center zero and calibrated (Neg.) LAG/LEAD (Pos.) in degrees. Measurements are made on voltages up to 250 Vac directly, 50 to 400 Hz.
- Conventional process signals are easily displayed on all BarGraph meters. Flow, pressure, speed, position, temperature and level can be measured and displayed in the appropriate engineering units.

***Features and applications apply to all meters on pages D•1398 to D•1401**

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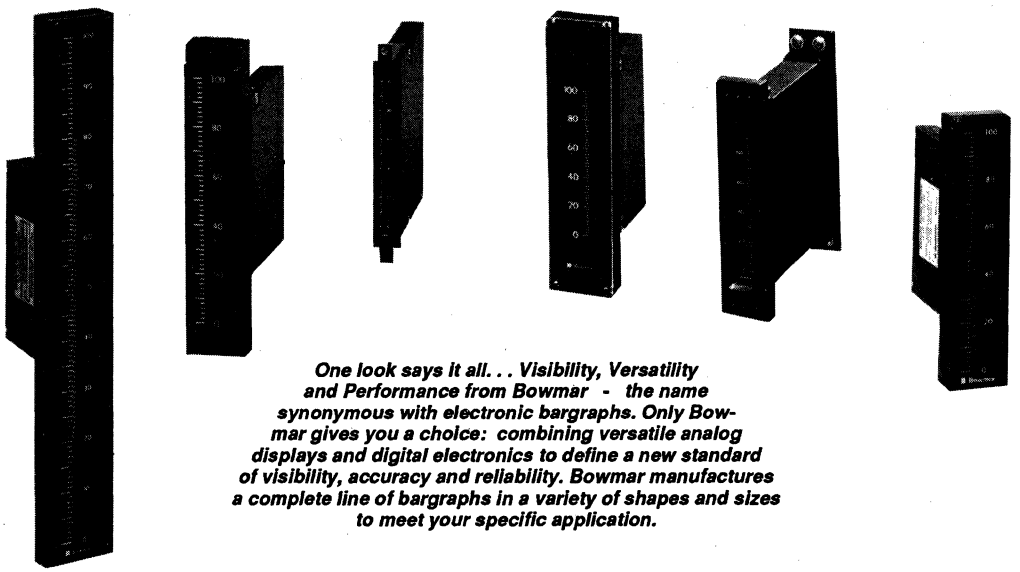
WESCHLER/BOWMAR



One look says it all. . . Visibility, Versatility and Performance from Bowmar - the name synonymous with electronic bargraphs. Only Bowmar gives you a choice: combining versatile analog displays and digital electronics to define a new standard of visibility, accuracy and reliability. Bowmar manufactures a complete line of bargraphs in a variety of shapes and sizes to meet your specific application.

Bowmar Bargraph Features and Options

	APM 100	APM 200	APM 500	APM 600	APM 800	BG 100	BG 600	BGD 100
FEATURES								
DC Input	●	●	●	●	●	●	●	●
AC Input	●	●	●	●	●	●	●	●
Digital Input	●	●	●	●	●	●	●	●
VU Input	●		●	●	●			
End-reading Display	●	●	●	●	●	●	●	●
Center-zero Display	●	●			●			●
Digital Display		●						●
Resolution	1%	1%	2%	2%	1%	1%	2%	1%
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Mounting (Front/rear)	f/r	f/r	f/r	r	r	f/r	r	r
OPTIONS								
Auto-polarity	●	●	●	●	●	●	●	●
BCD Output	●		●	●	●	●	●	●
Bezel: Black Metal	●					●		
Bezel: NEMA-4				●			●	
Custom Input Range	●	●	●	●	●	●	●	●
Custom Scales	●	●	●	●	●	●	●	●
Differential Input	●	●	●	●	●	●	●	●
Green, 3" Bargraph Display	●	●				●		●
High Input Impedance Voltmeter	●		●	●	●	●	●	●
Hold Function	●		●	●	●	●	●	●
Increased Input Damping	●	●	●	●	●	●	●	●
Line Power Supply	●	●	●	●	●	●	●	●
Mixed Color LEDs			●	●	●		●	
Non-visible Set Point(s)	●		●	●	●	●	●	●
Red Filter		●		●	●		●	
Solderless Connector						●	●	●
Solder Type Connector						●	●	●
Switch Options (Visible set point)	●		●	●	●	●	●	●
Visible Set Point(s)	●	●		●	●			●

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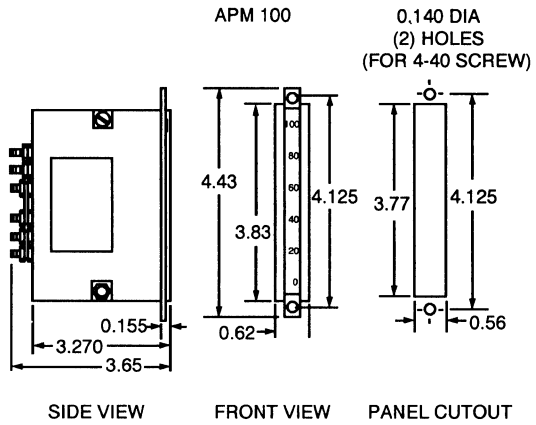
WESCHLER/BOWMAR

APM 100 Series — Priced from $180.00

The most popular Bowmar meter provides the maximum features in the smallest package of any 100-segment bargraph. The excellent visibility of this meter permits a greater number of variables to be presented in less space than by conventional means. Two basic designs are available: End-reading (bar grows from one end) and Center-zero (bar grows in either direction from the center).

Features

- 100 segments (0.55" x 3.75")
- 1% resolution, 0.5% accuracy
- End-reading or center-zero display
- Visible or non-visible set points
- 5 volt power
- Bar or point display
- Brightness control
- Full range of inputs
- Front or rear mounting

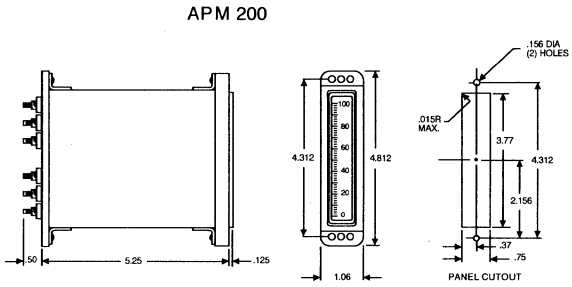


APM 200 Series — Priced from $480.00

The military version of the APM 100 series is qualified for a number of military standards and features a watertight case. This meter is ideal for harsh and unusual environments in industrial plants, equipment, jet engine test instrumentation, ships, and aircraft. The rugged construction and all-metal case of this 100-segment bargraph holds up to the worst possible abuse. Specialized military versions include a digital display, lighting mask and custom ranging among other options.

Features

- 100 segments (0.75" x 3.75")
- 1% resolution, 0.5% accuracy
- End-reading or center-zero display
- Visible or non-visible set points
- 5 volt power
- Bar or point display
- Brightness control
- Full range of inputs
- Front or rear mounting

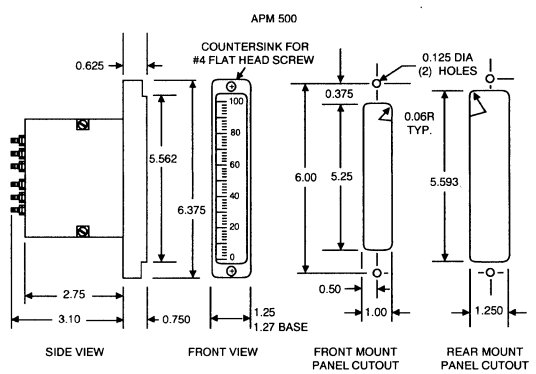


APM 500 Series — Priced from $215.00

This thin-lined 50-segment meter permits easy replacement of edge-reading analog meters. The wide viewing angle of this bargraph permits the operator to work anywhere within the vicinity of the meter and still read the variable. The meter mounts from the front (or optionally from the rear) of the panel.

Features

- 50 segments (1.25" x 6.375")
- 2% resolution, 0.5% accuracy
- End-reading display
- Visible or non-visible set points
- 5 volt power
- Bar or point display
- Brightness control
- Full range of inputs
- Front or rear mounting



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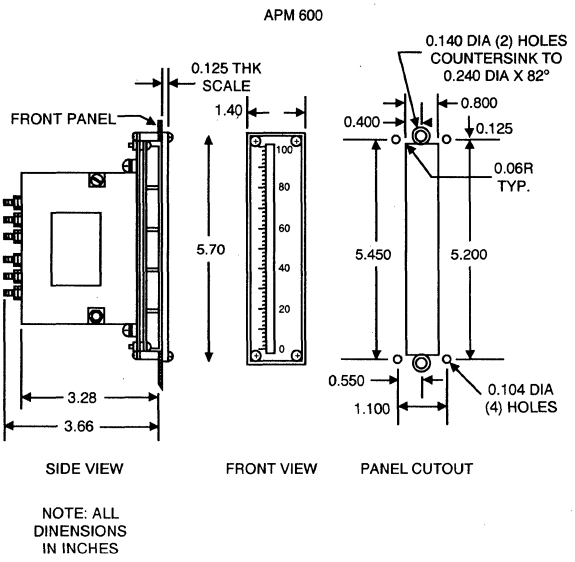
APM 600 Series **Priced from $215.00**

This flush mount meter projects only 0.125" in front of the panel - just the thickness of the scale. Visible at greater than fifty feet, the APM 600 has a clean look. An optional NEMA-4 bezel provides a watertight panel for use in harsh environments.

Features

- 50 segments (1.40" x 5.70")
- 2% resolution, 0.5% accuracy
- End-reading display
- NEMA-4 drip-proof bezel (optional)
- Visible or non-visible set points
- 5 volt power
- Bar or point display
- Brightness control
- Full range of inputs
- Rear mounting

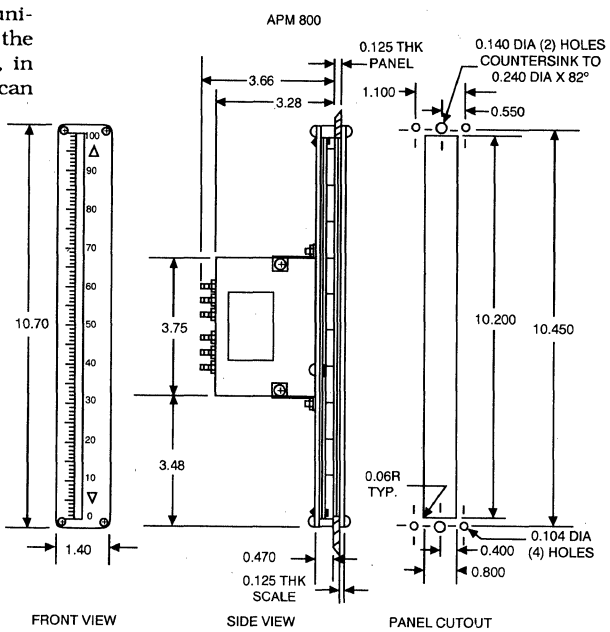


APM 800 Series **Priced from $280.00**

This ten-inch bargraph is an extremely effective communicator at any distance. The meter electronics mount from the rear of the panel while the scale mounts from the front, in similar fashion to its shorter cousin, the APM 600. You can see the strong visual impact of this bargraph meter.

Features

- 100 segments (1.40" x 10.70")
- 1% resolution, 0.5% accuracy
- End-reading or center-zero display
- Visible or non-visible setpoints
- 5 volt power
- Bar or point display
- Full range of inputs
- Rear mounting



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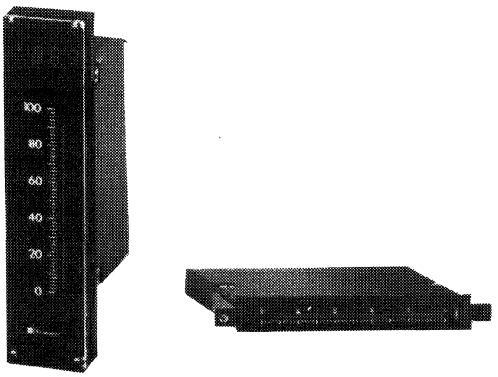
WESCHLER/BOWMAR

BG Bargraph Series



The BG 100 and BG600 are low-cost versions of the APM Series. These meters are available in a limited number of standard ranges. The available ranges are designed to work with off-the-shelf transducers to measure virtually any phenomenon. The BGD Series effectively communicates information more directly and at greater distances than a simple digital display. The bar display provides relative information such as percentage or level while the digital display provides absolute value or quantity.

BG100 & BG600 Features

- End-reading display
- Non-visible set points
- 5 volt power
- Bar or point display
- Brightness control
- Inputs: 0-1, 0-5, 0-10 Vdc, 4-20 mA
- Solder-type edge connector supplied

BG100 Features

- 100 segments (0.55" x 3.75")
- 1% resolution, 0.5% accuracy
- Front or rear mounting

BG600 Features

- 50 segments (1.40" x 5.70")
- 2% resolution, 0.5% accuracy
- Drip-proof bezel (optional)
- Rear mounting

BGD Features

- 100 segments (1.40" x 5.70")
- 1% resolution, 0.5% accuracy
- 3½ or 4 digits
- End-reading or center-zero display
- Visible or non-visible set points
- 5 volt power
- Bar or point display
- Brightness control
- Full range of inputs

MODEL	BG100	BG600	BGD100
PRICES STARTING FROM:	$150.00	$215.00	$395.00
DESCRIPTION	3" display 100 LED element bargraph	5" display 50 LED element bargraph	5" display 100 LED element bargraph with 4 digits
SIGNAL RANGES Absolute Maximum	Standard: 0-1 Vdc; 0-5 Vdc; 0-10 Vdc; 4-20 mA. Custom: 50 mV to 100 Vdc; 10 µA to 10 Adc. 250% overrange 150% reverse polarity	Standard: 0-1 Vdc; 0-5 Vdc; 0-10 Vdc; 4-20 mA. Custom: 50 mV to 100 Vdc; 10 µA to 10 Adc. 250% overrange 150% reverse polarity	Standard: 0-1 Vdc; 0-5 Vdc; 0-10 Vdc; 4-20 mA. Custom: 50 mV to 100 Vdc; 10 µA to 10 Adc. 250% overrange 150% reverse polarity
LINEARITY Gains Temperature Coefficient Zero Temperature Coefficient Resolution	±1.0% ±0.15% / °C maximum ±0.01% / °C maximum 1%	±1.0% ±0.15% / °C maximum ±0.01% / °C maximum 2%	±1.0% ±0.15% / °C maximum ±0.01% / °C maximum 0.1%
INPUT IMPEDANCE	100K ohms or greater for volt-meters. 100 mV shunt for current meters.	100K ohms or greater for volt-meters. 100 mV shunt for current meters.	100K ohms or greater for volt-meters. 100 mV shunt for current meters.
METER RESPONSE TIME (zero to full scale)	2.5 milliseconds	2.5 milliseconds	2.5 milliseconds
POWER SUPPLY Voltage Typical current	5.0 Vdc, ±0.25 V -6 Vdc absolute maximum 50 mA point 380 mA full bargraph	5.0 Vdc, ±0.25 V -6 Vdc absolute maximum 50 mA point 380 mA full bargraph	5.0 Vdc, ±0.25 V -6 Vdc absolute maximum 60 mA point 450 mA full bargraph and digits
REAR CONNECTOR	Card edge connector supplied. Optional Phoenix #MKDSF 3/3-5.08 connector solderless applications.	Card edge connector supplied. Optional Phoenix #MKDSF 3/3-5.08 connector solderless applications.	Card edge connector supplied. Optional Phoenix #MKDSF 3/3-5.08 connector solderless applications.

WESCHLER INSTRUMENTS
DIVISION OF HUGHES CORPORATION
16900 Foltz Parkway ■ Cleveland, OH 44136
Phone: (216) 238-2550 ■ FAX: (216) 238-0660

OSCILLOSCOPES

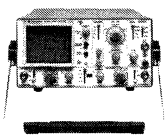
Manufacturer	Starting EEM Page No.	Model/ Series	Bandwidth (MHz)	Rise-time (ns)	Vertical Sensitivity (mV/div)	Sweep Rate (µS/div)	No. of Traces	No. of Channels	Lab	Field	Delayed Sweep	Auto	External Trigger	Z-Axis Input	X-Y Display Mode	Storage	IEEE-488 Interface
B & K Precision	D•1407	2190	20	3.5	1 - 5	0.5 - 50	6	3	√	√	√	√	√	√	√		
		2522	20	17.5	-5 - 5	0.5 - 0.2 Sec.	2	2	√		√	√	√		√		
		1422	20		10 - 20	0.5 - 100	2	2	√	√	√	√	√		√		
		1541A	10 - 40	8.8	5mV - 5V	0.2 - 0.5	2	2	√			√	√	√	√		
		2160	60	35	1	5	2	2	√		√	√	√	√	√		
		2125	20	17.5	1	0.1 - 0.2 Sec.	2	2	√		√	√	√		√		
		2120	20	17.5	1	0.5 - 0.2 Sec.	2	2	√				√		√		
		2120A	20	17.5	5mV - 5V	0.1 - 0.2 Sec.	2	2	√			√	√	√	√		
John Fluke Mfg. Co.	D•1408	PM 3055, PM 3050	60	5.8	2mV	5ps/div.	4	2+1	√	√	√	√	√	√	√		√
		PM 3340	2 GHz	175ps	1mV/div.	20ps/div.	8	2	√		√	√	√		√	√	√
		PM 3070, PM 3065	100 MHz	3.5ps	2mV	5ns/div.	4	2+1	√	√	√	√	√	√	√		√
		PM 3365A, PM 3375	100 MHz	3.5ps	2mV/div.	5ns/div.	4	2	√	√	√	√	√	√	√	√	√
		PM 3350A, PM 3355	60	5.8	2mV	5ns/div.	4	2	√	√	√	√	√	√	√	√	√
		PM 3335	60 MHz	5.8ns	2mV/div.	5ns/div.	4	2	√	√	√	√	√	√	√	√	√
		PM 3092, PM 3094	200 MHz	1.75ns	2mV/div.	2ns/div.	4	2+2	√	√	√	√	√	√	√		√
Kikusui International Corp.	D•1411	COM 7XX1A	200	3.5	1mV/div. - 5V/div.	.01	4	4	√	√	√	√	√	√	√	√	√
		CO50007m	100		5mV/div. - 5V/div.	.05	8	3	√	√	√	√	√	√	√		
Mint Systems	D•1412	7010	100 MHz	3.5ns	1mV/div.- 10s/div.	1ns/div.- 5V/div.	8 Analog, 64 Logic (Digital) traces Max.	8 Analog, 64 Logic Channel Max.	√	√	√	√	√		√	√	√

BK PRECISION / OSCILLOSCOPES

MAXTEC INTERNATIONAL CORP.
6470 W. Cortland St. • Chicago, IL 60635 • 312-889-9295 • TELEX #210017 • FAX 312-794-9740

40 MHz BATTERY OPERATED SCOPE WITH CURSORS AND READOUTS

NEW



Model 1443
$1,695.00

■ **On-screen display of voltage, time and frequency** ■ **Complete self-contained portable scope** ■ **Battery pack** *included* ■ **Battery charger** *included* ■ **Soft carrying case** *included* ■ **Two 10:1 probes** *included* ■ **Dual Trace** ■ **1mV/div sensitivity** ■ **Optional high-impact protective case** ■ **AC** *or* **DC operation** ■ **Fixed signal display**

SPECIFICATIONS

VERTICAL AMPLIFIERS (CH 1 and CH 2). **Sensitivity:** 1mV to 5V/div; 12 ranges in 1-2-5 steps with fine adjustment. **Accuracy:** ±3%. **Input Impedance:** 1 MΩ±2%, 30pF ±10%. **Frequency Response:** DC: DC to 40MHz (−3 dB). AC: 10Hz to 40MHz (−3 dB). **Rise Time:** 8.8nS. **Crosstalk:** At least 1000:1 (60 dB) at 50 kHz. **Operating Modes:** CH-1, CH-2, Dual (ALT and CHOP), ADD. **Max. Input Voltage:** 250V (DC + AC peak).

HORIZONTAL AMPLIFIER: X-Y Mode: Set SEC-DIV switch to X-Y position; CH1: Y axis; CH 2: X axis. **Sensitivity:** 1 mV to 5V/div. **Input Impedance:** 1 MΩ±2%, 30pF ±10%. **Frequency Response:** DC to 1 MHz (−3 dB).

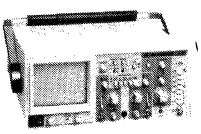
SWEEP SYSTEM: Sweep Speed: 0.5 µs to 0.5 s/div, ±3%, in 19 ranges, 1-2-5 steps with fine adjustment. **Sweep Magnification:** X10, ±6%. **Linearity:** ±3%; ±6% for X10 magnification.

TRIGGERING: Trigger Modes: AUTO, NORM, TV-H, TV-V. **Trigger Sensitivity:** Internal: 1 div or more, 20 Hz to 40 MHz; Ext: 1V or more, 20 Hz to 40 MHz.

CRT: Readouts: CH 1 and CH 2 volts per division, DUAL, ADD INCAL, and INV for vertical axis; Time/Div, UNCAL, and X10 MAG for horizontal axis. **Cursors:** Measure voltages, time and frequency. **CRT Type:** 3.5-inch rectangular with internal graticule. **Display Area:** 8×10 divisions. **Accelerating Voltage:** 15 kV.

GENERAL: Calibrating Voltage: 2V p-p ±2%, 1 kHz square wave. **Power Requirements:** 90 to 130 VAC and 180 to 260 VAC, 48 to 440 Hz; 11 to 14 VDC at approx. 0.8A. **Built-in Battery:** Ni-Cad type, 1 hour operating time, 12 to 14 hour charging time. **Dimensions (H×W×D):** 11×21.5×33.5 cm (4.3×8.5×13.2 in.). **Weight:** 14 lbs. (6.3kg).

DIGITAL STORAGE/ANALOG OSCILLOSCOPE



Model 2522
$1,050.00

■ **20MHz analog bandwidth** ■ **10MS/s sampling rate** ■ **2k memory per channel** ■ **20MHz equivalent time sampling** ■ **Pre-trigger capture**

SPECIFICATIONS

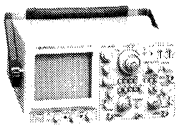
Storage Word Size: 2048×8 bits/channel (2 k/channel with direct sampling, 1 k/channel with equivalent time sampling). **Vertical Resolution:** 1 in 256, approximately 25 steps/div. **Horizontal Resolution:** 1 in 2048, approximately 200 samples/div. **Sampling Rate:** 10 M samples/sec to 10 samples/sec, reduced in proportion to t.b. Direct sampling at time base settings of 20 µ/s div and slower, equivalent time sampling at t.b. settings of 10 µ s/div and faster. **Time Base Expander:** For storage of slow time events, time base steps 10 ms/div and slower have selectable 1/1 or 1/100 rate. 1/100 rate expands time base from 1 sec/div to 20 sec/div in 1-2-5 sequence. **Equivalent Time Sampling Bandwidth:** 20 MHz for repetitive waveforms. **Dot Joining:** Linear interpolation between samples.

DIGITAL DISPLAY MODES
Roll: Stored data and display updated by triggered sweep. **Hold:** Freezes channel 1 and channel 2 data. **Save CH2:** Freezes channel 2 data immediately. **Pretrigger Storage:** Switchable to 0% or 50%.

PLOT OUTPUT
CH 1 and CH 2 Outputs: Selected by PLOT switch on rear panel. **Output Sweep Rate:** Output sweep rate is 1/10 of TIME/DIV setting (and 1/100 switch when applicable). **Pen Lift Output:** Available at PEN DOWN jack on rear panel. TTL high, pen up. TTL low, pen down.

ANALOG MODE SPECIFICATIONS
Similar to Model 2120.

TRIPLE-INPUT SIX-TRACE PORTABLE 100 MHz OSCILLOSCOPE



Model 2190
$1,645.00

■ **1 mV sensitivity to full bandwidth** ■ **Three channel 6-trace display** ■ **Dual timebase** ■ **23 calibrated sweeps** ■ **Rectangular CRT with internal graticule and scale illumination** ■ **19 kV accelerating voltage** ■ **V mode—displays signals unrelated in frequency** ■ **Alternate sweep function** ■ **Signal delay line** ■ **20 MHz bandwidth limiter** ■ **Video separators** ■ **CH 1 output.**

SPECIFICATIONS

VERTICAL AMPLIFIERS (CH 1 and CH 2): **Deflection Factor:** 1 mV/div to 5 V/div with vernier. **Accuracy:** ±3%
Response: DC: DC to 100 MHz (−3 dB). AC: 10 Hz to 100 MHz (−3 dB). **Rise Time:** 3.5 ns or less. **Input Z:** 1 MΩ ±1%/22 pF. **Modes:** CH1, ADD, CH2, CH3.

TRIGGERING
A trigger: Signal Source: INT, LINE, EXT, EXT ÷5. **Sensitivity:** DC to 10 MHz: 0.4 DIV (INT), 0.04V (EXT). 10 MHz to 100MHz; 1.5 DIV (INT), 0.15V (EXT). Video signal: 2 DIV (INT), 0.2V (EXT). **Coupling:** AC HF REF, TV, DC. **B trigger:** triggering signal is A. **EXT trigger:** CH3 uses the same trigger. **Input Z:** 1 MΩ ±2% 22pF ±2pF. **Max. input voltage:** 100V (DC + AC peak).

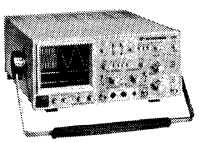
HORIZONTAL
Horizontal axis display: A, ALT, B, B TRIG'D

A Sweep: Sweep modes: AUTO, NORM, SINGLE. **Sweep Time:** 20nS to 0.5S/DIV; 2nS to 50nS/DIV (at ×10 MAG): 23 step selection in 1-2-5 sequence, ±3% for 10°C to 35°C. **B sweep:** Delay system: Continuous delay, Triggered delay, Triggered to A trigger. **Sweep magnification:** 10 times (max. sweep time is 2nS/DIV). **X-Y Operation:** CH 1 becomes X axis, CH 2 is Y axis. **Z-AXIS INPUT.** Sensitivity: 3V p-p. Response: DC-5MHz. **CRT Type:** 6" rectangular.

OTHER SPECIFICATIONS
Power: 90-253 VAC; 50/60 Hz, approx. 65 W. **Dimension:** (H×W×D): 15.2×29.4×40 cm. **Weight:** 7.8 kg

ACCESSORIES SUPPLIED
Two 10:1 Probes, Instruction Manual, Schematic Diagram and Parts List.

60 MHz DUAL-TRACE DUAL TIME BASE OSCILLOSCOPE



Model 2160
$1,099.00

■ **1 mV sensitivity** ■ **sweep to 5 ns/div** ■ **22 calibrated ranges—main time base** ■ **19 calibrated ranges—delayed time base** ■ **Rectangular CRT with internal graticule** ■ **12 kV accelerating voltage** ■ **Signal delay line** ■ **Beam Finder** ■ **V mode—displays two signals unrelated in frequency** ■ **Component Tester** ■ **Channel 1 output** ■ **Z axis input** ■ **X-Y operation** ■ **Single sweep.**

SPECIFICATIONS

VERTICAL AMPLIFIERS (CH 1 and CH 2): **Sensitivity:** 1 mv/div to 5 mv/div. **Attenuator:** 12 calibrated steps in 1-2-5 sequence. Vernier control provided. **Input Impedance:** 1 MΩ + 2%. 30 pF + 5 pF. **Frequency Response:** 5 mV/div to V/div: DC: DC to 60 MHz (−3 dB). AC: 5 Hz to 60 MHz (−3 dB). **Rise Time:** 5 mV/div to 5 V/div: 5.8 ns. **Operating Modes:** CH 1: CH 1, single trace. CH 2: CH 2, single trace. DUAL: CH 1 and CH 2, dual trace. Alternate or Chop selectable at any sweep rate. ADD: algebraic sum of CH 1 + CH 2.

SWEEP SYSTEM: Operating Modes: Main, Mix. **Delay Main Time Base:** 0.05 µs/div to 0.5 s/div in 1-2-5 sequence, 22 steps, Vernier control provided. **Delayed Time Base:** 0.5 µs/div to 50 ms/div in 1-2-5 sequence, 19 steps. **Holdoff:** Continuously adjustable for main time base from NORM to 10 times normal. **Delay Time Position:** Continuously variable.

TRIGGERING: Trigger Modes: AUTO (free run), NORM, SINGLE. **Source:** CH 1, CH 2, ALT (V MODE), EXT, LINE.

HORIZONTAL AMPLIFIER: X-Y mode: CH 1: Y axis, CH 2: X axis. **Frequency Response:** DC: DC to 2 MHz (−3 dB). AC: 5 Hz to 2 MHz (−3 dB).

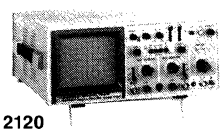
CRT: Type: 6-inch rectangle with internal graticule. **Display Area:** 8 x 10 div (1 div = 1 cm). **Accelerating Voltage:** 12 kV. **Phosphor:** P31. **Scale Illumination:** Continuously variable.

COMPONENT TESTER: Components Tested: Resistors, capacitors, inductors, and semiconductors.

OTHER SPECIFICATIONS: Environment: Full Operation: 0° to +40°C, 85% max. R.H. **Power Requirements:** 120 V/220 V ±10%, 50/60 Hz. **Dimensions:** (H x W x D) 5¾ x 13⅜ x 17" (146 x 340 x 430 mm).

ACCESSORIES SUPPLIED: Two 10:1 Probes, Instruction Manual, Schematic Diagram and Parts List. AC Power Cord.

20 MHz DUAL-TRACE OSCILLOSCOPE



Model 2120
$549.00

■ **Dual or single trace operation** ■ **1 mV/div sensitivity** ■ **20 MHz response at a true 3 dB** ■ **AUTO/NORM triggered sweep operation with AC, TVH, TVV and Line coupling** ■ **Calibrated 18 step time-base with x10 maginifier** ■ **X-Y operation** ■ **Bright, sharp rectangular CRT with P31 phosphor** ■ **Front panel trace rotation control** ■ **Tilt stand and soft handle** ■ **Selectable + slope** ■ **Built in calibration source** ■ **Compact low-profile design.**

SPECIFICATIONS

VERTICAL AMPLIFIERS (CH 1 and CH 2): **Sensitivity:** 5 mV/div to 5V/div in 1-2-5 sequence, 10 steps. Plus Vernier control. **Input Impedance:** 1 MΩ + 2%, 35pF + 5pF. **Frequency Response:** 5 mV to 5V/div (CAL): DC to 20 MHz (−3 dB). 1 mV/div (uncalibrated): DC to 10 MHz (−3 dB). **Rise Time:** Approximately 17.5 ns. **Operating Modes: CH 1:** CH 1, single trace. **CH 2:** CH 2, single trace. **ALT:** Dual trace, alternating. **CHOP:** dual trace, chopped. **ADD:** Algebraic sum of CH 1 + CH 2. **DC to 20 MHz:** 4 divisions. **DC to 10 MHZ:** 8 divisions.

TRIGGERING
Trigger Modes: AUTO (free run) or NORM. **Trigger Source:** CH 1, CH 2, ALT, EXT, LINE. **Maximum External Trigger Voltage:** 200 Vdc + ac peak. **Trigger Coupling:** AC 30 Hz to 30 MHz. TV H, TV V

SWEEP SYSTEM
Sweep Speed: 0.5 µs/div to 0.2 s/div in 1-2-5 sequence, 18 steps. Vernier control. **Sweep Magnification:** 10x, ±6%.

HORIZONTAL AMPLIFIER
X-Y Mode: CH 1 Y axis. CH 2 X axis.

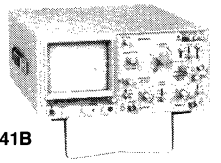
CRT
Type: Rectangular with internal graticule. **Display Area:** 8 x 10 div (1 div = 1 cm). **Accelerating Voltage:** 2 kV. **Phosphor:** P31.

OTHER SPECIFICATIONS
Power: 115 V/230 V ±10%, 50/60 Hz, approx. 35W. **Dimensions:** (W x H x D): 12.6 x 5.1 x 14.2" (320 x 130 x 361 mm). **Weight:** Approximately 15 lbs (6.75 kg).

ACCESSORIES SUPPLIED
Two Probes, Schematic Diagram and Parts List, AC Power Cord, Spare Fuse.

40 MHz DUAL TRACE OSCILLOSCOPE

NEW



Model 1541B
$845.00

■ **1 mV/div sensitivity** ■ **20 calibrated sweeps** ■ **Video sync separators** ■ **Z axis input** ■ **x10 sweep mag. Single sweep** ■ **V mode-dispays two signals unrelated in frequency** ■ **Channel 1.output**

SPECIFICATIONS

VERTICAL AMPLIFIERS (CH 1 and CH 2): **Sensitivity:** 5 mV/div to 5 V/div. 1 mV/div, with x5 gain. **Input Impedance:** 1 MΩ ± 2%/30pF. **Frequency Response:** DC to 40 MHz (−3 dB), DC to 20 MHz (−3 dB) at x5 gain. **Rise Time:** 8.8 ns (x5 gain: 17.5 ns). **Operating Modes:** CH 1: CH 2: DUAL; Alternate/Chop, ADD.

SWEEP SYSTEM
Sweep Speed: 0.2µs/div to 0.5 s/div (±3%) in 1-2-5 sequence, 20 steps, Vernier control provided. **Sweep Magnification:** 10x ± 5%.

EXTERNAL TRIGGER
Imput Impedance: 1 MΩ ± 2%, approximately 30 pF. **Maximum Input:** 100 V (DC + AC peak) to 1 kHz.

HORIZONTAL AMPLIFER:
(Input thru EXT TRIG). **EXT Horizontal Mode:** Trace swept by exit. horiz. signal. Vert. Axis modes CH 1, CH 2, DUAL, and ADD. **Bandwidth:** DC to 2 MHz (−3 dB).

OTHER SPECIFICATIONS
Operating Environment: Same as Model 2160.
Power Requirements: 100 V/120 V/220 V/230 V/240 V ±10%, 50/60 Hz, approximately 35W.
Dimensinos: (H x W x D) 6.3 x 12.8 x 17.7" (34 x 14.5 x 45 cm). **Weight:** 16.5 lbs (7.4 kg).

ACCESSORIES SUPPLIED
Two 10:1 probes, manual, schematic parts list.

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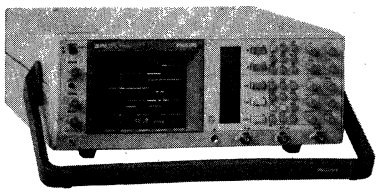
FLUKE® PHILIPS

Oscilloscopes

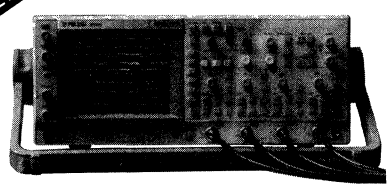


PM 3070

PM 3050/55 60 MHz & PM 3065/70 100 MHz

- AUTOSET for automatic amplitude, time, and trigger setting
- LCD panel displays status and settings
- 16 kV CRT acceleration voltage
- Fast action up/down controls and cold switching
- GPIB/IEEE-488 interface option
- Single timebase, dual timebase and cursor versions

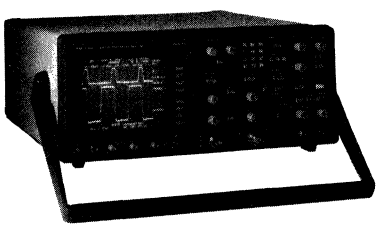
NEW



PM 3094

PM 3092 and PM 3094 Analog Oscilloscopes

- Choice of 2 models with 200 MHz bandwidths
- Unprecedented 1% voltage and timing accuracy
- Autoset for instant, optimized display
- Delayed Time Base with full trigger capabilities
- Powerful cursor measurements with direct numeric readout
- On-screen ground level indicators, channel identifiers & trigger level display
- Automatic voltmeter measurements
- Probe recognition, automatic or manually selectable
- Standard RS-232-C interface, IEEE-488.2 optional, full remote capability
- ISO 9001 quality certification
- HDTV trigger facilities



PM 3340

PM 3340 2 GHz Digitizing Oscilloscope

- DC to 2 GHz bandwidth
- 175 ps risetime
- Trigger response up to 2 GHz
- 4 memories of 4K bytes x 10-bit words
- 1 mV/div vertical sensitivity
- Automatic cursor measurements of amplitude, time, frequency and phase
- Signal processing including basic algebraic functions, plus filter, FFT and histogram
- Eye pattern mode for PCM inspection
- Standard GPIB/IEEE-488 and RS-232C interfaces
- Probes operate over full bandwidth
- AUTOSET function gives instant front panel set-up for any input signal

Also see our Multimeters in EEM Section 2900.

Call Fluke toll-free at 1-800-44-FLUKE to order or for more information

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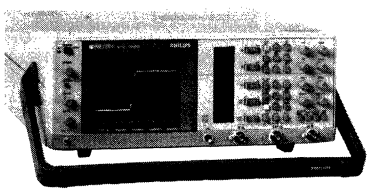
FLUKE® PHILIPS

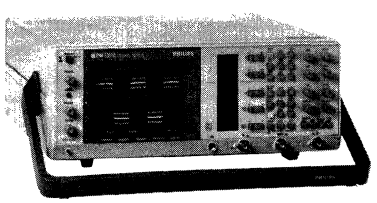
Oscilloscopes



PM 3350A

PM 3350A & PM 3355 Digital Storage Oscilloscopes

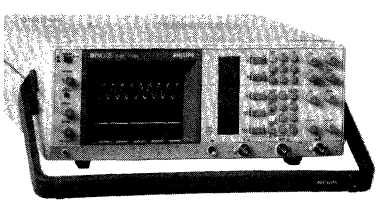
- Analog oscilloscope plus fast digital storage oscilloscope
- Sample rates of 250 MS/s (PM 3355) or 100 MS/s (PM 3350A) on each channel
- Synchronous sampling on both channels
- 60 MHz analog bandwidth with 100 MHz triggering on both models
- AUTOSET for instant on-screen trace display in both operating modes
- 64 front-panel set up memories
- 12K reference memory stores up to 6 reference traces
- Advanced cursors for automatic measurements of voltage & time parameters
- Average and envelope display modes
- Dual time base referencing with autozoom
- GPIB/IEEE-488 and RS-232C interface options



PM 3365A

PM 3365A & PM 3375 Digital Storage Oscilloscopes

- Dual digital and analog oscilloscope functionality in one
- Synchronous real time sampling on both channels up to a high 250 MS/s (PM 3375) or 100 MS/s (PM 3365A), plus sequential sampling
- Analog and digital repetitive bandwidth to a full 100 MHz with 150 MHz triggering
- AUTOSET for instant display of any input signal in both operating modes
- 64 front panel set-up memories
- 12K reference memory stores up to 6 reference traces
- Advanced cursors for automatic measurements
- Average and envelope display modes
- Dual time base referencing with autozoom
- Interface options for extensive remote control or screen plot/print



PM 3335

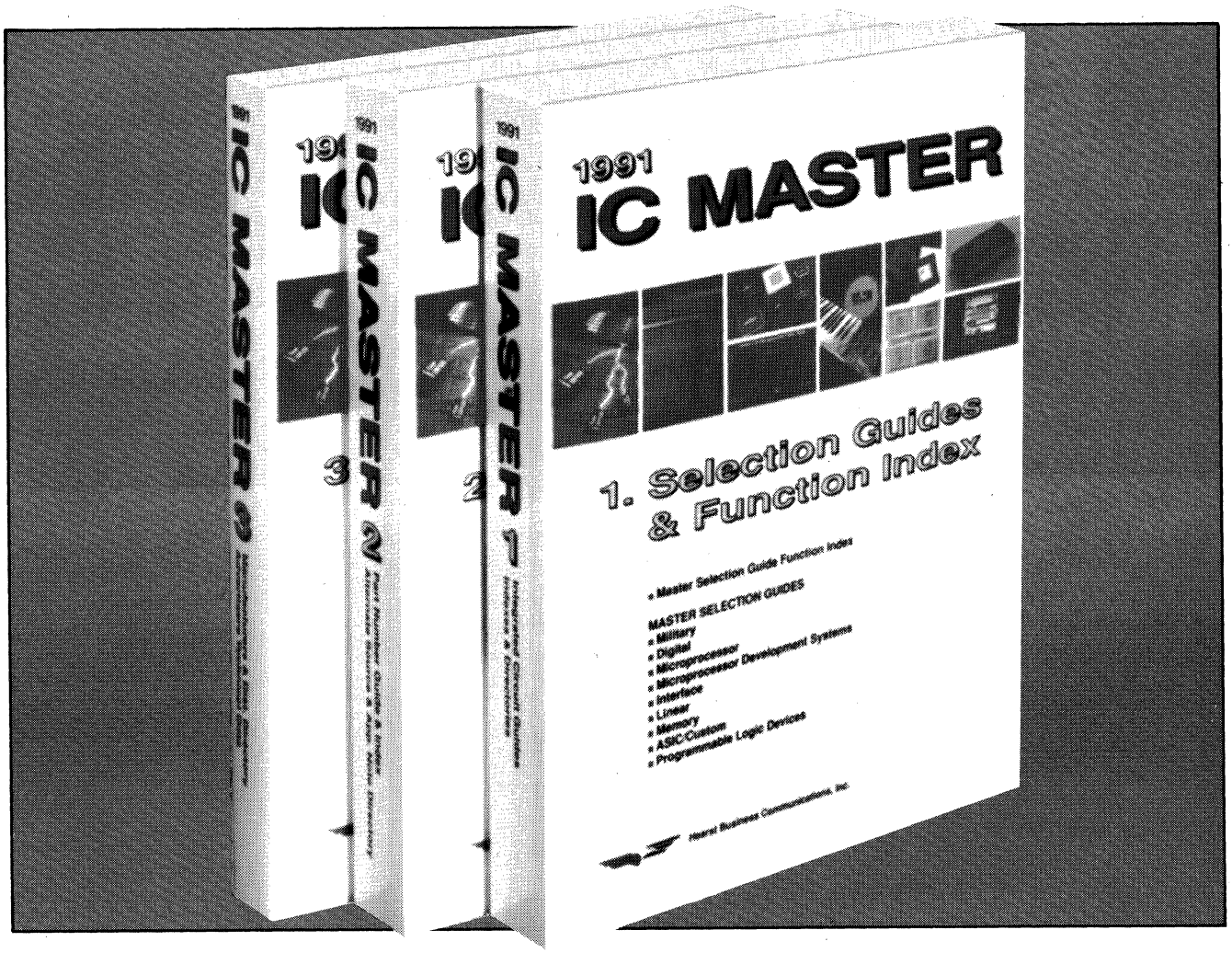
PM 3335, 60 MHz, 20 MS/s Digital Storage Oscilloscope

- Analog oscilloscope plus full function digital storage oscilloscope
- 20 MS/s synchronous real time sample rate on each channel
- 60 MHz analog bandwidth
- Deep 8K bytes x 8-bit waveform acquisition memory even at max sample rate
- Second reference memory for comparison of waveforms
- AUTOSET for instant on-screen trace display
- Standard cursors for many on-screen measurements
- GPIB/IEEE-488 and RS-232 interface options

Also see our Multimeters in EEM Section 2900.

Call Fluke toll-free at 1-800-44-FLUKE to order or for more information

SUPER TIME SAVER!



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KIK offers feature packed, precision oscilloscopes, from 20 to 100 MHz, analog and digital storage for bench testing, engineering labs, field service and educational applications. Scopes vary from 1 to 4 channels.

All offer peak-to-peak level lock automatic triggering that holds the signal in-sync no matter how often you change vertical input range or time base controls.

ANALOG AND DIGITAL STORAGE

- 20 - 100 MHz frequency bandwidth
- 2 - 4 display channels
- Displays up to 8 traces
- Patented auto focus
- Alternate sweep mode
- GPIB programmable (opt.)
- Rugged, portable

For sales and service available nationwide call us.

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- 6″ and 7″ CRT
- Modular design
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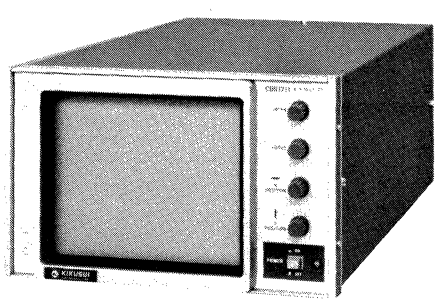
- Switching regulated power supply
- BNC connectors for easy hookup
- Modifications to suit your requirement



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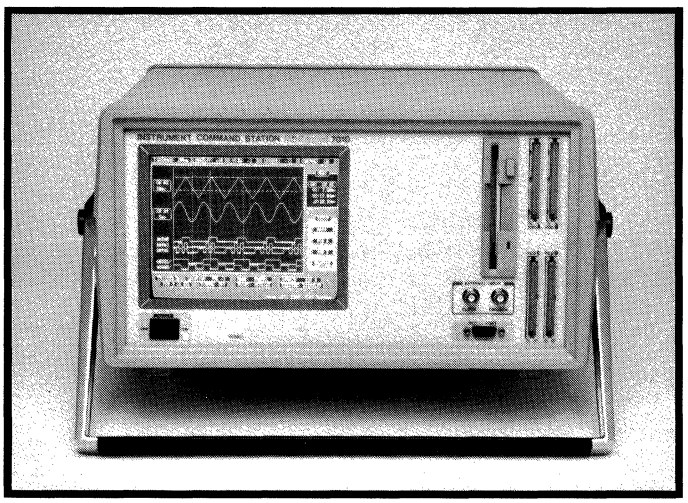
MiNT Systems™

Designed for Versatility



7010 Instrument Command Station™

- **Application-specific instrumentation platform, supports up to 4 instruments simultaneously (via Instrument Pods™)**
- **Provides up to 8 Digital Storage Oscilloscope (DSO) 100 MHz channels**
- **100 ps Time Base resolution**
- **Up to 64 logic timing analyzer channels**
- **Combination trigger setups**
- **Modular instrument approach provides a host of test and measurement capabilities**

The MiNT Systems ICS™ 7010 (Instrument Command Station) is a cost effective solution for general test and measurement requirements. Starting with the basic command station, the user can configure the system by selecting unique Instrument Pods™. For example, combine DSO and logic analyzer pods to allow simultaneous acquisition of analog and digital data that can be labeled and sized on the display screen. Add analog and digital stimulus pods to create a complete test system. The modular design of the ICS allows the user to select various instrument combinations for specific test and measurement applications.

Specifications

Concurrent Instruments: 4 max.

Display
9-inch Raster CRT
External Color Monitor (optional)

Non-Volatile Storage (for test setups and waveform data)
3.5-inch High Density Floppy Disk Drive
3.5-inch Hard Disk Drive (optional)

Test Setup Modes: 3
Disk setup mode
Auto setup mode
Manual setup mode

Time Base
Range: 1 ns/div to 10 s/div
Resolution: 100 ps
Accuracy: 0.01% or 100 ps

Trigger
Sources: line, individual channel or combination of channels
Pre-trigger: 0 to 20 divisions
Post-trigger: 0 to 2,000 divisions
Modes: Auto, Normal, Single, and Roll

Time Measurement
Range: 1 ns to 100 s
Accuracy: 0.01% or 100 ps

Frequency Measurement
Range: 0.1 Hz to 100 MHz
Accuracy: 0.01%

Signal Average: 2, 4, 8, 16, 32, 64, and 128

Math Functions: Invert, Add, Subtract, Multiply, and Divide

Statistical: Histogram per bit weight

X-Y Operation
Any two Analog channels
Z intensity: Any Analog channel

Cursors
Vertical cursors: 3
Horizontal cursors: 3

Waveform Memory: 2 per signal channel

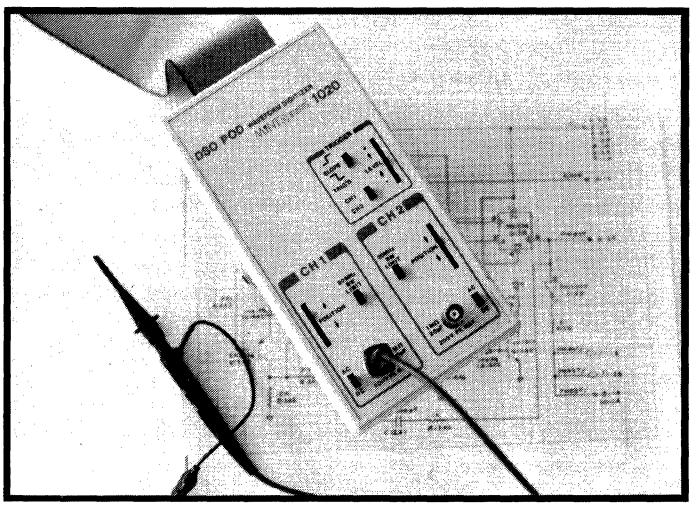
Hardcopy: parallel graphic printer output

Communications Interface: RS232, IEEE488 (optional)

Modular iNstruments and Test Systems
MiNT Systems Corporation 1633 S. Main Street, Milpitas, California 95035 USA

MiNT Systems™

Designed for Versatility

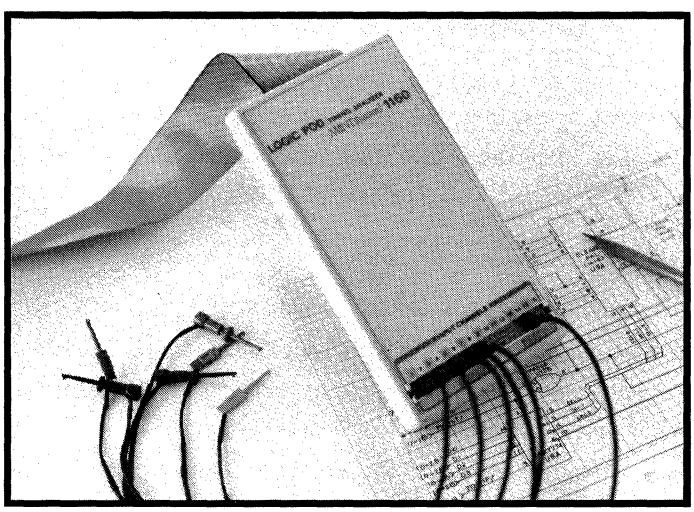


DSO Pod™

- **100 MHz Analog Signal Bandwidth**
- **Full-featured Digital Storage Oscilloscope**
- **Capability of channel number expansion**
- **100 M samples/sec single-shot**
- **10 G samples/sec equivalent sampling rate on repetitive signals**

Specifications

Number of channels: 2
Bandwidth (-3db): DC to 100 MHz
AC coupling: 10 Hz to 100 MHz
Rise Time: 3.5 ns
Input Impedance: 1 MΩ and 20 pf
Trigger Sensitivity: 0.5 div
Vertical Sensitivity: 1 mV/div to 5 V/div
Vertical resolution: 0.4% (8-bit)
Maximum Sampling Rate
100 M Samples/sec, single channel
50 M Samples/sec, dual channel
Waveform Record Length: 8000 points



Logic Timing Pod™

- **100 MHz maximum clock rate**
- **8K memory depth**
- **16 channels, expandable to 64**
- **Glitch capture**
- **Auto Setups**
- **±10 V input signal range**
- **Detachable probe tips**
- **Pre-set logic levels for TTL, ECL, and CMOS**

Specifications

Number of Channels: 16
Input Impedance: 100 KΩ and 20 pf
Input Signal: ±10 V
Threshold Accuracy: 100 mV
Glitch Capture: 5 ns
Maximum Sampling Rate
100 MHz 8 channels, 50 MHz 16 channels
Trigger: external and any channel combination

To order or obtain more information about the above products or other product lines, such as the standalone **Digital Storage Oscilloscope (DSO)**, **Signal Generator/Synthesizer**, or **LCR Meter**, call (408) 262-7171 or fax (408) 262-5387.

Modular iNstruments and Test Systems

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Hearst Engineering Software

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The all new 1991 version of the world famous Alternate Source Directory is now available in floppy disk form for your IBM XT & AT and 100% compatible personal computer with hard drive.

The **1991 ICMASD** contains the more than 180,000 listings that appear in the Alternate Source Directory Section contained in Volume Two of the printed version of the 1991 IC Master ...plus additional discontinued parts. The database includes complete vendor addresses and phone numbers.

You can personalize the **ICMASD** for your application. The program allows you to add comments, up to 20 digits long, to each listing. These comments can be part numbers, prices, or any information specific to your needs. You may also add, delete and/or discontinue devices!

For greater flexibility the base number search feature enables you to access parts by base number, i.e., the device number stripped of prefixes and suffixes. You don't need to know the manufactures codes to call up any of the alternates to these devices.

The **1991 ICMASD** is fast, convenient and very user friendly!

Complete program documentation is included. When ordering, be sure to specify if you want the **1991 ICMASD** on three, double-sided, double-density disks OR on one high-density disk.

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Published Annually in March

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ANOTHER ASTRO-MED FIRST IN 8-CHANNEL RECORDERS

LASER PRINTER RESOLUTION!

- **Laser Quality Writing—300 dpi**
- **20 kHz Frequency Response**
- **Automatic Self-Calibration—Traceable to NBS**
- **Expandable to 16 Channels**
- **Data Capture with 200 kHz Sample Rate Per Channel**
- **Built-In Programmable Signal Conditioners**

From its laser-sharp charts to its unparalleled frequency response, this remarkable new 8-channel recorder brings you the technology of the Twenty-First Century today! It outperforms even Astro-Med's MT-9500, which in 1987 was heralded as the first breakthrough in 8-channel recorders in 20 years. It has 50% more resolution, 4 times higher frequency response, and 8 times more memory than the MT-9500. With automatic self-calibration traceable to NBS, expandability to 16 channels, and a host of other important features. We call it the MT-95000, a product so unique that it is protected by U.S. Patent No. 4,739,344.

Astro-Med, Inc.®

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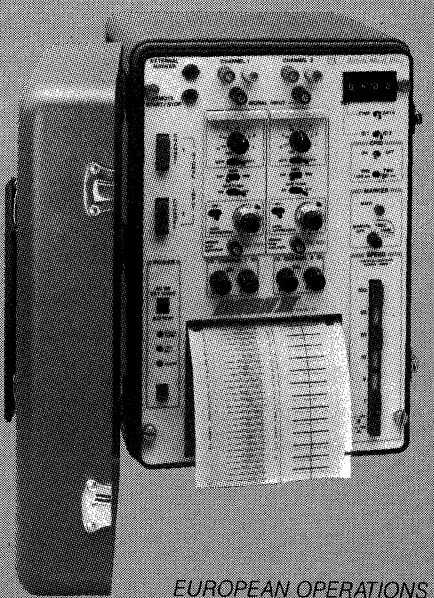
ASTRO-MED'S NEW TECHNOLOGY LEADS THE WORLD IN PORTABLE FIELD AND LAB RECORDERS

Astro-Med's New Technology–with its advanced software and no moving parts–brings you the Dash IV, the world's most powerful and reliable 4-channel recorder. Lightweight, compact, and built into a tough plastic carrying case, it's ready to take anywhere. In either the field or lab, the Dash IV simplifies your most complex recording tasks with its menu-driven operation and automatic self-calibration. You get many other outstanding features too: like 25 kHz real time frequency response, data capture, the sharpest tracings you've ever seen, and a complete family of "personality modules" (signal conditioners) that adapt the Dash IV for virtually any application.

- **DC to 25 kHz Real Time**
- **Battery/AC or 12 VDC**
- **Data Capture and Playback**
- **Separate Channels or Full Overlap**
- **Simple Menu-Driven Operation**
- **Automatic Self-Calibration**

Astro-Med's New Technology is the ideal design for a field recorder. Operating without vulnerable moving parts, the Dash II 2-channel field recorder assures reliable, accurate performance under the most brutal operating conditions: shock, vibration, heat, cold, etc. To simplify data analysis, it prints a system log channel and signal conditioner switch settings on the chart. It's very compact and lightweight and built into a tank tough carrying case, so you can carry it easily into any environment. The Dash II is the worlds only *true* field recorder.



- **Compact & Lightweight; Only 32 Lbs with Batteries**
- **Battery/AC or 12 VDC**
- **DC to 500 Hz Full Scale Real Time Frequency Response**
- **Prints Time and Date**
- **Separate or Overlapping Channels**
- **Rugged Protective Case**

Phone, Fax, or write for literature and a demonstration of any of these recorders.

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DC TO 25 kHz REAL TIME RESPONSE

FINALLY! A BATTERY POWERED 8-CHANNEL FIELD AND LAB RECORDER

- Only 28 Lbs Including Internal Battery
- Full 8-1/2 Inch Wide Chart
- Data Capture and Playback– 32 kSamples per Channel
- Eight Separate and Over-lapping Channels
- Internal Battery, AC, and 12 VDC Operation
- Chart Speeds to 200 mm/sec

The new Dash 8 Field and Lab Recorder is the world's first and only truly portable eight channel recorder. Powered by an internal battery (or external 120/220 VAC), the Dash 8 is at home anywhere.

The Dash 8 records eight channels of data from DC to 25 kHz real time as well as eight event channels along with eight channels of alphanumeric data.

Traces are clear and sharp under all conditions. There are no pens, no liquids, and no moving parts to break and wear out thanks to Astro-Med's New Technology thermal recording technique.

Phone, write or Fax for details!

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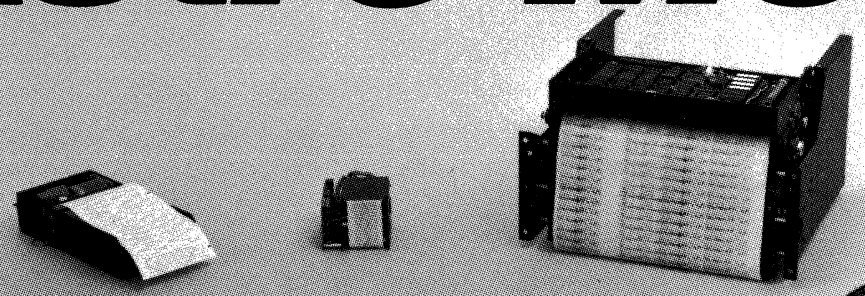
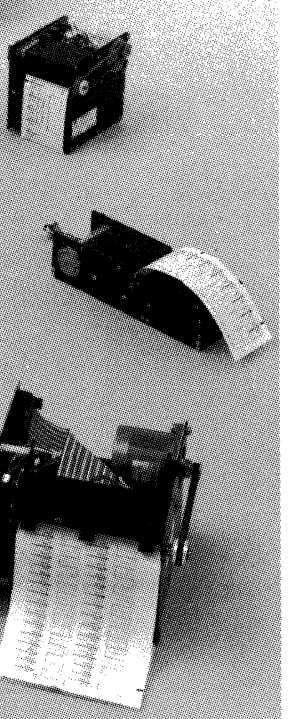


An OEM digital recorder for every industrial and medical application

For the OEM digital recorder that your equipment deserves, talk to Astro-Med. Only Astro-Med has the complete line-up–from 2 inch to 12 inch machines. And since all Astro-Med digital recorders use the same dual port interface, you can expand your product line quickly and inexpensively.

Astro-Med digital recorders. With no moving parts, high speed, and beautiful diagnostic-quality tracings. Clearly superior. Developed and made by the leader in industrial and medical OEM recorders since 1971!

Send for our new OEM digital recorder catalog today. Or call toll free 800-343-4039 for immediate service.



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PRINTER/RECORDERS

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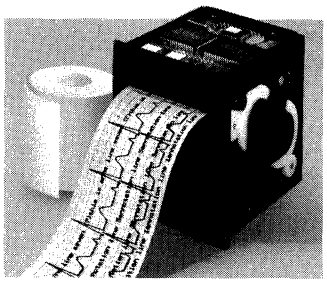
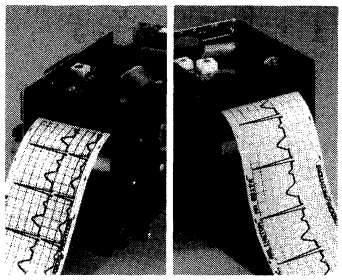
Sub-Compact 2" Recorder
AR-42

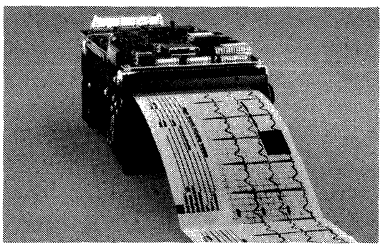


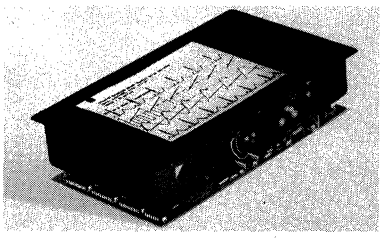
Featuring the smallest size, lightest weight and lowest power drain available, this 2" printer is ideal for both portable and table-top applications. It provides full output capabilities, including waveforms, text and bit-mapped graphics printed in real time over customized background grids. An unmatched 800 dpi resolution and curve-smoothing software ensure clean, accurate waveforms. Prints up to three traces simultaneously, with real-time annotation. Macro file capability facilitates data transfer from host. Designed for simple integration into host instrument.

Compact 2" Recorders
AR-40/AR-41



These reliable, high-precision recorders are designed to handle the output requirements of a wide range of diagnostic, analytical and monitoring instruments. Available data formats include bit-mapped graphics, vertical and horizontal text and multichannel waveforms with 2 lines of floating annotation. Background grids are user-programmable. High-resolution recording (200 × 800 dots/in) ensure crisp, well-defined images. Interfacing with a host instrument is simple and straightforward. Model AR-41 uses host power supply. Model AR-40 has integral supply.





Compact 4" Recorders
AR-100/AR-100 FB

The **Model AR-100** is a compact, versatile recorder that prints text, graphics and waveforms over user-customized background grids. It provides up to 6 output channels for side-by-side traces, complete with up to 6 lines of real-time annotation. Proprietary, curve-smoothing software, extremely high printing resolution (200 × 800 dots/in) and a 10-bit dynamic range provide accurate, high-definition wave reproduction. Electrical and mechanical interfacing with the host instrument is simple and straight forward. Chart speeds are continuously variable from 1 mm/hr to 100 mm/sec. An extremely compact mechanical configuration saves valuable space in the host instrument.

The **Model AR-100 FB** is similar in specifications and performance to the Model AR-100, but provides the added convenience of a flat, horizontal writing surface that facilitates the addition of notes and comments directly on the emerging record.

APPLICATIONS SUPPORT

GSI works with you from product concept and design through production. As a partner in your design and implementation, we support all of your software and hardware needs, ensuring quick and easy integration of our recorders into your products.

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When you have special electrical, mechanical, or output requirements to meet specific market demands, our engineering staff is available to assist you. We may suggest simple modifications to our standard products; or, to truly differentiate your product, a full custom recorder.

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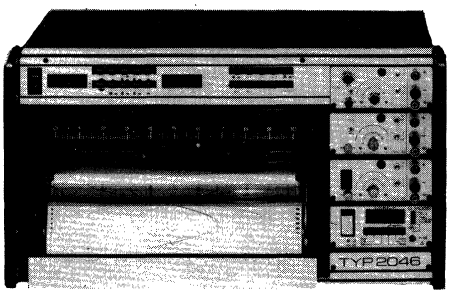
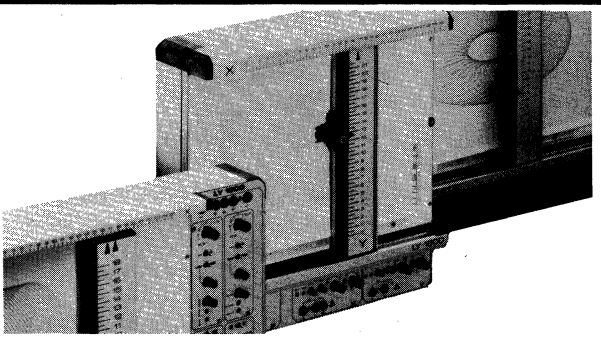
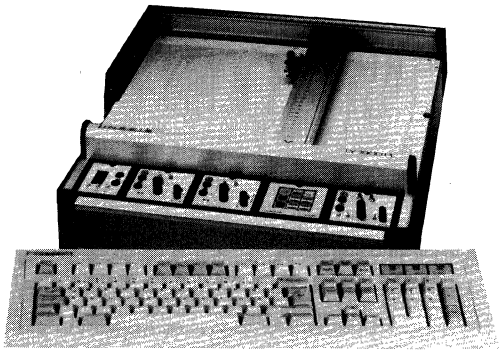


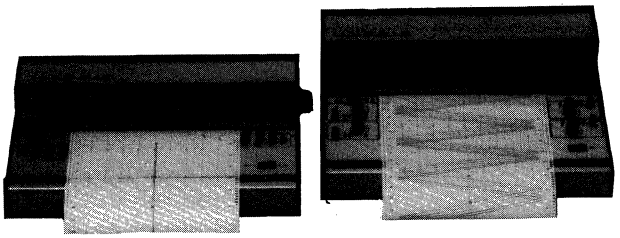
L 2006
Modular rackmount recorder
Plot-function for each channel, time and event marker
Data synchronization(MZK), 35 input modules



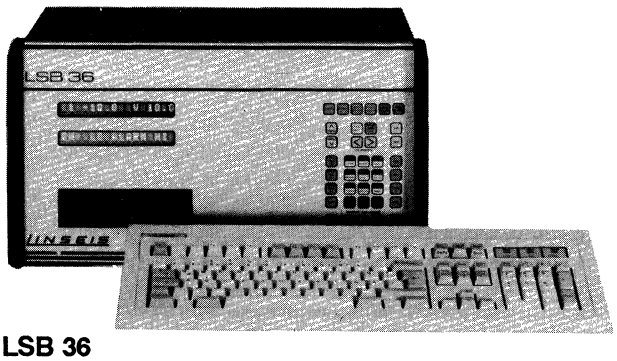
LY 1400 / LY 1500 / LY 1600
Universal standard XY-recorders
High writing speed, US-format 7x10 inch
Stable construction, powerfull, solid construction



LY 1900 PL
Fast XY-recorder combined with digital plotter to print out comments to analog curves, Time base generator
Exchangeable modules for XY-operation



L 6510 / L 6530
Economy standard flatbed recorder
Linearized thermocouples (Type S, K, J, T)
Special input module to measure humidity



LSB 36
Scanner / Hybrid Recorder
Datalogger function, User scaling, Seperate channel programming, 1.52 sec sampling for all 36 channels

L 4100 / L 4000
Digital flatbed recorder
5 functions in one: Chart recorder, Temperature recorder, XY-recorder, Plotter, Computer-front end

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- Single and Dual Channel Models
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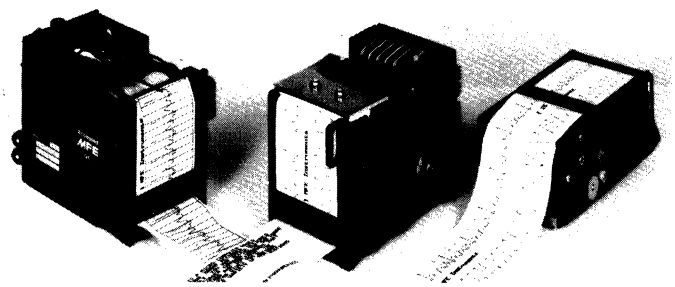
- DC or Stepper Motor



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New Generation of Thermal Array

- High Resolution Printhead
- Waveforms/Alphanumerics
- Analog and Digital Inputs
- Graphics
- IBM Compatible

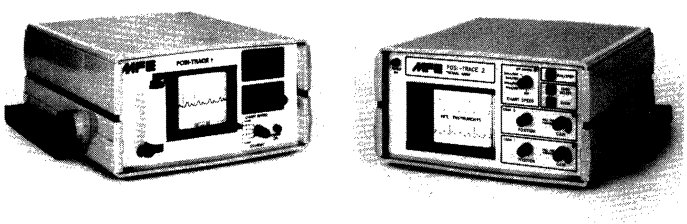
COMPACT END USER RECORDERS

Low-Cost, Versatile, User Friendly

POSI-TRACE 1

Thermal Stylus

- High Quality Pen Motor and Stylus
- Multiple Chart Speeds
- Proven Performance
- 40mm Chart Width



POSI-TRACE 2 NEW

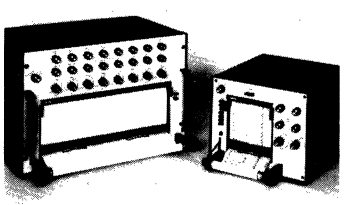
New End User Thermal Array

- High Resolution Printhead
- Single, Dual, and Dual Overlapping Modes
- Analog and Digital Inputs
- Alphanumerics and Graphics
- IBM Compatible
- Battery Power Optional

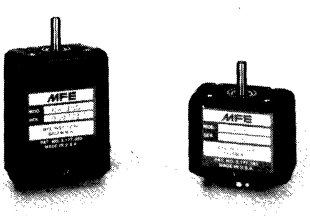
1000 SERIES MULTI-CHANNEL END USER RECORDERS

High Performance/Low-Cost

- Thermal Stylus
- Two Through Eight Channel Models
- Wide Sensitivity Range
- Two-Year Warranty
- Multiple Chart Speeds
- Portable and Rackmount



LIMITED ROTATION MOTORS



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Applications:

- Pen Motors
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- Bar Code Readers
- Actuators
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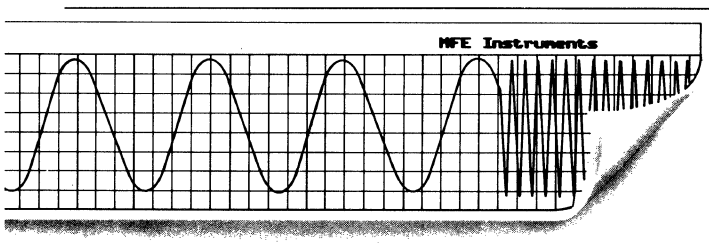

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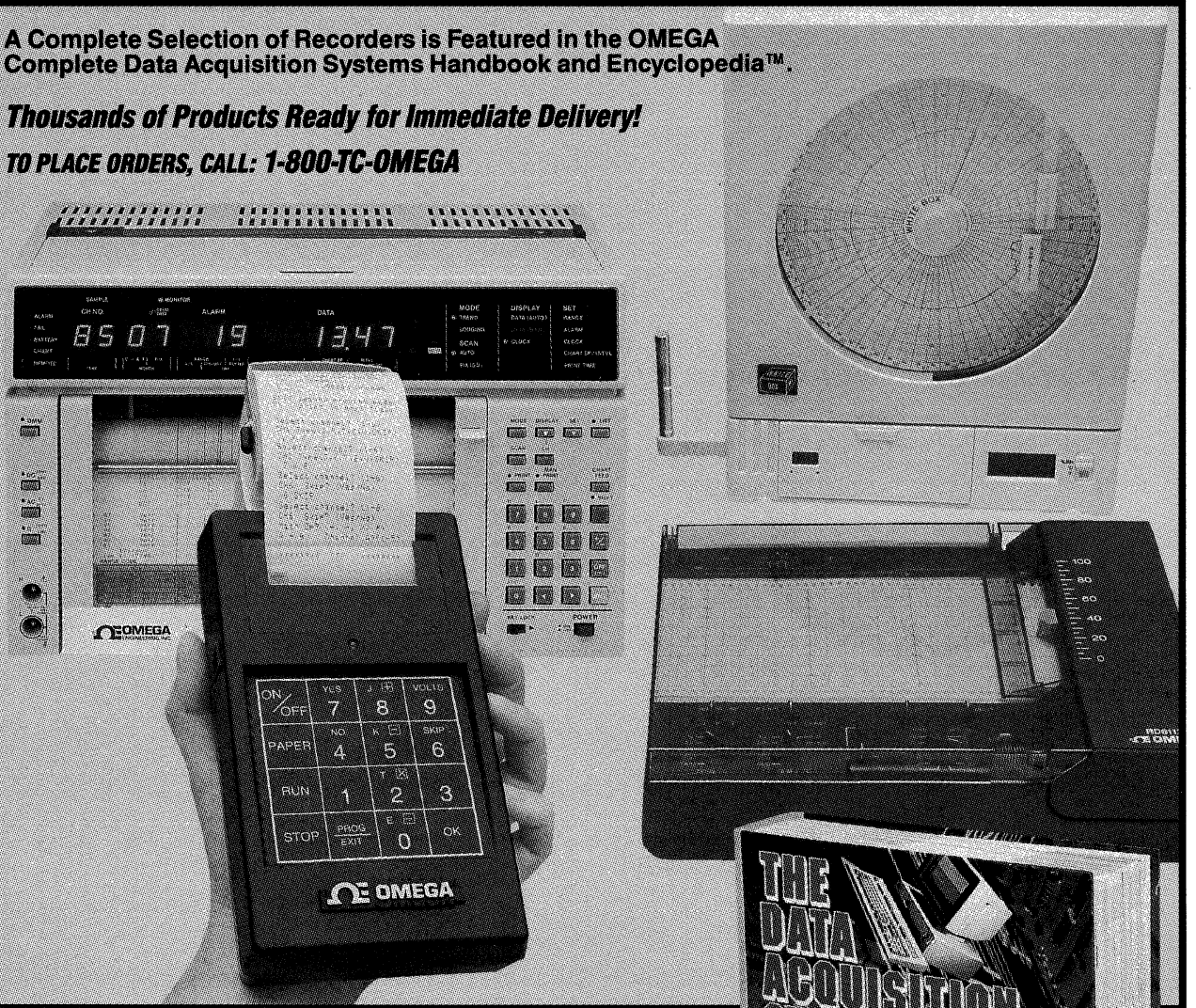

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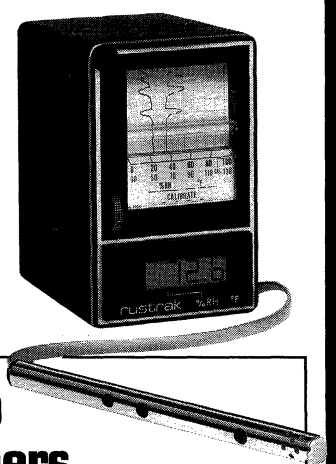
rustrak®

RECORDERS AND DATA LOGGERS...

FOR ALL YOUR RECORDING NEEDS, THINK RUSTRAK



Rustrak Ranger Data Loggers

Rustrak Ranger data loggers are microprocessor-based recording, reporting and analyzing systems. Data is collected, stored in memory and then transferred to a PC. Recording can take place for a year or more. Rangers are rugged enough for use in the harshest environments; their battery operation and compact size also make them ideal for use in remote locations or where space is limited. Easily programmed through just two keys, the Ranger's LCD prompts the operator during the set-up sequence. Pronto software, included free with every data logger, is used for plotting, analyzing, hard copy reporting and storage of the data. Accessories include input modules, probes and tamper-proof and weatherproof enclosures. Available in a 4 channel or an 8 channel analog/digital model with 4 math channels.

Rustrak Strip Chart Recorders

For over 30 years, Rustrak has produced the most comprehensive strip chart recorder line in the industry for the accurate and dependable recording of trend data. Compact size makes Rustrak the ideal choice for portable applications and for areas where space is limited. Packaged in 1 to 3 channel or 100 mm configurations, the recorders are used for recording input signals such as dc voltage and current, ac voltage and current, temperature, humidity, pressure, events and more. Over 350 combinations of writing and chart speed are available. Available with or without digital display. Continuous recording from 10 minutes to 1500 days on one roll of paper. Accuracy as low as 1% of span and response time as fast as .25 second. Standard features include interchangeable gear trains, access window, chart advance, tear-off or reroll mode, a rugged finish, and mounting brackets.

For a catalog and the name of your nearest distributor

rustrak®
A MARK IV COMPANY
Rt. 2 & Middle Road East Greenwich Rhode Island 02818
401-884-6800 • 800-332-3202 • TWX: 710-387-1500

CALL 800-332-3202

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

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AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
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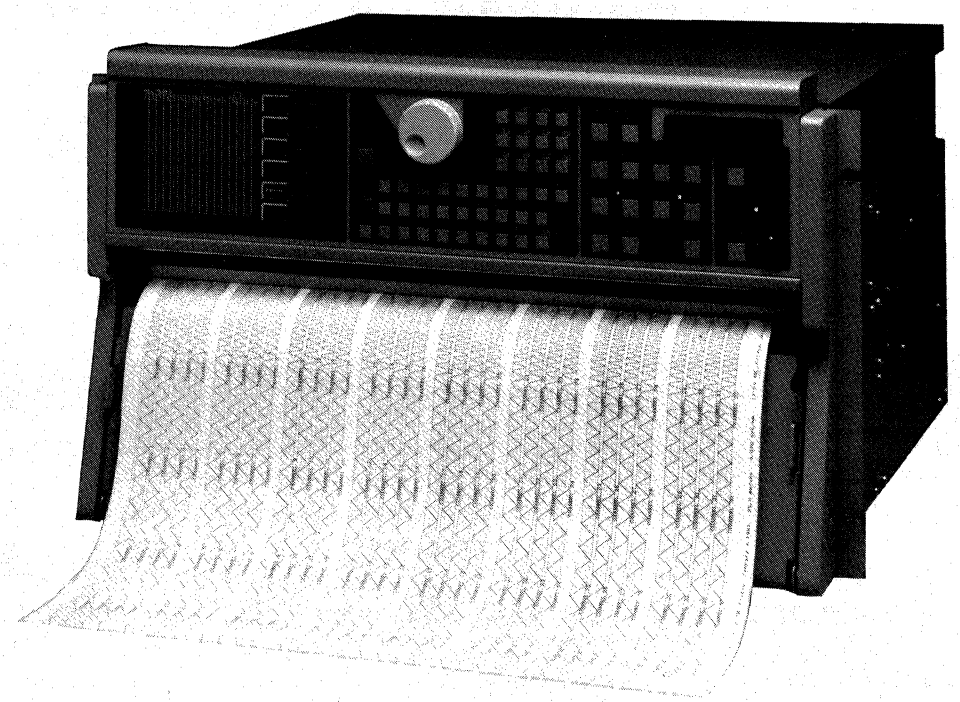
Wow! That Must Be a Western Graphtec Recorder...



Western Graphtec has the right technology for every challenge: high performance ***Arraycorders*** *with four to 32 channels, as well as a wide selection of field portable models. Proven* ***Pen Recorders*** *from one to twelve channels, made for lab and field use. A comprehensive line of* ***Servocorders****, now including some of the most modern digital models.* ***Multicorders*** *and* ***Hybrid Recorders*** *for every budget.* ***X—Y Recorders****, and* ***Data Acquisition Systems****...and so much more.*

And yet despite all of our science and technological innovations, we never forget that high tech was supposed to make our lives easier—not more difficult. Western Graphtec: dedicated to the ***Science of Simplicity.***

Shown above, the remarkable new Mark 12 Data Management System. Combining the best features of paper-based recorders and computer-based data acquisition systems:

- *4 to 32 channels—each with 20kHz bandwidth*
- *Built in video monitor*
- *SCSI port for streaming data to disk in real-time.*
- *Design-your-own-charts and grids versatility*
- *2 million sample battery-backed memory*

We even created our own printhead—a single 15" array which eliminates the data gap suffered by 2-headed recorders. Completely designed and built right here in the USA with a two year warranty on everything. That's power. That's Western Graphtec.

GRAPHTEC

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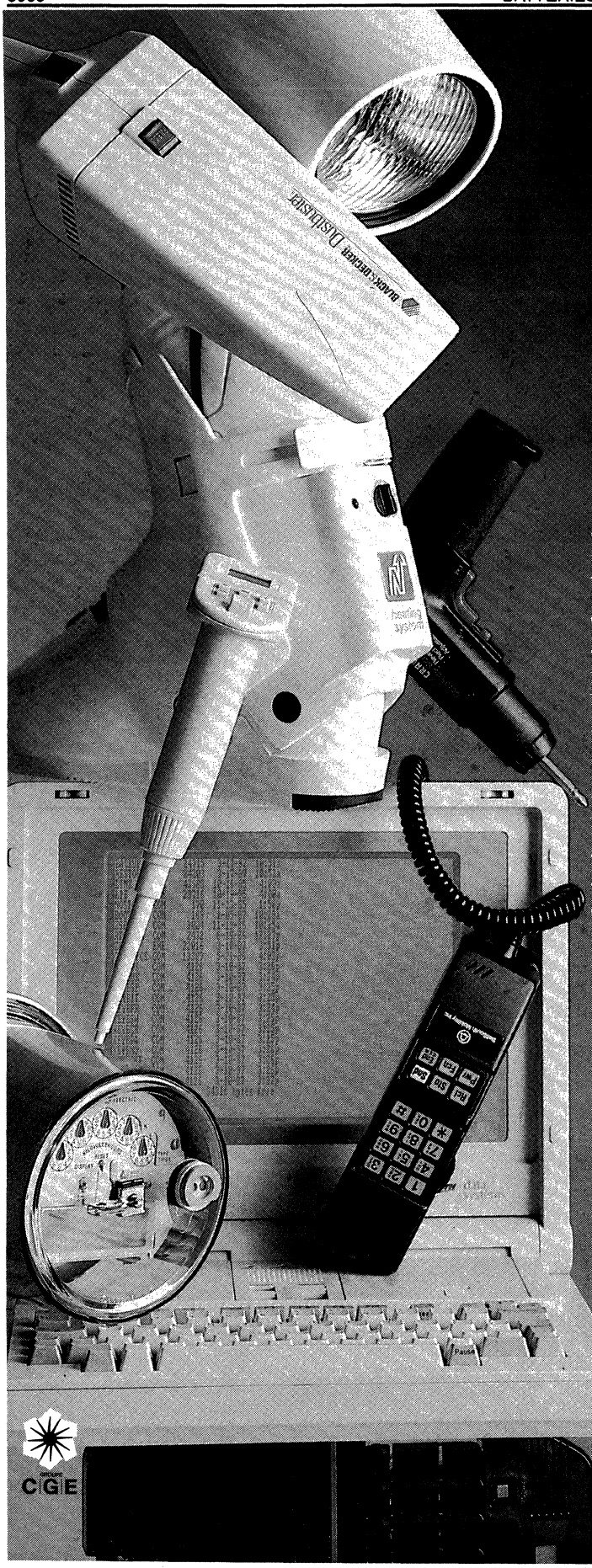
WESTERN GRAPHTEC, INC.

Western Graphtec, Inc. 11 Vanderbilt, Irvine, CA U.S.A. 92718 Toll-free: (800) 854-8385 or (714) 770-6010 FAX: (714) 855-0895



SAFT BATTERIES. ONE FOR ALL. ALL FROM ONE.

Powering the portable electronics of the 80's has been a major problem for product design engineers. And the 90's will be even more challenging. But there is a one source supplier who can meet almost any portable power design challenge. With the industry's broadest line of Nicad® batteries and a variety of lithium chemistries, SAFT allows today's design engineer to design portability into a broad spectrum of electronics, from simple toys to sophisticated computers. And, best of all, this full range of portable power is available from a single source–one order, one shipment, one invoice.

For more information on our complete line of Nicad batteries, contact SAFT America Inc., Portable Battery Division, 711 Industrial Boulevard, Valdosta, Georgia 31601, or call (912) 247-2331. For information on our variety of lithium chemistries, contact SAFT America Inc., Advanced Battery Systems Division, 107 Beaver Court, Cockeysville, Maryland 21030, or call (301) 771-3200.

SAFT

CGE

PRIMARY BATTERIES

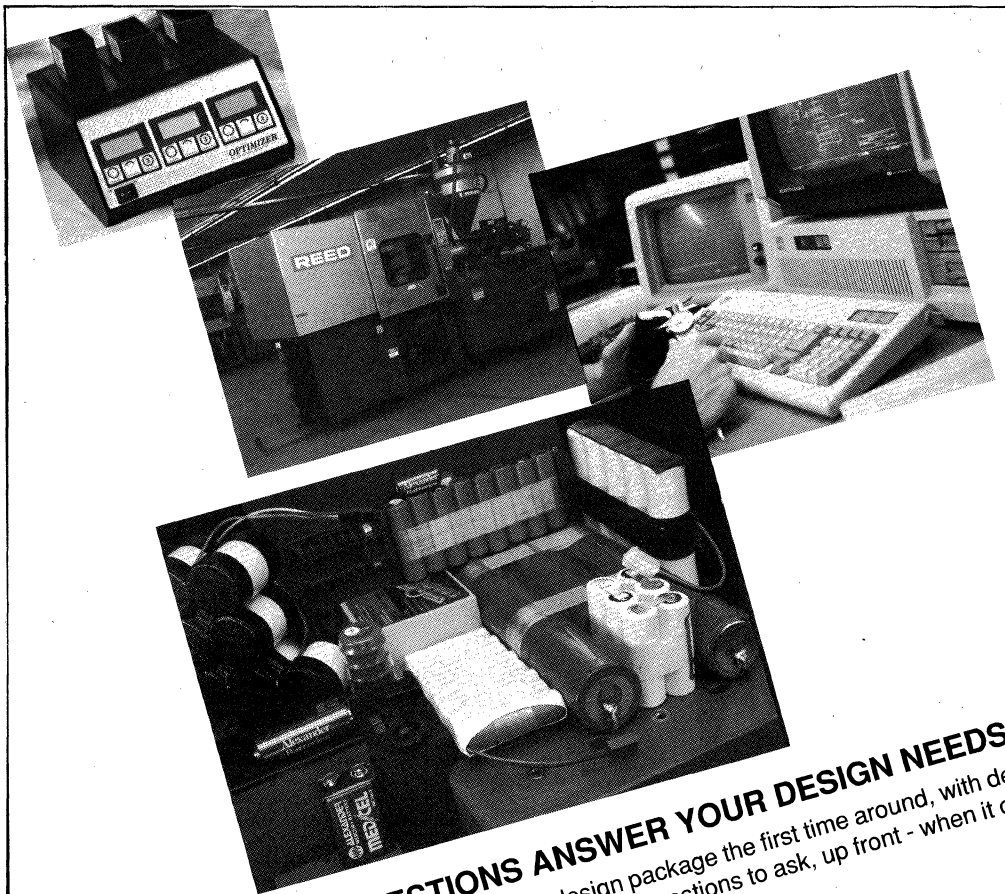
Manufacturer	Starting EEM Page No.	Carbon Zinc	Mercury Oxide	Manganese Dioxide	Alkaline Manganese	Silver Oxide	Zinc Air	Zinc Carbon	Zinc Chloride	Lithium					Other types
										Carbon Monofluoride	Sulphur Dioxide	Thionyl Chloride	Iodine	Manganese Dioxide	
Alexander Batteries	D•1431	√	√		√	√			√	√	√	√	√	√	
Avex Electronics Inc.	D•1432			√	√						√	√		√	Lithium Copper Oxyphosphate
Battery Engineering	D•1435											√			
Cell-Con	D•1436				√									√	
Duracell, Inc	D•1439		√		√	√	√			√	√	√	√	√	
Eagle-Picher	D•1444									√		√			
Electrochem Industries	D•1451											√		√	Lithium Bromine; Lithium Sulfuryl Chloride
Engineered Assemblies & Components Corp.	D•1452	√	√		√	√	√		√	√	√	√	√	√	
Eveready Battery Co.	D•1456	√	√	√	√	√	√	√	√					√	
Gould Inc., Foil Div.	D•1466													√	
Lyntronics	D•1467		√		√	√				√	√	√		√	Mil Spec, High rate
Panasonic Industrial Co.	D•1470			√	√					√				√	
Plainview Batteries Inc.	D•1476				√					√	√	√		√	Lithium Copper Sulphide
Power Conversions Inc.	D•1480									√	√	√		√	
Saft America Inc.	D•1486										√	√		√	
Sanyo Energy Corp.	D•1489				√									√	
Seiko Instruments	D•1490											√			
Shogyo Int'l Corp.	D•1491		√			√		√							
Tadiran Electric Industries Inc.	D•1493											√			
Tauber Electronics Inc.	D•1496	√	√	√	√	√	√	√	√	√	√	√	√	√	Lithium Oxyhalide
Varta Batteries Inc.	D•1497		√		√	√	√							√	Primary Coin Cells

SECONDARY BATTERIES (RECHARGEABLE)

Manufacturer	Starting EEM Page No.	Lead Acid	Nickel Cadmium	Silver Oxide Zinc	Nickel Iron	Silver Oxide Cadmium	Carbon Lithium	Gas Recom-binant	Copper Oxide Lithium	Other Types
Alexander Batteries	D•1431	√	√							
Avex Electronics Inc.	D•1432	√	√							
Cell-Con Inc.	D•1436		√							
CSB/USA (Taiwan Kobe Battery Co., Ltd.)	D•1437	√								
Eagle-Picher	D•1444	√	√							
Engineered Assemblies & Components Corp.	D•1452	√	√							
Eveready Battery	D•1456		√							
Gates Energy	D•1458	√	√					√		Nickel-Metal Hydride
Lyntronics	D•1467	√	√	√		√	√	√	√	Mil-Spec, High rate
Panasonic Industria Co.	D•1470	√	√							Lithium Pentoxide
Plainview Battery Inc.	D•1476	√	√				√	√		Lithim Mang-anese Dioxide
Power-Sonic Corp.	D•1483	√	√							
Saft America Inc.	D•1486		√							
Sanyo Energy Corp.	D•1489		√							Nickel Metal Hydride
Seiko Instruments	D•1490									Polymer Lithium Battery
Shogyo Int'l. Corp.	D•1491		√			√				
Tauber Electronics Inc.	D•1496	√	√	√		√	√	√	√	
Varta Batteries Inc.	D•1497		√							Single cells
Yuasa Battery Inc.	D•1499	√	√					√		

BATTERY ACCESSORIES & SERVICES OF VALUE ADDED DISTRIBUTORS (VARs)

Manufacturer	Starting EEM Page No.	Value Added Reseller		Battery Accessories				Other
		Custom Design	Custom Assembly	Chargers	Analyzers	Holders	Clips	
Alexander Batteries	D•1431	√	√	√	√	√	√	
Avex Electronics Inc.	D•1432	√	√					
Battery Engineering	D•1435	√	√					
Lyntronics	D•1467	√	√					
Memory Protection Devices	D•1469	√				√		
Plainview Batteries Inc.	D•1476	√	√	√		√	√	
Power Dynamics Inc.	D•1484	√	√			√	√	
Power Sonic	D•1483	√	√	√				
Sanyo Energy	D•1489	√	√	√		√	√	Solar cells
Seiko Instruments	D•1490	√	√			√		
Shogyo Int'l Corp.	D•1491			√		√	√	
Tadiran Elctrn. Inds. Inc.	D•1493	√						
Tamura Corp.	D•1494			√				
Tauber Electroncis Inc.	D•1496	√	√	√	√	√	√	
Yuasa Battery	D•1499	√	√	√				



OUR KEY QUESTIONS ANSWER YOUR DESIGN NEEDS

You'll get the right battery design package the first time around, with delivery to meet your schedule. We know the right questions to ask, up front - when it counts.

23 years experience

Each year Alexander:

- Grades and sorts more than seven million nickel-cadmium cells.
- Assembles more than three million batteries.
- Produces 16 million mercury cells.
- Welcomes FDA inspections.
- Manufactures sophisticated nickel-cadmium battery chargers and analyzers/conditioners.

In-house packaging

Alexander Batteries are packaged with your choice of casing including:

- Shrink-wrapped insulation vinyl.
- Custom-design vacuum formed.
- Custom-designed injection molded. Tools and dies are produced 'in-house'.

Major suppliers

- Alexander
- Emmerich
- Eveready
- Gates (GE)
- Panasonic
- Powersonic
- Rayovac
- Saft
- Sanyo
- Varta

Electrochemical systems

- Alkaline
- Carbon Zinc
- Lithium
- Mercury
- Nickel-Cadmium
- Lead Acid
- Silver Oxide
- Zinc Chloride

Call, fax or write for additional information and design assistance.

Alexander® Batteries

New Product / OEM Division
P.O. Box 28880, San Diego, CA 92128
PH: 619-480-4445, FAX: 619-480-1351

AVEX CORPORATION

PORTABLE BATTERY DIVISION

...YOUR PARTNER(S) FOR PORTABLE POWER

*At AVEX, every day is **Earth Day.** To help you promote a better **environment,** AVEX will accept your used NICAD cells and packs for **disposal.** There will be **no charge** for this service, although shipping charges must be prepaid.*

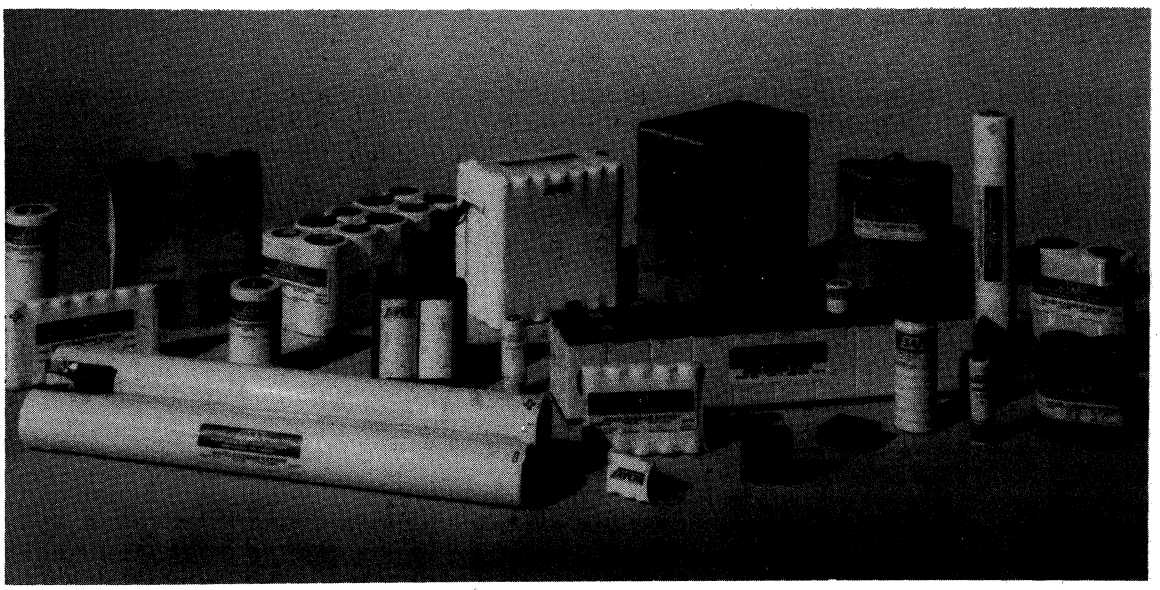
AVEX is the largest SAFT INC. contract value-added distributor and assembler for NICAD™ and LITHIUM batteries and BATTERY PACKS in the U.S. From sales to engineering to service, the people at AVEX PORTABLE BATTERY await your call. We are eager to be of service.

— SEE THE NEXT TWO PAGES —

FOR IMMEDIATE DELIVERY CALL TOLL-FREE 1-800-345-1295 (OUTSIDE PA)

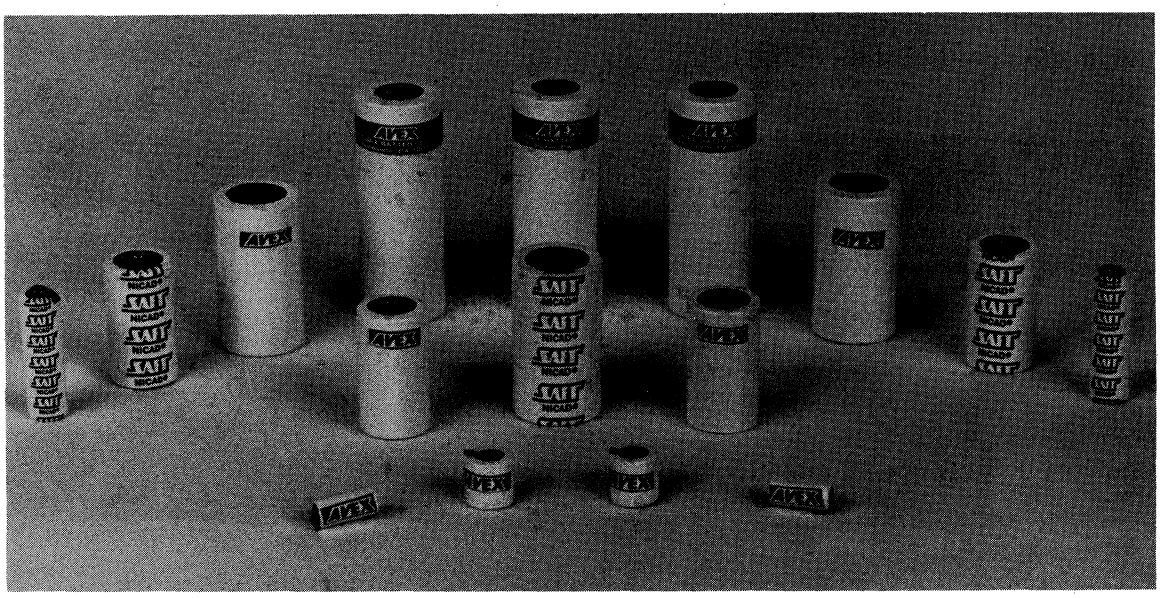
FAX 1-215-638-9108 **1-215-638-1515 (IN PA)**

AVEX . . . YOUR PARTNER FOR PORTABLE POWER



CUSTOM PACKS™

AVEX manufactures, assembles, and tests a wide variety of battery packs, custom designed to fit your most exacting specifications. Both AVEX/SAFT, NICAD and LITHIUM Batteries are offered. Voltage ratings from 1.2 on up. Current capacities from 10 mAh to 10 Ah. Contact your AVEX salesperson for more details.



NICAD™

AVEX distributes the full SAFT line of NICAD batteries, from a 1/3AA cell rated at 0.110 mAh to a super F cell rated at 10.0 Ah. AVEX's complete range of batteries includes standard cells, high temperature Polytemp™ cells and the fast charge, low resistance VR series of cells. AVEX has a cell available to solve even the most difficult battery requirement. Additional information on any of these products is available from our office.

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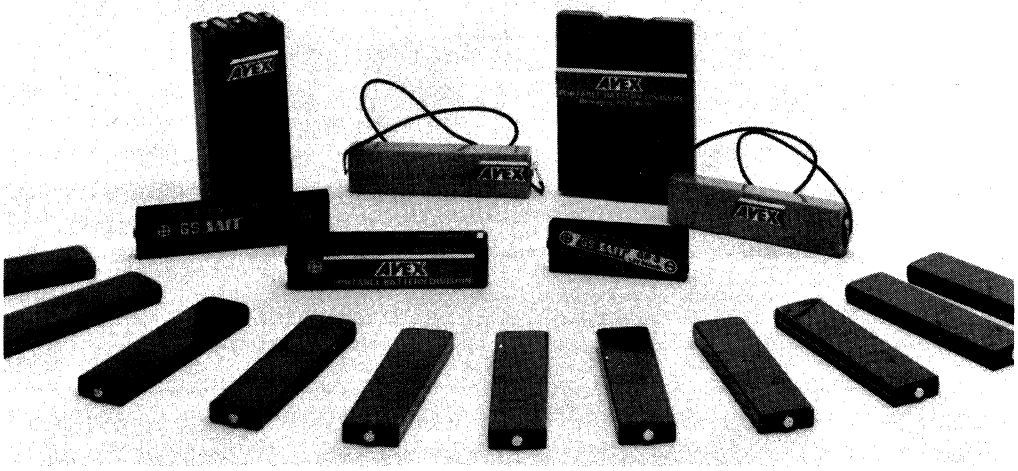

AVEX/SAFT Introduces The World's First *Flat* Nicad Cell!

PRISMATIC NICAD CELL'S G.P. SERIES

THIS FLAT CELL DESIGN AFFORDS 30% HIGHER VOLUME EFFICIENCY when compared to regular cylindrical cells. G.P. SERIES cells can be made into a multitude of packs. Cells range from 360 mAh = GP4, 540 mAh = GP6, 765 mAh = GP9, and 1800 mAh = GP20. Consult your AVEX salesperson for more details.

LITHIUM

AVEX/SAFT lithium batteries offer performance characteristics unequalled by other battery types: exceptional shelf life, high cell voltages, wide operating temperature ranges and the highest energy densities. There are a variety of cell chemistries available to assure a proper fit between application and battery: LS-Lithium/Thionyl Chloride Batteries, 3.5V, −40 to +70°C; LX-Lithium/Sulfur Dioxide Batteries, 2.95V, −55 to +70°C; LC-Lithium/Copper Oxide Batteries, 1.5V, −40 to +70°C; LCP-Lithium/Copper Oxyphosphate Batteries, 2.4V, −40 to +75°C; LM-Lithium/Manganese Dioxide Batteries 3.0V, −20 to + 55°C. These different chemistries are available in a number of sizes and shapes. Capacity at 70°F. 24 hr. rate. Additional information on any of these products is available from our offices.

AVEX ELECTRONICS CORPORATION

PORTABLE BATTERY DIVISION

P.O. Box 1026 • 1683 Winchester Rd. • Bensalem, PA 19020
1-215-638-1515 (in PA) • FAX 1-215-638-9108

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FREE CATALOG ON REQUEST

CHARACTERISTICS OF BATTERIES AND FUEL CELLS

System	Anode	Cathode	Theoretical battery		Practical battery		
			Voltage, V	Capacity, Ah/kg	Typical voltage, V	Capacity[a]	
						Wh/kg	Wh/dm³
Primary:							
Leclanche	Zn	MnO_2	1.6	230	1.2	65	175
Magnesium	Mg	MnO_2	2.0	270	1.5	100	195
Organic cathode	Mg	*m*-DNB	1.8	1,400	1.15	130	180
Alkaline MnO_2	Zn	MnO_2	1.5	230	1.15	65	200
Mercury	Zn	HgO	1.34	185	1.2	80	370
Mercad	Cd	HgO	0.9	165	0.85	45	175
Silver oxide	Zn	AgO	1.85	285	1.5	130	310
Zinc-air	Zn	Air (O_2)	1.6	815	1.1	200	190
Li-organic electrolyte	Li	[b]	2.1-5.4	130-660	1.8-3.2	250	400
Secondary:							
Lead-acid	Pb	PbO_2	2.1	55	2.0	37	70
Edison	Fe	Ni oxides	1.5	195	1.2	29	65
Nickel-cadmium	Cd	Ni oxides	1.35	165	1.2	33	60
Silver-zinc	Zn	AgO	1.85	285	1.5	100	170
Silver-cadmium	Cd	AgO	1.4	230	1.05	55	120
Zinc-nickel oxide	Zn	Ni oxides	1.75	185	1.6	55	110
Zinc-air[c]	Zn	Air (O_2)	1.6	815	1.1	150	155
Cadmium-air[c]	Cd	Air (O_2)	1.2	475	0.8	90	90
Zinc-O_2	Zn	O_2	1.6	610	1.1	130	120
H_2-O_2	H_2	O_2	1.23	3,000	0.8	45	65
Reserve:							
Cuprous chloride	Mg	CuCl	1.5	240	1.4	45	65[d]
Silver-chloride	Mg	AgCl	1.6	170	1.5	60	95[d]
Zinc-silver oxide	Zn	AgO	1.85	285	1.5	30	75[e]
Thermal	Ca	[b]	2.8	240	2.6	10	20[f]
Ammonia-activated	Mg	*m*-DNB	2.2	1,400	1.7	22	60[g]
High-	NA	S	2.1	685	1.8	200	[h]
temperature	Li	S	2.2	1,150	1.8	200	[i]
Solid electrolyte	Ag	Polyiodide	0.66	. . .	0.6	180	75[j]
Fuel cell:							
Hydrogen[c]	H_2	Air	1.23	26,000	0.7		[k]
Hydrazine[c]	N_2H_4	Air	1.5	2,100	0.7	800[b]	[l]
Methanol[c]	CH_2OH	Air	1.3	1,400	0.9	175[b]	185[m]

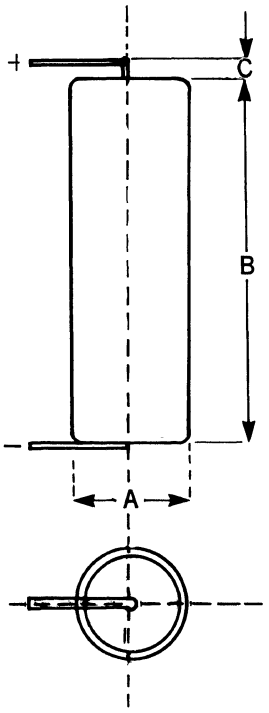
a Delivered capacity when discharged at normal temperatures (20°C) at normal discharge rates.
b Based on fuel consumption only.
c Weight of air not considered in computation of watt hours.
d Water-activated
e Automatically activated; high rate discharge; 2- to 10-min rate.
f Fused salt; heat-activated; high rate discharge; 2- to 10-min rate.
g Four-minute discharge rate.
h β-alumina electrolyte, 300°C operation.
i Fused salt; 350°C operation.
j Solid $RbAg_4I_5$ electrolyte.
k Several different cathode materials used.
l Fuel consumption is based on source of H_2.
m Based on methanol battery-fuel supply in situ.

BEI LITHIUM THIONYL CHLORIDE CELLS

"PRIMACELL" FEATURES

- Hermetic all-welded 304 SS construction
- Reinforced glass-to-metal seals
- Long shelf life
- 3.6V cell voltage
- Stable operating voltage
- 100% inspection
- Suitable for medical and military applications
- 200°C operation available

GENERAL PURPOSE TYPES (−55 to +100°C)



BEI Type	Capacity (Ampere-hours)	A (mm)	B (mm)	C (mm)	Weight (grams)
10-12	.14	10	12	3	2.7
10-18	.30	10	18	3	3.8
10-35	.75	10	35	3	6.5
10-42 (AAA)	.90	10	42	3	7.6
10-54	1.20	10	54	3	8.5
13-38	1.30	13	38	3	12.
14-24 (1/2AA)	.85	14	24	3	10.
14-48 (AA)	1.80	14	48	3	19.
26-48 (C)	7.0	26	48	0	52.
26-102 (CC)	16.0	26	102	0	100.
33-60 (D)	12.0	33	60	0	105.
33-120 (DD)	28.0	33	120	0	220.
64-152 (#6)	135.	64	152	0	950.

HIGH TEMPERATURE TYPES (−40 to +150°C)*

BEI Type	Capacity (Ampere-hours)	A (mm)	B (mm)	C (mm)	Weight (grams)
14-50HT (AA)	1.6	14	50	3	19
26-48HT (C)	6.0	26	48	0	52
26-102HT (CC)	14.0	26	102	0	100
33-60HT (D)	11.0	33	60	0	105
33-127HT (DD)	24.0	33	127	0	220

*ALSO, TO 200°C AVAILABLE

ALSO AVAILABLE:

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- **PACKAGING OF CELLS INTO CUSTOM BATTERY PACKS**

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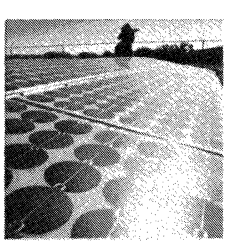
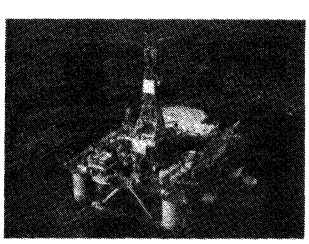
- Lead Calcium Grid Design
- Usable in any Position
- Starved Electrolyte Design
- Cyclical or standby application
- No Memory Effect
- Gas Recombination Technology

® MH14533

BATTERY CSB MODEL	STANDARD TERMINAL (Optional)	NOMINAL VOLTAGE (V)	NOMINAL CAPACITY (AH)	DIMENSIONS								WEIGHT (Approx.)	
				L		W		H		H (Over Terminal)			
				mm	in.	mm	in.	mm	in.	mm	in.	Kgs.	Lbs.
GP612	F1	6	1.2	97	3.82	25	0.98	51	2.01	57	2.24	0.28	.62
GP630	F1	6	3.0	134	5.28	34	1.34	60	2.36	66	2.60	0.62	1.40
GP640	F1(F2)	6	4.0	70	2.76	45	1.77	101	3.98	107	4.21	0.83	1.83
GP642	F1(F2)	6	4.2	70	2.76	48	1.89	102	4.01	108	4.25	0.80	1.76
GP665	F1(F2)	6	6.5	151	5.94	34	1.34	94	3.70	100	3.94	1.2	2.6
GP680	F1(F2)	6	8.0	151	5.94	50	1.97	94	3.70	100	3.94	1.7	3.8
GP6100	F1(F2)	6	10.0	151	5.94	50	1.97	94	3.70	100	3.94	1.9	4.2
GP1212	F1	12	1.2	98	3.86	48	1.89	51	1.99	57	2.24	0.56	1.2
GP1220	F1	12	2.0	178	7.01	34	1.34	60	2.36	66	2.60	0.93	2.06
GP1230A	F1	12	3.0	134	5.27	69	2.72	60	2.36	66	2.60	1.2	2.64
GP1240	F1(F2)	12	4.0	90	3.54	70	2.75	101	4.01	107	4.21	1.7	3.74
GP1270	F1(F2)	12	7.0	151	5.94	65	2.56	94	3.70	100	3.94	2.5	5.5
GP12100A	F1(F2)	12	10.0	151	5.94	101	3.98	94	3.70	100	3.94	3.8	8.36
GP12150	B1(F2)	12	15.0	181	7.13	76	2.99	167	6.57	167	6.57	6.1	13.5
GP12240	B1(F2)	12	24.0	166	6.53	175	6.89	125	4.92	125	4.92	9.0	19.8
GP12380	B2	12	38.0	197	7.76	165	6.50	170	6.69	170	6.69	14.5	30.9

TERMINALS - F1) FASTON TYPE .187 F2) FASTON TYPE .250 B1) M5 BOLT & NUT B2) LEAD POST/M5 BOLT & NUT
CASE MATERIAL - (UL1778) 94V-2 AVAILABLE JANUARY 1, 1992 BATTERIES DESIGNATED AS "FR" SERIES
AIR TRANSPORTATION - CSB BATTERIES ARE CLASSIFIED AS "DRY CHARGED" AND MAY BE SHIPPED BY AIR
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTIFICATION





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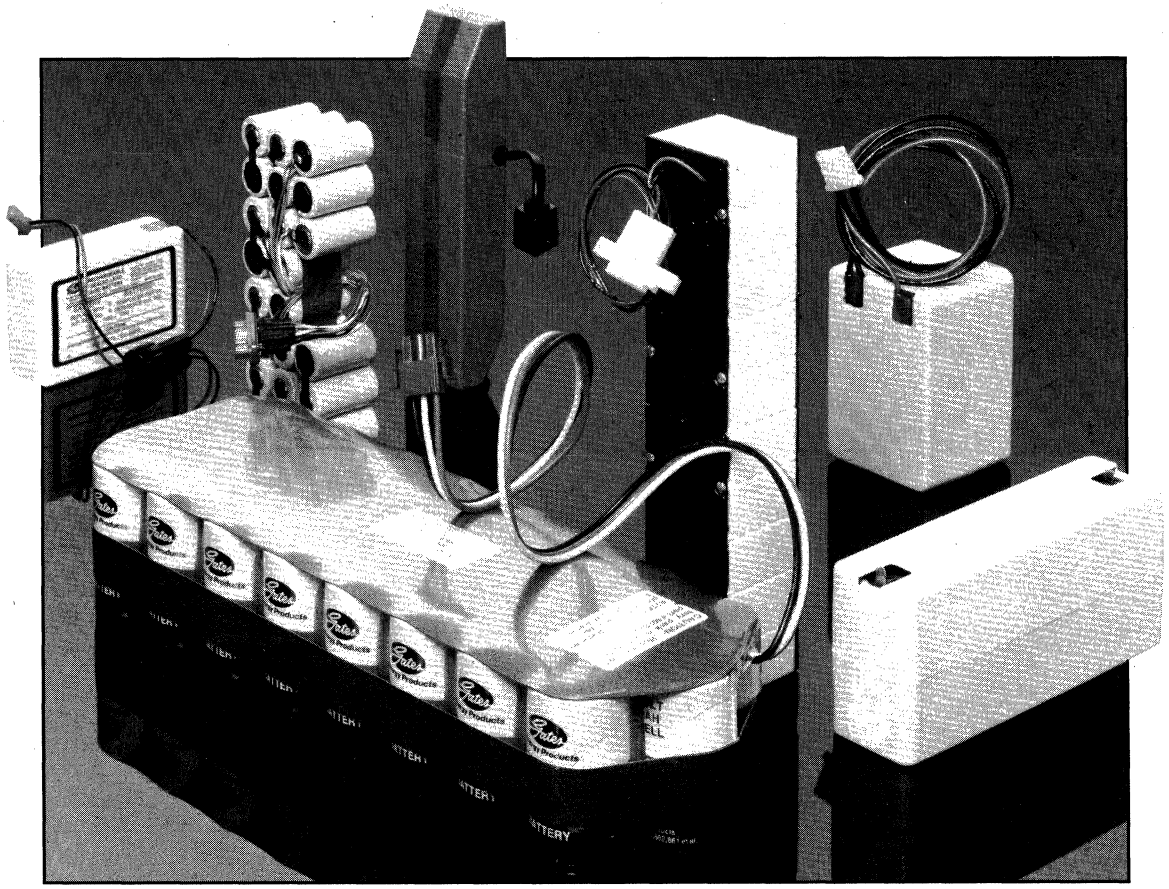
PORTABLE POWER



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SPECIFICATION SUMMARY

Premium Primary Batteries for OEM Applications:
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DURACELL *BATTERIES*

ALKALINE
CELLS & BATTERIES

DURACELL®alkaline-manganese dioxide batteries are the popular choice for most consumer, industrial and military applications where an economical, general purpose battery is required. Advantages include high energy output, reliability, long shelf life, and superior low temperature performance.(1) In standard sizes, the DURACELL® alkaline battery system is generally available in cylindrical and multicell configurations.

Duracell is committed to working with manufacturers in the design and production of tomorrow's electronic products. Our Sales Engineers can provide expert applications and product specifications assistance to help you match the optimum premium primary battery system to your requirements. We are also ready to assist you in developing your concepts into successful products by offering global supply and distribution information and production launch support. If you have additional questions, or would like to discuss your applications with one of our Sales Engineers, please contact Duracell. To receive detailed information on a particular battery system, or on a specific battery product, call (800) 431-2656 for the latest technical literature. We would appreciate hearing from you.

	DURACELL PRODUCT NUMBER	SIZE	NOMINAL VOLTAGE (V)	RATED CAPACITY(2) (mAh)	RATED VOLTAGE CUTOFF (V)	RATED LOAD (OHMS)	APPROX. DRAIN (mA)	DIMENSIONS(4) MAXIMUM in.	MAXIMUM mm	MAXIMUM in.	MAXIMUM mm	MAXIMUM in.	MAXIMUM mm	AVERAGE WEIGHT oz.	AVERAGE WEIGHT g	AVERAGE VOLUME in.³	AVERAGE VOLUME cm³	TERMINALS(3)	CROSS REFERENCE NEDA/ ANSI	CROSS REFERENCE IEC
	CYLINDRICAL CELLS-STANDARD PRODUCTS							**DIAMETER**		**HEIGHT**										
	MN1300	D	1.5	14,250	0.8	4.7	235	1.346	34.20	2.421	61.50	—	—	4.71	133.5	3.29	54.0	F	13A	LR20
	MN1400	C	1.5	7,100	0.8	10.0	110	1.031	26.20	1.969	50.00	—	—	2.32	65.8	1.59	26.0	F	14A	LR14
	MN1500	AA	1.5	2,450	0.8	24.0	50	0.571	14.50	1.988	50.50	—	—	0.80	22.7	0.46	7.5	F	15A	LR6
	MN2400	AAA	1.5	1,120	0.8	160.0	8	0.413	10.50	1.752	44.50	—	—	0.38	10.8	0.22	3.6	F	24A	LR03
	MN9100	N	1.5	800	0.8	100.0	12	0.472	12.00	1.189	30.20	—	—	0.34	9.5	0.19	3.1	F	910A	LR1
	OTHER SELECTED MULTICELL BATTERIES - STANDARD PRODUCTS							**LENGTH**		**HEIGHT**		**WIDTH**								
	MN1203	–	4.5	4,400	2.4	20	175	2.441	62.00	2.638	67.00	0.866	22.00	5.43	154.0	4.88	80.0	TL	706A	3LR12
	7K67	J	6.0	565	3.2	340	14	1.400	35.56	1.900	48.26	0.360	9.14	1.20	34.0	0.92	15.0	RF	1412AP	4LR61
*	MN908	LANTERN	6.0	13,000	3.2	15	290	2.665	67.69	4.312	109.52	2.665	67.69	21.60	612.0	29.75	487.5	CS	908A	–
*	MN918	LANTERN	6.0	27,000	3.2	9	490	5.365	136.27	4.937	125.40	2.865	72.77	44.80	1,270.0	72.04	1,180.6	IS	918A	–
	MN1604	9-VOLT	9.0	565	4.8	510	14	1.043	26.50	1.938	49.20	0.688	17.50	1.62	45.9	1.28	21.0	MS	1604A	6LR61
	MN21	CYLINDRICAL	12.0	33	6.0	20K	.50	0.406	10.32	1.122	28.50	–	–	0.26	7.6	0.15	2.4	F	1811A	–
	OTHER SELECTED MULTICELL BATTERIES - INDUSTRIAL PRODUCTS							**LENGTH**		**HEIGHT**		**WIDTH**								
*	PC908	LANTERN	6.0	13,000	3.2	15	290	2.665	67.69	4.312	109.52	2.665	67.69	21.60	612.0	29.75	487.5	CS	908AC	–
*	PC915	LANTERN	6.0	13,000	3.2	15	290	2.665	67.69	4.350	110.49	2.665	67.69	21.60	612.0	29.20	478.5	IS	915AC	–
*	PC918	LANTERN	6.0	27,000	3.2	9	490	5.365	136.27	4.937	125.40	2.865	72.77	44.80	1,270.0	72.04	1,180.6	IS	918AC	–
*	PC903	LANTERN	7.5	40,000	4.0	10	650	7.250	184.15	3.749	95.22	4.062	103.17	78.40	2,222.6	106.00	1,737.0	IS	903AC	–

(1) Operating temperature range is -4°F (-20°C) to 130°F (54°C)
(2) Rated at 70°F (21°C). Typical capacities can be higher based on user's particular application.
(3) Terminal code: F-flat; S-snap; RF-recessed flat; CS-coiled springs; IS-insulated screw; MS-miniature snap; TL-tab leads.
(4) Dimensions are IEC/ANSI standards.
* Dimensions are Duracell standards

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DURACELL®XL™ lithium/manganese dioxide (Li/MnO_2) batteries possess high energy density, high rate capability over a broad temperature range,[1] and excellent capacity retention determined at over 95% after five years at room temperature. DURACELL®XL™ Li/MnO_2 batteries are ideally suited for a wide range of uses, from supplying high current output for pulse-type applications to providing long-term standby power for memory retention.

Duracell is committed to working with manufacturers in the design and production of tomorrow's electronic products. Our Sales Engineers can provide expert applications and product specifications assistance to help you match the optimum premium primary battery system to your requirements. We are also ready to assist you in developing your concepts into successful products by offering global supply and distribution information and production launch support. If you have additional questions, or would like to discuss your applications with one of our Sales Engineers, please contact Duracell. To receive detailed information on a particular battery system, or on a specific battery product, call (800) 431-2656 for the latest technical literature. We would appreciate hearing from you.

For manufacturers' sales offices, see yellow pages

DURACELL PRODUCT NUMBER	SIZE	NOMINAL VOLTAGE (V)	TYPICAL VOLTAGE (V)	RATED CAPACITY[2] (mAh)	LOAD (OHMS)	APPROX. DRAIN (mA)	VOLTAGE CUTOFF (V)	MAX. DISCHARGE CURRENT (mA)		MAX. REVERSE CHARGING CURRENT[3] (mA)	DIMENSIONS				AVERAGE WEIGHT		AVERAGE VOLUME		TERMINALS (4)	CROSS REFERENCE
											MAXIMUM DIAMETER		MAXIMUM HEIGHT							NEDA/ ANSI
								(cont.)	(pulse)		in.	mm	in.	mm	oz.	g	$in.^3$	cm^3		
HIGH POWER CYLINDRICAL CELLS (SPIRAL-WOUND)																				
DL123A	1×2/3A	3.0	3.2-3.3	1,300	100	28.0	2.0	1,200	5,000	20	0.665	16.89	1.358	34.50	0.600	17.0	0.438	7.18	F	5018LC
DL2/3A	2/3A	3.0	3.2-3.3	1,300	100	28.0	2.0	1,200	5,000	20	0.669	16.99	1.333	33.86	0.600	17.0	0.438	7.18	F, PC	5017LC
DL1/3N	1/3N	3.0	3.2-3.3	160	2,700	1.0	2.0	20	80	2	0.457	11.61	0.425	10.80	0.116	3.3	0.069	1.13	F	5008LC
MICROLITHIUM™ CYLINDRICAL CELLS (BOBBIN)																				
DL1/2AAL	1/2AA	3.0	3.2-3.3	650	30,000	0.5	2.0	3	10	5	0.571	14.50	0.906	23.01	0.247	7.0	0.232	3.80	F, PC, T	5028LC
DLAAL	AA	3.0	3.2-3.3	1,900	15,000	1.0	2.0	4	20	15	0.571	14.50	1.988	50.50	0.600	17.0	0.509	8.34	F, PC, T	5042LC
MICROLITHIUM™ COIN CELLS																				
DL2016	—	3.0	3.2-3.3	70	10,000	0.3	2.0	4	15	8	0.787	20.00	0.063	1.60	0.060	1.7	0.031	0.49	F	5000LC
DL2025	—	3.0	3.2-3.3	140	10,000	0.3	2.0	3	15	8	0.787	20.00	0.098	2.50	0.088	2.5	0.048	0.79	F	5003LC
DL2032	—	3.0	3.2-3.3	180	10,000	0.3	2.0	3	15	8	0.787	20.00	0.126	3.20	0.106	3.0	0.061	1.00	F, PC, T	5004LC
DL2325	—	3.0	3.2-3.3	190	15,000	0.3	2.0	3	15	8	0.905	23.00	0.098	2.50	0.106	3.0	0.063	1.04	F, PC, T	5002LB
DL2430	—	3.0	3.2-3.3	270	10,000	0.3	2.0	3	20	10	0.965	24.50	0.118	3.00	0.141	4.0	0.086	1.41	F, PC, T	5011LC
DL2450	—	3.0	3.2-3.3	550	20,000	0.2	2.0	2	10	10	0.965	24.50	0.197	5.00	0.217	6.2	0.144	2.36	F, PC, T	5029LC
STANDARD BATTERIES																				
DL245	2×2/3A	6.0	6.4-6.6	1,300	200	28.0	4.0	1,200	5,000	20	[6]		[6]		1.400	39.7	1.320	21.70	F	5032LC
DL223A[5]	2×2/3A	6.0	6.4-6.6	1,300	200	28.0	4.0	1,200	5,000	20	[6]		[6]		1.340	38.0	1.340	20.10	F,C	5024LC
PX28L	2×1/3N	6.0	6.4-6.6	160	5,400	1.0	4.0	20	80	2	0.512	13.00	0.992	25.20	0.329	9.4	0.204	3.35	F, PC, T	1406LC

(1) Operating temperature range is – 40°F (– 40°C) to 140°F (60°C). Information on performance beyond this range available upon request.
(2) Rated at 68°F (20°C). Typical capacities can be higher based on user's particular application.
(3) Li/MnO_2 cells should not be charged. UL has established these values as the maximum current the cell will tolerate in the event of diode failure.
(4) Terminal code: F-flat; PC-printed circuit board pins; C-connector; T-tabs.
(5) DL223A is also available as DL223AR with wire leads, connector and Velcro patch for computer clock/calendar, and memory back-up applications.
(6)

	HEIGHT		WIDTH		THICKNESS	
	in.	mm	in.	mm	in.	mm
DL245	1.772	45.00	1.339	34.00	0.669	17.00
DL223A	1.417	36.00	1.378	35.00	0.768	19.50

Note: Contact Duracell for information regarding transportation and disposal.

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DURACELL *BATTERIES*

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CELLS & BATTERIES

When discharged on a continuous or frequent basis, DURACELL® zinc air cells and batteries deliver high energy density at a low operating cost compared to other primary systems. Zinc air batteries also provide a constant output voltage throughout their operating life and are well suited for various medical, communications and monitoring applications. Each cell and battery is sealed at the factory to provide a consistently fresh product to the end user. DURACELL® zinc air button cells can be designed and manufactured into multicell battery packs, capable of meeting specific electrical/mechanical requirements.

Duracell is committed to working with manufacturers in the design and production of tomorrow's electronic products. Our Sales Engineers can provide expert applications and product specifications assistance to help you match the optimum premium primary battery system to your requirements. We are also ready to assist you in developing your concepts into successful products by offering global supply and distribution information and production launch support. If you have additional questions, or would like to discuss your applications with one of our Sales Engineers, please contact Duracell. To receive detailed information on a particular battery system, or on a specific battery product, call (800) 431-2656 for the latest technical literature. We would appreciate hearing from you.

DURACELL PRODUCT NUMBER	NOMINAL VOLTAGE (V)	RATED CAPACITY(1) (mAh)	RATED VOLTAGE CUTOFF (V)	LOAD (Ohms)	APPROX. DRAIN (mA)	DIMENSIONS MAXIMUM		DIMENSIONS MAXIMUM		DIMENSIONS MAXIMUM		AVERAGE WEIGHT		AVERAGE VOLUME		TERMINALS	LIMITING CURRENT (mA)	INTERNAL IMPEDANCE(2) (Ohms)	CROSS REFERENCE (NEDA.ANSI)
						in.	mm	in.	mm	in.	mm	oz.	g	cu. in.	cc				
BUTTON CELLS								**DIAMETER**		**HEIGHT**									
DA230	1.4	60	0.9	3000	0.50	0.230	5.84	0.140	3.56	—	—	0.010	0.3	0.005	0.08	FLAT	2.0	16.0	—
DA312	1.4	110	0.9	1500	0.85	0.307	7.80	0.138	3.50	—	—	0.020	0.6	0.008	0.13	FLAT	6.0	7.5	7002Z
DA13	1.4	210	0.9	1500	0.85	0.307	7.80	0.210	5.33	—	—	0.032	0.9	0.013	0.21	FLAT	10.0	7.5	7000Z
DA675	1.4	530	0.9	620	2.00	0.455	11.56	0.210	5.33	—	—	0.063	1.8	0.031	0.50	FLAT	25.0	3.0	7003Z
DA630	1.4	1000	1.0	330	3.90	0.613	15.57	0.243	6.17	—	—	0.120	3.5	0.062	1.02	FLAT	25.0	2.0	7007Z
DA1204	1.4	6300	1.0	33	38.00	1.203	30.56	0.422	10.72	—	—	0.750	21.1	0.440	7.24	FLAT	150.0	0.5	7008Z
PRISMATIC/RECTANGULAR BATTERIES						**LENGTH**		**HEIGHT**		**WIDTH**									
DA146	8.4	1500	6.0	1300	5.80	1.030	26.16	1.750	44.45	0.656	16.66	1.060	30.0	1.076	17.63	SNAP	22.0	12.0	7004Z
DA412P	5.6	6500	4.0	150	32.00	2.570	65.28	2.570	65.28	0.570	14.48	3.700	105.0	3.670	60.00	FLAT	80.0	2.0	—

(1) Rated at 70°F (21°C).Typical capacities can be higher based on user's particular application.
(2) Impedance is less than or equal to number shown.

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MERCURY
CELLS & BATTERIES

Mercury batteries from Duracell are able to withstand high ambient temperature and high humidity. These cells have high volumetric energy density, stable voltage and good shelf life.

Duracell also offers a complete line of silver cells and batteries. Call (800) 431-2656 to receive detailed technical information.

Duracell is committed to working with manufacturers in the design and production of tomorrow's electronic products. Our Sales Engineers can provide expert applications and product specifications assistance to help you match the optimum premium primary battery system to your requirements. We are also ready to assist you in developing your concepts into successful products by offering global supply and distribution information and production launch support. If you have additional questions, or would like to discuss your applications with one of our Sales Engineers, please contact Duracell. To receive detailed information on a particular battery system, or on a specific battery product, call (800) 431-2656 for the latest technical literature. We would appreciate hearing from you.

For manufacturers' sales offices, see yellow pages

DURACELL PRODUCT NUMBER	SIZE	NOMINAL VOLTAGE (V)	RATED CAPACITY[1] (mAh)	COMPONENT CELL TYPE	RATED VOLTAGE CUTOFF (V)	LOAD (OHMS)	APPROX. DRAIN (mA)	DIMENSIONS								AVERAGE WEIGHT		AVERAGE VOLUME		TERMINALS	CROSS REFERENCE	
								MAXIMUM DIAMETER		MAXIMUM HEIGHT		MAXIMUM LENGTH		MAXIMUM WIDTH							NEDA/ ANSI	IEC
								in.	mm	in.	mm	in.	mm	in.	mm	oz.	g	in.³	cm³			
BUTTON CELLS																						
D343	—	1.35	120	—	1.0	13,000.0	0.1	0.455	11.56	0.137	3.48	—	—	—	—	0.052	1.471	0.021	0.338	FLAT	—	—
RM13	—	1.40	95	—	0.9	1,500.0	0.8	0.305	7.75	0.210	5.33	—	—	—	—	0.035	1.000	0.015	0.250	FLAT	—	NR48
RM41	—	1.40	150	—	0.9	1,000.0	1.3	0.455	11.56	0.165	4.19	—	—	—	—	0.070	1.980	0.026	0.430	FLAT	1182M	NR43
RM312	—	1.40	45	—	0.9	1,500.0	0.9	0.305	7.75	0.140	3.56	—	—	—	—	0.020	0.567	0.010	0.164	FLAT	1178M	—
PX625	—	1.35	300	—	0.9	470.0	2.7	0.615	15.60	0.238	6.05	—	—	—	—	0.015	4.250	0.070	1.150	FLAT	1122M	NR9
MP675H	—	1.40	235	—	0.9	625.0	2.7	0.455	11.56	0.210	5.33	—	—	—	—	0.100	2.840	0.034	0.550	FLAT	1127MD	NR44
PX675	—	1.35	200	—	0.9	1,250.0	0.5	0.455	11.56	0.210	5.33	—	—	—	—	0.100	2.840	0.034	0.550	FLAT	—	MR44
CYLINDRICAL CELLS & BATTERIES																						
RM1R	—	1.35	1,000	—	0.9	220.0	5.7	0.625	16.00	0.646	16.42	—	—	—	—	0.430	12.200	0.200	3.280	FLAT	1109M	MR50
RM12R	—	1.35	3,800	—	0.9	16.0	78.0	0.625	15.88	1.965	49.91	—	—	—	—	1.400	40.000	0.600	9.840	FLAT	1113M	—
RM601R	—	1.35	1,800	—	0.9	33.0	40.0	0.625	15.88	1.140	28.96	—	—	—	—	0.780	22.000	0.340	5.570	FLAT	1121M	—
RM640R	—	1.35	500	—	0.9	100.0	12.5	0.625	15.88	0.440	11.18	—	—	—	—	0.280	7.950	0.130	2.130	FLAT	1125M	NR52
RM822	—	1.40	750	—	0.9	80.0	15.0	.905	22.99	.227	5.76	—	—	—	—	.380	10.800	0.140	2.290	FLAT	—	—
RM828	—	1.40	900	—	0.9	25.0	50.0	.905	22.99	.284	7.21	—	—	—	—	.470	13.400	0.180	2.940	FLAT	—	—
ZM9	AA	1.40	2,500	—	0.9	25.0	50.0	0.560	14.22	1.969	50.01	—	—	—	—	1.050	29.800	0.450	7.370	FLAT	—	NR6
MP401H	N	1.40	1,250	—	0.9	300.0	4.4	0.455	11.56	1.148	29.16	—	—	—	—	0.440	12.500	0.180	2.940	FLAT	1118M	NR1
TR132R	—	2.70	1,000	RM1R	1.8	440.0	12.0	0.673	17.10	1.315	33.40	—	—	—	—	0.940	26.700	0.432	7.200	FLAT	—	—
TR133R	—	4.05	1,000	RM1R	2.7	660.0	12.0	0.673	17.10	2.004	50.90	—	—	—	—	1.420	40.260	0.655	10.790	FLAT	1314M	—
TR134R	—	5.40	1,000	RM1R	3.6	880.0	12.0	0.673	17.10	2.620	66.55	—	—	—	—	1.890	53.580	0.878	14.380	FLAT	—	—
TR164R	—	5.40	500	RM640R	3.6	400.0	12.5	0.673	17.10	1.767	44.90	—	—	—	—	1.200	34.000	0.591	9.690	FLAT	1410M	4NR52
TR175	—	7.00	235	MP675H	4.5	2,350.0	2.7	0.500	12.70	1.093	27.76	—	—	—	—	0.420	11.910	0.202	3.310	FLAT	1501M	—
TR177	—	9.80	235	MP675H	6.3	3,290.0	2.7	0.510	12.95	1.844	46.84	—	—	—	—	0.580	16.440	0.350	5.750	SNAPS	1606M	—
TR286	—	8.40	750	RM822	5.4	480.0	15.0	1.000	25.40	1.940	49.30	—	—	—	—	2.720	77.000	1.520	24.900	SNAPS	—	—
TR289	—	12.60	750	RM822	8.1	720.0	15.0	1.000	25.40	2.410	61.30	—	—	—	—	3.910	111.000	1.880	30.800	SNAPS	—	—
TR431	—	12.30	900	RM828	8.1	400.0	28.0	1.030	26.16	3.200	81.28	—	—	—	—	4.100	115.000	2.480	40.500	SNAPS	1801M	—
OTHER MULTICELL BATTERIES																						
TR146X	—	8.40	600	RM635	5.4	1,200.0	6.3	—	—	1.750	44.45	1.031	26.19	0.660	16.76	1.800	51.000	1.09	18.000	SNAPS	1604M	—

(1) Rated at 70°F (21°C). Typical capacities can be higher based on user's particular application.

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Carefree®

Valve Regulated, Lead-Acid Rechargeable Batteries

Eagle-Picher features the world's largest selection of sealed, lead-acid, rechargeable batteries

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Performs at rated capacity on first cycle.

No memory limitations.

Delivers rated capacity upon demand, whether use is cyclic or stand-by.

Lead-Calcium grid. Maintains constant charge characteristics throughout life.

Long life and High reliability.

Requires only proper recharging for years of service.

Rechargeable. Provides hundreds of charge-discharge cycles.

Charging

The life of all maintenance-free, lead-acid batteries can be greatly affected by the charging method used. To achieve optimum performance and life from batteries, the charging method must be adjusted to the conditions of service.

Float Service

A battery in float service is being subjected to continuous charging and is called upon to deliver power at infrequent intervals or in case of a power outage. Under this condition, the battery charging should be:

Constant Potential	2.28-2.32 Volts/Cell
Limiting Current	20%- Rated Capacity in Amps
Charging Time	Continuous

Cyclic Service

A battery in cyclic service is normally being discharged at a more frequent interval than when it is in float service. In cyclic service it has less time to recharge. Under this condition, the battery charging should be:

Constant Potential	2.50-2.55 Volts/Cell
Limiting Current	50%-Rated Capacity in Amps
Charging Time	10-24 Hours

Carefree Sealed Lead-Acid Batteries

Battery Number	Nom Cap 20 Hr. Rate	Length In (mm)	Width In (mm)	Ht. In (mm)	Ht. Inc Terms	Wt. Lbs
CF2V2.5	2.	2.30(58.42)	1.04(26.42)	2.60(66.04)	2.94(74.88)	.5
CF2V5	5.2	2.33(59.18)	1.06(26.92)	3.95(100.03)	4.33(109.98)	.8
CF2V30	28.0	3.34(84.84)	2.15(54.61)	6.50(165.10)	6.85(173.99)	4.1
CF2V140	125.0	7.42(188.47)	4.51(114.55)	7.42(188.47)	8.34(211.84)	21.5
CF4V8	8.0	4.03(102.36)	2.00(50.80)	3.75(95.25)	3.93(99.82)	2.4
CF4V15	15.0	5.27(123.86)	1.78(45.21)	6.80(172.72)	7.12(180.85)	4.7
CF6V1/2	0.45	1.92(48.77)	1.00(25.40)	2.00(50.80)	2.25(57.15)	0.3
CF6V1	0.90	2.00(50.80)	1.65(41.91)	1.97(50.04)	2.20(55.88)	0.5
CF6V2.6	2.60	5.30(134.62)	1.35(34.29)	2.37(60.20)	2.56(65.02)	1.5
CF6V4	4.00	2.76(70.10)	1.89(48.01)	4.02(102.11)	4.22(107.19)	1.7
CF6V4.5	4.50	6.00(152.40)	1.34(34.04)	3.75(95.25)	3.95(100.33)	2.8
CF6V5.3	5.60	5.22(132.59)	1.85(46.99)	3.08(78.23)	3.08(78.23)	2.6
CF6V5.5	5.50	6.00(152.40)	1.34(34.04)	3.75(95.25)	3.95(100.33)	2.8
CF6V8	8.00	6.00(152.40)	2.00(50.80)	3.75(95.25)	3.93(99.82)	2.6
CF6V9	9.00	4.25(107.95)	2.75(69.85)	5.50(139.70)	5.50(139.70)	4.5
CF6V9.5	11.00	4.25(107.95)	2.75(69.85)	5.50(139.70)	5.50(139.70)	5.1
CF6V15	15.00	3.60(91.44)	3.34(84.84)	6.49(164.85)	6.70(170.18)	6.4
CF6V30	28.00	6.25(158.75)	3.35(85.09)	6.50(165.10)	6.75(171.45)	12.1
CF6V40	40.00	6.51(165.35)	4.91(124.71)	6.53(165.86)	6.75(171.45)	16.5
CF6V50	50.00	7.43(188.72)	4.52(114.81)	7.46(189.48)	8.37(212.60)	21.5
CF8V6	6.00	3.34(84.84)	2.15(54.61)	6.50(165.10)	6.66(169.16)	3.9
CF12V1/2	0.45	1.92(48.77)	2.05(52.07)	2.00(50.80)	2.25(57.15)	0.6
CF12V1/2L	0.45	3.85(97.79)	1.00(25.40)	2.00(50.80)	2.25(57.15)	0.6
CF12V1	0.90	3.30(83.82)	2.00(50.80)	1.97(50.04)	2.20(55.88)	1.1
CF12V1L	0.90	4.02(102.11)	1.65(41.91)	1.97(50.04)	2.20(55.88)	1.1
CF12V1.5	1.50	7.02(178.31)	1.33(33.78)	2.40(60.96)	2.60(66.04)	1.9
CF12V1.5PP	1.50	3.00(76.20)	2.26(57.40)	8.75(222.25)	NA	2.3
CF12V2.6S1	2.60	5.28(134.11)	2.52(64.01)	2.30(58.42)	2.48(62.99)	2.7
CF12V4	4.00	3.81(96.77)	2.76(70.10)	4.02(102.11)	4.22(107.19)	3.4
CF12V5L	5.20	6.12(155.45)	2.42(61.47)	3.94(100.08)	4.16(105.66)	4.8
CF12V5PP	5.20	6.12(155.45)	2.42(61.47)	6.60(167.64)	NA	5.0
CF12V5.3	5.60	5.22(132.59)	3.72(94.49)	3.08(78.23)	3.08(78.23)	5.2
CF12V8	8.00	6.00(152.40)	4.03(102.36)	3.75(95.25)	3.93(99.82)	7.9
CF12V9	9.00	5.53(140.46)	4.25(107.95)	5.50(139.70)	5.50(139.70)	9.0
CF12V9L	9.00	8.52(216.41)	2.75(69.85)	5.50(139.70)	5.50(139.70)	9.0
CF12V9LPP	9.00	8.52(216.41)	2.75(69.85)	5.50(139.70)	NA	9.0
CF12V15	15.00	7.22(189.39)	3.34(84.84)	6.49(164.85)	6.70(170.18)	12.8
CF12V20	22.00	6.51(165.35)	4.91(124.71)	6.53(165.86)	6.75(171.45)	16.2
CF12V30	28.00	6.72(170.69)	6.25(158.75)	6.50(165.10)	6.75(171.45)	24.2
CF12V30L	28.00	10.04(25.5)	4.31(10.95)	6.50(165.10)	6.75(171.45)	24.2
CF18V1	0.90	4.90(124.46)	2.00(50.80)	1.97(50.04)	2.20(55.88)	1.7
CF24V20	22.0	9.83(249.68)	6.51(165.35)	6.53(165.86)	6.75(171.45)	33.0
CF24V30	28.0	12.50(317.50)	6.72(170.69)	6.50(165.10)	6.75(171.45)	48.4

Carefree Magnum, Extra Capacity Batteries

CFM4V4.6	4.60	1.87(47.50)	1.89(48.01)	4.02(102.11)	4.22(107.19)	1.3
CFM4V10	9.50	4.03(102.36)	2.00(50.80)	3.75(95.25)	3.93(99.82)	2.6
CFM6V4.6	4.60	2.76(70.10)	1.89(48.01)	4.02(102.11)	4.22(107.19)	1.8
CFM6V6.4	6.4	522(132.59)	1.85(46.99)	3.08(78.23)	3.08(78.23)	
CFM6V6.5	6.50	6.00(152.40)	1.34(34.04)	3.75(95.25)	3.95(100.33)	2.8
CFM6V10	9.50	6.00(152.40)	2.00(50.80)	3.75(95.25)	3.93(99.82)	3.85
CFM6V12	12.0	4.25(107.95)	2.75(69.85)	5.50(139.70)	5.50(139.70)	5.1
CFM6V18	18.0	3.60(91.44)	3.34(84.84)	6.49(164.85)	6.70(170.18)	6.8
CFM6V33	33.0	6.25(158.75)	3.35(85.09)	6.50(165.10)	6.75(171.45)	12.2
CFM12V3	3.0	5.28(134.11)	2.52(64.01)	2.30(58.42)	2.48(62.99)	3.1
CFM12V4.6	4.6	3.80(96.52)	2.76(70.10)	4.02(102.11)	4.22(107.19)	3.6
CFM12V4.6M	4.6	3.55(90.17)	2.76(70.10)	4.01(101.85)	4.22(107.19)	4.1
CFM12V6.2L	6.2	6.12(155.45)	2.42(61.47)	3.94(100.08)	4.16(105.66)	5.4
CFM12V6.5	6.5	5.95(151.13)	2.58(65.53)	3.75(95.25)	3.95(100.33)	5.6
CFM12V10	10.0	6.00(152.40)	4.00(101.60)	3.75(95.25)	3.93(99.82)	7.7C
CFM12V12	12.0	5.53(140.46)	4.25(107.95)	5.50(139.70)	5.50(139.70)	10.2
CFM12V12L	12.0	8.52(216.41)	2.75(69.85)	5.50(139.70)	5.50(139.70)	10.2
CFM12V12LPP	12.0	8.52(216.41)	2.75(69.85)	5.50(139.70)	5.50(139.70)	10.2
CFM12V18	18.0	7.21(188.13)	3.34(84.84)	6.49(164.85)	6.70(170.18)	13.6
CFM12V25	25.0	6.51(165.35)	4.91(124.71)	6.53(165.86)	6.75(171.45)	17.3
CFM12V33	33.0	6.72(170.69)	6.25(158.75)	6.50(165.10)	6.75(171.45)	24.5

Carefree UPS, High Output Batteries

CF6V10UPS	10.0	6.00(152.40)	2.00(50.80)	3.75(95.25)	3.93(99.82)	4.1
CFP6V18UPS	18.0	3.60(91.44)	3.34(84.84)	6.49(164.85)	7.33(186.18)	7.2
CFP6V33UPS	33.0	6.25(158.75)	3.35(85.09)	6.40(162.56)	7.34(186.44)	12.5
CFP6V60UPS	60.0	7.42(188.47)	4.51(114.55)	7.42(188.47)	8.32(211.33)	22.0
CFP12V25UPS	25.0	6.51(165.35)	4.91(124.71)	6.50(165.10)	7.37(187.20)	19.7

EAGLE PICHER
Electronics Division
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Keeper II®

Memory Backup & Consumer Replaceable Batteries

The electrochemistry of Eagle-Picher's Keeper II Lithium batteries ensures years of dependable service in stand-by applications where long-life memory back-up is required.

Its prismatic design allows the Keeper II to be customized to meet unique commercial applications.

Keeper II® Batteries

Years of low rate, continuous use.

Standby power for 10 years and more.

Microcalorimetry tests show an 80% retention of capacity in 15 years.

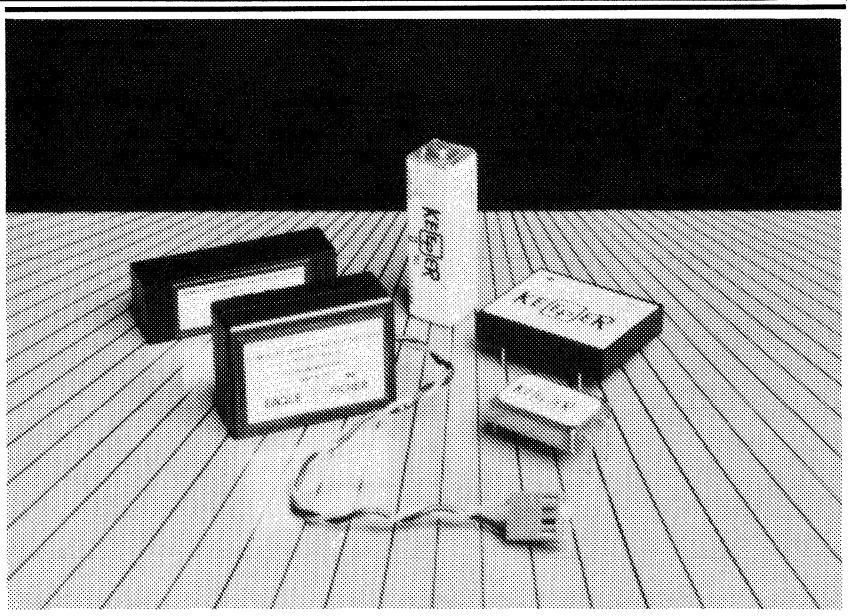
Highest utilization of valuable board space when compared to round and cylindrical cells.

Energy density is significantly higher than other chemistries.

Wave solderability.

Underwriters Laboratories recognized component.

Hermetically sealed to ensure long life and non leakage at high temperatures.



All Eagle-Picher batteries are made in the United States of America

Keeper II Lithium Batteries

Specifications

Battery No.	Working Voltage	Capacity 350 hr. rate	Length		Width		Thickness		Weight (Grams)
			IN.	MM	IN.	MM	IN.	MM	
LTC-3PN	3.5	350mAH	.60	15.24	.65	16.51	.25	6.35	4.0
LTC-3PN-S2	3.5	350mAH	.65	16.51	.25	6.35	.60	15.24	4.0
LTC-3PN-S4	3.5	350mAH	.60	15.24	.25	6.35	.65	16.51	4.0
LTC-7P	3.5	750mAH	1.20	30.48	.70	17.78	.35	8.89	9.0
LTC-7PN	3.5	750mAH	1.00	25.40	.65	16.51	.25	6.35	6.8
LTC-7PN-S4	3.5	750mAH	.65	16.51	.25	6.35	1.00	25.40	6.8
LTC-7PN-S6	3.5	750mAH	1.00	25.40	.25	6.35	.65	16.51	6.8
LTC-7PMP	3.5	1500mAH	1.50	38.10	1.20	30.48	.35	8.89	19.0
LTC-7PMS	7.0	750mAH	1.50	38.10	1.20	30.48	.35	8.89	19.0
LTC-16P*	3.5	1600mAH	1.44	36.58	.55	13.97	.55	13.97	16.0
LTC-7P-MP-F-S2***	3.5	1500mAH	1.50	38.10	1.20	30.48	.45	11.43	25.0
LTC-16P-CO-F-S11**	3.5	1600mAH	1.86	47.24	.66	16.76	.66	16.76	25.0

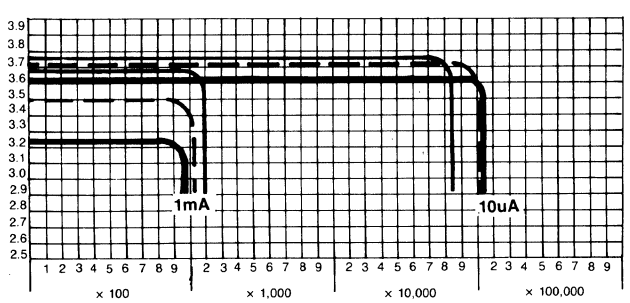
*Standard termination button negative case positive also available with tabs. **Standard termination is .20 square pins, 1.700 center to center.
***Battery contains diode and resistor protection (IN5817 diode 1.6K resistor). Working voltage rate dependant.

Keeper II® Magnum™ Batteries

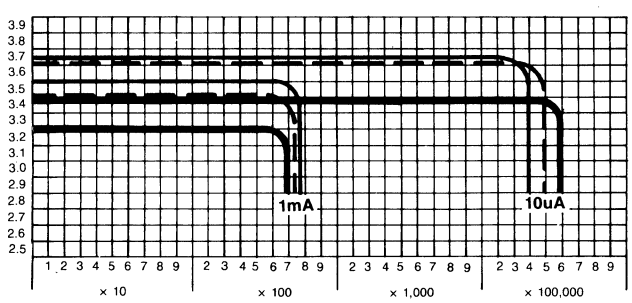
Battery No.	Working Voltage	Capacity 350 hr. rate	Length		Width		Thickness		Weight (Grams)
			IN.	MM	IN.	MM	IN.	MM	
LTC-16M	3.5	1600mAH	1.71	43.43	.99	25.15	.37	9.40	20
LTC-16M-S2	3.5	1600mAH	1.50	38.10	.90	22.86	.28	7.11	18
LTC-16M-MS-S1*	7.0	1600mAH	1.92	48.79	1.03	26.16	.68	17.27	45

*Battery is standard transistor-type configuration

Typical LTC-16P Discharge Characteristics At Varied Temperatures



Typical LTC-7P Discharge Characteristics At Varied Temperatures



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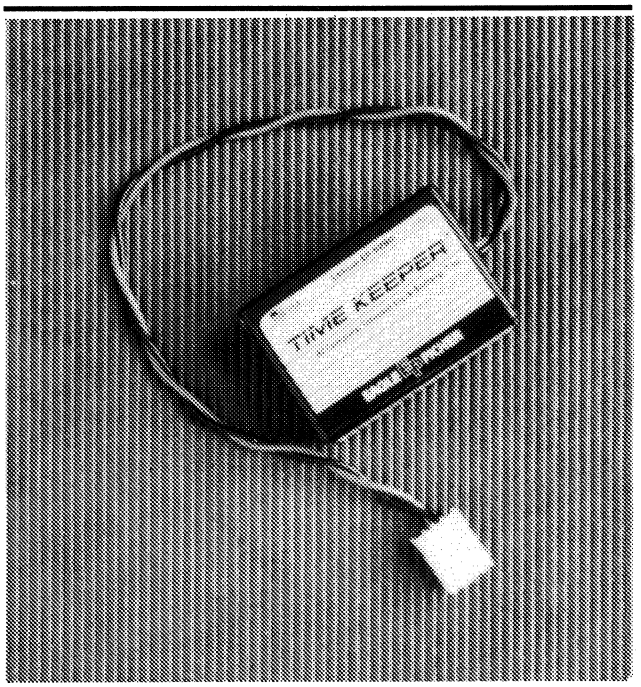
Electronics Division
Box 130 • Bethel Road • Seneca, Missouri 64865 • Phone: 417-776-2256 • FAX-417-776-2257

TIME KEEPER™ Computer Clock Batteries



Save Time Every Day. Save Money Every Time.

Introducing Time Keeper Computer Clock Batteries.

Powerful, new alternatives which rival any original equipment battery for safety, reliability and service life. And they're available immediately!

Your Customers Save Time And Money, Too!
Over 9 million 286 and 386-based PC's are currently in use. An estimated 14 million more will be shipped in the next two years. Each one requires a replaceable battery which maintains the internal real time clock and important configuration files.

Your customers can rely on Time Keeper to provide that power. Every Day! And, because these batteries are produced in the USA, you can rely on Eagle-Picher for lower prices, reliable service and instant delivery. Every Time!

Time Keeper Computer Clock Batteries. Available immediately. Call now for more details!

TIME KEEPER™ Computer Batteries

Battery No.	Working Voltage	Capacity 350 hr. rate 25°C	Length		Width		Thickness		Weight (Grams)	MOLEX Connector (Or Equal)	Pin Polarization				Diode	Resistor
			IN.	MM	IN.	MM	IN.	MM			1	2	3	4		
LTC-16P-CO-F-S3***	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	22-41-4043	O*	KEY	POS	NEG	1N914	1K
LTC-16P-CO-F-S5***	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	50-57-9004	NEG	POS	KEY	O*	N/A	N/A
LTC-16P-CO-F-S6*** (EP5242)	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	22-41-4033	NEG	O*	POS	X**	N/A	N/A
LTC-16P-CO-F-S7***	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	22-01-3037	POS	NEG	O*	X**	N/A	N/A
LTC-16P-CO-F-S8*** (EP5242/W)	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	50-57-9004	POS	KEY	O*	NEG	N/A	N/A
LTC-16P-CO-F-S9***	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	22-01-3037	NEG	O*	POS	X**	N/A	N/A
LTC-16P-CO-F-S12	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	22-01-3037	POS	NEG	O*	X**	N/A	N/A
LTC-16P-CO-F-S14	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	NONE	—	—	—	—	N/A	N/A
LTC-16P-CO-F-S15	3.5	1600mAH	1.90	48.26	.70	17.78	.72	18.29	30.0	641191-4****	POS	KEY	O*	NEG	N/A	N/A
LTC-16P-MS-F-S9*** (EP5253)	6.8	1600mAH	1.90	48.26	1.30	33.02	.70	17.78	53.0	50-57-9004	POS	KEY	O*	NEG	1N914	39K
LTC-16P-MS-F-S10*** (EP5257)	6.8	1600mAH	1.90	48.26	1.30	33.02	.70	17.78	53.0	22-01-3047	POS	KEY	O*	NEG	1N914	30K
LTC-16P-MS-F-S11*** (EP5280)	6.8	1600mAH	1.90	48.26	1.30	33.02	.70	17.78	53.0	22-41-4043	POS	KEY	O*	NEG	(2)1N914	11K
LTC-16P-MS-F-S12***	7.0	1600mAH	1.90	48.26	1.30	33.02	.70	17.78	53.0	22-01-3037	POS	NEG	O*	X	N/A	N/A
LTC-16P-MP-F-S1***	3.5	3200mAH	1.90	48.26	1.30	33.02	.70	17.78	53.0	22-01-3037	POS	NEG	O*	X	N/A	N/A

*O is blank. **is 3-pin connector. ***Optional case size, as well as internal resistors, diodes or connectors may be ordered to exact customer specifications. All replaceable battery modules have 9"(±.25) wire leads. ****Amp only. Time Keeper™ batteries containing diode and resistor protection (working voltage rate dependant). See table above for diode and resistor values.

Compatability Chart

Time Keeper	Replaces	Computer
EP-5242	TL-5242*	AT&T 3B
EP-5242/W	TL-5242/W*	Kaypro
EP-5253	TL-5253*	IBM PC/AT, PC Limited, AST-286, Hewlett Packard, Vectra, NCR-PC8, Samsung 3001, Pro Executive 286
EP-5257	TL-5257*	Tandy 3000, Epson Equity
EP-5280	TL-5280*	Compaq Desk Pro 286, Portable 286

*Or original equipment battery installed in computer.

3 Year Limited Warranty

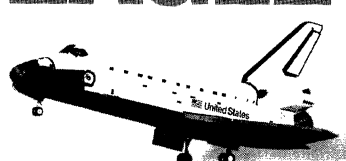
Eagle-Picher will replace the Time Keeper products, if found to be defective because of workmanship and/or materials, within 3 years from purchase. No other warranty is expressed or implied. Under no circumstances will Eagle-Picher be liable for consequential damages.

Electrical Specifications

Operating Temperature ..... −55°C to 75°C
Shelf Life At 25°C of rated capacity ..... 10 years

EAGLE PICHER
Electronics Division
Box 130 • Bethel Road • Seneca, Missouri 64865 • Phone: 417-776-2256 • FAX-417-776-2257

NO OTHER LITHIUM BATTERY MANUFACTURER POWERS AS MANY DIFFERENT PRODUCTS AS EAGLE-PICHER.



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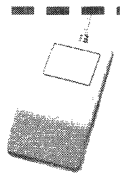


EAGLE EP PICHER

Electronics Division (Lithium Batteries)

Military: P.O. Box 47 • Joplin, MO 64802 • (417) 623-8000 • Commercial: P.O. Box 130 • Seneca, MO 64865 • (417) 776-2256

Lithium Batteries

For Military And Aerospace Applications

Batt/Cell Part #	Type & Configuration	OCV	Cap. (Ahr.)	Vol. (In^3)	Wt. (g.)	Remarks
MAP-9152	$Li/SOCL_2$	7.3	1.6	1.36	40	
MAP-9153	$Li/SOCL_2$	3.65	0.75	.16	6.8	
MAP-9161	$Li/SOCL_2$	3.65	0.35	0.097	4.5	
MAP-9164-1	$Li/SOCL_2$	3.65	1.6	0.9	28	
MAP-9164	$Li/SOCL_2$	3.65	1.5	0.9	28	
MAP-9166	$Li/SOCL_2$	3.65	1.6	1.36	28	
MAP-9168	$Li/SOCL_2$	3.65	1.5	0.57	19	
MAP-9170	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9172	$Li/SOCL_2$	3.65	3	1.63	113.5	
MAP-9172-1	$Li/SOCL_2$	3.65	3	1.63	113.5	
MAP-9176	$Li/SOCL_2$	3.65	3	0.84	19	
MAP-9179	$Li/SOCL_2$	3.65	1.5	0.76	25	
MAP-9180	$Li/SOCL_2$	14.60	0.75	0.73	28	
MAP-9181	$Li/SOCL_2$	21.90	1.5	15.68	120	
MAP-9182-1	$Li/SOCL_2$	3.65	0.75	0.16	7.1	
MAP-9182	$Li/SOCL_2$	3.65	0.75	0.16	7.1	
MAP-9183	$Li/SOCL_2$	7.30	6	15.5	246	
MAP-9187	$Li/SOCL_2$	3.65	12	21.85	343.3	
MAP-9188	$Li/SOCL_2$	3.65	1.6	1.05	30	
MAP-9190	$Li/SOCL_2$	21.90	0.75	1.089	41	
MAP-9192	$Li/SOCL_2$	7.20	0.75	0.81	29	
MAP-9194	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9195	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9196	$Li/SOCL_2$	3.65	1.6	1.19	22	
MAP-9197	$Li/SOCL_2$	3.65	0.75	0.51	14.3	
MAP-9199	$Li/SOCL_2$	3.65	0.75	0.27	9.5	
MAP-9200	$Li/SOCL_2$	3.65	0.75	0.81	29	
MAP-9201	$Li/SOCL_2$	7.20	0.75	1.57	24	
MAP-9202	$Li/SOCL_2$	7.20	0.75	2.18	28	
MAP-9203	$Li/SOCL_2$	18.2	0.75	1.23	35	
MAP-9206	$Li/SOCL_2$	3.65	1.5	0.57	19	
MAP-9207	$Li/SOCL_2$	7.30	0.75	0.29	14	
MAP-9208	$Li/SOCL_2$	3.65	1.6	0.9	30	
MAP-9215	$Li/SOCL_2$	3.65	0.35	0.097	4.5	
MAP-9217	$Li/SOCL_2$	3.65	0.001	0.001	0.40	Artillery Dynamics
MAP-9219	$Li/SOCL_2$	10.95	1.00	0.90	126.8	High Rate
MAP-9220	$Li/SOCL_2$	7.20	4.8	10.64	204	
MAP-9220	$Li/SOCL_2$	3.65	1.6	MS	MS	
MAP-9221	$Li/SOCL_2$	3.65	12.8	19.67	431	
MAP-9223	Li/CF_x	24.0	35.0	88.3	1860	
MAP-9224	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9225	Li/CF_x	15.0	240.0	301.3	6000	
MAP-9226	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9232	$Li/SOCL_2$	7.30	0.60	0.37	14.2	High Rate
MAP-9233	$Li/SOCL_2$	36.50	0.37	6.25	465	Artillery Dynamics
MAP-9235	$Li/SOCL_2$	3.65	15	21.85	499.4	
MAP-9241	$Li/SOCL_2$	3.65	0.75	0.16	6.8	

Customer Service

Eagle-Picher's battery facilities benefit from a unique combination of multiple system capability and a large support organization. those benefits, coupled with strong customer orientation, Midwest economics and our long-term commitment to the product, have made us a leader in the industry of special purpose military batteries. The large existing production base, plus continued development into new battery technologies, is assurance that Eagle-Picher will meet your battery needs now, and still be here to produce them in the future.

EAGLE PICHER
Lithium Batteries Group
P.O. Box 47 • Joplin, MO 64802 • Phone: (417) 623-8000 • TWX: 910-774-4508 • FAX: (417) 623-8000, ext. 201

Lithium Batteries

For Military And Aerospace Applications

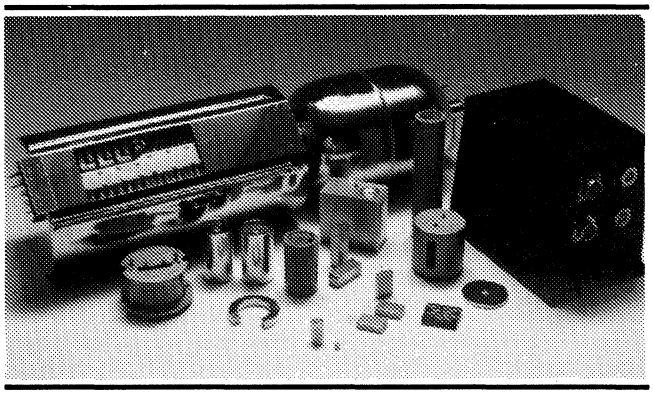
Eagle-Picher's been producing cells and batteries for the Aerospace market for over 30 years. This long-term commitment has made us one of the world's most diversified battery manufacturers.

Today, our Electronics Division produces more than 20 different cell systems, including:

- Lithium/Carbon Monofluoride
- Lithium/Thionyl Chloride
- Reserve Lithium/Thionyl Chloride
- Calcium/Thionyl Chloride
- Silver-Zinc
- Reserve Silver-Zinc
- Nickel-Hydrogen
- Calcium/Calcium Chromate Thermal
- Lithium-Alloy/Iron Disulfide Thermal
- Lead Acid
- Sealed Nickel-Cadmium
- Vented Nickel-Cadmium
- Nickel-Zinc

Lithium Battery Systems

Eagle-Picher produces the two most energetic lithium systems available on the market today: Lithium/Carbon monofluoride (Li/CF_x) and Lithium/Thionyl chloride (Li/$SOCl_2$).



Development And Production Capabilities

Eagle-Picher's in-house capabilities are unmatched in the industry. A group of over 100 engineers, for design and project management, enables Eagle-Picher to staff a battery program of any magnitude. 200 people in our machine tool facility fabricate tooling and fixturing for hardware development and production.

Eagle-Picher has built qualified batteries for nearly every major weapons system currently used by the U.S. Government. We've earned a reputation for high quality, low cost development and production.

Eagle-Picher produces Lithium anode cells in Li/CF_x, Li/$SOCL_2$, and Reserve Li/$SOCL_2$. Batteries and cells are produced both as special purpose designs and 'off the shelf' existing designs. Some of the existing cells and batteries are listed below.

Batt/Cell Part #	Type & Configuration	OCV	Cap. (Ahr.)	Vol. (In^3)	Wt. (g.)	Remarks
GAP-9051	Li/$SOCL_2$ Reserve	3.65	0.28	0.17	7.0	Low Rate
GAP-9059	Li/$SOCL_2$ Reserve	32.90	3.5	45.9	1880	
GAP-9133	Li/$SOCL_2$ Reserve	81.50	28.75	421.3	10450	Multiisection
GAP-9133	Li/$SOCL_2$ Reserve	33.3	7.5	MS	MS	Multisection
GAP-9146	Li/$SOCL_2$ Reserve	14.80	1.1	5.09	350	Artillery Dynamics
GAP-9175	Li/$SOCL_2$ Reserve	85.00	5.8	421.3	10450	Multisection
GAP-9175	Li/$SOCL_2$ Reserve	37.00	8.0	MS	MS	Multisection
GAP-9218	Li/$SOCL_2$ Reserve	3.65	0.001	0.007	0.40	Artillery Dynamics
GAP-9246	Li/$SOCL_2$ Reserve	18.3	0.006	0.118	5.75	Artillery Dynamics
GAP-9254	Li/$SOCL_2$ Reserve	22.00	.073	5.59	150	Artillery Dynamics
GAP-9254	Li/$SOCL_2$ Reserve	11.00	.294	MS	MS	Multisection
LCF-111	Li/CF_x	3.00	240	34.7	880	>300 Whr./Lb.
LCF-112	Li/CF_x	3.00	39.4	6.06	170	>250 Whr./Lb.
LCF-113	Li/CF_x	3.00	12.0	3.00	93	High Rate
LCF-114	Li/CF_x	3.00	25.0	6.22	178	
LCF-115	Li/CF_x	3.00	25.0	6.22	180	Space Qualified
LCF-311	Li/CF_x	3.00	3.75	2.80	96	ALCM Cell
LCF-312	Li/CF_x	3.00	1.60	1.60	45	ALCM Cell
LCF-313	Li/CF_x	3.00	40.0	8.30	250	
LCF-314	Li/CF_x	3.00	6.0	2.11	64	High Rate
LCF-315	Li/CF_x	3.00	9.8	2.11	65	Low Rate
LCF-511	Li/CF_x	3.00	0.34	0.13	7.6	High Rate
LCF-512	Li/CF_x	3.00	0.60	0.20	8.7	High Rate
LCF-5P	Li/CF_x	3.00	0.50	0.28	8.5	OEM/Commercial
LCF-5PN	Li/CF_x	3.00	0.50	0.16	6.0	OEM/Commercial
LTC-311	Li/$SOCL_2$	3.65	1.00	0.27	13.3	High Rate
LTC-312	Li/$SOCL_2$	3.65	0.22	0.08	5.3	High Rate
LTC-313	Li/$SOCL_2$	3.65	0.60	0.16	7.08	High Rate
LTC-314	Li/$SOCL_2$	3.65	.310	0.10	6.5	High Rate
LTC-511	Li/$SOCL_2$	3.65	0.37	0.35	26.0	Artillery Dynamics

EAGLE EP PICHER

Lithium Batteries Group

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Lithium Batteries

For Military And Aerospace Applications

Batt/Cell Part #	Type & Configuration	OCV	Cap. (Ahr.)	Vol. (In^3)	Wt. (g.)	Remarks
MAP-9032	Li/CF_x	39.00	23.5	181.9	3402	Space Qualified
MAP-9036	Li/CF_x	39.00	23.5	279.8	4082	Space Qualified
MAP-9037	Li/CF_x	39.00	23.5	296.4	6124	Space Qualified
MAP-9045	Li/CF_x	3.00	0.35	0.24	9	
MAP-9046	Li/CF_x	30.00	3.75	120.3	3405	ALCM Batt Multisection
MAP-9046	Li/CF_x	30.00	3.75	MS	MS	ALCM Batt Multisection
MAP-9052	Li/CF_x	3.00	0.5	0.26	9	
MAP-9056	Li/CF_x	3.00	0.5	0.16	6.8	
MAP-9057	$Li/SOCL_2$	3.65	0.75	0.26	9	Military LTC-7P
MAP-9058	Li/CF_x	36.00	25.0	147.7	4086	Space Qualified
MAP-9062	$Li/SOCL_2$	10.95	0.25	0.13	16.5	High Rate
MAP-9063	$Li/SOCL_2$	3.65	3.2	1.18	48	
MAP-9066	$Li/SOCL_2$	3.65	3	0.54	24	
MAP-9068	Li/CF_x	3.00	1	5.08	68.5	
MAP-9068-1	$Li/SOCL_2$	3.65	1.5	5.08	68.5	
MAP-9070	Li/CF_x	3.00	0.5	0.26	9	
MAP-9072-1	$Li/SOCL_2$	3.65	1.5	1.39	20.6	
MAP-9072-2	$Li/SOCL_2$	3.65	22.5	1.39	20.6	
MAP-9074	$Li/SOCL_2$	3.65	1.6	0.56	22	
MAP-9076	$Li/SOCL_2$	6.00	1.5	4	95	Multisection
MAP-9076	$Li/SOCL_2$	-3.00	0.75	MS	MS	Multisection
MAP-9077-1	$Li/SOCL_2$	3.65	2.8	0.54	24	
MAP-9077	$Li/SOCL_2$	3.65	2.8	0.54	24	
MAP-9078-1	$Li/SOCL_2$	3.65	1.2	0.28	12	
MAP-9078	$Li/SOCL_2$	3.65	1.2	0.28	12	
MAP-9081	$Li/SOCL_2$	3.65	0.35	0.09	4	
MAP-9083	Li/CF_x	24.00	25.0	147.7	4086	Space Qualified
MAP-9084	Li/CF_x	3.00	0.5	0.16	6.8	
MAP-9084-1	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9086	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9088	$Li/SOCL_2$	3.65	3	1.52	21.2	
MAP-9090	Li/CF_x	3.00	0.5	0.16	6.8	
MAP-9091	Li/CF_x	3.00	1	0.57	19	
MAP-9092	Li/CF_x	6.00	0.5	0.57	19	
MAP-9094	$Li/SOCL_2$	3.65	0.75	0.16	6.8	Military LTC-7PN
MAP-9095	$Li/SOCL_2$	3.65	1.5	0.57	19	Military LTC-7PMP
MAP-9096	$Li/SOCL_2$	7.30	0.75	0.57	19	Military LTC-7PMS
MAP-9097	$Li/SOCL_2$	3.65	1.2	0.28	12	
MAP-9098	$Li/SOCL_2$	3.65	1.6	0.4	16	Military LTC-16P
MAP-9099	$Li/SOCL_2$	3.65	1.6	0.4	16	
MAP-9102-1	$Li/SOCL_2$	3.65	0.75	0.26	9	
MAP-9102-2	$Li/SOCL_2$	3.65	0.75	0.26	9	
MAP-9106	$Li/SOCL_2$	3.65	0.75	0.26	9	
MAP-9108	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9113	$Li/SOCL_2$	7.20	12	17.9	1135	
MAP-9117	$Li/SOCL_2$	3.65	3	2.88	60	
MAP-9120	$Li/SOCL_2$	7.30	4.5	5.02	113.5	
MAP-9122	$Li/SOCL_2$	3.65	2.6	0.54	25	
MAP-9123	$Li/SOCL_2$	3.65	0.75	0.16	9	
MAP-9124	$Li/SOCL_2$	3.65	12	21.5	343.3	
MAP-9127	$Li/SOCL_2$	7.3	0.75	0.9	19	
MAP-9132	$Li/SOCL_2$	3.65	0.75	0.16	9	
MAP-9141	$Li/SOCL_2$	30.00	2.7	29.8	681	
MAP-9143	$Li/SOCL_2$	3.65	0.75	0.16	6.8	
MAP-9150	Li/CF_x	15.00	200.0	230.0	13.3	Multisection
MAP-9150	Li/CF_x	3.00	48.0	MS	MS	Multisection
MAP-9151	Li/CF_x	18.00	12.0	62.7	1400	Multisection
MAP-9151	Li/CF_x	3.00	48.0	MS	MS	Multisection

Lithium Battery Specialists

Electrochem Industries Lithium Power Sources

- High Energy Density • High Voltage
- High Reliability • Long Life
- 304L Stainless Steel Case • Glass-To-Metal Hermetic Seal • Over 10 Years Primary Lithium Cell & Pack Manufacturing Experience.

Lithium Bromine Complex

Unique BCX technology for superior performance in moderate drain rate applications requiring long life and high capacity.

Series/Size/Part #	Nominal Capacity Ah	Rated Current mA	Open Circuit Voltage	Operating Temperature Range °C
BCX 72 PC 3B50	1.0	1.0	3.9	-40/+72
BCX 72 ½AA 3B26	0.8	10	3.9	-40/+72
BCX 72 .5gAA 3B27	1.6	10	3.9	-40/+72
BCX 72 AA 3B64	2.0	20	3.9	-40/+72
BCX 72 ⅔A 3B793	1.5	10	3.9	-40/+72
BCX 72 C 3B70	7.0	50	3.9	-40/+72
BCX 72 D 3B75	14	175	3.9	-40/+72
BCX 72 DD 3B76	30	350	3.9	-40/+72

Non-Magnetic BCX Cells

Series/Size/Part #	Nominal Capacity Ah	Rated Current mA	Open Circuit Voltage	Operating Temperature Range °C
BCX 72 .5g AA 3B2500	1.6	10	3.9	-40/+72
BCX 72 C 3B1600	7.0	50	3.9	-40/+72
BCX 72 D 3B1320	14	175	3.9	-40/+72
BCX 72 DD 3B1415	30	350	3.9	-40/+72

Lithium Sulfuryl Chloride

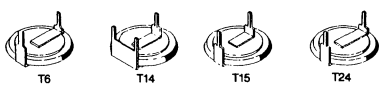
Proprietary design gives CSC and PMX power cells higher temperature and rate capabilities. Featuring no voltage delay, the CSC is excellent for applications requiring immediate power on demand or frequent on/off operation. PMX for high temp, severe mechanical environments.

Series/Size/Part #	Nominal Capacity Ah	Rated Current mA	Open Circuit Voltage	Operating Temperature Range °C
CSC 93 PC 3B45	1.0	0.5	3.9	-32/+93
CSC 93 ½AA 3B33	.75	20	3.9	-32/+93
CSC 93 AA 3B24	2.0	50	3.9	-32/+93
CSC 93 2/5C 3B665	2.5	50	3.9	-32/+93
CSC 93 ½C 3B29	3.4	75	3.9	-32/+93
CSC 93 C 3B30	7.0	175	3.9	-32/+93
CSC 93 D 3B35	14	500	3.9	-32/+93
CSC 93 DD 3B36	30	1000	3.9	-32/+93
PMX 150 AA 3B1065	1.6	20	3.9	0/+150
PMX 150 C 3B90	5.1	50	3.9	0/+150
PMX 150 D 3B95	12	100	3.9	0/+150
PMX 150 DD 3B2800	25	350	3.9	0/+150

Lithium Maganese Dioxide

MNO cells are extremely compact power sources. Low internal resistance results in a remarkably stable lifetime operating voltage.

Terminations Available for 3B980/CR2032



Series/Size/Part #	Nominal Capacity Ah	Rated Current mA	Open Circuit Voltage	Operating Temperature Range °C
MNO Coin 3B980/CR2032	0.2	.59	3.0	-20/+60

Lithium Thionyl Chloride

QTC cells are ideal for volatile memory backup, portable instrumentation, and many other applications requiring economy, long life, and high energy density. Single/multiple cell packaging available with customer specified connectors/terminations.

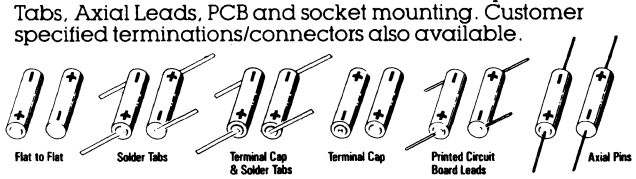
Series/Size/Part #	Nominal Capacity Ah	Rated Current mA	Open Circuit Voltage	Operating Temperature Range °C
QTC 85 PC 3B880	1.0	1.0	3.6	-40/+85
QTC 85 ½AA 3B960	.75	.04	3.6	-40/+85
QTC 85 ½AA 3B955	.75	.04	3.6	-40/+85
QTC 85 ⅔AA 3B950	1.5	.08	3.6	-40/+85
QTC 85 AA 3B940	1.9	0.1	3.6	-40/+85

Other Lithium Systems

E•I offers additional lithium cell technologies for a wide variety of special applications: high/low temperature, very high drain rates, tough environmental conditions, non-magnetic, etc. Call for technical assistance.

Terminations

Broad range of standard and coin cell terminations available Flat to Flat, Solder Tabs, Terminal Cap & Solder Tabs, Axial Leads, PCB and socket mounting. Customer specified terminations/connectors also available.



Custom Battery Packs

Our experienced Custom Pack Engineering Group can design a package of lithium power cells specifically for your application. Special fusing, protection circuitry, and insulation provide an extra measure of safety. All E•I battery packs undergo strict in-process and final Q.C. to assure highest reliability.

CELLection™ Service

We start with *your* requirements – space, voltage, current drain, temperature range, etc. – then the unique, structured CELLection process and our battery experts prepare a detailed recommendation for the optimum lithium power cell or pack for *your* application.

Electrochem
ELECTROCHEM INDUSTRIES
A Division of Wilson Greatbatch Ltd.
10,000 Wehrle Drive, Clarence, NY, U.S.A. 14031
(716) 759-2828 FAX: (716) 759-7390 TELEX: 137-084
Customer Service (716) 759-7320
(716) 759-2828

EAC Custom Battery Assembly and Distribution

ENGINEERED SOLUTIONS . . .

NICKEL CADMIUM
SEALED LEAD
LITHIUM
ALKALINE
MERCURY
SOLAR
AC/DC CHARGERS

DURACELL
ELECTROCHEM
GATES
PANASONIC
SANYO
VARTA
YUASA

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Computerized Sales & Customer Support

Computer Aided Design

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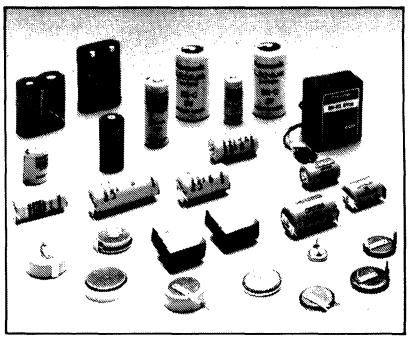
For more information call TOLL FREE: 1-800-447-5639

EAC Custom Battery Assembly and Distribution

MISCELLANEOUS PRIMARY TECHNOLOGIES
LITHIUM BATTERIES



PANASONIC CYLINDRICAL TYPE LITHIUM BATTERIES

Panasonic Lithium cells meet the most demanding requirements.

- (CF)n/Li and MnO_2/Li
- 5 cell configurations: C, A, 2/3A, 1/2A, 2/3AA
- Nominal voltage: 3V
- Capacities (mAh); 600 - 5,000

User Replaceable Packs:

- Three Standard Packs: BR-P2, CR-P2, CR123A
- Nominal Voltage: 3V & 6V
- Nominal Capacity: 1,200 mAh, 1,300 mAh

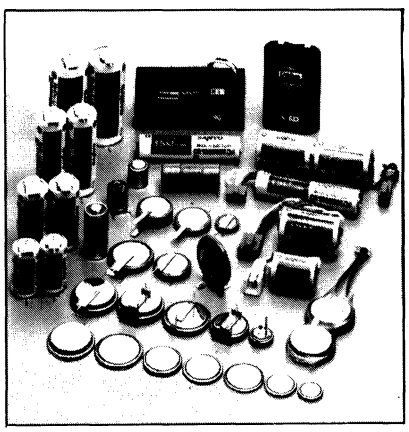
PANASONIC COIN TYPE LITHIUM BATTERIES

- High voltage of 3 volts is about twice that of conventional batteries.
- Extremely high energy density per unit of weight.
- For use in watches, cameras, calculators, memory back-up.
- 25 models in (CF)n/Li or MnO_2/Li
- Seven (7) Diameters from 10.0 mm - 30.0 mm
- Seven (7) Heights from 1.60 mm - 7.70 mm
- Weight from 0.6 g - 10.5 g

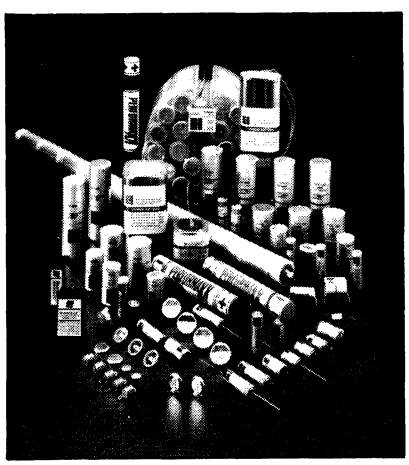
CARBON LITHIUM RECHARGEABLE BATTERIES/PIN TYPE LITHIUM BATTERIES/1.55V COPPER OXIDE LITHIUM BATTERIES

SANYO MANGANESE DIOXIDE LITHIUM BATTERIES

- A single 3-volt cell to replace two or three conventional units.
- High energy density.
- UL-approved safety, thanks to the use of manganese dioxide and stainless steel casing.
- Low self-discharge—0.5% for laser-sealed units, 1% per year for crimp seals.
- High discharge characteristics, even at high or low temperatures.
- Wide temperature range— −40 to+85°Cfor laser-sealed, −20to+70°C for crimp-sealed batteries.
- Capacities from 35 to 5000 mAh.



ELECTROCHEM LITHIUM SYSTEMS



Electrochem offers a wide variety of lithium technologies and cell sizes form DD's to tiny button cells and capacities from 70 mAh to over 30 Ah, with operating voltages from 2.7 to 3.8 volts. For maximum packaging efficiency, cells with a variety of lead configurations are available, including solder tabs. Cells are available to operate at temperatures as high as 150°C.

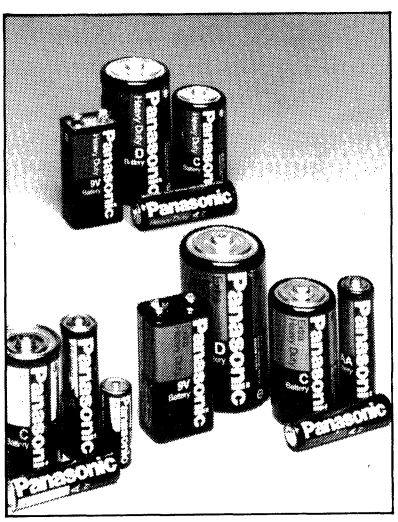
CARBON ZINC BATTERIES
PANASONIC
GENERAL PURPOSE BATTERIES

Panasonic Carbon Zinc Batteries are available in sizes ranging from "AAA" to "D", at 1.5 or 9 volts. Both general-purpose, heavy-duty, and extra heavy-duty batteries are available. The latter offer high leakage resistance and discharge characteristics that may be selected for virtually any application.

MERCURIC OXIDE BATTERIES
PANASONIC
EXCELLENT VOLTAGE STABILITY, LARGE CAPACITY

Mercury batteries offer superb performance as compact, high-strength power sources. With capacities ranging from 60 to 11,500 mAh at 1.35V, they are available in sizes from 7.9 mm diameter by 3.6 mm height, to 26 mm dia by 119 mm high. Major features include:

- Compact size.
- Stable operating voltage.
- Long shelf life.
- Wide operating temperature range.
- Ruggedness.
- Can be stacked to meet custom designs.



ALKALINE BATTERIES
PANASONIC CELL

Panasonic alkaline manganese batteries offer these features:

- Low cost.
- Long shelf life.
- High capacities (14 to 580 mAh).
- Compact size (6.8 to 24 mm dia. by 2.15 to 50.5 mm height).
- Superior low-temperature discharge characteristics.

EAC ENGINEERED ASSEMBLIES & COMPONENTS 380 North Street, Teterboro, N.J. 07608

For more information call TOLL FREE: 1-800-447-5639

EAC Custom Battery Assembly and Distribution

RECHARGEABLE NICKEL CADMIUM BATTERIES

SANYO NiCd BATTERIES (Standard "CADNICA")

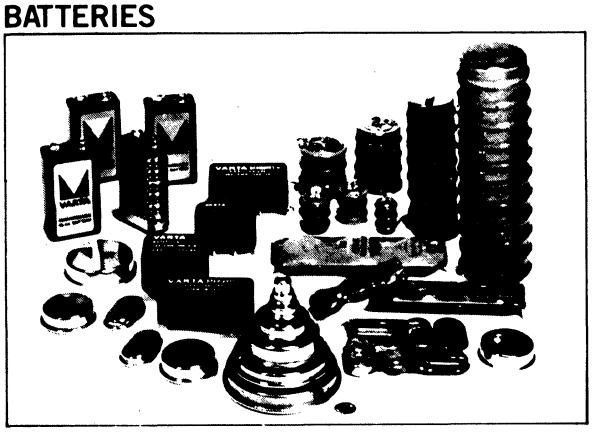
- Over 63 models.
- Capacities range from 50 to 20,000 mAh.
- Standard or quick-charge.
- Wide operating temperature range.

SANYO High Capacity CADNICA Batteries (E Series)
High capacity CADNICA batteries feature a capacity almost 40% higher than conventional CADNICA batteries, thanks to the use of high density electrode plates and a new design concept. This results in more energy density compared to batteries of the same size.

SANYO NiCd Batteries (CADNICA SLIM SERIES)
For increased packaging flexibility, CADNICA Slim KF Series NiCd batteries offer extremely thin profile—only 6 to 10.5 mm (about 1/4" to 3/8"). This permits the design of thin packages with either single or multiple KF Series cells (e.g., calculators, tape recorders, etc.).

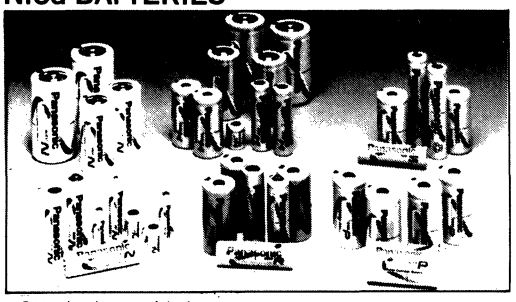
- Flat, rectangular shape.
- Capacities from 600 to 1200 mAh.
- Fast charging (one hour).
- Completely sealed.

VARTA NiCd BATTERIES



- A large variety of button cells.
- A wide range of capacities - 11 to 600 mAh.
- Can be assembled into custom battery packs.
- 500-2000 charge discharge cycles.
- Light weight and long life.
- High charge retention.
- No memory effect.

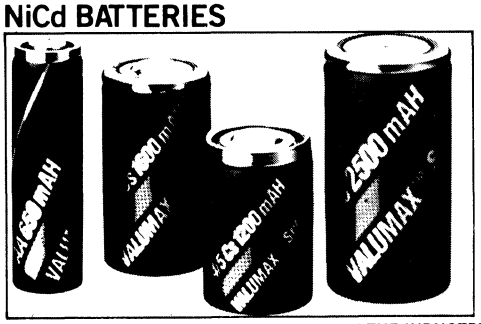
PANASONIC NiCd BATTERIES



- Standard or rapid charge.
- High operating temperature.
- High discharge rates.
- Over 500 charge/discharge cycles.
- High capacities (from 110 to 4400 mAh).

Panasonic High Capacity NiCd batteries (E Type)
Panasonic's unique technology has made it possible to produce a high capacity battery combining a high density positive plate and a large capacity pasted negative plate. The result is a capacity of 20% greater than that of a standard battery of the same size.

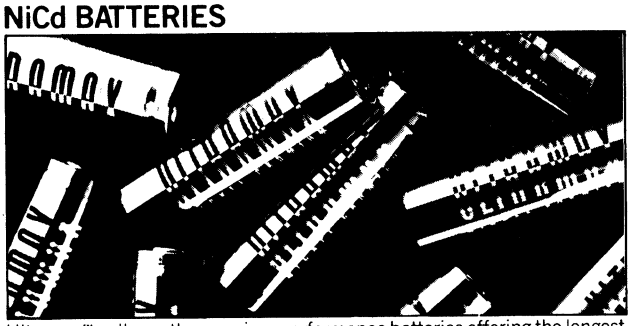
GATES VALUMAX™ NiCd BATTERIES



INTRODUCING THE HIGHEST STANDARDS IN THE INDUSTRY GATES NEW HIGH CAPACITY VALUMAX™ LINE

VALUMAX™ cells are available in virtually all sizes. Some of their major features include up to 25% more run time and up to 33% more capacity (4/5Cs, Cs and AAs)

GATES ULTRAMAX™ NiCd BATTERIES



Ultramax™ cells are the premium performance batteries offering the longest running times in nickel-cadmium technology today. Greater power density permitting smaller and lighter products, and fast recharge capability (full charge in just one hour), meet today's most demanding requirements.

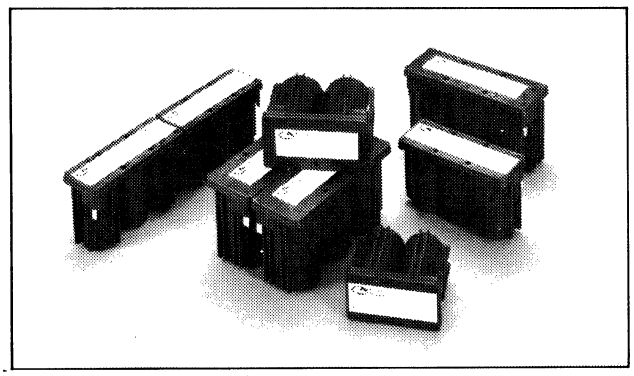
EAC ENGINEERED ASSEMBLIES & COMPONENTS 380 North Street, Teterboro, N.J. 07608

For more information call TOLL FREE: 1-800-447-5639

EAC Custom Battery Assembly and Distribution

RECHARGEABLE SEALED-LEAD BATTERIES (Valve Regulated)

GATES SEALED-LEAD MONOBLOC BATTERIES

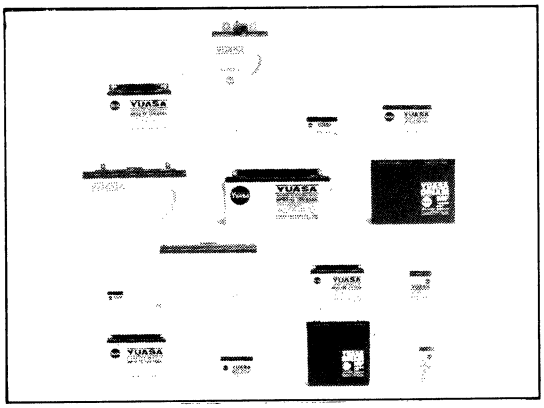


The outstanding features of Gates monobloc series is that it offers *internal* battery connections (rather than the conventional approach where individual cells are connected into a battery with external leads). This greatly improves battery reliability by drastically reducing the parts count. For additional voltage/current capacity, monobloc batteries may be connected in series or parallel.

For improved safety, a self-resealing vent will release excessive pressure that might occur under improper recharging conditions.

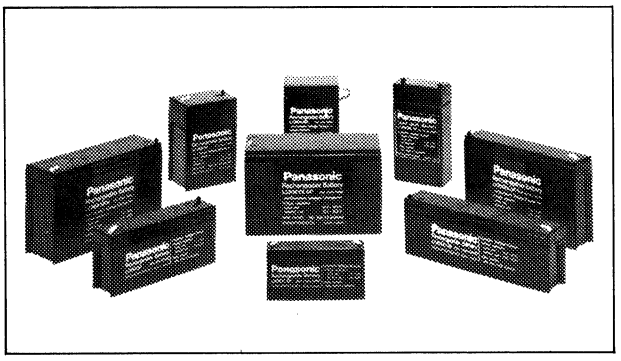
- Battery voltages—4 to 6 volts.
- High capacity—2.7 to 8.6 Ah.
- Low internal resistance—as low as 0.001 ohm.
- Cost effective—200-2000 charge/discharge cycles.
- Wide operating temperature range— -65° to +65°C.
- Long float life—up to eight years.

YUASA SEALED-LEAD NP SERIES BATTERIES



- Maintenance free. High energy density.
- Wide capacity range—0.8 to 65 Ah.
- Three voltages—4, 6, or 12 volts.
- Long cyclic or float life.
- Fully-sealed construction.

PANASONIC SEALED-LEAD LC SERIES BATTERIES



Thanks to its lead-calcium system, Panasonic LC sealed-lead batteries can withstand tough operating conditions, such as overcharge and deep discharge. Other user-oriented benefits include:

- Wide capacity range—1.3 to 120 Ah.
- Convenient voltage range—4, 6, or 12 volts.
- Long life, float or charge/discharge.
- Starved electrolyte.
- Maintenance free.
- Can be charged, discharged, or stored in any position.
- Leakproof (approved by DOT as "Drycell" for air shipment).
- UL recognized (File #MN137723).

GATES CYCLON SINGLE-CELL SEALED-LEAD BATTERIES

- High capacities—2.7 to 26 Ah.
- High peak power—135 to 600 W.
- Low internal resistance—as low as 0.001 ohm.
- High cell voltage—2V.
- Wide operating temperature range— -65 to +65°C.
- Long storage life—around four years at room temperature.
- Cost effective—200 to 2000 charge/discharge cycles.
- Long float life—up to eight years.

EAC ENGINEERED ASSEMBLIES & COMPONENTS 380 North Street, Teterboro, N.J. 07608

For more information call TOLL FREE: 1-800-447-5639

EVEREADY® ENGINEERING FOR INNOVATION

The name consumers trust

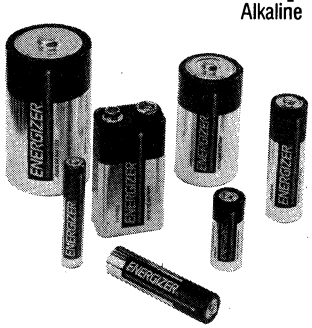
1991 marks 100 years of EVEREADY innovation and ingenuity. EVEREADY developed the world's first dry cell in the late 1800's. Since then, through a total commitment to quality, EVEREADY remains one of the most recognized and most trusted brand names of consumer products the world over.

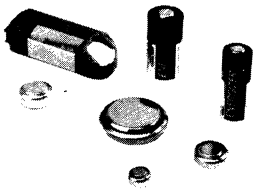
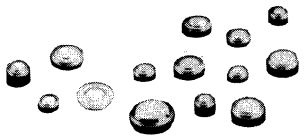
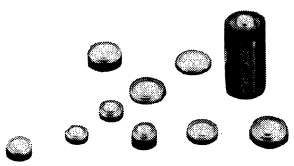
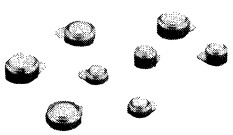
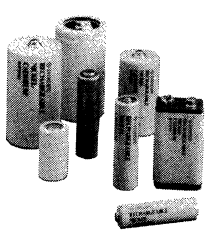
Comprehensive technical support

EVEREADY provides a consulting service of experienced battery engineers as an aid to manufacturers in need of special battery designs. In a recent survey of OEM customers, EVEREADY sales managers were rated significantly better than the competition on their knowledge and expertise in battery technology and in the service they provide.

For help with your specific battery problems, call (314)982-2000 or write Eveready Battery Company, Inc., Battery Engineering, 1EBC, Checkerboard Square, St. Louis, MO 63164.

CHOOSE THE RIGHT BATTERY FOR THE RIGHT JOB

	Characteristics	Configurations	Battery Voltage	Applications
CLASSIC (Zn/MnO_2) Standard C/Zn 	Economical, dependable Variety of shapes and sizes Good shelf life Voltage drops gradually with use Reduced performance at low temperatures	AA AAA C D 6V 9V Other Cylindrical and Rectangular	1.5 to 510	*Low to moderate periodic power needs* Radios, flashlights, lanterns, small lighted toys and novelties, barricade flashers, lighting and alarm systems, electric fence controllers, laboratory instruments, smoke detectors, remote control transmitters
SUPER HEAVY DUTY (Zn/MnO_2) Premium C/Zn 	Premium power at popular prices Variety of shapes and sizes Good shelf life Excellent leakage resistance Lasts longer than standard C/Zn batteries	AA AAA C D 6V 9V Other Rectangular	1.5 to 9	*Moderate to heavy current or regular use* Flashlights and lanterns, moderate power portable audio devices, calculators, motor driven devices, communication equipment, electronic games, remote control transmitters, clocks
ENERGIZER (Zn/MnO_2) Alkaline 	Premium price Variety of shapes and sizes Best, longest lasting power source Excellent shelf life Best low temperature characteristics Best voltage maintenance under load	AA AAA AAAA C D 9V Other Cylindrical and Rectangular	1.5 to 9	*Heavy current or continuous use* High power flashlights and lanterns, cameras and photo accessories, high drain toys and games, high power portable audio devices - Boom Boxes, CD players, personal stereo - "Walkman," portable TV's, smoke detectors, shavers, portable communication systems, medical instruments, clocks

	Characteristics	Configurations	Battery Voltage	Applications
MANGANESE DIOXIDE (Zn/MnO_2) 	Lower cost and energy density than silver oxide, mercuric oxide, and zinc air Variety of shapes and sizes Excellent shelf life Gradual sloping discharge curve Good low temperature characteristics Good resistance to shock, vibration, and acceleration	Miniature	1.5 to 12	*Miniature battery powered electronic equipment* Calculators, photo, novelties, watches, remote controls
MERCURIC OXIDE (Zn/HgO) 	Variety of shapes and sizes Outstanding shelf life High capacity Good resistance to shock, vibration, and acceleration Relatively flat discharge curve	AA 9V Miniature Other Cylindrical	1.35 to 8.4	*Miniature battery powered electronic equipment* Cameras, exposure meters, instruments, hearing aids, watches, calculators, microphones
SILVER OXIDE (Zn/Ag_2O) 	Variety of shapes and sizes Outstanding shelf life High capacity Flat discharge curve Good low temperature characteristics Good voltage maintenance under load Exceptional salting resistance Good resistance to shock, vibration, and acceleration	Miniature Photo	1.5 to 6	*Miniature battery powered electronic equipment* Hearing aids, cameras, instruments, watches, calculators
ZINC AIR (Zn/O_2) 	Variety of shapes and sizes Excellent shelf life until activated Highest capacity-to-volume ratio for miniature batteries Flat discharge curve Good low temperature characteristics Good resistance to shock, vibration, and acceleration Activated by removing tab covering from air access hole Must have access to air (oxygen) to operate	Miniature Hearing Aid 9V	1.4 to 8.4	*Miniature battery powered electronic equipment* Hearing aids, pagers
NICKEL CADMIUM (Ni/Cd) Rechargeable 	Variety of shapes and sizes Can be assembled into multicell packs Relatively flat discharge curve Good high and low temperature performance High resistance to shock, vibration, and acceleration Long cycle life, up to 1000 charges Higher self discharge than ENERGIZER alkaline Fast charge types available Consumer cells and chargers available Capacities from 80 mAh to 4 Ah available	AA AAA C D 9V	1.2 to 7.2	*Rechargeable devices, standby power and replacement cells for high usage devices* Portable tools and appliances, photoflash, remote control models, standby power, alarm systems, personal pagers, cordless phones, cellular phones, high use consumer devices, portable computers
LITHIUM (Li)	Variety of shapes and sizes High energy density Outstanding shelf life Leak resistant UL Recognition on most sizes Good low and high temperature use and storage performance Eveready Battery Company, Inc. St. Louis, MO 63164	AA Miniature Cylindrical	1.5 to 6	*Long life, low to moderate drain electronic equipment* Watches, calculators, cameras, memory back-up, hearing aids, pagers 1.5V AA for High Drain, High Tech Applications

Gates Energy Products

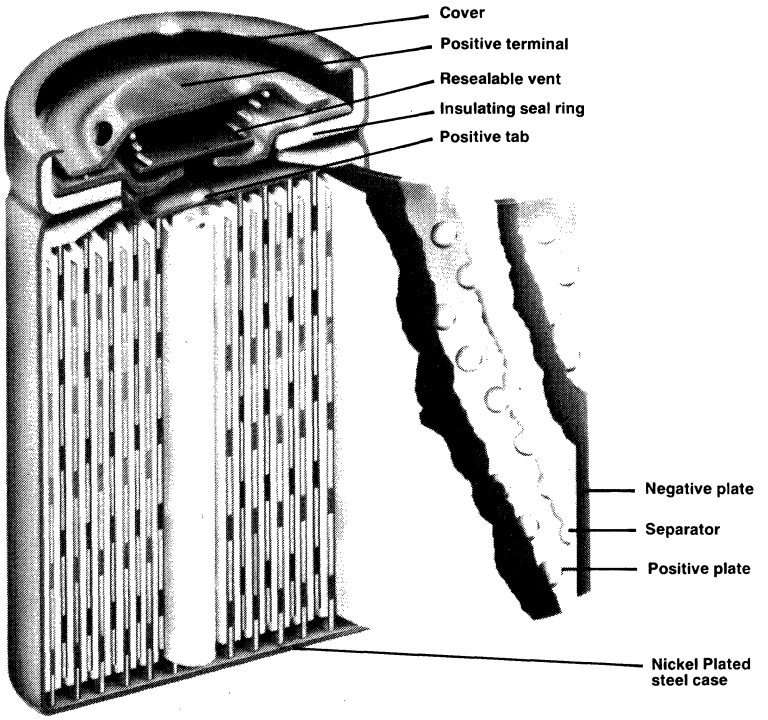
GATES SEALED RECHARGEABLE BATTERIES

Gates Energy Products, Inc. is a leading manufacturer of sealed rechargeable batteries, offering a full line of nickel-cadmium and sealed-lead cells, with capacities ranging from 0.065 Ah to 25 Ah. Gates technology adds power to your product with the Nickel-Metal Hydride and ULTRAMAX, the world's highest capacity nickel-cadmium battery which provide superior performance to your portable products. And, our Genesis sealed-lead battery for UPS applications is the most advanced design avaliable on the market today.

The Gates commitment to technical excellence goes beyond the product itself, to helping customers develop their own successful product designs. Our customer support helps you choose the battery that's right for your application and ensures that your product design achieves maximum performance.

- **Technical Support**
  Even the best product performs better when our batteries characteristics are matched to your product design. That is why at Gates our technical support staff works with you from the beginning in the design and development of your rechargeable, battery-powered products.
- **Applications Engineering**
  Our applications laboratory and engineers tackle your more complicated design questions, testing your product designs with Gates batteries to ensure compatibility **before** you make major manufacturing decisions.
- **Value-Added Services**
  One source can supply you with Gates nickel-cadmium and sealed-lead batteries built to your exact specifications. Whatever the configuration, we can provide the custom-built battery you need, including multi-cell shrink sleeve and plastic case assemblies and product packaging.

GATES NICKEL-CADMIUM RECHARGEABLE BATTERIES



Choose from a variety of cell performance types to meet your battery power needs:

- **VALUMAX™ Cells-** Premium capacity at a standard price makes VALUMAX your best value, dollar for dollar
- **Fast Charge Cells—** When you need quick turnaround, Fast charge cells can be recharged in one hour
- **GEMAX™ Cells-** Improved power delivery and long run times make GEMAX the choice for demanding applications
- **Goldtop™ Cells-** Excellent life in high-temperature environments
- **Goldtop Plus™ Cells–**The benefits of Goldtop with improved high-temperature charge acceptance for emergency lighting applications.
- **ULTRAMAX–**The highest capacity nickel-cadmium batteries you can buy, designed for ultra long run times
- **Millennium™ Power System–**The new name in consumer rechargeable batteries, available in traditional round cell sizes and camcorder packs.

The construction of Gates cells provides other performance advantages:

- **Long Life**
  Batteries have a long life while on standby charge. Since nickel-cadmium batteries neither consume nor lose active material during charging, they may be continuously overcharged at the specified rates with negligible effect on performance or life.
- **No maintenance and easy storage.**
  Nickel-cadmium batteries may be placed in open circuit storage in any state of charge for extended periods of time, without damage or loss of rechargeability. Because of their sealed configuration, there's no need to replenish electrolyte.
- **Excellent discharge capacity**
  Due to their low internal resistance, batteries can be discharged at rates up to 20 times their 1-hour discharge rate without impacting service life.
- **Resealable safety vent**
  If needed, Gates safety vent opens to relieve excessive pressure, then reseals automatically to prevent the cell from drying out.
- **Overcharge capability**
  Gates cells can be held on constant current overcharge for years, then provide instant power necessary for the load.
- **Flat discharge voltage profile**
  A flat voltage discharge curve means voltage will vary as little as 100 millivolts per cell until they near the end of discharge. Power delivery remains relatively constant during 80 to 90% of discharge.
- **Mount in any position**
  Small, lightweight cells will operate in any position. Maintenance-free, long-life performance makes them ideal for numerous cordless applications.
- **Operational over wide temperature range**
  Gates Energy Products nickel-cadmium batteries are available in operational ranges from −20°C to +50°C. High-temperature cells range up to +70° (cell temperature). Cells have long life even at elevated temperatures.

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Gates Energy Products

Nickel-Cadmium Cell Description

VALUMAX™ Cells (G-Series) Excellent performance at a standard price value for a variety of applications.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	Capacity(mAhr) 1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Dimensions Max Dia mm(in)	Typical Wt gr(oz)	Maximum Charging Current Std (mA)	Maximum Charging Current Time (Hr)	Maximum Charging Current Quick (mA)	Maximum Charging Current Time (Hr)
G-180AAA	AAA	180	160	65	44.2(1.74)	10.3(0.40)	10.5(0.37)	16		55	4-6
G-350AA	½AA	350	325	49	29.7(1.17)	14.1(0.56)	13.2(0.46)	32		80	4-6
G-550A	⅔A	550	500	45	27.7(1.09)	166(0.66)	17.0(0.60)	50		160	4-6
G-650AA	AA	650	600	35	49.0(1.93)	14.1(0.56)	24.0(0.85)	60		150	4-6
G-650CS	½Cs	650	600	29	25.9(1.02)	22.1(0.87)	26.4(0.93)	60		200	4-6
G-1000A	A	1000	900	29	48.8(1.92)	16.6(0.66)	30.7(1.08)	90	16-20	250	4-6
G-1200CS	⅘Cs	1200	1100	21	33.3(1.31)	22.1(0.87)	34.6(1.22)	105		330	4-6
G-1600CS	Cs	1600	1500	22	42.2(1.66)	22.1(0.87)	48.2(1.70)	150		400	4-6
G-2500C	C	2500	2300	19	49.0(1.93)	25.5(1.00)	69.3(2.45)	230		780	*4-6
G-2300D	½D	2300	2200	18	35.8(1.41)	32.3(1.27)	76.3(2.69)	220		900	*4-6
G-4300D	D	4300	4000	11	58.4(2.30)	32.3(1.27)	130.0(4.59)	400		1600	*4-6
G-6700F	F	6700	6200	6	87.4(3.44)	32.3(1.27)	193.1(6.81)	620		N/A	N/A

*G-2500C, G-2300D and G-4300D: Charge termination or reduction from quick charge rate is required.

VALUMAX™ Fast Charge Cells (GF-Series) VALUMAX cells with fast charge capability.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	Capacity(mAhr) 1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Dimensions Max Dia mm(in)	Typical Wt gr(oz)	Fast Charge (1-Hour Charge) (mA)
GF-350AA	½AA	350	325	49	29.7(1.17)	14.1(0.56)	13.2(0.46)	390
GF-550A	⅔A	550	500	45	27.7(1.09)	16.6(0.66)	17.0(0.60)	600
GF-650AA	AA	650	600	35	49.0(1.93)	14.1(0.56)	24.0(0.85)	700
GF-650CS	½Cs	650	600	29	25.9(1.02)	22.1(0.87)	26.4(0.93)	720
GF-1000A	Af	1000	900	29	48.8(1.92)	16.6(0.66)	30.7(1.08)	1000
GF-1200CS	⅘Cs	1200	1100	21	33.3(1.31)	22.1(0.87)	34.6(1.22)	1260
GF-1600CS	Cs	1600	1500	22	42.2(1.66)	22.1(0.87)	48.2(1.70)	1650
GF-2500C	C	2500	2300	19	49.0(1.93)	25.5(1.00)	69.3(2.45)	2760
GF-4300D	D	4300	4000	11	58.4(2.30)	32.2(1.27)	130.0(4.59)	4620

Note: Fast charge (1-hour) requires charge termination control.

ULTRAMAX™ Cells (GL-Series) Long run times for demanding applications.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	Capacity(mAhr) 1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Dimensions Max Dia mm(in)	Typical Wt gr(oz)	Maximum Charging Current Std (mA)	Maximum Charging Current Time (Hr)	Maximum Charging Current Quick (mA)	Maximum Charging Current Time (Hr)
GL-600A	⅔A	600	550	45	27.7(1.09)	16.6(0.66)	17.0(0.60)	55	16-20	180	4-5
GL-800AA	AA	800	725	36	49.0(1.93)	14.1(0.56)	21.6(0.76)	75		240	*4-5
GL-1000A	⅘A	1000	900	35	42.4(1.67)	16.6(0.66)	28.0(0.99)	90		300	*4-5
GL-1200A	A	1200	1050	29	48.8(1.92)	16.6(0.66)	30.7(1.08)	105	16-20	350	4-5
GL-1700A	⅘A	1700	1500	26	66.3(2.61)	16.6(0.66)	41.8(1.47)	150	16-20	500	*4-5
GL-2000CS	Cs	2000	1800	25	42.2(1.66)	22.1(0.87)	52.0(1.83)	180		600	*4-5

*Charge termination or reduction from quick charge rate is required after 5 hours.

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Gates Energy Products

Nickel-Cadmium Cell Description

ULTRAMAX™ Fast Charge Cells (GLF-Series) ULTRAMAX performance with fast charge capabilities.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Max Dia mm(in)	Typical Wt gr(oz)	Fast Charge (1-Hour Charge) (mA)		
GLF-600A	⅔A	600	550	45	27.7(1.09)	16.6(0.66)	17.0(0.60)	55	860	*4-5
GLF-750AA	AA	750	700	36	49.0(1.93)	14.1(0.56)	21.6(0.76)	840		
GLF-1200A	A	1200	1050	29	48.8(1.92)	16.6(0.66)	30.7(1.08)	105	1600	*4-5
GLF-800AA	AA	800	725	36	49.0(1.93)	14.1(0.56)	21.6(0.76)	870		
GLF-1000A	⅘A	1000	900	35	42.4(1.67)	16.6(0.66)	28.0(0.99)	1070		
GLF-1700A	⅔A	1700	1500	26	66.3(2.61)	16.6(0.66)	41.8(1.47)	1800		
GLF-1800CS	Cs	1800	1600	22	42.2(1.66)	22.1(0.87)	48.2(1.70)	1920		
GLF-2000CS	Cs	2000	1800	25	42.2(1.66)	22.1(0.87)	52.0(1.83)	2160		
GLF-2800C	C	2800	2500	19	49.0(1.93)	25.5(1.00)	72.4(2.55)	3100		
GLF-5000D	D	5000	4500	11	58.4(2.30)	32.3(1.27)	130.0(4.59)	5500		

Note: Fast charge (1-hour) requires charge termination control.

GEMAX® Cells (GX-Series) Higher power delivery for demanding applications such as housewares, radio controlled cars, and light duty power tools.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Max Dia mm(in)	Typical Wt gr(oz)	Maximum Charging Current Std (mA)	Time (Hr)	Quick (mA)	Time (Hr)
GX-1100CS	⅘Cs	1100	1050	15	33.3(1.31)	22.1(0.87)	34.6(1.22)	105	16-20	330	4-5
GX-1500CS	Cs	1500	1400	10	42.2(1.66)	22.1(0.87)	46.2(1.63)	150	16-20	400	5-6

GEMAX™ Fast Charge Cells (GXF-Series) GEMAX benefits with one-hour charge capability.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Max Dia mm(in)	Typical Wt gr(oz)	Fast Charge (1-Hour Charge) (mA)
GXF-1100CS	⅘Cs	1100	1050	15	33.3(1.31)	22.1(0.87)	34.6(1.22)	1260
GXF-1500CS	Cs	1500	1400	10	42.2(1.66)	22.1(0.87)	46.2(1.63)	1680

Note: Fast charge (1-hour) requires charge termination control.

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Nickel-Cadmium Cell Description

XP60™ Cells (GP-Series) Excellent power delivery and cycle life for fast-charge and high-rate applications such as professional power tools and competition R.C. cars.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	Capacity(mAhr) 1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Dimensions Max Dia mm(in)	Typical Wt gr(oz)	Fast Charge (1-Hour Charge) (mA)
GP-1200CS	Cs	1200	1000	9	42.2(1.66)	22.1(0.87)	46.2(1.63)	1440

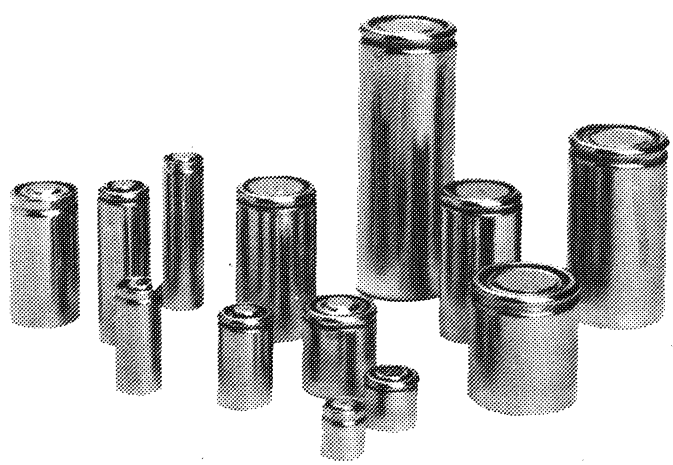
Goldtop® Cells (GH-Series) Excellent life at elevated temperature applications such as emergency lighting inverter power.

Model Number	Cell Type	Capacity(mAhr) 0.2C min	Capacity(mAhr) 1.0C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Dimensions Max Dia mm(in)	Typical Wt gr(oz)	Maximum Charging Current Std (mA)	Std Time (Hr)	Quick (mA)	Quick Time (Hr)
GH-1500CS	Cs	1500	1400	18	42.2(1.66)	22.1(0.87)	43.7(1.54)	140		350	5-6
GH-2300D	½D	2300	2200	18	35.8(1.41)	32.3(1.27)	76.3(2.69)	220	16-20	N/A	N/A
GH-4300D	D	4300	4000	12	58.4(2.30)	32.3(1.27)	130.1(4.59)	400		N/A	N/A
GH-6000F	F	6000	5600	5	87.4(3.44)	32.3(1.27)	218.0(7.69)	560		N/A	N/A

Goldtop® MP²™ Cells (GM-Series) Memory Preservation Product. Excellent life and leakage protection for printed circuits at elevated temperatures.

Model Number	Cell Type	Capacity(mAhr) 0.1C min	Typical Re (mΩ)	Dimensions Max Ht mm(in)	Dimensions Max Dia mm(in)	Typical Wt gr(oz)	Maximum Charging Current Std (mA)	Std Time (Hr)	Quick (mA)	Quick Time (Hr)
GM-65MP80	MP80	65	183	15.1(0.59)	12.6(0.50)	5.1(0.18)	7		22	
GM-100AA	⅓AA	100	118	17.1(0.67)	14.1(0.56)	7.4(0.26)	10	16-20	33	4-5
GM-350AA	½AA	350	61	29.7(1.17)	14.1(0.56)	13.0(0.46)	30		90	
GM-600AA	AA	600	37	49.0(1.93)	14.1(0.56)	23.5(0.83)	60		150	

- Nominal cell voltage 1.2V.
- Standard range for use up to +50°C (cell temperature)
- Goldtop High temperature cells range up to +70°C (cell temperature)
- The sizes shown are maximum overall bare cell dimensions.
- Fast charge systems will require charge control for high rate termination.



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Energy Products

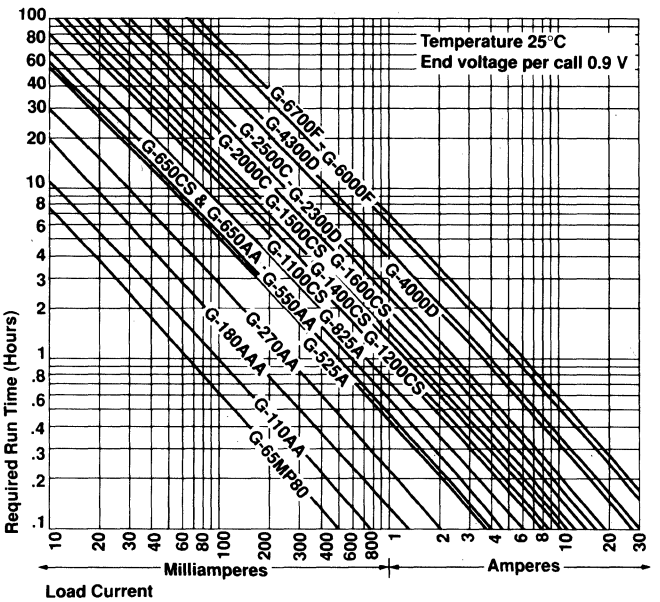
Nickel-Cadmium Performance Characteristics

Use of Selector Guide

1. Locate the room-temperature discharge current for your application on horizontal axis.
2. Choose the desired run time on the vertical axis.
3. The intersection of the run time and the discharge current defines the necessary capacity. The required capacity is indicated by the model number which provides a reference for the cell specifications.
4. Any cell that is above or to the right of the intersection will meet the cell discharge requirement at room temperature. If the application requires a cell with special characteristics such as operation at high temperature, refer to the cell description section to determine the availability of a suitable product.
5. Because of ongoing changes in the product line, not all cells listed in the cell description section are represented on the chart.

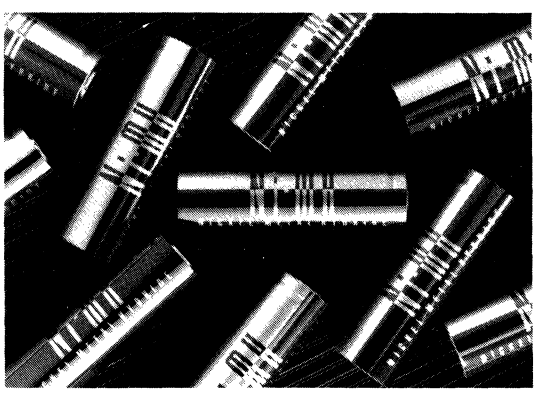
Example: The application requires a discharge current of 300mA for 5 hours.

Solution: The run time and discharge current intersect on the capacity line marked "G-1500CS." This model number indicates a Cs diameter cell from Gates product line would meet the minimum capacity required for this application. Other cell options are indicated on the chart (anything above and to the right).



Note: This chart uses nominal room-temperature parameters. Careful attention must be paid to various derating factors such as charge temperature, discharge temperature, etc. which may cause the cell to deliver less capacity. If this occurs, a larger cell may be required. Consult Gates Energy Products for additional assistance in determining the appropriate cell size and design for specific applications.

NICKEL-METAL HYDRIDE CELLS



Nickel-Metal Hydride has been heralded as the rechargeable technology of the future. It offers up to twice the run time of standard Nickel-Cadmium batteries of the same size. This allows designers to create portable products that are smaller and lighter. The cell sizes in the Nickel-Metal Hydride line were chosen for their utility in high-growth areas, such as cellular phones and new smaller, lighter-weight laptop and notebook computers.

Cell Selection

Model Number	Cell Size	Capacity (mAhr)
GMH-1100AA	AA	1100
GMH-900A	2/3A	900
GMH-1400A	4/5A	1400
GMH-1600A	A	1600
GMH-2300A	4/3A	2300
GMH-2700CS	Cs	2700

GATES SEALED-LEAD BATTERIES

Gates invented and patented the starved-electrolyte, oxygen recombining sealed-lead battery. The unique construction of Gates sealed-lead cells offers advantages not found in conventional lead-acid batteries. The starved electrolyte system allows recombination of gas to prevent dry-out and the venting of acid vapor, effectively eliminating terminal corrosion and allowing mounting in any position.

Gates offers a wide range of sealed-lead single-cell and monobloc batteries.

- **Cyclon®**—single cells for design versatility
- **Monoblocs**—standard batteries for volume applications
- **Genesis™**—reliable prismatic batteries for use in uninterruptible power supplies

Single cells can be custom assembled to meet your precise needs. Available in four basic design sizes—D,X,J and BC—Gates single cells can be connected in series or parallel to meet voltage, capacity and space reqirements.

Monobloc batteries offer you the convenience of a preassembled component for a diversity of applications. Monoblocs are available in 4-and 6-volt modules of D,X, and E sizes. 6-volt monoblocs are available in UL94VO flame-retardant cases. These can also be connected in series or in parallel for additional voltage capacity.

Gates new Genesis sealed-lead battery is available in 15-minute ratings of 120 and 190 watts per cell, to provide unsurpassed reliability and performance for uninterruptible power supplies. Genesis delivers all the power needed in those first critical minutes, while setting new industry standards in weight, size, terminal design, reliability and high-rate discharge power.

Standard batteries are available in a wide range of voltage and amp-hour choices using either shrink-sleeve or plastic case packaging. If your needs are more specialized, Gates can custom assemble batteries to your precise amp-hour and voltage requirements with the packaging type, geometry and terminations best suited to your design.

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Gates Energy Products

Gates' sealed-lead cell construction offers numerous other performance advantages over conventional designs:

- **Long life float and cyclic applications**
  In both float and cyclic applications, Gates sealed-lead batteries have proven long life.
- **Impressive low-temperature performance**
  Gates cells offer excellent performance in high- and low-temperature environments.
- **Long storage life**
  Low self-discharge rates mean Gates sealed-lead cells can be stored for long periods of time compared to conventional batteries.
- **Dependable use in any application**
  Sealed design allows use in any position, even near delicate electronic circuitries. Available UL rating of 94-VO (flame-retardant) for both single cell and monobloc batteries qualifies them for use in emergency lighting, office products, data processing and medical equipment.
- **High rate charge/discharge**
  Low internal resistance allows a high rate of charge or discharge.
- **Excellent mechanical and vibrational characteristics**
  Wound construction is inherently stronger than rectangular configuration.

SEALED-LEAD SPECIFICATIONS

Cell Size	D	X	E	J	BC
Single Cell (2 Volts)	●	●	NA	●	●
Monobloc (4 Volts)	●	●	●	NA	NA
Monobloc (6 Volts)	●	●	●	NA	NA
Capacity Rating					
20 hour rate	2.7Ah	5.4Ah	8.6Ah	13.0Ah	26.0Ah
10 hour rate	2.5Ah	5.0Ah	8.0Ah	12.5Ah	25.0Ah
1 hour rate	1.8Ah	3.2Ah	5.8Ah	9.0Ah	17.5Ah
Internal Resistance (max. for a charged cell)	$10x10^3$ohms	$6x10^3$ohms	$5x10^3$ohms	$4x10^3$ohms	$3x10^3$ohms
	Measured on Hewlett-Packard 4328A milliohm meter.				
Standard Electrical Terminals	.187″x.025″	.250″x.025″	.250″x.025″	.312″x.032″	.312″x.032″
	Contact Gates Sales Representative for special terminal options.				
Storage Time	Ta = 0°C		7,200 days		
	Ta = 23°C		1,200 days		
	Ta = 65°C		60 days		
Cell Temperature Range	Storage		−65°C to +65°C		
	Discharge		−65°C to +65°C		
	Charge		−40°C to +65°C		
Battery Charging	Constant Voltage				
	Cyclic		2.40-2.50V/cell		
	Float		2.30-2.40V/cell		
	Constant Current				
	Cyclic (max.)		C/5 rate		
	Float (max.)		C/500 rate		
Cycle Life	200-2,000 cycles 200 cycles—100% depth of discharge, one cycle per day (Charge: 2.45V constant voltage, no current limit; Discharge: C/5 rate). 2000 cycles—25% depth of discharge (Charge: 2.45V/cell for 7.5 hours, 2.0A current limit; Discharge: C/2 rate for 30 minutes). More cycles are avaialble with shallower discharges.				
Expected Float Life	8 to 10 years Based on accelerated test methods, 2.35 volts constant voltage charge at 23°C ambient temperature.				

●—available NA—not available

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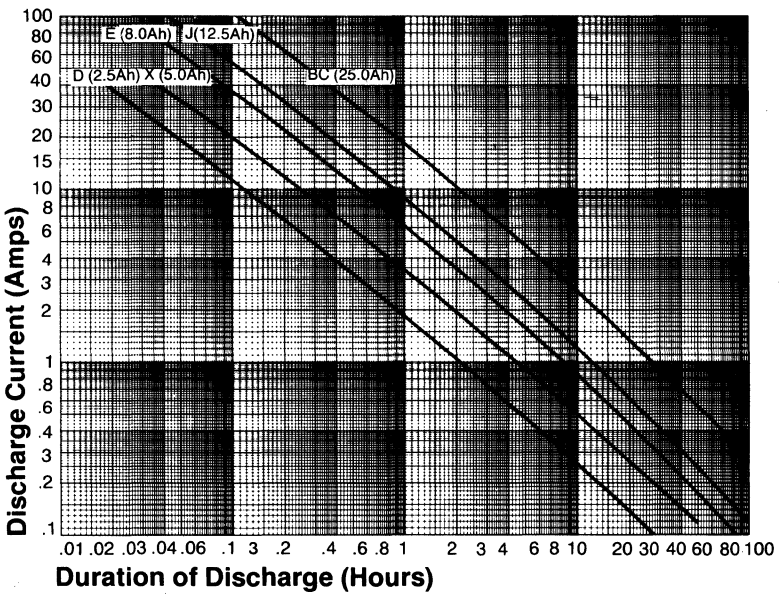
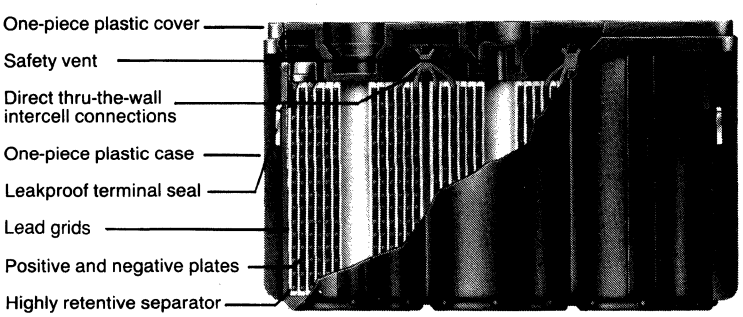
Gates Energy Products

New cells must be cycled appropriately before full rated capacity, as shown on this curve, is reached.

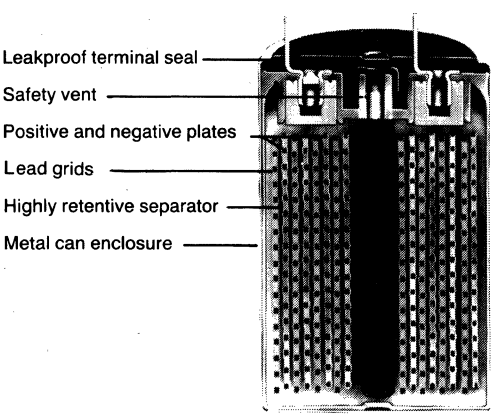
SEALED-LEAD PERFORMANCE CHARACTERISTICS



GATES MONOBLOC BATTERY CONSTRUCTION



GATES SINGLE CELL CONSTRUCTION



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Gates Energy Products

GENESIS™ SEALED-LEAD BATTERIES FOR UPS

The new Genesis line of sealed-lead batteries has been specifically designed to meet the needs of the uninterruptible power supply marketplace. Genesis will supply all the required power in those first critical minutes, while setting new industry standards in weight, size, terminal design, longevity and high-rate discharge power.

High Energy Density
Genesis provides 60% more power than existing batteries of the same case size at the 15-minute rate.

Excellent Reliability
Genesis features the Gates patented starved-electrolyte, recombining technology developed almost two decades ago. All features have been designed to optimize Gates patented technology for high-rate, UPS applications.

Smaller & Lighter
Because of its high energy density, Genesis allows UPS systems designers to downsize their systems by 30% to 50%.

Industry Standard Sizes
Genesis is designed to fit into existing UPS cabinets, thereby reducing the amount of engineering needed for retrofit.

Maintenance-Free Design
Recombinant sealed technology combined with hardened copper terminals eliminates periodic terminal tightening, while assuring no acid leakage.

Office Compatible
The Genesis battery features a flame-retardant, UL 94-VO case, flame arrestor vent and sealed design for use in the office environment.

Long Life
Gates technology has been proven in demanding telecommunications field conditions for over seventeen years.

APPLICATIONS
Primary applications for the Genesis G12V120W15 are uninterruptible power supplies used as distributed power backup systems, especially for minicomputer and networked PC applications.

SPECIFICATIONS (G12V120W15)

Nominal Voltage
12 volts (6 cells @ 2 volts/cell)

Power Output
5 Minute - 250 watts/cell 1500 watts/battery
10 Minute - 190 watts/cell 1140 watts/battery
15 Minute - 120 watts/cell 720 watts/battery

Operating Temperature Range
Maximum - 60°C
Minimum - – 40°C

Weight
10 kg (22 lbs)

Nominal Dimensions
Height - 4.92 in. (125 mm)
Length - 6.54 in. (166 mm)
Width - 6.89 in. (175 mm)

Terminals
Construction - hardened copper
Hardware - M6x1-6H12SS bolt with washer

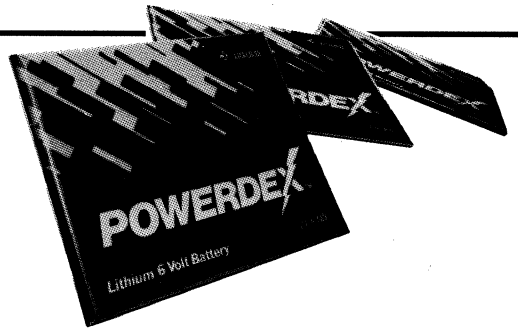
DEVELOPMENT HISTORY AND STATUS
Genesis batteries are prismatic forms of the wound sealed-lead batteries produced by Gates Energy Products since the early 70's. Genesis uses the basic electrochemistry and design techniques proved by the wound cells in rugged commercial applications.

P.O. BOX 147114 / GAINESVILLE, FLORIDA 32614-7114
TEL. 1-800-67-POWER / FAX (904)-462-4726

POWERDEX®

An Ultra-Thin, Ultra-Light, High-Energy Lithium Battery.

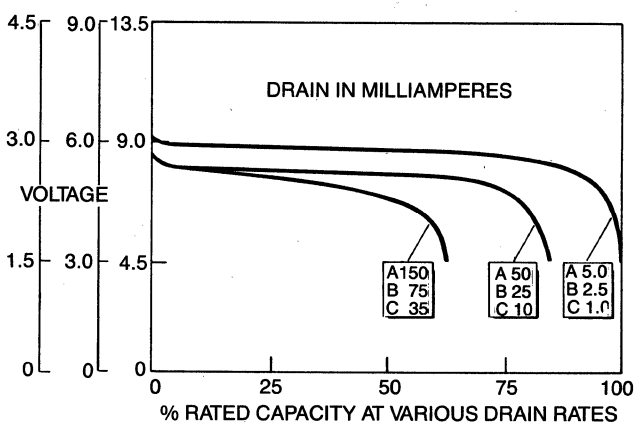
PORTABLE POWER/ HIGH ENERGY LITHIUM BATTERIES

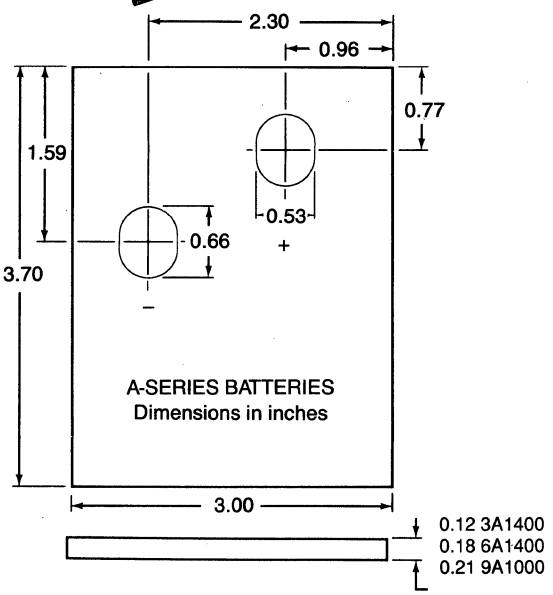


Portable Power

The Gould POWERDEX® battery is portable power technology brought to a new plane. Phenomenal power-to-weight and power-to-volume ratios offer the broadest possible freedom for product designs. The construction of POWERDEX™ batteries results in a safe solution for high energy density in a planar geometry battery.

Technical Data





Advantages

- High energy density
- Flat discharge curve
- Long shelf life
- Planar construction
- Wide operating temperature range
- Unique terminal arrangement
- Safe operation

An Ultra-Thin, Ultra-Light, High-Energy Lithium Battery.

A New Dimension in Portable Power...
The POWERDEX® battery brings planar geometry to the contemporary design of electronic equipment. With high energy density, high capacity, a flat discharge profile, and a shelf life of more than five years, the advanced technology of POWERDEX® planar batteries expands the potential of product design and performance.

The exceptionally efficient bipolar cell design and construction of POWERDEX® battery provides reliable, low-resistance connection between cells. Together with this advanced construction, lithium manganese dioxide chemistry produces a portable power source safe for industrial and consumer devices.

...For a New Generation of Products
The POWERDEX® battery is an excellent choice of portable power for low- to medium-drain industrial and consumer applications. Its planar geometry can be accommodated in a wide range of electronic devices.

TABLE II
Characteristics of Gould Powerdex® Lithium Power Source

Battery Designation		Battery Size, Inches, Max.	Nominal Voltage	Rated Capacity mAh	Recommended Max. Discharge Rate mA
A	3A1400	3.7 x 3.0 x 0.12	3	1400	125
	6A1400	3.7 x 3.0 x 0.18	6	1400	125
	9A1000	3.7 x 3.0 x 0.21	9	1000	125
B	3B300	3.0 x 1.91 x 0.09	3	300	60
	3B500	3.0 x 1.91 x 0.13	3	500	60
	6B300	3.0 x 1.91 x 0.15	6	300	60
	6B500	3.0 x 1.91 x 0.17	6	500	60
C	3C020S	1.58 x 1.18 x 0.02	3	20	0.2
	3C050	1.58 x 1.18 x 0.06	3	50	20
	3C050M	1.58 x 1.18 x 0.04	3	50	20
	3C150	1.58 x 1.18 x 0.08	3	150	20
	3C150M	1.58 x 1.18 x 0.065	3	150	20
	6C050	1.58 x 1.18 x 0.08	6	50	20
	6C050M	1.58 x 1.18 x 0.07	6	50	20
	9C050M	1.58 x 1.18 x 0.12	9	50	20

For more information on technical data, design assistance, prices and delivery write or call: Dr. Ralph J. Brodd, Manager, Lithium Power Sources 1 (216) 953-5065
Gould, Inc.
35129 Curtis Boulevard, Eastlake, Ohio 44095 or call 1 (800) 722-7890

GOULD
Electronics

Don't throw this message in the ol' circular file!

Instead...

1. Photocopy the form below. Enlarge it (125--150%) ...or write very small.
2. Fill it out.
3. Fax your form to 516-243-0232.
4. Sit back and relax... We'll do the rest.

IMPORTANT MESSAGE

TO Engineering DATE _____ TIME _____ A.M. P.M.

WHILE YOU WERE OUT

M Gary

OF Lyntronics

PHONE 516-243-6397

TELEPHONED		PLEASE CALL	
CALLED TO SEE YOU	X	WILL CALL AGAIN	
WANTS TO SEE YOU		RUSH	
RETURNED YOUR CALL	X	URGENT	X

MESSAGE

New designs to your spec. Customized !! battery designs

Lyntronics Inc.

DO NOT REMOVE

569 Acorn Street, Unit 5
Deer Park, New York 11729

516.243.6397...VOICE
516.243.0232...FAX

COMPANY _____
NAME / TITLE _____
ADDRESS _____
TELEPHONE ( ) _____ FAX ( ) _____

INSTRUCTIONS: ***Take pen in hand. Check off boxes. Fill in Blanks. ...Isn't this fun?***

MARKET

☐ Consumer
☐ Military
☐ Industrial

TYPE

☐ Primary (Throwaway)
☐ Secondary (Rechargeable)

DUTY CYCLE

(Primaries get only one trip, but they still have a duty cycle.)

CYCLIC
☐ Portable Power
☐ Partial Discharge
☐ Deep Discharge

FLOAT
☐ Standby
☐ Backup
☐ Memory Protection

ELECTRONIC SPECIFICATIONS

Specifications are determined by what your device can live with.
We find the system that will perform to these specs, unless it's made of unobtainium alloys.

VOLTAGE
Nominal _____
Maximum _____
Minimum _____

CURRENT
☐ Continuous
☐ Pulse
Duration _____
(of pulse/total run)

Peak Drain _____ Average Drain _____
% of cycle _____ % of cycle _____

Drain with device at idle *(if any)* _____
(don't forget LED's, etc.)

RECHARGE CYCLE

Sorry...Primary users have to skip this section.
Rejoin the fun at "Environmental".

☐ Continuous (float)
☐ Overnight

☐ 5 Hour
☐ 1 Hour

☐ Less

ENVIRONMENTAL

DISCHARGE TEMP
☐ Room
☐ Other
Maximum _____
Minimum _____

RECHARGE TEMP
☐ Same as discharge
New Maximum _____
New Minimum _____

TERMINATION
☐ Tabs
☐ Wire Leads
☐ Special Connector
☐ Open to Suggestions

SPECIAL REQUIREMENTS
(Explosion proof, waterproof, charge termination sensors, etc.)
☐ Yes
☐ No
☐ We'll Talk

SPACE AVAILABLE *(H x L x W, footprint, board mountable, etc.)*

_____

DEDICATED OR MATING ENCLOSURE
☐ Yes ☐ No

Add additional drawings or other information to your FAX. *Also include the menu from your favorite deli.*

...Thanks, Gary...

CHARACTERISTICS OF BATTERIES AND FUEL CELLS

System	Anode	Cathode	Theoretical battery		Practical battery		
			Voltage, V	Capacity, Ah/kg	Typical voltage, V	Capacity[a]	
						Wh/kg	Wh/dm³
Primary:							
Leclanche	Zn	MnO_2	1.6	230	1.2	65	175
Magnesium	Mg	MnO_2	2.0	270	1.5	100	195
Organic cathode	Mg	*m*-DNB	1.8	1,400	1.15	130	180
Alkaline MnO_2	Zn	MnO_2	1.5	230	1.15	65	200
Mercury	Zn	HgO	1.34	185	1.2	80	370
Mercad	Cd	HgO	0.9	165	0.85	45	175
Silver oxide	Zn	AgO	1.85	285	1.5	130	310
Zinc-air	Zn	Air (O_2)	1.6	815	1.1	200	190
Li-organic electrolyte	Li	[b]	2.1-5.4	130-660	1.8-3.2	250	400
Secondary:							
Lead-acid	Pb	PbO_2	2.1	55	2.0	37	70
Edison	Fe	Ni oxides	1.5	195	1.2	29	65
Nickel-cadmium	Cd	Ni oxides	1.35	165	1.2	33	60
Silver-zinc	Zn	AgO	1.85	285	1.5	100	170
Silver-cadmium	Cd	AgO	1.4	230	1.05	55	120
Zinc-nickel oxide	Zn	Ni oxides	1.75	185	1.6	55	110
Zinc-air[c]	Zn	Air (O_2)	1.6	815	1.1	150	155
Cadmium-air[c]	Cd	Air (O_2)	1.2	475	0.8	90	90
Zinc-O_2	Zn	O_2	1.6	610	1.1	130	120
H_2-O_2	H_2	O_2	1.23	3,000	0.8	45	65
Reserve:							
Cuprous chloride	Mg	CuCl	1.5	240	1.4	45	65[d]
Silver-chloride	Mg	AgCl	1.6	170	1.5	60	95[d]
Zinc-silver oxide	Zn	AgO	1.85	285	1.5	30	75[e]
Thermal	Ca	[b]	2.8	240	2.6	10	20[f]
Ammonia-activated	Mg	*m*-DNB	2.2	1,400	1.7	22	60[g]
High-temperature	NA	S	2.1	685	1.8	200	[h]
	Li	S	2.2	1,150	1.8	200	[i]
Solid electrolyte	Ag	Polyiodide	0.66	. . .	0.6	180	75[j]
Fuel cell:							
Hydrogen[c]	H_2	Air	1.23	26,000	0.7		[k]
Hydrazine[c]	N_2H_4	Air	1.5	2,100	0.7	800[b]	[l]
Methanol[c]	CH_2OH	Air	1.3	1,400	0.9	175[b]	185[m]

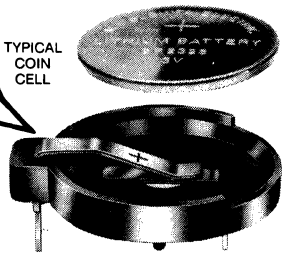
a Delivered capacity when discharged at normal temperatures (20°C) at normal discharge rates.
b Based on fuel consumption only.
c Weight of air not considered in computation of watt hours.
d Water-activated
e Automatically activated; high rate discharge; 2- to 10-min rate.
f Fused salt; heat-activated; high rate discharge; 2- to 10-min rate.
g Four-minute discharge rate.
h β-alumina electrolyte, 300°C operation.
i Fused salt; 350°C operation.
j Solid $RbAg_4I_5$ electrolyte.
k Several different cathode materials used.
l Fuel consumption is based on source of H_2.
m Based on methanol battery-fuel supply in situ.

BATTERY HOLDERS

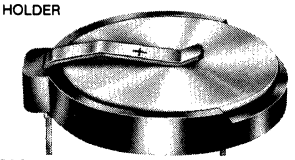
For Lithium, NiCd, Carbon, Carbon-Zinc & Alkaline Cells.

NEW POSITIVE CONTACT

TYPICAL COIN CELL

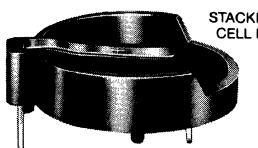


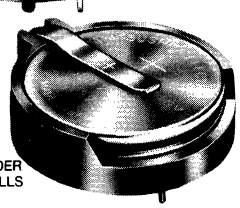
COIN CELL HOLDER



HOLDER WITH COIN CELL

STACKING COIN CELL HOLDER



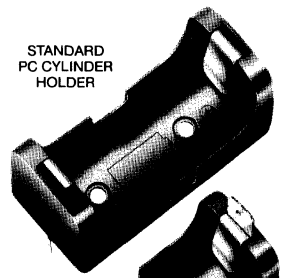


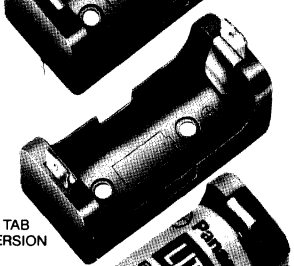
STACKING HOLDER WITH 2 COIN CELLS

BH-500 12MM COIN CELL HOLDER

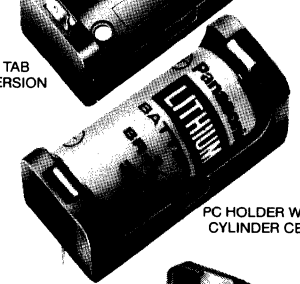
U.S. Patent No. 4,487,820

STANDARD PC CYLINDER HOLDER

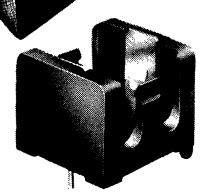




TAB VERSION

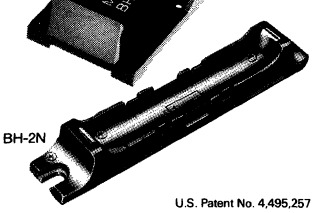


PC HOLDER WITH CYLINDER CELL



BH-1/3N

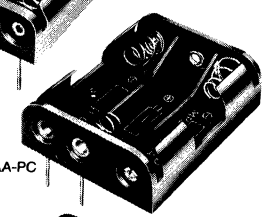
BH-9VPC HOLDER



BH-2N

U.S. Patent No. 4,495,257

BH2AA-PC



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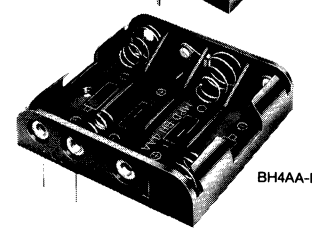
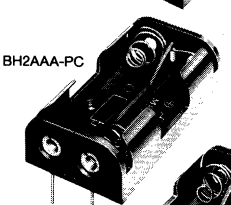
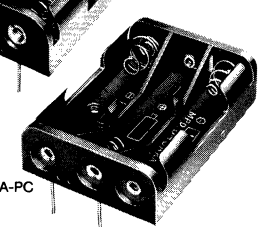


BH4AA-PC

BH2AAA-PC





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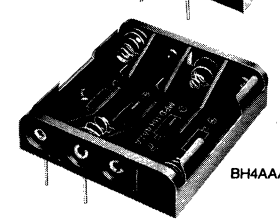


BH4AAA-PC

FOR MEMORY BACK-UP SYSTEMS

COIN CELL SERIES

Printed circuit board-mounted lithium coin cell battery holders eliminate the need for permanent solder tab mounting of cells. Unique molded design permits easy insertion and removal of battery without desoldering or special tools. Fits 3-volt coin cells: sizes 12mm, 20mm, 23mm and 24mm. UL flammability rating — UL94V-0.

HORIZONTAL SERIES

Fits 3-volt lithium and other horizontal cells: sizes 2/3A, 1/2AA, AA, C, 2N and 1/3N, 9 volt batteries, too. Simple PC board mounting with fast-on tab terminals for hardware soldering and eyelet mounting. UL flammability rating — UL94V-0.

BATTERY PACK SERIES

Three styles: PC (Printed Circuit), W (Wire), SF (Snap Fastener, male/female terminals). Fits all AA and AAA type cells, 2, 3 and 4 cell capacity. Corrosion-free nickel plated contacts; impact-resistant nylon #6, UL flammability rating — UL94V-2.

Memory Protection Devices, Inc. *CUSTOM BATTERY HOLDERS AVAILABLE ON REQUEST*

320 BROAD HOLLOW ROAD, FARMINGDALE, NY 11735 • 516-293-5891 • FAX 516-752-1971

Panasonic

RECHARGEABLE SEALED LEAD-ACID BATTERIES

General Description

The LCR Series is a sealed lead-acid rechargeable battery system. The lead-calcium rechargeable (LCR) battery, will stand up to tough operating conditions such as overcharge and deep discharge. In field service, troubles due to abnormal, improper operation or misuse are reduced to a minimum.

Applications

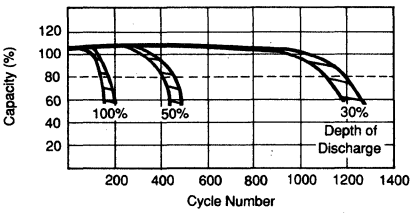
- **Consumer Applications**
  Portable VTR/VCR, TV, record players, tape recorders, vacuum cleaners and appliances, and as portable power supplies.
- **Communication and Telephone Equipment**
  Cordless portable telephones, and transceivers
- **Office Equipment**
  Portable calculators, computers, electronic cash registers, printer, and typewriters.
- **Memory Back up & UPS**
  UPS systems, electronic cash registers, computers, sequencers.
- **Tools and Engine-start**
  Grass and hedge trimmers, cordless drills, screwdrivers, engine-start, and electric saws.
- **Instrument and Medical Equipment**
  Electronic instruments, measuring equipment, medical electronics and heart defibrillators.
- **Photography**
  Electronic cameras strobe, VTR and movie lights.
- **Toys and Hobby**
  Radio-controllers, motor driving, lights.
- **Emergency Devices**
  Lights, fire and burglar alarms, communication systems, fire shutters.

Features

- Exceptional deep discharge recovery
- Long service life; float or cyclic
- Starved electrolyte
- Maintenance-free operation
- Charge, discharege, or store in any position
- No corrosive gas generation
- Leakproof design
- No memory effect
- Approved as "dry cell" for airshipment by Department of Transportation and IATA
- UL component recognized (all major models) File #MH13723(N)

• Cycle Life

Cycle life is very much dependent on the depth of the discharge which the battery encounters during each cycle.



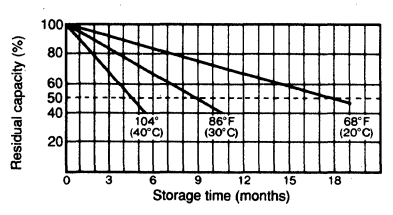
Cycle Life vs. Depth of Discharge

• Float or Back up Life

The expected float life at room temperature is approximately 8 years on the basis of accelerated tests.

• "Shelf Life"

Self-discharge rate is very much dependent on the storage temperature as shown in the graph. Lower temperatures allow the battery to be stored for longer periods. (Each ten degree drop results in halving of self-discharge rate and doubles storage time.)



Shelf Life vs. Storage Temperature

• Temperature Range Summary

Discharge:	5° ~ 122°F	– 15° ~ 50°C
Charge:	32° ~ 104°F	0° ~ 40°C
Storage:	5° ~ 104°F	– 15° ~ 40°C

• Charging method and battery application

	Cyclic operation	Trickle operation	Float operation
Constant Voltage (Note: all at 68°F, 20°C)	Regulation range of controlled voltage: 6 volt batteries: 7.3V to 7.5V 12 volt batteries: 14.6V to 15.0V Initial current: 0.4C or less	Regulation range of controlled voltage: 6 volt batteries: 6.8V to 6.9V 12 volt batteries: 13.6V to 13.8V Initial current: 0.4C or less	Regulation range of controlled voltage: 6 volt batteries: 6.8V to 6.9V 12 volt batteries: 13.6 to 13.8V Initial current: 0.4C or less

Panasonic Industrial Company • Battery Sales Group Offices

Headquarters
East Coast Office
P.O. Box 1511
Secaucus, NJ 07096-1511
(201) 348-5272

Panasonic
Midwest Office
425 E. Algonquin Road
Arlington Heights, IL 60005
(708) 640-2504

Panasonic
West Coast Office
6550 Katella Avenue
Cypress, CA 90630
(714) 373-7538

Panasonic
Southeast Office
1854 Shackleford Ct.
Norcross, GA 30093
(404) 925-6768

Panasonic
South Central Office
4500 Amon Carter Boulevard
Fort Worth, TX 76155
(817) 685-1150

Panasonic

RECHARGEABLE SEALED LEAD-ACID BATTERIES

Model Number	Nominal Voltage	*Nominal Capacity		Dimensions				Weight (Approx)	Standard Terminals or Connectors
		10 hour rate	20 hour rate	Length	Width	Height	Total Height (including terminals)		
	(V)	(Ah)	(Ah)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	lbs. (g)	
General Type									
LCR 6V1.3P	6	1.2	1.3	3.82(97)	0.94(24)	1.97(50)	2.16(56)	0.66(300)	Faston Type 187
LCR 12V1.3P	12	1.2	1.3	3.82(97)	1.87(47.5)	1.97(50)	2.16(56)	1.30(5.90)	"
LCR 12V2.2P	12	2.0	2.2	6.97(177)	1.34(34)	2.36(60)	2.60(66)	1.76(800)	"
LCT-1912AP	12	1.8	1.9	0.94(23.8)	7.17(182)	2.33(61.5)	2.43(61.7)	1.40(635)	Pressure Contact
LCR 6V2.4P	6	2.2	2.4	2.60(66)	1.30(33)	3.88(98.5)	4.11(104.5)	1.15(520)	Faston Type 187
LCR 6V3.4P	6	3.0	3.4	5.28(134)	1.34(34)	2.36(60)	2.60(66)	1.36(620)	"
LCR 12V3.4P	12	3.0	3.4	5.28(134)	2.64(67)	2.36(60)	2.60(66)	2.73(1240)	"
LCR 6V3.2P	6	3.0	3.2	2.60(66)	1.30(33)	4.69(119)	4.92(125)	1.46(660)	"
LCR 6V4P	6	3.7	4.0	2.76(70)	1.89(48)	4.02(102)	4.25(108)	1.83(830)	"
LCR 6V4PL	6	3.7	4.0	2.76(70)	1.89(48)	4.02(102)	4.02(102)	1.83(830)	Lead wire Type
LCR 12V4PF	12	3.7	4.0	2.76(70)	3.82(97)	4.02(102)	4.33(110)	3.66(1660)	Faston Type 187
LCR 6V6.5BP	6	5.8	6.5	5.95(151)	1.34(34)	3.70(94)	3.94(100)	2.54(1150)	Faston Type 187 or 250
LCR 12V6.5BP	12	5.8	6.5	5.95(151)	2.54(64.5)	3.70(94)	3.94(100)	4.96(2250)	"
LCR 6V10BP	6	9.3	10.0	5.95(151)	1.97(50)	3.70(94)	3.94(100)	3.86(1750)	"
LCR 12V10PF	12	9.3	10.0	5.95(151)	3.98(101)	3.70(94)	4.01(102)	7.72(3500)	"
LCR 12V17BP	12	15	17	7.13(181)	3.00(76)	6.58(167)	6.58(167)		M5 Bolt and Nut type
Large Capacity Type									
LCL 12V20P	12	18	20	7.28(185)	4.92(125)	6.50(165)	6.50(125)	16.5(7.5 Kg)	M5 Bolt and Nut type
LCL 12V24P	12	22	24	4.92(125)	6.50(165)	6.89(175)	6.89(175)	19.2(8.7 Kg)	"
LCL 12V33P	12	30	33	7.70(196.5)	5.12(130)	6.10(155)	7.09(180)	26.5(12 Kg)	M6 Bolt and Nut type
LCL 12V38P	12	35	38	7.76(197)	6.50(165)	6.89(175)	6.89(175)	28.7(13 Kg)	"
LCL 12V65P	12	57	65	13.8(350)	6.54(166)	6.85(174)	6.85(174)	41.9(19 Kg)	"
LCR 12V80P	12	70	80	16.03(407)	6.82(173)	8.27(210)	9.69(246)	80.0(36 Kg)	M8 Bolt and Nut type
LCR 12V100P	12	86	100	19.77(502)	7.09(180)	8.27(210)	10.04(255)	100.0(45 Kg)	"
LCR 12V120P	12	104	120	19.89(505)	8.67(220)	8.27(210)	10.04(255)	115.0(52 Kg)	"
High Rate Type									
LCS 214P	4	2.1	2.2	1.90(48.3)	1.41(35.8)	2.48(63.1)	2.52(63.9)	0.57(260)	Pressure Contact
LCS 218P	8	2.1	2.2	1.89(48.0)	2.65(67.3)	2.48(63.1)	2.50(63.4)	1.15(520)	"
LCS 318P	8	3.1	3.2	1.89(48.0)	2.65(67.3)	3.56(90.3)	3.57(90.6)	1.59(720)	"
LCS 384P	4	3.8	4.0	1.88(47.8)	1.40(35.5)	4.6(118.7)	4.69(119)	1.08(490)	"
LCS 386P	6	3.8	4.0	2.03(51.5)	1.88(47.7)	4.67(118.7)	4.69(119)	1.52(690)	"
LCS 414P	4	4.1	4.3	1.88(47.8)	1.40(35.5)	4.67(118.7)	4.69(119)	1.12(510)	"
LCS 416P	6	4.1	4.3	1.88(47.8)	2.03(51.5)	4.67(118.7)	4.69(119)	1.63(740)	"
LCS 2912PL	12	2.9	3.0	4.02(102)	2.19(55.5)	3.11(79)	3.14(79.8)	2.76(1250)	Leadwire Type
Compact/Specialty Type									
LCR-1812VBNC	12	1.8	1.9	7.89(200.5)	0.98(24.8)	2.38(60.5)	2.38(60.5)	1.54(700)	DC Plug
LCS-2012VBNC	12	2.0	2.1	7.90(200.7)	0.98(24.8)	2.43(61.7)	2.43(61.8)	1.54(700)	Pressure contact
LCS-2312AVBNC	12	2.3	2.4	7.17(182)	0.94(23.85)	2.42(61.5)	2.43(61.7)	1.40(635)	"
LCS-2012BVBN	12	2.0	2.2	1.14(29)	3.11(79)	6.02(153)	6.02(153)	1.58(715)	"
LCS-2012DVBN	12	1.95	1.95	5.65(143.5)	0.94(23.85)	2.55(64.8)	2.56(65)	1.30(590)	"
LCR-3012VBNC	12	3.0	3.2	9.45(240)	1.34(34)	2.72(69)	2.72(69)	2.91(1320)	DC Plug

*The data shown above are mean values and should be obtained within 3 times of charge/discharge cycles.

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Panasonic

RECHARGEABLE NICKEL CADMIUM BATTERIES

General Description

Panasonic offers a wide range of cells for various applications and requirements:

• Standard • Rapid-charge • High-temperature emergency and memory back-up • High-capacity • High-rate discharge and rapid charge • Super high capacity and rapid charge

Discharge

The discharge characteristics of the Panasonic Ni-Cd cell are extremely flat when compared to those of dry cells.

Discharge voltage characteristics depend upon discharge current and temperature.

Life

The Panasonic Ni-Cd cell can be charged and discharged hundreds of times.

Under normal conditions, more than 500 cycles (charge/discharge) can be expected. The cell has reached its end of life when capacity falls below 80% of original rating.

Life is decreased by charge/discharge cycles beyond the specified temperature or current range or by extended storage under conditions which exceed specified temperature limits or by cell reversal.

Effects of Temperature upon Performance

The standard Panasonic Ni-Cd cell has excellent discharge characteristics at normal temperatures. If the temperature during charge and discharge is high, capacity tends to decrease. When cells are trickle-charged at a high temperature, this tendency is accelerated. Therefore, it is recommended that special high temperature cells be used for applications in high temperature ambients.

Special Purpose Batteries

Rapid-charge Type

The rapid charge type has a specially improved negative plate with increased gas absorption characteristics. It can be subjected to uncontrolled charging at the 1 C rate and a rapid-charge in 1 to 1.5 hours is possible.

High-temperature Type

By using a polypropylene separator, this type cell can withstand a temperature of 65°C (149°F) during use. When charge is conducted at a low charging current of C/20 to C/30 in a high-temperature ambient, this type cell has a sharply improved capacity compared to a standard cell, due to special electrolyte.

Panasonic cells for high-temperature use can be classified into two types according to application: the emergency back-up type and the memory back-up type.

(A) Emergency back-up

Emergency back-up normally uses DH, CH, SCH or AAH, and a trickle or float charge of C/20 to C/30 is usually applied.

(B) Memory back-up

This application requires less capacity and normally uses AAH, 1/3AAH. In addition to excellent high-temperature characteristics, the charge/discharge characteristics for small currents in the μA range are excellent.

High-capacity Type

The extra capacity cells combine a high-capacity density positive plate with a high-density paste negative plate. These cells have 20 ~ 30% more capacity than equivalent standard cells.

High-rate Discharge and rapid charge type

Using edge-welded plates and terminals the resulting cell has sharply reduced internal resistance and improved voltage characteristics during high rate discharge.

Super high capacity and rapid charge type

The super high capacity and rapid charge type is designed to meet the demands of high capacity and rapid charge applications. It combines a high-density positive plate which is made of form nickel positive and pasted negative plates. The resulting capacity is approximately 40% greater than that of Panasonic rapid charge type battery of the same size.

Applications

• For Cyclic Use

Consumer Applications

Shavers, portable VTRs (VCRS), radios, television, tape recorders, portable computers.

Communication and Telephone Equipment

Cordless and portable telephones, transceivers, pocket pagers, car telephone systems.

Instruments and Medical Equipment

Electronic instruments, measuring equipment, medical electronics, heart defibrillators.

Tools

Grass and hedge trimmers, cordless drills, screwdrivers, hammer drills, saws.

Office Equipment

Portable calculators, lap top computers, electronic cash registers, printers, typewriters

Photography

Electronic cameras, strobe, VTR and movie lights.

Toys and Hobby

Radio-controllers, model motor driving, lights.

• For Trickle or Float Charge Use

Memory Backup

Electronic cash registers, computers, sequences, memory chips.

Emergency Devices

Lights, fire and burglar alarms, communication systems, fire shutters.

Charging Methods

Standard Charge

Panasonic Ni-Cd cells are charged using constant current or semi-constant current charges. The rate of charge is dependent on the size and type of cell. Standard cells, sub C and smaller, can be charged at rates from C/3 ~ C/4 to C/20.

Rapid-charge Type

The rapid charge type Panasonic Ni-Cd cell can be rapidly charged in 1 ~ 1.5 hours using recommended charging circuits and controls. The cell is normally charged at the 1C rate for 1 ~ 1.5 hours, at which time charging current is reduced to C/10 (or less) to complete the charge.

Temperature Conditions

Charge

Charging temperature ranges are:

• Standard charge:	0° ~ 45°C (32° ~ 113°F)
• C/3 quick charge:	10° ~ 45°C (50° ~ 113°F)
• Trickle (float) charge:	0° ~ 65°C (32° ~ 149°F)
• Rapid Charge (−∇V method):	10° ~ 40°C (50° ~ 104°F)
• Temperature sensing system:	10° ~ 40°C (50° ~ 104°F)

Discharge

Discharge temperature ranges are −20° to +65° (−4° to +140°F).

Storage

Panasonic cell can withstand very long storage time under typical conditions at a storage temperature range of −20° to +45°C (−4° ~ 113°F). If the cell must provide full capacity after storage, completely charge the cell before use. In addition, after prolonged storage, completely normal capacity can be returned within 1 ~ 3 charge/discharge cycles.

Memory Backup Type

Panasonic has PC mount memory backup batteries. These are 110 MAH 2.4v and 3.6v "L" type stacks and "F" type side by side. Please consult Panasonic Regional Office for additional information.

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Panasonic

RECHARGEABLE NICKEL CADMIUM BATTERIES

Standard

Model No.	Nominal voltage (V)	Nominal capacity C/5(mAh)	Standard charge		Quick charge		Dimensions		Approximate weight oz. (g)
			Current (mA)	Hours (h)	Current (mA)	Hours (h)	Diameter inch (mm)	Height inch (mm)	
P-11AA	1.2	110	11	15	27.5	6	0.55±0.02(14.0±0.5)	0.66±0.02(16.8±0.5)	0.23(6.5)
P-15N	1.2	150	15	15	38	6	0.45±0.02(11.5±0.5)	1.16±0.02(29.5±0.5)	0.28(8)
P-15NC	1.2	150	15	15	38	6	0.45±0.02(11.5±0.5)	1.12±0.02(28.5±0.5)	0.28(8)
P-18AAA	1.2	180	18	15	54	5	0.39±0.02(10.0±0.5)	1.73±0.02(44.0±0.5)	0.35(10)
P-22AAA	1.2	220	22	15	66	5	0.39±0.02(10.0±0.5)	1.73±0.02(44.0±0.5)	0.35(10)
P-27AA	1.2	270	27	15	80	5	0.55±0.02(14.0±0.5)	1.09±0.02(27.7±0.5)	0.42(12)
P-30AA	1.2	300	30	15	90	5	0.55±0.02(14.0±0.5)	1.09±0.02(27.7±0.5)	0.42(12)
P-50AA	1.2	500	50	15	150	5	0.55±0.02(14.0±0.5)	1.95±0.02(49.5±0.5)	0.78(22)
P-50AA/FT	1.2	500	50	15	150	5	0.55±0.02(14.0±0.5)	1.88±0.02(47.8±0.5)	0.78(22)
P-60AA	1.2	600	60	15	180	5	0.55±0.02(14.0±0.5)	1.95±0.02(49.5±0.5)	0.78(22)
P-60AA/FT	1.2	600	60	15	180	5	0.55±0.02(14.0±0.5)	1.88±0.02(47.8±0.5)	0.78(22)
P-60SC	1.2	600	60	15	150	6	0.89±0.02(22.5±0.5)	1.02±0.02(26.0±0.5)	1.02(29)
P-100C	1.2	1000	100	15	333	4.5	1.00±0.02(25.3±0.5)	1.20±0.02(30.5±0.5)	1.59(45)
P-220C	1.2	2200	220	15	730	4.5	1.00±0.02(25.3±0.5)	1.94±0.02(49.3±0.5)	2.65(75)
P-240C	1.2	2400	240	15	1500	2.4	1.00±0.02(25.3±0.5)	1.92±0.03(48.8±0.7)	2.55(73)
P-400D	1.2	4000	400	15	—	—	1.27±0.03(32.3±0.7)	2.36±0.04(59.9±1.0)	4.80(136)

High Capacity

Model No.	Nominal voltage (V)	Nominal capacity C/5(mAh)	Standard charge		Dimensions		Approximate weight oz. (g)
			Current (mA)	Hours (h)	Diameter inch (mm)	Height inch (mm)	
P-70SCE	1.2	700	70	15	0.89±0.02(22.5±0.5)	1.02±0.02(26.0±0.5)	1.06(30)
P-150SCE	1.2	1500	150	15	0.89±0.02(22.5±0.5)	1.67±0.02(42.5±0.5)	1.80(51)
P-440DE	1.2	4400	440	15	1.29±0.03(32.3±0.7)	2.36±0.04(59.9±1.0)	4.94(140)

High Temperature

Model No.	Nominal voltage (V)	Nominal capacity C/5(mAh)	Trickle charge		Dimensions (with tube)		Approximate weight oz. (g)
			Current (mA)	Hours (h)	Diameter inch (mm)	Height inch (mm)	
P-11AAH	1.2	100	37	48	0.55±0.02(14.0±0.5)	0.66±0.02(16.8±0.5)	0.23(65)
P-50AAH/FT	1.2	500	17	48	0.55±0.02(14.0±0.5)	1.88±0.02(47.8±0.5)	0.78(22)
P-120SCH	1.2	1200	40	48	0.89±0.02(22.5±0.5)	1.67±0.02(42.5±0.5)	1.80(51)
P-180CH	1.2	1800	60	48	1.00±0.02(25.3±0.5)	1.94±0.02(49.3±0.5)	2.65(75)
P-400DH	1.2	4000	133	48	1.27±0.03(32.3±0.7)	2.36±0.04(59.9±1.0)	4.90(139)

Rapid Charge

Model No.	Nominal voltage (V)	Nominal capacity C/5(mAh)	Rapid charge		Dimensions		Approximate weight oz. (g)
			Current (mA)	Hours (h)	Diameter inch (mm)	Height inch (mm)	
P-30AAR	1.2	300	300	1.5	0.55±0.02(14.0±0.5)	1.09±0.02(27.7±0.5)	0.42(12)
P-45AR	1.2	450	450	1.5	0.65±0.02(16.5±0.5)	1.10±0.02(28.0±0.5)	0.63(18)
P-50AAR/FT	1.2	550	500	1.5	0.55±0.02(14.0±0.5)	1.88±0.02(47.8±0.5)	0.78(22)
P-60AAR/FT	1.2	600	600	1.5	0.55±0.02(14.0±0.5)	1.88±0.02(47.8±0.5)	0.78(22)
P-60SCR	1.2	600	600	1.5	0.89±0.02(22.5±0.5)	1.02±0.02(26.0±0.5)	0.95(27)
P-70AR	1.2	700	700	1.5	0.65±0.02(16.5±0.5)	1.67±0.02(42.5±0.5)	0.95(27)

High Rate Discharge and Rapid Charge

Model No.	Nominal voltage (V)	Nominal capacity C/5(mAh)	Rapid charge		maximum discharge current(A)	Dimensions		Approximate weight oz. (g)
			Current (mA)	Hours (h)		Diameter inch (mm)	Height inch (mm)	
P-100SCR	1.2	1000	1000	1.5	10	0.89±0.02(22.5±0.5)	1.30 ±0.02(33.0±0.5)	1.23(35)
P-120SCRP	1.2	1200	1200	1.5	30	0.89±0.02(22.5±0.5)	1.67 ±0.02(42.5±0.5)	1.66(47)
P-130SCR	1.2	1300	1300	1.5	13	0.89±0.02(22.5±0.5)	1.67 ±0.02(42.5±0.5)	1.66(47)
P-140SCR	1.2	1400	1400	1.5	14	0.89±0.02(22.5±0.5)	1.67 ±0.02(42.5±0.5)	1.66(47)
P-120SCPC	1.2	1200	1200	1.5	30	0.89±0.02(22.5±0.5)	1.634±0.02(41.5±0.5)	1.66(47)
P-130SCRC	1.2	1300	1300	1.5	13	0.89±0.02(22.5±0.5)	1.634±0.02(41.5±0.5)	1.66(47)
P-140SCRC	1.2	1400	1400	1.5	14	0.89±0.02(22.5±0.5)	1.634±0.02(41.5±0.5)	1.66(47)

Super High Capacity and Rapid Charge "S" Type

	Model No.	Nominal voltage (V)	Nominal capacity C/5(mAh)	Rapid charge		Dimensions		Approximate weight oz. (g)
				Current (mA)	Hours (h)	Diameter inch (mm)	Height inch (mm)	
SM60	P-120AS	1.2	1200	1000	1.6	0.65±0.02(16.5±0.5)	1.67±0.02(42.5±0.5)	0.92(26)
	P-140AS	1.2	1400	1400	1.5	0.65±0.02(16.5±0.5)	1.95±0.02(49.5±0.5)	1.16(32)
	P-230SCS	1.2	2300	2000	1.6	0.88±0.02(22.5±0.5)	1.94±0.02(49.2±0.5)	2.24(57)
SM30	P-60AS	1.2	600	600	1.5	0.65±0.02(16.5±0.5)	1.10±0.02(28.0±0.5)	0.63(18)
	P-70AAS/FT	1.2	700	700	1.5	0.55±0.02(14.0±0.5)	1.88±0.22(47.8±0.5)	0.74(21)
	P-110AS	1.2	1100	1100	1.5	0.65±0.02(16.5±0.5)	1.67±0.02(42.5±0.5)	0.88(25)
	P-100AAS	1.2	1000	1000	1.5	0.55±0.02(14.0±0.5)	2.54±0.02(64.5±0.5)	1.02(29)
	P-110AAS	1.2	1100	1100	1.5	0.55±0.02(14.0±0.5)	2.54±0.02(64.5±0.5)	1.02(29)
	P-180SCS	1.2	1800	1500	1.6	0.88±0.02(22.5±0.5)	1.67±0.02(42.5±0.5)	1.66(47)

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Panasonic

PRIMARY LITHIUM BATTERIES

Cylindrical Type Lithium Batteries

Features

The common characteristics of (CF)n/Li and MnO_2/Li batteries are as follows:

- High voltage
- Long shelf life
- High rate discharge
- Strong leakage resistance
- UL component recognized (most models) File #MH12210(N)
- High energy density
- Stable operation
- Wide operating temperatures
- Excellent durability

(CF)n/Li batteries also offer the following:

- Flat discharge voltage and stable internal impedance.
- Excellent safety

MnO_2/Li batteries add the following characteristics:

- High rate discharge
- High voltage

(CF)n/Li Batteries

Model No.	Electrical Characteristics (20°C)					Dimensions (Max.)		Approx. Weight (g)
	Nominal Voltage (V)	*Nominal Capacity (mAh)	Standard Drain (mA)	Continuous Maximum Drain (mA)	Max. Pulse (mA)	Diameter (mm)	Height (mm)	
BR-C	3	5,800	150	300	1,000	26.0	50.0	47.0
BR-A	3	1,800	2.5	250	1,000	17.0	45.5	18.0
BR-2/3A	3	1,200	2.5	250	1,000	17.0	33.5	13.5
BR-1/2A	3	650	2	120	500	17.0	23.0	9.5
BR-2/3AA	3	600	2	80	500	14.5	33.5	9.5

*Nominal Capacity shown above is based on standard drain and cut off voltage down to 1.8V at 20°C.

MnO_2/Li Batteries

Model No.	Electrical Characteristics (20°C)					Dimensions (Max.)		Approx. Weight (g)
	Nominal Voltage (V)	**Nominal Capacity (mAh)	Standard Drain (mA)	Continuous Maximum Drain (mA)	Max. Pulse (mA)	Diameter (mm)	Height (mm)	
CR17335	3	1,750	1.0	8	80	17.0	33.5	17.0
CR14250	3	850	0.5	5	60	14.5	25.0	9.5
CR-2/3A	3	1,300	5	250	3,000	17.0	33.5	17.0

User Replaceable Packs

Features

- Consumer replaceable (Recognized by UL)
- High safety and reliability
- Rapid discharge for strobes is possible at 6 V.
- Superior shelf life with minimal self-discharge
- High-current pulse discharge is possible.
- Application is possible over a wide temperature range.
- Light weight
- High energy density

Model	CR123A	2CR5M	CR-P2	BR-P2
Nominal Voltage (V)	3	6	6	6
**Nominal Capacity (mAh)	1,300	1,300	1,300	1,200
Dimensions (mm)	17.1 x 34.5	17 x 34 x 45	19.5 x 34 x 36	19.5 x 34 x 36
Weight (g)	17	37	37	31

**Nominal Capacity shown above is based on standard drain and cut off voltage down to 2.0V per cell at 20°C

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Panasonic LITHIUM PRIMARY BATTERIES

Coin Type Lithium Batteries

Features
- High voltage of 3 volts, about twice that of conventional batteries.
- Extremely small self-discharge for a long service and shelf life.
- A wide operational temperature range.
- Compact and lightweight, with extremely high energy density per unit weight.
- Extremely safe (poly-carbonmonofluoride lithium batteries)
- Extremely strong load pulse characteristics (manganese dioxide lithium batteries).

Applications
- Electronic watches (digital and analogue)
- Calculators
- Cameras
- Electronic translators
- For memory backup in all types of devices (with tab terminals)
- Other compact, low power consuming cordless appliances

(CF)n/Li batteries: Poly-carbon monofluoride

Model No.	Electrical characteristics(20°C)				Recommended Drain			Dimensions		
	JIS	IEC	Nominal Voltage (V)	Nominal Capacity (mAh)	Pulse (mA)	Standard (mA)	Low (μA)	Diameter (mm)	Height (mm)	Weight (g)
BR1216	—	—	3	25	5	0.03	1	12.5	1.60	0.6
BR1220	—	—	3	35	5	0.03	1	12.5	2.00	0.7
BR1225	—	—	3	38	5	0.03	1	12.5	2.50	0.9
BR1616	—	—	3	48	8	0.03	1	16.0	1.60	1.0
BR2016	—	—	3	75	10	0.03	1	20.0	1.60	1.5
BR2020	—	—	3	100	10	0.03	2	20.0	2.00	2.0
BR2032	—	—	3	190	10	0.03	4	20.0	3.20	2.5
BR2320	—	—	3	110	10	0.03	2	23.0	2.00	2.5
BR2325	—	—	3	165	10	0.03	3	23.0	2.50	3.0
BR2330	—	—	3	255	10	0.03	5	23.0	3.00	3.2
BR3032	—	—	3	500	10	0.03	10	30.0	3.20	5.5

MnO_2/Li batteries: Manganese dioxide

Model No.	Electrical characteristics(20°C)					Recommended Drain			Dimensions		
	JIS	IEC (V)	Nominal Voltage (mAh)	Nominal Capacity (mA)	Continuous (mA)	Pulse (mA)	Standard (mA)	Low (μA)	Diameter (mm)	Height (mm)	Weight (g)
CR1025	—	—	3	30	0.5	5	0.10	1	10.0	2.50	0.7
CR1216	—	—	3	25	2	5	0.10	1	12.5	1.60	0.7
CR1220	—	—	3	35	2	5	0.10	1	12.5	2.00	0.9
CR1616	—	—	3	50	3	8	0.10	1	16.0	1.60	1.2
CR1620	—	—	3	70	3	8	0.10	1	16.0	2.00	1.3
CR2012	—	—	3	55	5	10	0.10	1	20.0	1.20	1.4
CR2016	CR2016	—	3	75	5	10	0.10	2	20.0	1.60	1.7
CR2025	CR2025	—	3	150	3	15	0.20	3	20.0	2.50	2.5
CR2032	CR2032	—	3	180	3	15	0.20	4	20.0	3.20	3.3
CR2320	—	—	3	125	5	15	0.20	3	23.0	2.00	3.0
CR2330	—	—	3	260	4	15	0.20	5	23.0	3.00	4.0
CR2354	—	—	3	500	3	15	0.20	5	23.0	5.40	5.9
CR3032	—	—	3	500	7	15	0.20	10	30.0	3.20	7.1
CR2477	—	—	3	1000	3	10	0.20	10	24	7.70	10.5

Vanadium Pentoxide Lithium Rechargeable Batteries

Model No.	Nominal voltage (V)	Nominal Capacity (mAh)	Dimensions (mm)		Basic battery weight (g)	Recommended drain (μA)*1
			External diameter	Height		
VL2020	3.0	20	20.0	2.0	2.2	< 70
VL2320	3.0	30	23.0	2.0	2.8	<100
VL2330	3.0	50	23.0	3.0	4.0	<100
VL1220	3.0	7	12.5	2.0	0.8	< 20

Charge/ discharge	About 1000 times with a 10% discharge depth
Charge	20 to 30h to fully charge at a fixed voltage of 3.4 ± 0.15V *2
Operating temperature	−20°C(−4°F) ~ 60°C(140°F)

*CYLINDRICAL ALKALINE BATTERIES

Features
- High current and large capacity for excellent performance
- Stable voltage and current
- Excellent storage life
- Unsurpassed resistance leakage

Applications
- Headphone stereo, radio-cassette recorders, strobes, cameras, electronic calculators, 8mm cameras, electric shavers, tape recorders, high-power flashlights, toys and other cordless products.

Model Number	V	Diameter (in.)	Height (in.)	Av.Wt. (gms)
AM1 (Size "D")	1.5	1.346	2.421	135
AM2 (Size "C")	1.5	1.031	1.969	65
AM3 (Size "AA")	1.5	.571	1.988	24
AM4 (Size "AAA")	1.5	.413	1.752	12
AM5 (Size "N")	1.5	.742	1.189	9

Model Number	V	L(m)	W(m)	D(m)	Wt. (gms)
6AM6 (9V)	9	1.929	1.043	0.689	47

*MANUFACTURED IN U.S.A.

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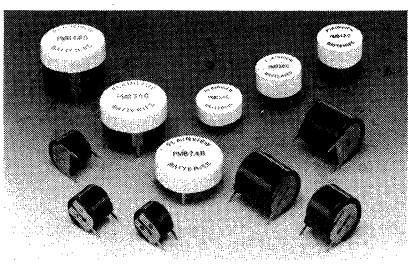
Plainview Batteries nickel-cadmium button cells

Nickel-Cadmium ZA, Z2A, and Z3A Button Cells

The ZA series offers the most complete line of nickel-cadmium cells combining maximum capacity and low internal resistance with economy. All conventional NC cells have a nominal voltage of 1.2 V. Plainvew uses special processing to also offer twin and triple cells with 2.4 and 3.6 V output in hermetically sealed single housings which are smaller and more reliable than other methods. Single, dual and triple cells may then be combined to form batteries of similar capacity. Battery pack assemblies can be supplied to your requirements in assemblies up to 12 volts. ZA cells are mass plate designs with low self dissipation and retain over 50% of original capacity after a year at room temperature.



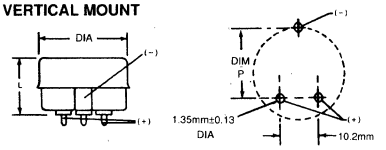
NICKEL-CADMIUM BATTERIES—ZA, Z2A & Z3A. Oper. Temp. –40°C to +55°C except ZA65T –40°C to +65°C.										
Single Cells		**ZA15**	**HA33**	**ZA35**	**ZA60**	**ZA65**	**ZA65T***	**ZA110**	**ZA180**	**ZA280**	**ZA600**
Nominal Voltage	V	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Nominal capacity	mAh	15	33	35	60	65	65	110	180	280	600
Discharge rate (max)	mA	15	33	40	100	110	110	165	250	280	300
Charge rate (max)	mA	1.5	3.3	3.5	6.0	6.5	6.5	11.0	18.0	28.0	60.0
Cell diameter	mm	11.5	11.5/9.5	15.5	15.5	15.5	15.5	22	25	25	35
Cell height	mm	3.8	5.4	4	6	6	6	4.5	6	9	10
Double Cells		**Z2A15**	**Z2A35**	**Z2A65**	**Z2A110**	**Z2A180**	**Z2A250**	**Z2A300**			
Nominal Voltage	V	2.4	2.4	2.4	2.4	2.4	2.4	2.4			
Nominal Capacity	mAh	15	35	65	110	180	250	300			
Discharge rate (max)	mA	15	40	75	165	250	250	600			
Charge rate (max)	mA	1.5	3.5	6.5	11.0	18.0	25.0	30.0			
Cell diameter	mm	11.5	15.5	15.5	22	25	25	35			
Cell height	mm	7	6.5	12	7.5	10	13.5	10			
Triple Cells		**Z3A15**	**Z3A65**				**DA280**	**VA600**			
Nominal Voltage	V	3.6	3.6		Multi-	1.2	1.2				
Nominal Capacity	mAh	15	65		element		280	600			
Discharge rate (max)	mA	15	75		High		560	1800			
Charge rate (max)	mA	1.5	6.5		Discharge		28	60			
Cell diameter	mm	11.5	15.5		Cells > > > >		25	35			
Cell height	mm	10	17.4				9	10			

PMB Series Rechargeable Memory Back-Up Batteries

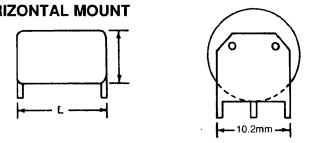
Whenever current drains approach or exceed 0.1 mA, the PMB series of miniature, PC board mounting batteries are the power source of choice. Selected specially for volatile computer and clock/calendar memory protection, Plainview PMB series nicad batteries are *standardized* versions of the ZA series with printed circuit board mounting pins. The PMB series combines long life with small size and PCB mounts. They retain over 50% of original capacity after one year at room temperature. Design life is 5 to 7 years at a constant trickle charge rate.

Model Number	Nominal Volts V	Nominal Capacity mAh	Max Discharge Current mA	Max Charge Current mA	Max Contin. Trkl Chg mA	Diam mm	Length/ Height mm L	Std. Orientation Axis Horz/Vert	Pins #	Pin Space mm P
PMB2.4/15	2.4	15	15	1.5	0.15	12	7.5	H	2,3	7.25
PMB2.4C	2.4	35	40	3.5	0.35	16.5	7.1	V	3	12.7
PMB2.4/65	2.4	65	75	6.5	0.65	16.5	12.5	H,V	2,3	12.25
PMB2.4B	2.4	110	165	11	1.1	23.5	9.6	V	3	17.8
PMB3.6/15	3.6	15	15	1.5	0.15	12	10.5	H	2,3	10.25
PMB3.6C	3.6	35	40	3.5	0.35	16.5	11.3	V	3	12.7
PMB3.6/65	3.6	65	75	6.5	0.65	16.5	17.9	H,V	2,3	17.4
PMB3.6B	3.6	110	165	11	1.1	23.5	14.3	V	3	17.8
PMB4.8/15	4.8	15	15	1.5	0.15	12	14.5	H	2,3	14.25
PMB4.8C	4.8	35	40	3.5	0.35	16.5	13.6	V	3	12.7
PMB4.8/65	4.8	65	75	6.5	0.65	16.5	24.4	H,V	2,3	24.25
PMB4.8B	4.8	110	165	11	1.1	23.5	17.5	V	3	17.8

VERTICAL MOUNT



HORIZONTAL MOUNT

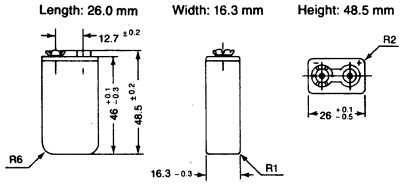


PB SERIES 9 VOLT RECHARGEABLE "TRANSISTOR" BATTERIES

The Plainview 9 Volt Rechargeable Transistor Batteries are the answer to standard packaging of Ni-Cads for new designs as well as replacing primary 9V batteries economically. The PB1600 Series is available as 7.2, 8.4, and 9.6 volts at 110mAh nominal, 120mAh typical capacity. With low internal impedance, low self discharge and rechargeable cycle life of over 500 times, the Plainview 9V rechargeable is the power source of choice.

Dimensions and Weight (approx.)

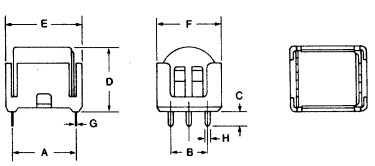
Length: 26.0 mm Width: 16.3 mm Height: 48.5 mm



	PB1604	PB1605	PB1606
Nom. V	7.2	8.4	9.6
# Cells	6	7	8
Nom. mAh	110	110	110
Typ. mAh	120	120	120
Max. Continuous mA	165	165	165
Max. Surge A	1	1	1

ASSEMBLY MODULE

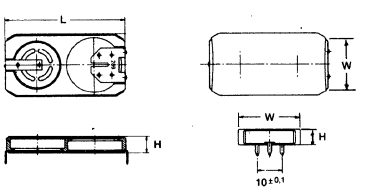
The Plainview Assembly Module/Battery Holder is a unique concept that allows using the PMB back-up Ni-Cad button cell batteries with unusual flexibility.The module may be installed on a PC board during the normal manufacturing process using either through hole or SMT surface mount technology. The battery may then be inserted into the module at any time and of course is then **FIELD REPLACEABLE** without soldering, a "GREEN" consideration.



Type	Voltage V	Capacity mAh	Dimensions A	B	C	D	E	F	G	H
PMB-AM 2.4/65	2.4	65	12.1	10.0	4	17.5	16	18	0.25	1.2
PMB-AM 3.6/65	3.6	65	17.8	10.0	4	17.5	21	18	0.25	1.2

FLAT PAKS —PMBF

Plainview has recently introduced a new low profile flat series of its PMB batteries for applications where the battery height of PCB mounted batteries is critical. Although all of our ZA button cells can be assembled into flat packs, those listed below are now standard additions to the PMB Series—the new PMBF Series.



P/N	Voltage V	Capacity mAh	Dimensions mm L	W	H
PMBF 2.4/33	2.4	33	27.9	14	6.8
PMBF 2.4/35	2.4	35	35.5	18	5.2
PMBF 2.4/65	2.4	65	35.5	18	7.3
PMBF 2.4/110	2.4	110	48.2	25	6.0
PMBF 3.6/33	3.6	33	38.1	14	6.8
PMBF 3.6/35	3.6	35	50.8	18	5.2
PMBF 3.6/65	3.6	65	50.8	18	7.3
PMBF 3.6/110	3.6	110	71.1	25	6.0

Plainview Batteries, Inc.
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Plainview Batteries NiCd cylindrical cells/flat cells/paks

Plainview's range of NiCd cylindrical and flat cells offers an extremely wide range of the best quality rechargeables available. With our wide offering of sizes, capacities, and features, Plainview has the cell you require. Furthermore, we have the skill and experience to put together the Plainview Application Specific Battery (PASB) pack or assembly to meet your electrical mechanical and interconnect requirements. Give us your technical requirements and Plainview will give you a timely competitive price and technical quotation.

PN STANDARD SERIES

Model	Nominal Voltage (V)	Capacity (mAh) at 0.2C rate		Standard charge		Quick charge		Internal resistance (mΩ)	External dimensions (including tube)		Weight (approx. g)
		Minimum	Typical	Current (mA)	Time (hr.)	Current (mA)	Time (hr.)		Diameter (D) (mm)	Height (H) (mm)	
PN-50AAA	1.2	50	55	5	14 ~ 16	15	4 ~ 6	55.0	$10.5^{0}_{-0.5}$	16.0^{0}_{-1}	3.5
PN-110AA	1.2	110	120	11		33		30.0	$14.5^{0}_{-0.5}$	17.0^{0}_{-1}	8
PN-120TA	1.2	120	130	12		36		34.0	$7.8^{0}_{-0.5}$	42.5^{0}_{-1}	7
PN-150N	1.2	160	170	15		45		27.0	$12.0^{0}_{-0.5}$	29.5^{0}_{-1}	9
PN-200AAA	1.2	200	220	20		60		21.0	$10.5^{0}_{-0.5}$	44.5^{0}_{-1}	10
PN-200A	1.2	200	225	20		60		20.0	$17.0^{0}_{-0.5}$	17.0^{0}_{-1}	11
PN-270AA	1.2	270	305	27		81		15.0	$14.5^{0}_{-0.5}$	30.0^{0}_{-1}	14
PN-500A	1.2	500	525	50		150		9.0	$17.0^{0}_{-0.5}$	28.0^{0}_{-1}	20
PN-600AA	1.2	600	650	60		180		12.0	$14.2^{0}_{-0.5}$	50.0^{0}_{-1}	24
PN-650SC	1.2	650	700	65		—		6.0	23.0^{0}_{-1}	26.0^{0}_{-1}	29
PN-1300SC	1.2	1300	1450	130		—		4.2	23.0^{0}_{-1}	43.0^{0}_{-2}	50
PN-1500SC	1.2	1500	1650	150		—		4.2	23.0^{0}_{-1}	43.0^{0}_{-2}	50

Operating temperature range: Change: 0° ~ 45°C (standard), 10° ~ 45°C (quick) discharge: – 20° ~ 60°C; storage: – 30° ~ 50°C (– 30 ~ 35°C for long periods)

PKR STANDARD SERIES

Model	Nominal Voltage (V)	Capacity (mAh) at 0.2C rate		Standard charge		Internal resistance (mΩ)	External dimensions (including tube)		Weight (approx. g)
		Minimum	Typical	Current (mA)	Time (hr.)		Diameter (D) (mm)	Height (H) (mm)	
PKR-1300SC	1.2	1300	1450	130	14 ~ 16	6.0	23.0^{0}_{-1}	43.0^{0}_{-2}	48
PKR-2000C	1.2	2000	2200	200		5.2	26.0^{0}_{-1}	50.0^{0}_{-2}	75
PKR-2800D	1.2	2800	3200	280		4.5	34.0^{0}_{-2}	44.0^{0}_{-2}	110
PKR-4400D	1.2	4400	15000	440		3.8	34.0^{0}_{-2}	61.0^{0}_{-2}	150
PKR-7000F	1.2	7000	7500	700		3.4	34.0^{0}_{-2}	91.0^{0}_{-2}	230
PKR-10000M	1.2	10000	12000	1000		2.6	43.0^{0}_{-2}	91.0^{0}_{-2}	400
PKR-20000M	1.2	20000	24000	2000		2.5	43.0^{0}_{-2}	146.0^{0}_{-2}	660

Operating temperature range: Charge: 0° ~ 45°C (standard); discharge: – 20° ~ 60°C; storage: – 30° ~ 50°C (– 30 ~ 35°C for long periods)
Note: When using assembled batteries consisting of KR-4400D or higher model batteries, consideration must be given to the problem of cell temperature increase.

PX HIGH CAPACITY SERIES

Model	Nominal Voltage (V)	Capacity (mAh) at 0.2C rate		Standard charge		Internal resistance (mΩ)	External dimensions (including tube)		Weight (approx. g)
		Minimum	Typical	Current (mA)	Time (hr.)		Diameter (D) (mm)	Height (H) (mm)	
PX-225AE	1.2	225	245	23	14 ~ 16	20.0	17.0^{0}_{-1}	17.0^{0}_{-1}	12
PX-600AE	1.2	600	650	60		10.0	17.0^{0}_{-1}	28.0^{0}_{-1}	21
PX-700AAE	1.2	700	770	70		11.0	$14.2^{0}_{-0.5}$	50.0^{0}_{-1}	27
PX-750AAE	1.2	750	825	75		11.0	$14.2^{0}_{-0.4}$	$50.0^{0}_{-0.5}$	27
PX-1000AE(L)	1.2	950	1050	100		8.0	17.0^{0}_{-1}	43.0^{0}_{-2}	31
PX-1200AE	1.2	1200	1300	120		7.6	17.0^{0}_{-1}	50.0^{0}_{-2}	34
PX-1700AE	1.2	1700	1850	170		7.0	17.0^{0}_{-1}	67.0^{0}_{-2}	45
PX-1700SCE	1.2	1700	1850	170		5.5	23.0^{0}_{-1}	43.0^{0}_{-2}	53
PX-2000SCE	1.2	2000	2200	200		5.5	23.0^{0}_{-1}	50.0^{0}_{-2}	63
PX-2400CE	1.2	2400	2650	240		5.0	26.0^{0}_{-1}	50.0^{0}_{-2}	76
PX-2800CE	1.2	2800	3000	280		5.5	26.0^{0}_{-1}	50.0^{0}_{-2}	78
PX-5000DE	1.2	5000	5400	500		3.5	34.0^{0}_{-2}	61.0^{0}_{-2}	155

Operating temperature range: Charge: 0° ~ 45°C (standard); discharge: – 20° ~ 60°C; storage: – 30° ~ 50°C (– 30 ~ 35°C for long periods)

SLIM/FLAT CELLS (GUM PACKS)

Model	Nominal Voltage (V)	Capacity (mAh) at .02C rate	Standard charge		External dimensions (including tube)			Weight (approx. g)
			Charging Current (mA)	Time (Hrs.)	L (mm)	W (mm)	T (mm)	
PKF-A600	1.2	600	60	14 ~ 16	67.0^{0}_{-1}	$17.0^{0}_{-0.5}$	$6.0^{0}_{-0.5}$	23
PKF-A900	1.2	900	90	14 ~ 16	67.0^{0}_{-1}	$17.0^{0}_{-0.8}$	$8.0^{0}_{-0.5}$	30
PKF-A1200	1.2	1200	120	14 ~ 16	67.0^{0}_{-1}	$17.0^{0}_{-0.8}$	$10.5^{0}_{-0.5}$	38

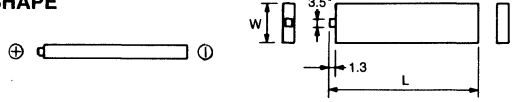
Recommended temperature ranges: Charging: 0° ~ 45°C (Standard);
Discharging: – 20° ~ 60°C; Storage: – 30° ~ 50°C (– 30 ~ 35°C for long periods)

ASSEMBLY OPTIONS

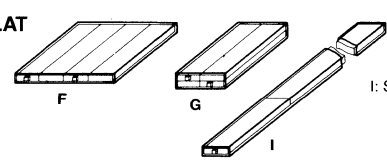
Common battery pack assemblies available from Plainview Batteries.

Code	Description	Schematic
A	Stick of cells	
B	Single row	
C	Double row	
D	Double row Stick	

EXTERNAL SHAPE



STANDARD FLAT ASSEMBLED BATTERIES



F: Flat Pack
G: Flat Pack
I: Stick of Cells

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23 Newtown Road • Plainview, N.Y. 11803 • TOLL FREE 800 NICAD-LI • IN NEW YORK 516-249-2873 • FAX 516-249-2876

Plainview PSLA series–sealed lead acid batteries

Model	Nominal Voltage (V)	Nominal Capacity (Ah) 20hr 1.75 v/cell	10hr 1.75 v/cell	5hr 1.70 v/cell	1hr 1.60 v/cell	0.5hr 1.60 v/cell	Dimensions (MAX inch) Length	Width	Height	Total Height	Weight APPROX (KG)	Terminal type
PSLA-0601	6	1	0.91	0.85	0.63	0.55	2.00	1.65	2.00	2.20	0.275	TAB
PSLA-0601.2	6	1.2	1.09	1.02	0.78	0.6	3.82	0.98	2.00	2.20	0.3	TAB
PSLA-0604	6	4	3.7	3.4	2.5	2	2.76	1.85	4.02	4.25	0.78	DC PLUG OR TAB
PSLA-0605L	6	5	4.6	4.2	3.2	2.5	2.63	2.63	3.78	4.25	0.98	SPRING & JACK
PSLA-0606.5	6	6.5	5.9	5.5	4.1	3.25	5.95	1.34	3.70	3.98	1.35	TAB
PSLA-0609.5	6	9.5	8.7	8.1	6.0	4.75	3.77	2.28	5.51	2	2	DC PLUG or JACK
PSLA-0612	6	12	10.9	10	7.2	6	5.95	1.96	3.70	3.98	2	TAB
PSLA-1201.2	12	1.2	1.09	1.02	0.78	0.6	3.89	1.65	2.04	2.28	0.57	TAB
PSLA-1202	12	2	1.82	1.7	1.26	1	7.01	1.34	2.36	2.60	0.83	TAB
PSLA-1202.5	12	2.5	2.25	2.1	1.5	1.25	7.16	0.94	2.43	2.43	0.64	PRESSURE CONTACT
PSLA-1203	12	3	2.73	2.25	1.92	1.5	5.27	2.64	2.36	2.67	1.3	TAB
PSLA-1204	12	4	3.7	3.4	2.5	2	3.54	2.75	4.02	4.25	1.53	DC PLU or TAB
PSLA-1207	12	7	6.4	5.95	4.55	3.5	5.95	2.56	3.70	3.98	2.45	TAB
PSLA-1217	12	17	15.5	14.4	11	8.5	7.13	2.99	6.57	6.57	6	BOLT & NUT-A
PSLA-1224	12	24	22	20.4	15.6	12	6.49	6.89	4.92	4.92	8.7	BOLT & NUT-A
PSLA-1231	12	31	28	26.3	19.8	15.5	7.71	5.15	6.65	7.28	11	BOLT & NUT-B
PSLA-1240	12	40	36	34	25.2	20	7.75	6.53	6.89	6.89	13.8	BOLT & NUT-B
PSLA-1270	12	70	63	59.5	44.1	35	13.78	6.53	6.85	6.85	22.8	BOLT & NUT-B
PSLA-1280	12	80	73	64	48	40	13.07	6.85	8.42	9.41	32	BOLT & NUT-B
PSLA-1290	12	90	82	72	54	45	13.07	6.85	8.42	9.41	32	BOLT & NUT-B
PSLA-12100	12	100	91	80	60	50	13.07	6.85	8.42	9.41	32	BOLT & NUT-B
PSLA-12150	12	150	136	120	90	75	20.11	10.55	9.17	10.70	45	BOLT & NUT-C
PSLA-12200	12	200	182	160	120	100	20.11	10.55	9.17	10.70	54	BOLT & NUT-C

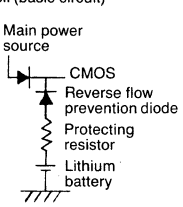
Plainview Batteries lithium cylindrical cell batteries

Lithium cylindrical cell batteries are real powerhouses. They have voltages ranging from 2.8-3.6 volts in single cells, and capacities to 35Ah. Plainview offers four lithium cylindrical cell chemistries. Lithium sulphur dioxide, manganese dioxide, thionyl chloride and carbon monofluoride. Each chemistry has unique attributes. Your Plainview application engineer can help to select the proper cell for *your* application. Plainview will manufacture battery pack assemblies to meet your voltage and capacity requirements.

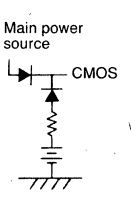
Type, Seal & O.P. Temp °C	Part No.	O.C. Voltage	Capacity Ah	Std. Discharge Current mA	Max Discharge Current mA Continuous	Pulse	Max Dimensions mm Diameter D	Height (L)	Weight Grams	Terminals Available
Lithium **Thionyl Chloride** Hermetic Seal −55 to +125 Safety Vent	TO4/1/2 AA	3.68	0.9	.09	8	16	14.2	27.9	9	P, T, R, A
	TO6/AA	3.68	1.8	.18	17	34	14.2	50.3	16	P, T, R, A
	T32/2/3 A	3.68	1.45	.15	13.5	27	16.3	34.5	17	P, T, R, A
	T52/C	3.68	5.5	.55	50	100	25.7	49.5	52	P, T, R, A
	T20/D	3.68	12	1.1	100	200	33.3	60.2	99	P, T, R, A
	T21/F	3.68	18	2.0	180	360	33.3	88.9	140	P, T
	T22/DD	3.68	28	3.0	280	560	33.3	118.11	185	P, T
Lithium **Sulfur Dioxide** Hermetic Seal −55 to +125 Safety Vent	G04/1/2 AA	2.8	.5	17	125	500	14.2	27.9	8	P, T, R
	G06/AA	2.8	1.1	46	250	1000	14.2	50.3	14	P, T, R
	G32/2/3 AA	2.8	.96	3	200	900	16.3	34.5	12	P, T, R
	G52/C	2.8	3.4	125	800	3000	25.7	49.5	44	P, T
	G20/DD	2.8	8.3	750	2000	6000	33.3	60.2	80	P, T
	G70	2.8	9	160	2250	6000	38.4	50.3	90	T
	G60	2.8	28	1000	2500	10,000	41.6	116.6	230	T
	G62	2.8	35	1250	3000	12,000	41.6	139.7	280	T
Lithium **Manganese Dioxide** Crimped Seal −20 to +70°C Laser Seal −40 to +85°C	CR 1/3 N	3	.160	2.0	60	80	11.6	10.8	3.3	P, T, R
	CR 15335	3	1.0	10	1000	3000	15.0	33.5	15	P, T, R
	CR 15400	3	1.3	10	1000	3000	15.0	40.0	17	P, T, R
	CR 14250 SE	3	.8	0.5	7	60	14.5	25.0	9	P, T, R
	CR 12600 SE	3	1.4	1	15	250	12.0	60.0	15	P, T, R
	CR 17335 SE	3	1.7	1	8	80	17.0	33.5	17	P, T, R
	CR 17450 SE	3	2.5	1	9	80	17.0	45.0	22	P, T, R
	CR 23500 SE	3	5.0	1	10	100	23.0	50.0	42	P, T, R
Lithium **Poly Carbon Monofluoride** Elastomer Seal −40 to +85°C	BR 2/3 AA	3	0.6		80	500	14.5	33.5	9.5	P, T, R
	BR 1/2 A	3	0.65		120	500	17	23	9.5	P, T, R
	BR 2/3 A	3	1.2		250	1000	17	33.5	13.5	P, T, R
	BR C	3	5.0		300	1000	26	50	47	P, T, R

Memory backup circuit sample

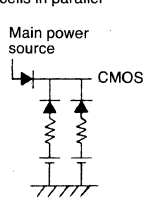
1. Using a single 3V cell (basic circuit)



2. Using two 3V cells in series



3. Using two 3V cells in parallel



Handling precautions

Items prohibited in order to ensure safe handling

Lithium batteries incorporate inflammable materials such as lithium and organic solvent. If lithium batteries are mistreated or handled incorrectly, they may burst open and ignite, possibly resulting in injury and/or fire.

When dealing with lithium batteries, carefully follow the precautions listed below in order to prevent accidents.

- Do not short circuit.
- Do not heat or incinerate.
- Do not apply solder directly.
- Do not charge.
- Do not disassemble, deform, or apply excessive pressure.
- Do not use different models or new and old batteries together.
- Always check proper polarity.

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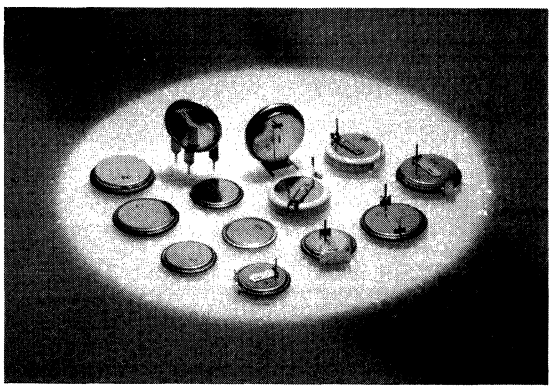
Plainview Batteries lithium coin cell batteries



Lithium coin cells are flat lithium primary batteries. They provide remarkable energy capacity in their small size and exhibit stable voltge discharge levels. LiBat coin cells can be used as a small source of internal power or, more commonly as power failure back-up energy sources.

Coin cell part numbers usually define the size. The first two digits give the diameter and the second two the cell height, both in mm.

Coin cell temperature ranges are $-20°C$ to $+70°C$.

Battery self dissipation is $\leq 1\%$ per year at room temperature. Cells can be used individually, in battery holders, or soldered directly to pc boards with several standard pinouts, (diagram below), and pinouts on request.

All Plainview lithium coin cells are UL recognized.

In general, pin spacing between positive and negative pins (Dimension C) on horizontal mount cells is 15.2, 17.8, or 20.3mm.

All cells can be made available with tabs. Battery holders are available for most common sizes.

Cell Type	Part No.	Nominal Voltage V.	Nominal Capacity mAh	Standard Discharge µA	Max Discharge Current µA Continuous	Max Discharge Current mA Pulse	A Diameter mm	B Height mm	Weight g	Terminals Available Fig. No.
Li CuS	751E	2	5	2	13	1.3	5.8	1.25	0.11	N.A.
	753E	2	7	3.5	42	1.3	5.8	1.65	0.13	N.A.
	772E	2	13	3.5	42	1.3	7.9	1.4	0.24	N.A.
	793E	2	23	5	74	1.3	9.5	1.65	0.41	N.A.
	795E	2	50	78	133	1.3	9.5	2.7	0.55	N.A.
Li Mn O_2	CR 927	3	30	10	63	.32	9.5	2.7	0.48	TAB
	CR 1220	3	35	100	2000	10	12.5	2	0.8	Fig. 4, TAB
	CR 1225	3	42	200	63	.32	12.5	2.5	1.0	Fig. 4, TAB
	CR 1620	3	60	200	3000	20	16.0	2.0	1.2	TAB
	CR 2016	3	80	300	5000	50	20.0	1.6	1.7	TAB
	CR 2025	3	140	300	6000	50	20.0	2.5	2.5	Fig. 4, TAB
	CR 2032	3	190	300	4000	40	20.0	3.2	3.0	Fig. 1, 2, 3, 4, TAB
	CR 2320	3	120	440	4400	21	23.0	2.0	2.5	TAB
	CR 2430	3	270	300	6000	50	24.5	3.0	4.0	Fig. 1, 2, 3, 4, TAB
	CR 2450	3	500	200	3000	30	24.5	5.0	6.2	Fig. 1, 2, 3, 4, TAB
	CR 2477	3	950	110	4400	21	24.7	7.7	8.4	Fig. 1, TAB
Li CFx	BR 1216	3	25	30	90	5	12.5	1.6	0.6	TAB
	BR 1220	3	35	30	180	5	12.5	2.0	0.7	Fig. 4, TAB
	BR 1225	3	38	30	180	5	12.5	2.5	0.9	Fig. 2, 4, TAB
	BR 1616	3	48	30	90	8	16.0	1.6	1.0	TAB
	BR 2016	3	75	30	180	10	20.0	1.6	1.5	TAB
	BR 2020	3	100	30	180	10	20.0	2.0	2.0	TAB
	BR 2032	3	190	30	180	10	20.0	3.2	2.5	TAB
	BR 2320	3	110	30	180	10	23.0	2.0	2.5	Fig. 1, 2, 3, 4, TAB
	BR 2325	3	165	30	180	10	23.0	2.0	3.0	Fig. 1, 2, 3, 4, TAB
	BR 2330	3	255	30	180	10	23.0	3.0	3.2	Fig. 1, 2, 3, 4, TAB
	BR 3032	3	500	30	180	10	30.0	3.2	5.5	TAB

Fig. 1

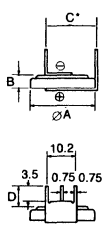


Fig. 2

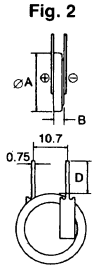


Fig. 3

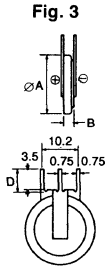
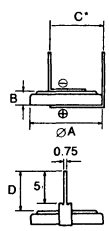


Fig. 4



Plainview batteries offers a choice of sizes: C* = 15.2, 17.8 AND 20.3

Plainview alkaline batteries

Model Number	Voltage Nominal	Capacity Nominal Ah	Size (mm) L	Size (mm) D
AAA	1.5	0.975	42.4	10.29
AA	1.5	2.2	50.37	14.15
C	1.5	5.65	49.75	25.7
D	1.5	11.5	61.31	33.4
9V	9	0.63	46 x 26.5 x 17.47 (LOA = 49.22)	

Plainview stocks replacement batteries for:

- Computer Clocks
- Programmable Controllers
- Utility Meters
- Cordless Phones
- Cellular Phones
- Cam Corders

Plainview Battery Accessories

- Battery Chargers
- Battery Holders
- Battery Clips (9V)

Plainview Batteries, Inc.
23 Newtown Road • Plainview, N.Y. 11803 • TOLL FREE 800 NICAD-LI • IN NEW YORK 516-249-2873 • FAX 516-249-2876

ETERNACELL®

LITHIUM-SDX

Why a Lithium Battery

Quite simply,—Today's lithium batteries—in one system or another —exceed all the parameters normally used to evaluate primary battery performance—they are:

- Voltage
- Energy Density
- Reliability
- Shelf Life
- Discharge Rate Capability
- High and low temp performance

LITHIUM BATTERIES ARE THE TOP STATE OF THE ART IN PRIMARY BATTERIES—

Of the various lithium systems, Eternacell® SDX (Li/SO_2) offers the best performance when all these features are taken into account and is the ideal choice for severe environmental or high rate applications. For long term, low rate drains the hermetic glass to metal seals and corrosion resistance packaging also make it an excellent choice.

The SDX—Sulphur Dioxide System has the greatest all-round performance coupled with the most reliable packaging at competitive pricing. It is the only lithium battery system in use by the U.S. Government for portable military applications. It is approved under MIL spec. MIL-B-49430 (ER)—Dec. '81, and its balanced chemistry makes it an extremely safe battery system. For these reasons, it is the best choice for a wide range of commercial and industrial applications.

General Specifications of SDX ETERNACELL® Lithium Sulfur-Dioxide Batteries

The Eternacell® SDX is offered in a complete line ranging in capacity from 0.5 ampere hours to 35 ampere hours. The following features are standard:

- Every cell bearing the SDX description is a balanced cell; that is, the lithium to sulfur-dioxide ratio does not exceed 1.1.
- Every cell incorporates a safety vent in the cell case.
- Every cell is hermetically sealed.
- Every cell is 100% voltage checked, and 100% high temperature stored prior to shipment.

Model No.	Old No.	Equiv. Size	Nom. Cap.	Rated Load (Amps)	Weight		Height		Diameter		Volume		Terminals
					OZ.	GM.	IN.	MM	IN.	MM	$IN.^3$	CC	
GO4/11	400-5S-BT	1/2 AA	.50	.017	.28	8	1.10	27.9	.56	14.2	.27	4.4	B
GO4/12	400-5S-PNT	1/2 AA	.50	.017	.28	8	.99	25.0	.56	14.2	.24	4.0	ST
GO4/13	400-5S-PC	1/2 AA	.50	.017	.28	8	1.03	26.1	.56	14.2	.25	4.2	PC
GO6/11	400S-BT	AA	1.1	.046	.49	14	1.98	50.3	.56	14.2	.49	8.0	B
GO6/12	400S-PNT	AA	1.1	.046	.49	14	1.98	50.5	.56	14.2	.49	8.0	ST
GO6/13	400S-PC	AA	1.1	.046	.49	14	1.89	48.0	.56	14.2	.46	7.6	PC
G31/12	440-10S-PNT	1/2 A	.59	.025	.32	9	1.05	26.7	.64	16.3	.3	4.9	ST
G32/11	440S-BT	2/3 A	.96	.003	.42	12	1.36	34.5	.64	16.3	.44	7.2	B
G32/12	440S-PNT	2/3 A	.96	.003	.42	12	1.35	34.4	.64	16.3	.43	7.1	ST
G32/13	440S-PC	2/3 A	.96	.003	.42	12	1.33	33.7	.64	16.3	.43	7.1	PC
G50/12	660-2S-PNT	3/4 C	2.5	.100	1.34	36	1.58	40.1	1.01	25.7	1.27	20.7	ST
G52/11	660S-BT	C	3.4	.125	1.55	44	1.95	49.5	1.01	25.7	1.56	25.6	B
G52/12	660S-PNT	C	3.4	.125	1.55	44	1.95	49.5	1.01	25.7	1.56	31.2	ST
G54/12	660-3S-PNT	1-1/4 C	4.4	.180	1.90	54	2.38	60.5	1.01	25.7	1.91	31.2	ST
G20/11	550S-BT	D	8.3	1.75	2.82	80	2.37	60.2	1.31	33.3	3.19	52.3	B
G20/12	550S-PNT	D	8.3	1.75	2.82	80	2.38	60.2	1.31	33.3	3.27	53.6	ST
G70/12	1500-20S-PNT		9.0	.160	3.17	90	1.98	50.3	1.51	38.4	3.54	58.1	ST
G58/12	660-4S-PNT		10.0	.420	3.70	105	1.96	49.8	1.64	41.6	4.14	67.8	ST
G60/12	660-5S-PNT		28.0	1.0	8.11	230	4.59	116.6	1.64	41.6	9.69	158.8	ST
G62/12	660-5AS-PNT		35.0	1.25	9.87	280	5.50	139.7	1.64	41.6	11.61	190.3	ST

B = button
ST = solder tab
PC = printed circuit

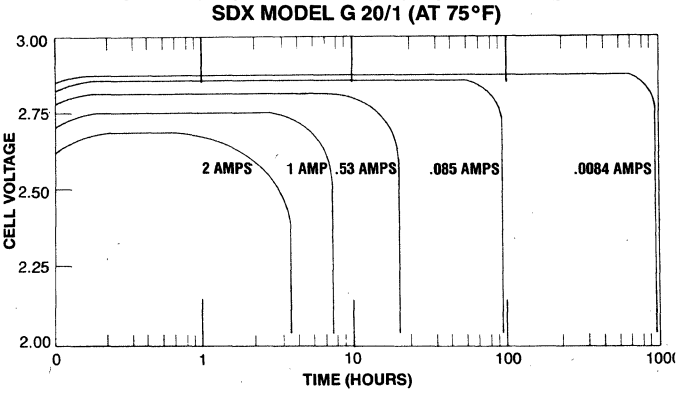
Operating Voltage Considerations:

The operating voltage of all cells is affected by Load—(current or drain rate), ambient temperature and to a certain extent the capacity remaining in a cell or battery when it comes into use. Here are typical voltage curves for design considerations: Cell voltage as a function of load: (D size cell typical)

Total Performance:

Eternacell® SDX cells by Power Conversion can be used in the widest range of application conditions and the most stringent product and storage environments. They meet or exceed the most rigid military, industrial and commercial specifications. They offer: • Excellent high rate performance • The best low temperature performance • Long term storage and operation at temperatures up to 85°C • Forced discharge of 200% of capacity • Shelf life of 10 years • True hermetic seals • The flexibility of high voltage, high energy, lightweight cells

DISCHARGE CHARACTERISTICS OF ETERNACELL® SDX MODEL G 20/1 (AT 75°F)



HAWKER ETERNACELL BATTERIES
Power Conversion, Inc.
280 Midland Avenue, Saddle Brook, NJ 07662
Phone: 201-796-4800 • Telex: 13-0292 • Fax: 201-796-6243
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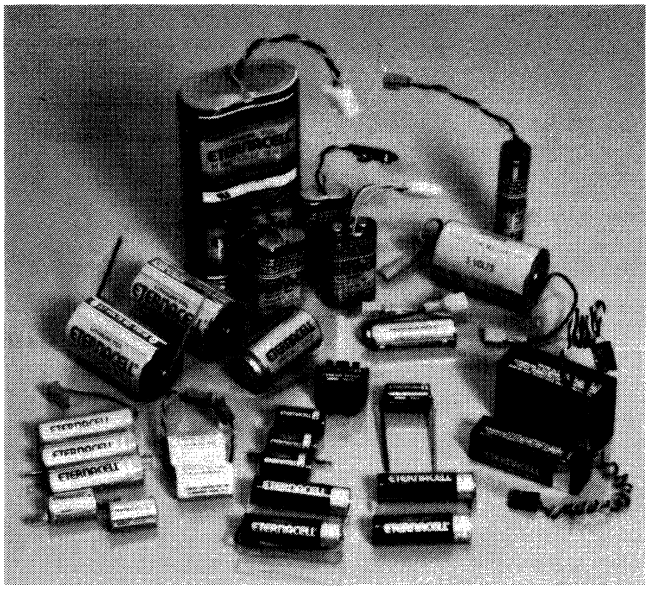
ETERNACELL®

LITHIUM-TCL



HIGH ENERGY—HIGH VOLTAGE IDEALLY SUITED FOR MEMORY SUPPORT

The TCL system allows operation of many electronic functions in addition to volatile memory support—with just a single cell. Today's Lithium batteries exceed all the previously accepted operating parameters for primary batteries and allow design freedom from virtually all shelf life and operating temperature constraints. While not intended for high rate applications, **Eternacell TCL batteries offer a combination of features unmatched by any other lithium battery system.**

Committed to Continuing Development

Formed in 1970 specifically to develop and apply high energy battery systems, Power Conversion introduced the first commercial lithium systems and today is the leading manufacturer of lithium batteries in the world, supplying both high and low rate requirements for commercial, industrial and government applications. Today Power Conversion markets four lithium battery systems to cover all types of applications from low rate miniaturization to large size, high rate cells capable of meeting extreme environmental requirements.

These systems are:
TCL — Lithium Thionyl Chloride ($Li/SOCl_2$)
SDX — Lithium Sulphur Dioxide (Li/SO_2)
MDX — Lithium Manganese Dioxide (Li/MNO_2)
CFX — Lithium Carbon Monofluoride (Li/CFX)

General Specifications of TCL Eternacell® Lithium Thionyl Chloride Batteries

The Eternacell® TCL is offered in a complete line ranging in capacity from 0.8 ampere hours to 11 ampere hours.
The following features are standard:

- Every cell is a power limited cell designed for safe operation.
- Every cell incorporates a safety vent in the cell case.
- Every cell is hermetically sealed.
- Every cell is 100% voltage checked, and 100% high temperature stored prior to shipment.

Model No.	Equivalent Size	Weight		Height		Diameter		Nominal Capacity (AHR)	Capacity @10,000 Hrs (AHR)	Protected C-MOS Support Capacity (AHR) (100,000 Hrs)	Terminals
		OZ.	GM	IN.	MM.	IN.	MM				
T04/51 T04/52 T04/53 T04/56	1/2 AA	.32	9	.975	27.9 25.0 26.2 27.9	.56	14.2	.850	.90	.85	Button Solder Tab Radial PC Axial*
T06/51 T06/52 T06/53 T06/56	AA	.56	16	1.96	49.3	.56	14.2	1.80	1.80	1.75	Button Solder Tab Radial PC Axial*
T32/51 T32/52 T32/53 T32/56	2/3 A	.60	17	1.32	33.1	.64	16.6	1.50	1.50	1.50	Button Solder Tab Radial PC Axial*
T52/51 T52/52 T52/56	C	1.8	52	1.95 1.95 1.95	49.5 49.5 49.5	1.01	25.7	5.00	5.50	6.00	Button Solder Tab Axial*
T20/51 T20/52 T20/56	D	3.5	99	2.37 2.38 2.38	60.2 60.2 60.2	1.31	33.3	10.00	11.00	11.5	Button Solder Tab Axial*

*20gA Insulated 1.75 Inch Axial Lead Wire Each Terminal

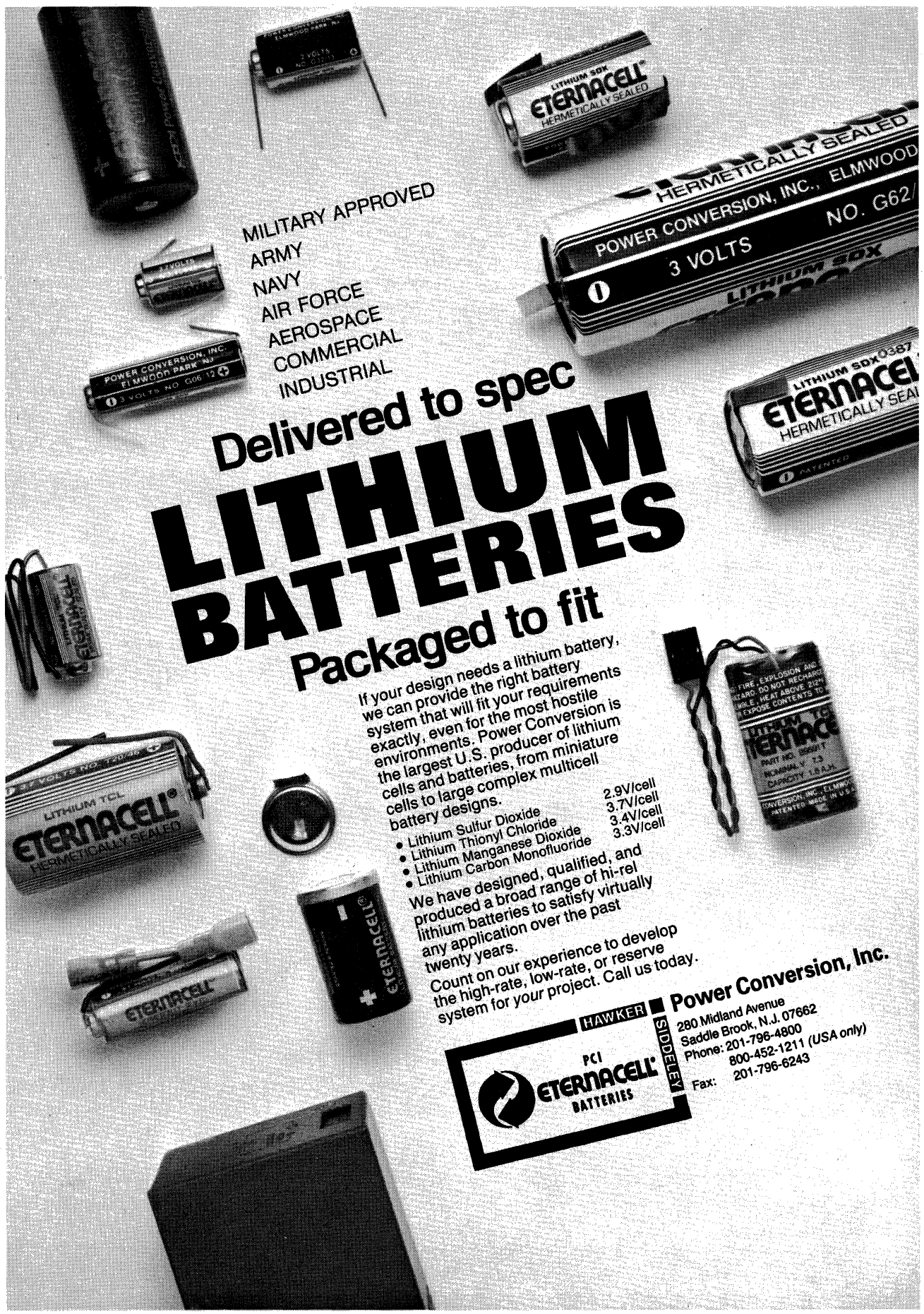
MODEL B9591T

The PCI Lithium Eternacell Computer Clock Battery Model No. B9591T contains the highest energy of any original equipment or replacement computer clock battery. This results in the longest service life in the industry, up to two (2) years longer than other battery systems. The Model B9591T contains two (2) high energy 3.65 volt AA size cells, a protective diode and current limiting resistor in a plastic case with wire leads to a connector and a velcro mount. This rugged design is Underwriters Laboratory, Inc. component recognized ( ) and has a shelf life in excess of ten (10) years.

SPECIFICATIONS:

Voltage: Open Circuit 7.3
Nominal Operating 4.5
Capacity: 1.8 AH
Shelf Life (Minimum): 10 yrs.
Temp. Rnage: – 40°C to 85°C
Dimension-Length: 2¼ in.
Width: 1½ in.
Height: ⅞ in.
Lead Length: 8½ in.
Mount: Velcro Strip
Terminals: 4 pin Connector with key

HAWKER ETERNACELL BATTERIES SPECIALTY POWER SYSTEMS
Power Conversion, Inc.
280 Midland Avenue, Saddle Brook, NJ 07662
Phone: 201-796-4800 • Telex: 13-0292 • Fax: 201-796-6243
Toll Free (800) 452-1211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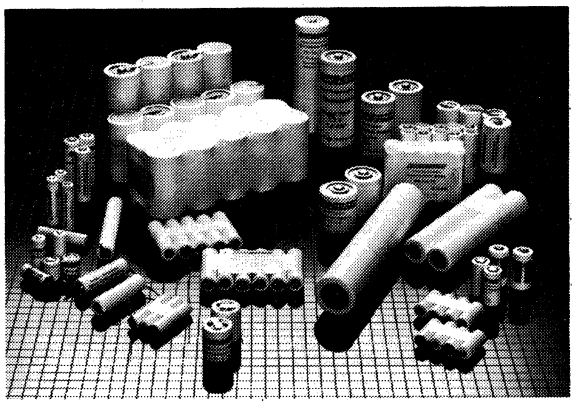
800-452-1211 (USA only)
Fax: 201-796-6243

RECHARGEABLE POWER SONIC BATTERIES



SEALED LEAD-ACID BATTERIES

Model	Voltage (V)	Nominal Capacity @ 20 hr. rate (A.H.)	Current @ 20 hr. rate (mA)	DIMENSIONS								Weight	
				Length		Width		Height		Height Over Terminal			
				in.	mm.	in.	mm.	in.	mm.	in.	mm.	lbs.	kg.
PS-445	4	4.5	225	1.93	49	2.09	53	3.70	94	3.86	98	1.5	0.7
PS-490	4	9.0	450	4.02	102	1.73	44	3.70	94	3.86	98	2.4	1.1
PS-605	6	0.5	25	2.28	58	0.57	15	1.99	51	2.20	56	0.2	0.09
PS-610	6	1.0	50	2.00	51	1.65	42	2.00	51	2.20	56	0.6	0.3
PS-612	6	1.2	60	3.94	100	0.94	24	2.09	53	2.24	57	0.6	0.3
PS-618	6	2.0	100	2.95	75	2.00	51	2.09	53	2.28	58	0.9	0.4
PS-626	6	3.0	150	5.28	134	1.34	34	2.35	60	2.56	65	1.3	0.6
PS-630	6	3.2	160	2.60	66	1.30	33	4.65	118	4.80	122	1.5	0.7
PS-640	6	4.0	200	2.76	70	1.89	48	4.02	102	4.02	102	1.8	0.8
PS-660	6	6.5	325	5.95	151	1.34	34	3.70	94	3.86	98	2.6	1.2
PS-665	6	6.5	325	3.86	98	2.20	56	4.05	103	4.05	103	3.0	1.4
PS-682	6	8.0	400	3.86	98	2.20	56	4.65	118	4.65	118	3.3	1.5
PS-6100	6	10.0	500	5.95	151	2.00	51	3.70	94	3.86	98	4.6	2.1
PS-6200	6	20.0	1000	6.18	157	3.27	83	4.92	125	4.92	125	8.2	3.7
PS-1207	12	0.7	35	3.78	96	0.98	25	2.42	62	2.42	62	0.8	0.35
PS-1212	12	1.2	60	3.82	97	1.65	42	2.00	51	2.13	54	1.3	0.6
PS-1219	12	1.9	95	7.01	178	1.34	34	2.36	60	2.56	65	1.9	0.9
PS-1226	12	3.0	150	7.68	195	1.85	47	2.76	70	2.95	75	2.9	1.3
PS-1230	12	3.0	150	5.23	134	2.64	67	2.36	60	2.60	66	2.6	1.2
PS-1242	12	4.0	200	3.54	90	2.76	70	3.98	101	4.13	105	3.8	1.7
PS-1250	12	5.0	250	5.94	151	2.56	65	3.70	94	3.89	99	5.0	2.3
PS-1270	12	7.0	350	5.95	151	2.56	65	3.70	94	3.86	98	5.7	2.6
PS-1282S	12	8.0	400	4.40	112	3.86	98	4.65	118	4.65	118	6.7	3.0
PS-12100	12	10.0	500	5.95	151	4.00	102	3.70	94	3.86	98	9.2	4.2
PS-12120	12	12.0	600	5.95	151	3.86	98	3.70	94	3.86	98	8.8	4.0
PS-12150	12	17.0	850	7.13	181	2.99	76	6.57	167	6.57	167	12.8	5.8
PS-12200	12	20.0	1000	6.89	175	6.54	166	4.92	125	4.92	125	17.6	8.0
PS-12260	12	26.0	1300	6.89	175	6.54	166	4.92	125	4.92	125	18.7	8.5
PS-12330	12	33.0	1650	7.75	197	5.19	132	6.38	162	7.15	182	26.5	12.0
PS-12400	12	40.0	2000	7.64	194	6.85	174	6.85	174	6.85	174	28.7	13.0
PS-12600	12	60.0	3000	10.25	260	6.60	168	8.20	208	9.45	240	39.7	18.0
PS-12650	12	65.0	3250	13.80	350	6.54	166	6.85	174	6.85	174	47.5	21.5
PS-12800	12	80.0	4000	12.00	305	6.60	168	8.20	208	9.45	240	50.0	22.7
PS-121000	12	100.0	5000	19.69	500	7.08	180	7.68	195	9.84	250	88.3	40.0

TOLERANCES: Length and Width: ± 0.04 in. (1mm) – Height: ± 0.08 in. (2mm)

SEALED NICKEL-CADMIUM BATTERIES

Model	Nominal Voltage (V)	Capacity 5 hr. rate (mAh)	Standard Charge		Quick Charge		Diameter (Max.)		Height (Max.)		Weight	
			(mA)	(hrs.)	(mA)	(hrs.)	inches	mm.	inches	mm.	oz	g
PS-1/3AA	1.2	110	11	15	28	6.0	0.571	14.5	0.669	17.0	0.25	7
PS-N	1.2	150	15	15	38	6.0	0.473	12.0	1.142	29.0	0.30	9
PS-AAA	1.2	180	18	15	45	6.0	0.413	10.5	1.752	44.5	0.35	10
PS-2/3AA	1.2	250	25	15	75	4.5	0.571	14.5	1.181	30.0	0.42	12
PS-AA	1.2	600	60	15	150	4.5	0.571	14.5	1.988	50.5	0.74	22
PS-SC	1.2	1200	120	15	300	6.0	0.906	23.0	1.693	43.0	1.69	48
PS-C	1.2	2000	200	15	–	–	1.024	26.0	1.969	50.0	2.65	75
PS-1/2D	1.2	2200	220	15	–	–	1.300	33.0	1.476	37.5	3.03	86
PS-D	1.2	4000	400	15	–	–	1.339	34.0	2.402	61.5	5.47	155
PS-F	1.2	7000	700	15	–	–	1.339	34.0	3.583	91.5	8.82	250

Power Sonic Corporation • 3106 Spring Street • Redwood City, CA 94063 U.S.A. • (415) 364-5001
FAX 415-366-3662 TLX 348400

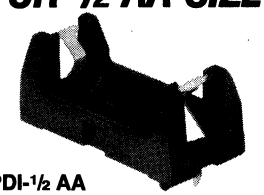
PDI®

Power Dynamics, Inc.

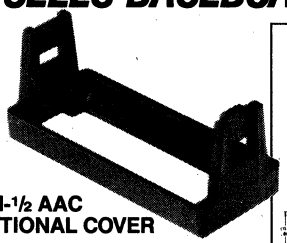
BATTERY HOLDERS

P.O. Box 539•59 Lakeside Avenue, West Orange, NJ 07052 (201) 736-5722•Fax (201) 736-8930

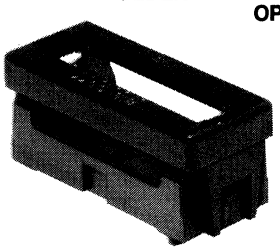
FOR ½ AA SIZE CELLS BASEBOARD MOUNTING



PDI-½ AA BATTERY HOLDER

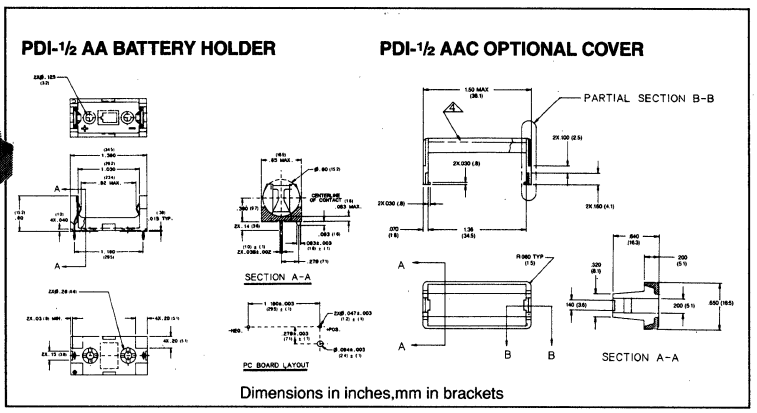


PDI-½ AAC OPTIONAL COVER

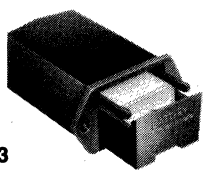


PDI-½ AAC. A PCB Baseboard mounting battery holder for half AA cells (max. dimensions 25.1mm x 14.9mm dia.). It has dual connections either by PC tag or .110″ series tabs/solder tags and two fixing holes to lock holder into the PCB or baseboard.

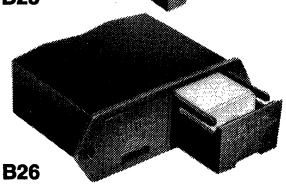
PDI-½ AAC is an optional cover with positive locking clips to hold it firmly in place on the above holder.



FOR PP3 SIZE CELLS PANEL MOUNTING



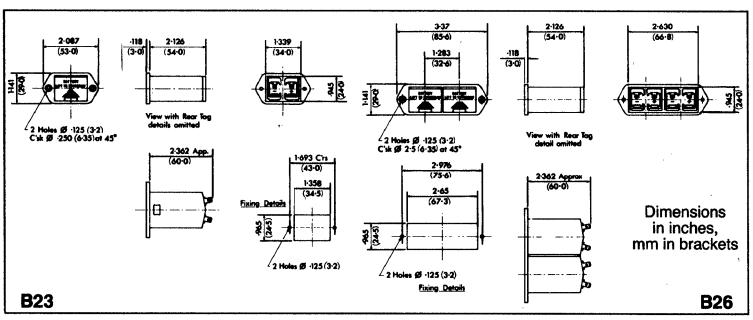
B23



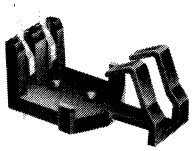
B26

B23, B26. Two panel mounting battery holders accepting **PP3** size cells (BS397, max. dimensions- W26.5 x D17.5 x H48.5mm).

- Removable loading magazines marked with polarity.
- Positive 'snap-in' location at full insertion & easy 'finger-lift' withdrawal.
- Direct self-contacting on insertion, with rear solder tag terminations.
- Contacts are self-compensating, allowing for battery terminal tolerances and variants.
- Spring compensation, allowing for battery case tolerances.

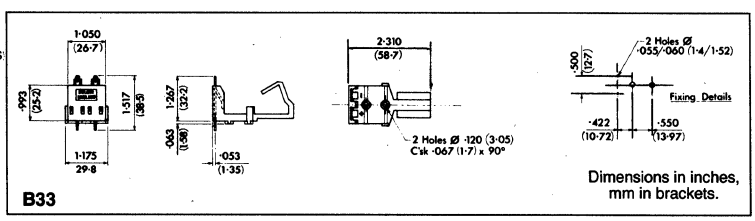


FOR PP3 SIZE CELLS BASEBOARD MOUNTING

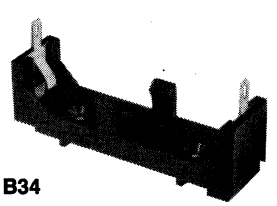


B33

B33. A PCB/Baseboard mounting battery holder accepting a single **PP3** size cell (BS397, max.dimensions W26.5 x D17.5 x H48.5mm). It has dual connections either by PC tag or .110″ series tabs/solder tags and two fixing holes to lock holder onto the PCB or base-board. Polarity is clearly marked. PC pin may be trimmed for base mounting only.

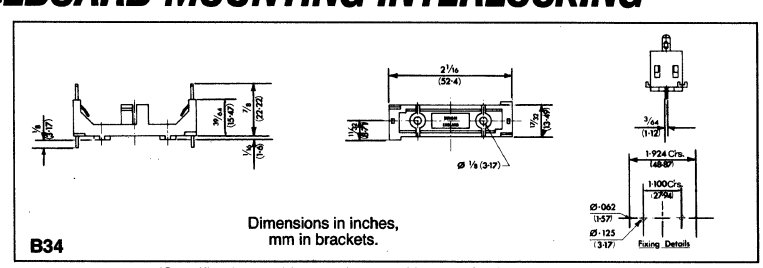


FOR AAA SIZE CELLS PCB/BASEBOARD MOUNTING-INTERLOCKING



B34

B34. A PCB/Baseboard mounting battery holder accepting a single **AAA** size cell (BS397, max. dimensions ϕ10.5mm x 44.5mm). However, this unit has an interlocking device allowing multiple assemblies to be constructed. It has dual connections either by PC tag or .110″ series tabs/solder tags and two fixing holes to lock holder onto the PCB or baseboard. Polarity is clearly marked. PC pin may be trimmed for base mounting only.



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Power Dynamics, Inc.

BATTERY HOLDERS

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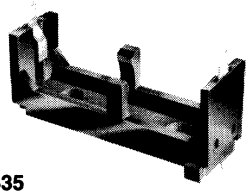
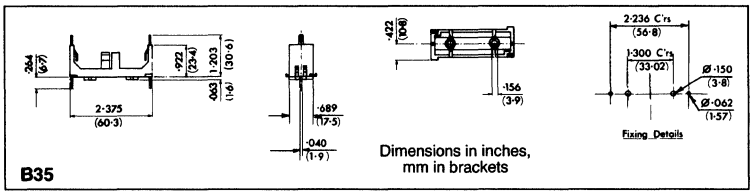
FOR AA SIZE CELLS BASEBOARD MOUNTING INTERLOCKING



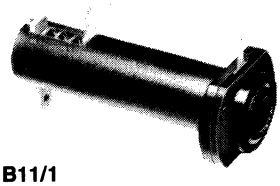
B35

B35 A PCB/Baseboard mounting battery holder accepting a single **AA** size cell (BS397, max. dimensions ϕ 14.5mm x 50.5mm). However, this unit has an interlocking device allowing multiple assemblies to be constructed. It has dual connections either by PC tag or .110" series tabs/ solder tags and two fixing holes to lock holder onto the PCB or baseboard. Polarity is clearly marked. PC pin may be trimmed for base mounting only.



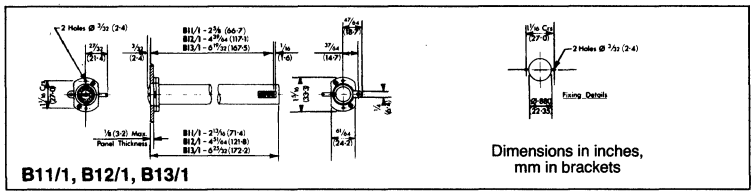
B35

FOR AA SIZE CELLS PANEL MOUNTING



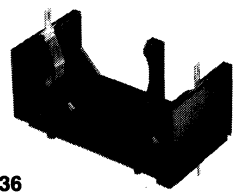
B11/1

B11/1, B12/1, B13/1. Panel mounting battery holders accepting 1, 2 or 3 **AA** size cell (BS397, max. dimensions ϕ14.5mm x 50.5mm). Flush fitting bayonet cap with coin slot is clearly marked 'Battery'. Mounting is from rear of panel, fixing by screws through front flange and supplementary rear bracket. Connection by .110" series tabs/ solder tags.



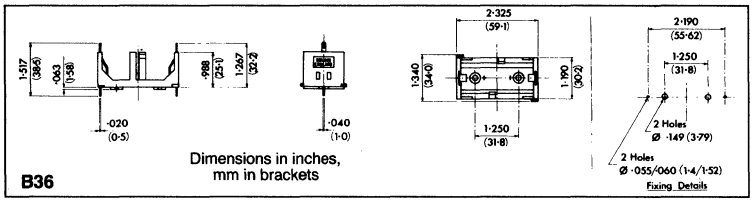
B11/1, B12/1, B13/1

FOR C SIZE CELLS PCB/BASEBOARD MOUNTING INTERLOCKING



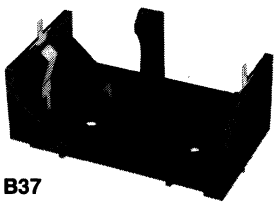
B36

B36. A PCB/Baseboard mounting battery holder accepting a single **C** size cell (BS397, max. dimensions ϕ 26.2mm x 50mm). However, this unit has an interlocking device allowing multiple assemblies to be constructed. It has dual connections either by PC tag or .110" series tabs/ solder tags and two fixing holes to lock holder onto the PCB or baseboard. Polarity is clearly marked. PC pin may be trimmed for base mounting only.



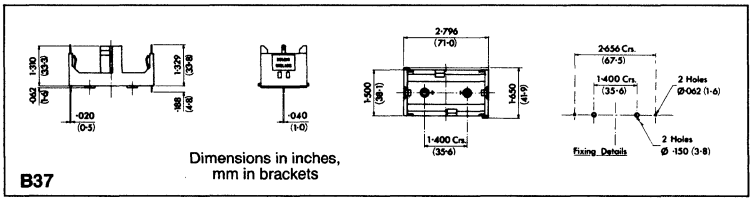
B36

FOR D SIZE CELLS PCB/BASEBOARD MOUNTING INTERLOCKING



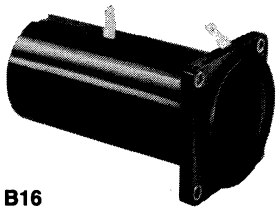
B37

B37 A PCB/Baseboard mounting battery holder accepting a single **D** size cell (BS397, max. dimensions ϕ 34.2mm x 61.5mm). However, this unit has an interlocking device allowing multiple assemblies to be constructed. It has dual connections either by PC tag or .110" series tabs/ solder tags and two fixing holes to lock holder onto the PCB or baseboard. Polarity is clearly marked. PC pin may be trimmed for base mounting only.



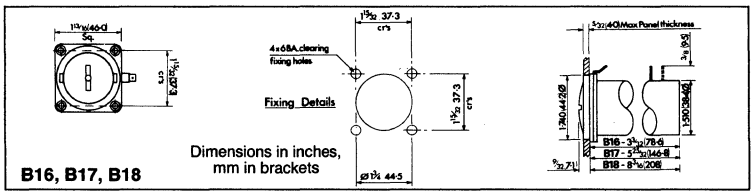
B37

FOR D SIZE CELLS PANEL MOUNTING



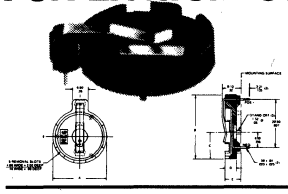
B16

B16, B17, B18. Panel mounting battery holders accepting 1, 2 or 3 **D** size cells (BS397, max. dimensions ϕ 34.2mm x 61.5mm). Flush fitting bayonet cap with coin slot is clearly marked 'Battery'. Mounting is from rear of panel, fixing by screws through front flange and supplementary rear bracket. Connection by .187" series tabs.



B16, B17, B18

FOR LITHIUM COIN CELLS NEW BERYLLIUM COPPER CONTACTOR



Use of fully heat-treated beryllium copper for the positive contact provides several benefits: Excellent electrical conductivity, totally non-magnetic - an important design consideration when near sensitive chips. Also permits high contact force with low stress-relaxation.

PART NUMBER	DIMENSIONS (mm/inches)				
	A	B	C	D	E
PDI-2032-0,-1,-2	22.86/.900	27.43/1.08	11.43/.450	4.95/.195	6.86/.270
PDI-2325-0,-1	25.40/1.00	28.78/1.13	12.70/.500	4.32/.170	6.99/.275
PDI-2425-0,-1	26.67/1.050	29.46/1.16	13.34/.525	4.32/.170	6.99/.275

(Specifications subject to change without notice.)

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STANDARD NICAD® CELLS

SAFT

Cell Size	Model Type	Model Series No.	.2C Rated Capacity MAH	Charge* Rate Range	Temp** Range	Discharge*** Rate Range	Dimensions Height inch	Dimensions Height mm	Dimensions Diameter inch	Dimensions Diameter mm	Weight grams
1/3 AA	SR	023	110	S, Q, R	S	Medium	0.660	16.76	0.535	13.57	4.0
1/3 Af	SR	023	225	S, Q, R	S	Medium	0.665	16.89	0.652	16.56	10.8
AAA	SR	023	180	S, Q, R	S	Medium	1.750	44.45	0.380	9.65	9.0
1/2 AA	SR	023	270	S, Q, R	S	Medium	1.181	30.00	0.535	13.59	10.8
2/3 Af	SR	023	450	S, Q, R	S	Medium	1.100	27.94	0.652	16.56	21.0
	VR	023	500	S, Q, R	S	Medium	1.098	27.89	0.657	16.70	21.0
	VE	136	600	S, Q, R	S	Medium	1.098	27.89	0.657	16.70	21.6
AA	SR	033	500	S, Q	S	Medium	1.967	49.96	0.535	13.59	26.0
	ST	037	500	S	H	Low	1.967	49.96	0.535	13.59	26.0
	VR	023	500	S, Q, R	S	Medium	1.976	50.20	0.555	14.10	26.0
	VE	026	600	S, Q, R	S	Medium	1.976	50.20	0.555	14.10	26.0
	VE	126	700	S, Q, R	S	Medium	1.976	50.20	0.555	14.10	26.0
	VT	037	600	S, Q	H	Low	1.976	50.20	0.555	14.10	26.0
1/2 C	VR	033	750	S, Q	S	Medium	0.945	24.00	1.008	25.60	31.0
Af	SR	023	850	S, Q, R	S	Medium	1.940	49.28	0.652	16.56	33.0
	VE	026	1000	S, Q, R	S	Medium	1.929	49.00	0.657	16.69	33.0
4/5 Cs	SR	023	900	S, Q, R	S	High	1.300	33.02	0.875	22.23	40
3/5 C	SR	033	1000	S, Q	S	Medium	1.160	29.46	1.008	25.60	40
Cs	VR	023	1300	S, Q, R	S	High	1.662	42.21	0.875	22.23	52
	VE	026	1400	S, Q, R	S	High	1.662	42.21	0.875	22.23	52
	VT	137	1300	S, Q	H	Low	1.662	42.21	0.875	22.23	52
	VR	033	1300	S, Q	S	Medium	1.662	42.21	0.875	22.23	52
	VE	126	1700	S, Q, R	S	High	1.662	42.21	0.875	22.23	52
	VY	025	1200	S, Q, R	S	High	1.662	42.21	0.875	22.23	52
	VY	125	1400	S, Q, R	S	High	1.662	42.21	0.875	22.23	52
CsD	VY	025	1800	S, Q, R	S	High	2.225	56.52	0.875	22.23	68
C	SR	033	2000	S, Q	S	Medium	1.880	47.75	1.008	25.60	68
	SR	023	2000	S, Q, R	S	High	1.880	47.75	1.008	25.60	68
	SE	036	2400	S, Q	S	Medium	1.880	47.75	1.008	25.60	68
	ST	037	2000	S	H	Low	1.880	47.75	1.008	25.60	68
	VR	023	2000	S, Q, R	S	High	1.949	49.50	0.998	25.35	75
1/2 D	SR	033	2200	S, Q	S	Medium	1.448	36.78	1.271	32.28	80
	SR	023	2200	S, Q, R	S	High	1.448	36.78	1.271	32.28	80
	ST	037	2200	S	H	Low	1.448	36.78	1.271	32.28	80
D	SR	033	4000	S, Q	S	Medium	2.318	58.88	1.271	32.28	130
	SE	036	4500	S, Q	S	Medium	2.318	58.88	1.271	32.28	130
	ST	037	4000	S	H	Low	2.318	58.88	1.271	32.28	130
	VR	023	4000	S, Q, R	S	High	2.374	60.30	1.274	32.35	150
	VE	026	4500	S, Q, R	S	High	2.295	58.29	1.274	32.35	150
	VE	126	5000	S, Q, R	S	Medium	2.295	58.29	1.274	32.35	150
F	SR	033	7000	S, Q	S	Medium	3.508	89.10	1.271	32.28	210
	ST	037	7000	S	H	Low	3.508	89.10	1.271	32.28	210
	VR	023	7000	S, Q, R	S	High	3.587	91.10	1.274	32.35	235
SF	VR	023	10000	S, Q	S	High	3.504	89.00	1.620	41.15	390

SPECIAL PRODUCTS

SAFT

Cell Size	Model Type	Model Series No.	.2C Rated Capacity MAH	Charge* Rate Range	Temp** Range	Discharge*** Rate Range	Dimensions Height inch	Dimensions Height mm	Dimensions Diameter inch	Dimensions Diameter mm	Weight grams
GB 50H	Button	019	50	S	S-H	Low	0.232	5.9	0.614	15.6	3.3
GB 150H	Button	019	150	S	S-H	Low	0.256	6.5	0.913	23.2	9.0
GB 250H	Button	019	250	S	S-H	Low	0.366	9.3	0.913	23.2	12.5
GF 20	Button	022	20	S	S-H	Low	0.118	3.0	0.614	15.6	2.0
GF 30	Button	022	30	S	S-H	Low	0.079	2.0	0.913	23.2	3.5
GF 40	Button	022	40	S	S-H	Low	0.087	2.2	0.913	23.2	4.0
GF 50	Button	022	50	S	S-H	Low	0.110	2.8	0.913	23.2	4.5
GF 90	Button	022	90	S	S-H	Low	0.181	4.6	0.913	23.2	6.5
GF 100	Button	022	100	S	S-H	Low	0.213	5.4	0.913	23.2	7.0
VB 4 E	Button	022	40	S, Q	S	Medium	0.236	6.0	0.618	15.7	3.5
VB 10 E	Button	022	100	S, Q	S	Medium	0.209	5.3	0.906	23.0	7.0
VB 22 E	Button	022	220	S, Q	S	Medium	0.307	7.8	0.988	25.1	12.0
VB 30 E	Button	022	300	S, Q	S	Medium	0.217	5.5	1.366	34.7	18.0
VB 60 E	Button	022	600	S, Q	S	Medium	0.386	9.8	1.366	34.7	31.0

PRISMATIC CELLS

Cell Size	Model Type	Model Series No.	.2C Rated Capacity MAH	Charge* Rate Range	Temp** Range	Discharge*** Rate Range	Dimensions Length inch	Dimensions Length mm	Dimensions Width inch	Dimensions Width mm	Dimensions Thickness inch	Dimensions Thickness mm	Weight grams
GP 4E	Prismatic	021	360	S	S	M	1.890	48.0	0.646	16.4	0.220	5.6	16
GP 6E	Prismatic	021	540	S	S	M	2.638	67.0	0.646	16.4	0.220	5.6	23
GP 9E	Prismatic	021	765	S	S	M	2.638	67.0	0.646	16.4	0.307	7.8	30
GP 20E	Prismatic	021	1800	S	S	M	2.638	67.0	0.646	16.4	0.646	16.4	58

LITHIUM

	Model	Standard Size	Nominal Voltage	Rated Capacity (Ah)	Maximum Dimensions Diameter inch	Maximum Dimensions Diameter mm	Maximum Dimensions Length inch	Maximum Dimensions Length mm	Weight oz.	Weight gr.	*Features
LC SERIES	LC3	1/2AA	1.5	1.40	0.571	14.5	1.020	26.0	0.26	7.3	B
	LC6	AA	1.5	3.30	0.571	14.5	1.990	50.5	0.61	17.4	B,RU
LCP SERIES	LCP3	1/2AA	2.5	0.95	0.571	14.5	1.020	26.0	0.25	7.0	B,RU
	LCP6	AA	2.5	2.30	0.571	14.5	1.990	50.5	0.60	17.0	B,RU
	LCP6 HT	AA	2.5	1.90	0.571	14.5	1.990	50.5	0.63	18.0	B,GTM,HT
	LCPH14 HT	C	2.5	4.50	1.032	26.2	1.969	50.0	1.94	55.0	S,GTM,HT
LM SERIES	LM17250	1/2AA	3.0	0.65	0.571	14.5	0.906	23.0	.24	7.0	B,RU
	LM17500	AA	3.0	1.90	0.571	14.5	1.988	50.5	.60	17.0	B,RU
	LM17335	2/3A	3.0	1.50	0.670	17.0	1.319	33.5	.53	15.0	B,RU
	LMH17335	2/3A	3.0	1.30	0.669	16.99	1.333	33.0	.60	17.0	RU
	HLD1/2AA	Special holder for use with 1/2AA to provide user replaceability.									

SAFT

	Model	Standard Size	Nominal Voltage	Rated Capacity (Ah)	Maximum Dimensions Diameter inch	Diameter mm	Length inch	Length mm	Weight oz.	Weight gr.	*Features
LX SERIES	LX1622	1/2A	3.0	0.50	0.660	16.8	1.050	26.7	0.35	10.0	S,GTM
	LX1634	2/3A	3.0	0.85	0.660	16.8	1.380	35.1	0.49	14.0	S,GTM,RU
	LX2618	2/5C	3.0	0.90	1.032	26.2	0.709	18.0	0.46	13.0	S,GTM
	LX2649	C	3.0	3.50	1.032	26.2	1.969	50.0	1.52	43.0	S,GTM,RU
	LXH2649	C	3.0	3.00	1.032	26.2	1.969	50.0	1.52	43.0	S,GTM,HR
	LXH2958	--	3.0	4.40	1.142	29.0	2.288	58.0	2.11	60.0	S,GTM,HR
	LX3457	D	3.0	7.50	1.346	34.2	2.420	61.5	3.00	85.0	S,GTM
	LXH3457	D	3.0	7.00	1.346	24.2	2.420	61.5	3.00	85.0	S,GTM,HR
	LX3851	--	3.0	8.00	1.496	38.0	1.890	48.0	3.06	87.0	S,GTM
LS SERIES	LS3	1/2AA	3.5	0.85	0.571	14.5	1.020	26.0	0.30	8.5	B,GTM,RU
	LS6	AA	3.5	1.80	0.571	14.5	1.990	50.5	0.54	15.4	B,GTM,RU
	LSH14	C	3.5	5.00	1.032	26.2	1.970	50.0	1.97	56.0	S,GTM,F
	LSH20	D	3.5	10.00	1.350	34.2	2.420	61.5	4.22	120.0	S,GTM,F

	Model	Nominal Voltage	Rated Capacity (Ah)	Length inch	Length mm	Dimension Width inch	Dimension Width mm	Height inch	Height mm	Weight lbs.	Weight gr.
BA 5000 SERIES	BA5567/U	2.8	.800	1.00	25.4	1.00	25.4	0.718	18.2	0.04	20.0
	BA5847/U	5.6	7.200	2.55	65.0	1.50	38.0	3.750	95.3	0.53	240.0
	BA5588/U	14.0	3.900	3.55	19.0	1.22	31.0	3.480	88.4	0.65	295.0
	BA5590/U	28.0	7.200	4.40	112.0	2.45	62.0	5.000	127.0	2.25	1021.0
	BA5598/U	14.0	8.000	3.57	52.4	4.69	119.1	2.06	52.4	1.50	681.0
	BA5112/U	11.2	1.800	2.25	57.2	1.54	39.1	3.06	77.7	0.40	180.0

LITHIUM METER BATTERIES

Model	Standard Appl.	Nominal Voltage	Rated Capacity (Ah)	Maximum Dimensions Diameter inch	Diameter mm	Length inch	Length mm	Weight oz.	Weight gr.	*Features
2LX2317	GE TM80	5.6	.675	1.0	25.4	1.65	41.9	1.1	32	GTM,GC
LS3	GE TM90	3.5	.850	.675	17.2	1.125	12.0	.42	12	GTM,GC
LX2649	SW EMT	2.8	3.500	1.03	26.2	1.97	50.0	1.52	43	GTM
2LX1622	SW MTM	5.6	.600	.645	16.4	2.20	55.9	.70	20	GTM,GC

SAFT

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WA Redmond, Energy Sales–206-883-2343

SANYO RECHARGEABLE NICKEL-CADMIUM BATTERIES

Standard Charge Batteries

Model No.	Size	Nominal voltage (v)	Minimum Capacity (mAH)	Outside Dimensions	
				Dia. (D) (mm)	Height (H) (mm)
N-50AAA	1/3AAA	1.2	50	10.5 $^{+0}_{-0.5}$	16.0 $^{+0}_{-1}$
N-110AA	1/3AA	1.2	110	14.5 $^{+0}_{-0.5}$	17.0 $^{+0}_{-1}$
N-120TA	AAAA	1.2	120	7.8 $^{+0}_{-0.5}$	42.5 $^{+0}_{-1}$
N-150N	N	1.2	160	12.0 $^{+0}_{-0.5}$	29.5 $^{+0}_{-1}$
N-200AAA	AAA	1.2	200	10.5 $^{+0}_{-0.5}$	44.5 $^{+0}_{-1}$
N-200A	1/3A	1.2	200	17.0 $^{+0}_{-1}$	17.0 $^{+0}_{-1}$
N-270AA	2/3AA	1.2	270	14.5 $^{+0}_{-0.5}$	30.0 $^{+0}_{-1}$
N-600AA	AA	1.2	600	14.2 $^{+0}_{-0.5}$	50.0 $^{+0}_{-1}$
N-650SC	2/3SC	1.2	650	23.0 $^{+0}_{-1}$	26.0 $^{+0}_{-1}$
N-1000SCR	4/5SC	1.2	1000	23.0 $^{+0}_{-1}$	34.0 $^{+0}_{-1}$
N-1100CR	2/3C	1.2	1100	26.0 $^{+0}_{-1}$	30.0 $^{+0}_{-1}$
N-1400SCR	SC	1.2	1400	23.0 $^{+0}_{-1}$	43.0 $^{+0}_{-2}$
N-1800C	C	1.2	1800	26.0 $^{+0}_{-1}$	50.0 $^{+0}_{-2}$
N-4000DL	D	1.2	4000	34.0 $^{+0}_{-1}$	61.0 $^{+0}_{-2}$
N-6PT	6F22	7.2	120	17.0(W)x26.0(L)x48.5(H)	

Temperature Range: Charge: 0 ~45°C (Standard Charge), 10 ~45°C (Quick Charge),
Discharge: −20~60°C, Storage: −30~50°C (Long Period: −30~35°C)

Cadnica Slim Batteries

Model No.	Nominal Voltage (v)	Minimum Capacity (mAh) At 0.2C Rate	Outside Dimension (With Tube)		
			L (mm)	W (mm)	T (mm)
KF-B400	1.2V	360mAh	48.0 $^{0}_{-0.8}$	17.0 $^{0}_{-0.8}$	6.1 $^{0}_{-0.6}$
KF-A600	1.2V	540mAh	67.0 $^{0}_{-1}$	17.0 $^{0}_{-0.8}$	6.1 $^{0}_{-0.6}$
KF-A900	1.2V	810mAh	67.0 $^{0}_{-1}$	17.0 $^{0}_{-0.8}$	8.0 $^{0}_{-0.5}$
KF-A1200	1.2V	1080mAh	67.0 $^{0}_{-1}$	17.0 $^{0}_{-0.8}$	10.3 $^{0}_{-0.6}$

High-Capacity Batteries—Extra Series

Model No.	Nominal Voltage (v)	Minimum Capacity (mAh)	Outside Dimension (Including Tube)	
			Diameter (D) (mm)	Height (H) (mm)
N-225AE	1.2	225	17.0 $^{0}_{-1}$	17.0 $^{0}_{-1}$
KR-600AE	1.2	600	17.0 $^{0}_{-1}$	28.0 $^{0}_{-1}$
N-700AAE	1.2	700	14.2 $^{0}_{-0.5}$	50.0 $^{0}_{-1}$
KR-1000AE(L)	1.2	950	17.0 $^{0}_{-1}$	43.0 $^{0}_{-2}$
KR-1200AE	1.2	1200	17.0 $^{0}_{-1}$	50.0 $^{0}_{-2}$
KR-1700AE	1.2	1700	17.0 $^{0}_{-1}$	67.0 $^{0}_{-2}$
KR-1700SCE	1.2	1700	23.0 $^{0}_{-1}$	43.0 $^{0}_{-2}$
KR-2000SCE	1.2	2000	23.0 $^{0}_{-1}$	50.0 $^{0}_{-2}$
KR2400CE	1.2	2400	26.0 $^{0}_{-1}$	50.0 $^{0}_{-2}$
KR5000DE(L)	1.2	5000	34.0 $^{0}_{-2}$	59.0 $^{0}_{-1}$

Standard Charge Batteries (KR-Series)

Model No.	Nominal Voltage (v)	Minimum Capacity (mAH)	Outside Dimensions	
			Dia. (mΩ)	Height (mm)
KR-1500SC	1.2	1500	23.0 $^{+0}_{-1}$	43.0 $^{+0}_{-2}$
KR-2000C	1.2	2000	26.0 $^{+0}_{-1}$	50.0 $^{+0}_{-2}$
KR-2800D	1.2	2800	34.0 $^{+0}_{-1}$	44.0 $^{+0}_{-2}$
KR-4400D	1.2	4400	34.0 $^{+0}_{-2}$	61.0 $^{+0}_{-2}$
KR-7000F	1.2	7000	34.0 $^{+0}_{-2}$	91.0 $^{+0}_{-2}$
KR-10000M	1.2	10000	43.0 $^{+0}_{-2}$	91.0 $^{+0}_{-2}$
KR-20000M	1.2	20000	43.0 $^{+0}_{-2}$	146.0 $^{+0}_{-2}$

Temperature Range: Charge: 0 ~45°C (Standard Charge), Discharge: 20 ~60°C, Storage: −30~50°C (Long Period: −30~35°C)

LITHIUM BATTERIES

3V Manganese Dioxide Lithium Batteries

Shape	Model No.	Nominal Voltage (v)	Nominal Capacity (mAh)	Standard Discharge Current (mA)	Max. Dimension (mm)	
					Dia. (D)	Height (H)
Flat Cells	CR1220	3	35	0.1	12.5	2.0
	CR1620	3	60	0.2	16.0	2.0
	CR2016	3	80	0.3	20.0	1.6
Crimp Sealed	CR2025	3	140	0.3	20.0	2.5
	CR2032	3	210	0.3	20.0	3.2
	CR2430	3	270	0.3	24.5	3.0
	CR2450	3	500	0.2	24.5	5.0
Cylindrical Cells	CR-1/3N	3	160	2.0	11.6	10.8
	2CR-1/3N	6	160	2.0	13.0	25.2
Crimp-Sealed	2CR5	6	1300	10.0	34(L)x17(W)x45(H)	
	CR-P2$_5$	6	1000	10.0	33.8(L)x19.5(W)x35.9(H)	
	CR15335	3	1000	10.0	15.0	33.5
	CR15400	3	1300	10.0	15.0	40.0
Cylindrical Cells	CR14250SE	3	850	0.5	14.5	25.0
	CR12600SE	3	1400	1.0	12.0	60.0
Laser-Sealed	CR17335SE	3	1800	1.0	17.0	33.5
	CR17450SE	3	2500	1.0	17.0	45.0
	CR23500SE	3	5000	1.0	23.0	50.0
Rechargeable	ML2016	3	20	2.0	20.0	1.6
	ML2430	3	70	3.0	24.0	3.0

Minimum capacity is based on standard discharge current down to 2.0V at 23 °C.

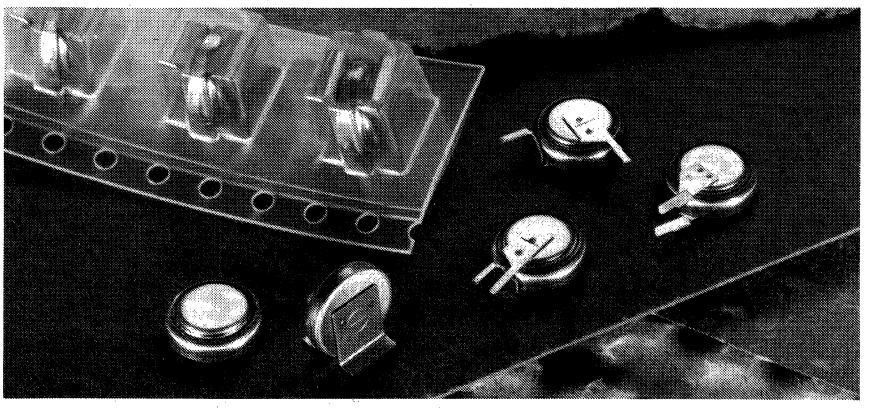
Also featuring NI-CD memory back-up batteries. Please call for more information.

SANYO Energy (U.S.A.) Corporation

Ask about our Fast-Charge Batteries and High-Temperature Batteries (for Stand-by or Cycle use)

SII
Seiko Instruments

MICRO BATTERIES



Lithium Coin Batteries

Model No.	Electrical Characteristics (at room temperature)				Dimensions		Weight	C.C.V.*		Storage loss
	Nominal Voltage (V)	Nominal Capacity (mAh)	Maximum Drain: Pulse lead	Maximum Drain: Continuous lead	Diameter (mm)	Height (mm)	(g)	+24°C (V)	-10°C (V)	(%/Y)
•CR1025	3.0	30	4	0.8	10.0	2.5	0.9	2.65	2.20	3
•CR1220		38	5	1	12.5	2.0	0.8	2.70	2.40	
CR2012		55	15	3	20.0	1.2	1.5			
•CR2016		70 (**80)				1.6	1.9			
•CR2025		140 (**155)				2.5	2.5			
•CR2032		180 (**200)				3.2	3.1			
CR2320		120	20	4	23.0	2.0	2.6			
•CR2325		170				2.5	3.3			
CR2430		250			24.5	3.0	4.6			
CR2450		550				5.0	6.8			

*C.C.V.: Closed Circuit Voltage 500ohm 5sec
**High Capacity Type
Any shapes of the terminal are available upon your request.
•U.L. Component Recognition (MH. 15628)

Rechargeable Polymer Lithium Batteries

Model	Electrical Characteristics (at room temperature)					Dimensions		Weight (g)
	Nominal Voltage (V)	Nominal Capacity (mAh)	Standard Discharge Current (mA)	Standard Charging Method	Cycle Characteristics	Diameter (mm)	Thickness (mm)	
AL920	3.0	0.5 (3~2V)	0.001~1	Constant Voltage Charging	More than 1000 cycles at depth of 0.1 mAh	9.5	2.1	0.9
AL2016		3 (3~2V)	0.001~5		More than 1000 cycles at depth of 1 mAh	20.0	1.6	1.7
AL2032		8 (3~2V)	0.001~5		More than 1000 cycles at depth of 3 mAh	20.0	3.2	2.6

U.L. Component recognition (MH.15628) (Any shapes of the terminal are available upon your request.)
Operating Temperature Range: -20°C~60°C

Polyacene Capacitors

Model	Electrical Characteristics (at room temperature)			Dimensions		Weight (g)
	Rating Operating Voltage (V)	Electrostatic Capacity (F)	Internal Resistance (Ohm)	Diameter (mm)	Thickness (mm)	
SC609	2.5	0.07	30	6.8	0.9	0.14
SC621		0.33			2.1	0.20
SC920		0.60	15	9.5		0.36
SC2016		2.70	4	20.0	1.6	1.6
SC2025		5.00			2.5	2.1
2SC609	5.0	0.035	60	6.9	2.4	0.29
2SC621		0.17			4.4	0.41
2SC920		0.30	30	9.6		0.73
2SC2016		1.30	8	20.2	3.7	3.6
2SC2025		2.50			5.5	4.5

Operating Temperature Range: -20°C~60°C

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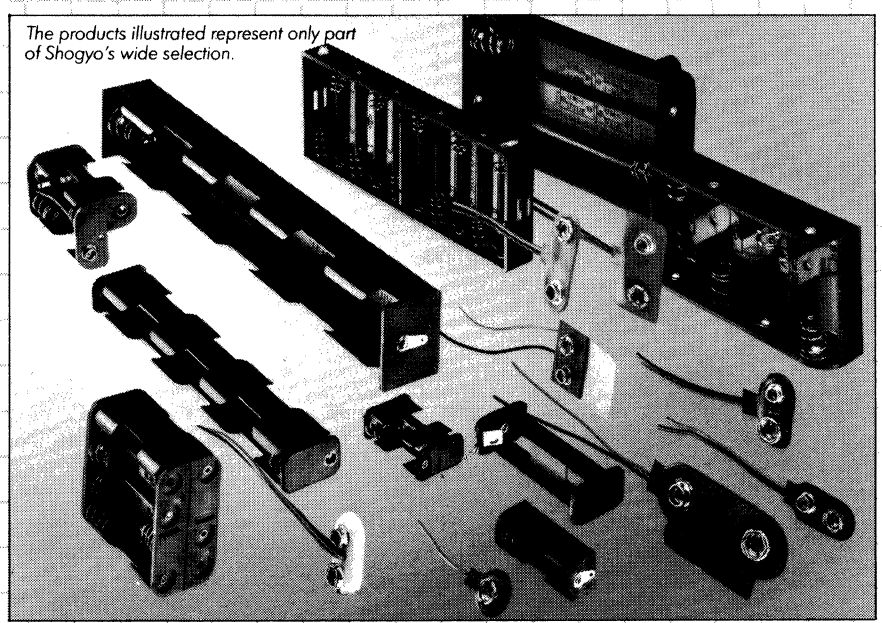

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SHOGYO

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

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- **HIGHEST ENERGY DENSITY.** 4 times as great as other batteries. Up to 420 Wh/kg and 800 mWh/cm³.
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CYLINDRICAL

Memory Back-Up	Model	Nom Current (mA)	Capac mAh	Dia. x Length
½ AA	TL-5101	1.0	850	0.57″ 1 ″
AA	TL-5104	1.0	1900	0.57″ 2 ″
Medium Power				
D	TP-5830	500.0	14000	1.3 ″ 2.4″
Xtra				
½ AA	TL-2150	15.0	750	0.57″ 1 ″
AA	TL-2100	15.0	1800	0.57″ 2 ″
C	TL-2200	20.0	5200	1.0 ″ 2 ″
D	TL-2300	30.0	13,500	1.3 ″ 2.4″
DD	TL-5137	50.0	27,000	1.3 ″ 4.8″

WAFER

Memory Back-Up				Dia. x Thk
1/6 DEL	TL-5135	0.1	1500	1.3″ 0.4 ″
1/10 DEL	TL-5134	0.1	1000	1.3″ 0.28″
BEL	TL-5186	0.1	370	0.9″ 0.28″

ASSEMBLIES — PC Real-Time Clock & CMOS Memory Back-Up

AEL	TL-5242	3.6V	0.7″×0.6″×2.4″
2XAEL	TL-5253	6.8V	0.8″×1.5″×2.3″
2XAEL	TL-5280	7.2V	0.8″×1.5″×2.3″
2XAEL	TL-5293	6.0V	0.8″×1.5″×2.3″

Terminals: Pressure Contact, Flat Strip, Axial Lead.

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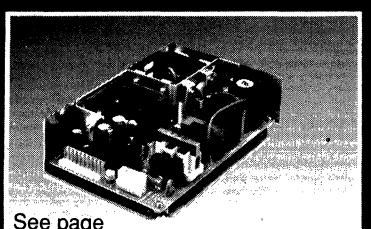
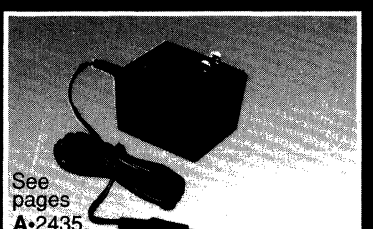
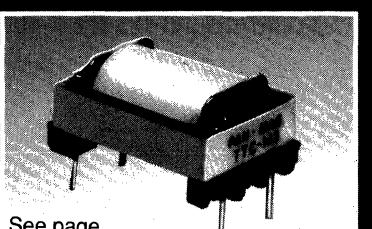


See page D•2062 **SINGLE AND MULTI–OUTPUT SWITCHERS**

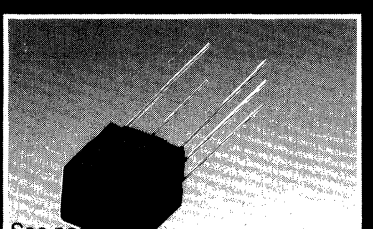


See pages A•2435, D•1495, D•2066 **WALL PLUG–IN, AC & DC POWER**

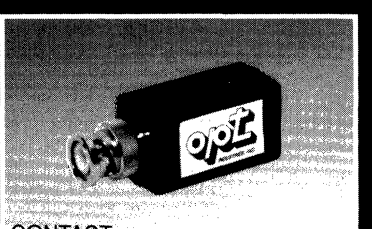


See page A•2428 **FCC PART 68 TELCOM LINE COUPLING**

See page D•2059 **DC/DC CONVERTERS SIP & DIP PKG**



See page A•2430 **MINIATURE AUDIO & PART 68 COUPLING**



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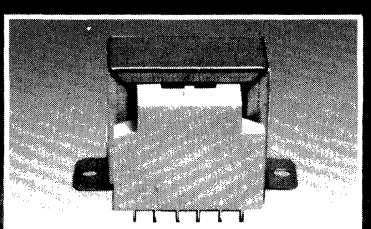
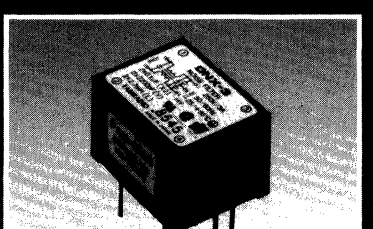
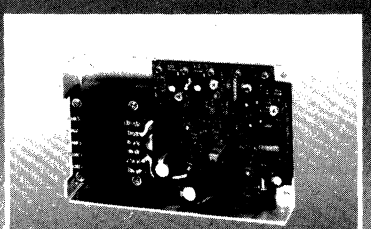


A•2432 **INT'L PCB POWER– UL 1411, IEC, VDE, & CSA**

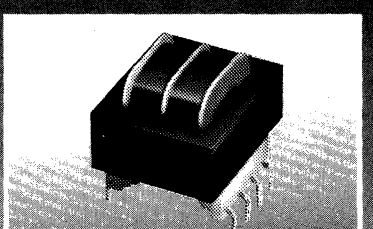


A•1643 **EMI LINE FILTERS**

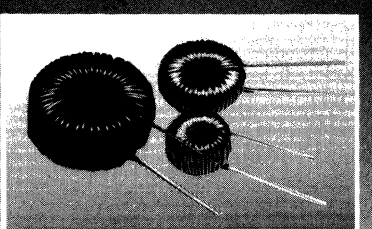
A•2431 **WIDE BAND PULSE– T1 & DIGITAL**



D•2064 **LINEAR POWER SUPPLIES**



A•2433 **UL/CSA PCB POWER**



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TAMURA BATTERY CHARGERS

Wall Plug-In, 120VAC, 60Hz.

file no. E82180 file no. LR38236

Tamura battery chargers are particularly suited for charging NiCd, lead acid and Gel-Cell batteries. They are UL 1310 listed for battery charger circuits. Contact the battery manufacturer for recommended voltage and current. For additional UL/CSA/VDE models see DC Power Supplies section for DC regulated and unregulated models and Transformers section for AC to AC models.

FEATURES

- UL Listed For Battery Charger Ckts.
- UL 544 Medical Capability.
- Thermal Overload Protection.
- 100% Testing.
- Transformer: 3 flange bobbin.
- US 3-Blade Ground Plug Available.
- Temp Range: 0 to +40°C.
- Case Temp Rise: ≤35°C.
- Oper Humidity: 10-90% RH.
- Material: Black ABS resin/UL 94-V0.
- No Audible Noise.

FIG. 1 UL/CSA

BATTERY CHARGER - 120VAC, 60Hz.

UL/CSA MODEL No.	RATED OUTPUT		OUTPUT VAC [1]			UL [2]	CSA [3]	PLUG [4]	PRICE (qty)			
	VOLTS DC	ma DC	100% FL 108VAC	100% FL 132VAC	10% FL 132VAC				1-9	10-24	25-99	100up
212A2220	4.5	150	3.80	5.20	7.35	UL*	L	Y	$7.00	$5.90	$5.60	$4.90
216A4222	4.5	350	3.50	5.20	8.70	UL*	C	F	7.30	6.20	5.80	5.10
416A2219	4.5	600	4.10	5.60	7.40	UL*	L	I	9.10	7.70	7.30	6.40
420AR4207	6.0	400	----------REGULATED----------			UL*	C	I	14.90	12.70	11.90	10.40
825A2617	6.0	2000	5.10	6.80	9.70	UL	C	I	24.10	20.50	19.30	16.90
212A2136	9.0	100	7.40	10.60	16.20	UL*	L	I	7.00	5.90	5.60	4.90
825A4620G	9.0	1200	7.80	10.40	13.70	UL	L	I	16.90	14.40	13.50	11.80
318A4146	12.0	200	10.30	13.50	17.60	UL*	L	L	8.90	7.60	7.10	6.20
416A2141	12.0	300	10.30	13.60	19.10	UL*	L	F	8.90	7.60	7.10	6.20
825A4425G	12.0	900	10.40	13.80	17.00	UL*	L	I	17.40	14.80	13.90	12.20
820A4276G	14.0	700	12.20	16.10	21.60	UL	L	I	15.60	13.30	12.50	10.90
820A4279G	16.0	400	13.90	18.10	21.70	UL	L	I	15.60	13.30	12.50	10.90
416A2045	18.0	100	16.10	20.30	24.10	UL*	C	I	8.90	7.60	7.10	6.20
811A4214	3-9 [5]	300	4.60	6.25	8.10	UL*	L	U	15.40	13.10	12.30	10.80

Note 1: Typical output voltage for % load (FL) and line (VAC) indicated.
Note 2: UL notations: UL, UL 1310 listed; UL*, UL 1310 listing includes a UL 1411 recognized transformer.
Note 3: Complies (C) with or is listed (L) to CSA 22.2, No. 223/66.
Note 4: See output plug table for dimensions, gender and polarity.
Note 5: Five switched output voltages of 3.0, 4.5, 6.0, 7.5 & 9.0VDC with universal, polarity reversing, output plugs. Ratings are for 6.0VDC setting.

MECHANICAL DIMENSION TABLE

SERIES PREFIX	LENGTH (L) mm (inch)	WIDTH (W) mm (inch)	HEIGHT (H) mm (inch)	WEIGHT gm (oz)	FIG No.
212A	53 (2.09)	36 (1.42)	35 (1.38)	120 (4.23)	1
216A	53 (2.09)	36 (1.42)	38 (1.50)	140 (4.94)	1
318A	60 (2.36)	45 (1.77)	42 (1.65)	190 (6.70)	1
416A	61 (2.40)	55 (2.17)	41 (1.59)	230 (8.11)	1
420AR	61 (2.40)	55 (2.17)	41 (1.59)	270 (9.52)	1
811A	84 (3.31)	56 (2.20)	35 (1.38)	260 (9.20)	1
820A-G	82 (3.23)	60 (2.36)	55 (2.17)	420 (14.81)	1
825A-G	82 (3.23)	60 (2.36)	55 (2.17)	490 (17.28)	1

OUTPUT PLUG DIMENSIONS

PLUG TYPE	D1 (mm)	D2 (mm)	L (mm)	MALE/ FEMALE	CTR PIN (+/-)	FIG No.
I	5.5	2.10	9.5	FEMALE	-	2
F	5.0	2.50	11.5	FEMALE	-	2
L	5.5	2.10	16.0	FEMALE	+	2
U	------Universal/Reversible Connector ------				rev	4
Y	3.5	3.00	14.0	MALE	+	3

FIG. 2 FEMALE

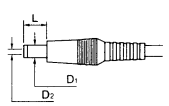


FIG. 3 MALE

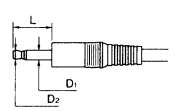
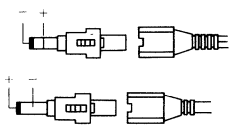


FIG. 4 UNIVERSAL/REVERSIBLE



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Rechargeable NiCds with Varta mass-plate construction
Varta VR mass-plate cell design provides far longer standby life with faster trickle charging and better overcharge protection. Most versatile configurations.

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- **Saftronic:** Special pin compatability in board mounting.
- **Flat Packs:** The thinnest packs...just one cell thick in batteries to 12V.
- **High-Temperature "T's":** For "hotter-than-normal" applications.
- **Stacks and Packs:** Standard or customized to fit virtually any application.

Cylindrical NiCd Rechargeables: For the higher-capacity applications: fast charging, capacities .1 to 7 Ah in standard N to D sizes and heavy-duty battery packs to 12 volts.

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Alkaline Primary Cells: The longer lasting alkalines with improved performance, capacity and leakage resistance.

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High-temperature Silver Oxide and New Silver Cadmium which operates up to 200°C. C-size only.

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VARTA

CHARACTERISTICS OF BATTERIES AND FUEL CELLS

System	Anode	Cathode	Theoretical battery		Practical battery		
			Voltage, V	Capacity, Ah/kg	Typical voltage, V	Capacity[a]	
						Wh/kg	Wh/dm³
Primary:							
Leclanche	Zn	MnO_2	1.6	230	1.2	65	175
Magnesium	Mg	MnO_2	2.0	270	1.5	100	195
Organic cathode	Mg	*m*-DNB	1.8	1,400	1.15	130	180
Alkaline MnO_2	Zn	MnO_2	1.5	230	1.15	65	200
Mercury	Zn	HgO	1.34	185	1.2	80	370
Mercad	Cd	HgO	0.9	165	0.85	45	175
Silver oxide	Zn	AgO	1.85	285	1.5	130	310
Zinc-air	Zn	Air (O_2)	1.6	815	1.1	200	190
Li-organic electrolyte	Li	[b]	2.1-5.4	130-660	1.8-3.2	250	400
Secondary:							
Lead-acid	Pb	PbO_2	2.1	55	2.0	37	70
Edison	Fe	Ni oxides	1.5	195	1.2	29	65
Nickel-cadmium	Cd	Ni oxides	1.35	165	1.2	33	60
Silver-zinc	Zn	AgO	1.85	285	1.5	100	170
Silver-cadmium	Cd	AgO	1.4	230	1.05	55	120
Zinc-nickel oxide	Zn	Ni oxides	1.75	185	1.6	55	110
Zinc-air[c]	Zn	Air (O_2)	1.6	815	1.1	150	155
Cadmium-air[c]	Cd	Air (O_2)	1.2	475	0.8	90	90
Zinc-O_2	Zn	O_2	1.6	610	1.1	130	120
H_2-O_2	H_2	O_2	1.23	3,000	0.8	45	65
Reserve:							
Cuprous chloride	Mg	CuCl	1.5	240	1.4	45	65[d]
Silver-chloride	Mg	AgCl	1.6	170	1.5	60	95[d]
Zinc-silver oxide	Zn	AgO	1.85	285	1.5	30	75[e]
Thermal	Ca	[b]	2.8	240	2.6	10	20[f]
Ammonia-activated	Mg	*m*-DNB	2.2	1,400	1.7	22	60[g]
High-temperature	NA	S	2.1	685	1.8	200	[h]
	Li	S	2.2	1,150	1.8	200	[i]
Solid electrolyte	Ag	Polyiodide	0.66	. . .	0.6	180	75[j]
Fuel cell:							
Hydrogen[c]	H_2	Air	1.23	26,000	0.7		[k]
Hydrazine[c]	N_2H_4	Air	1.5	2,100	0.7	800[b]	[l]
Methanol[c]	CH_2OH	Air	1.3	1,400	0.9	175[b]	185[m]

a Delivered capacity when discharged at normal temperatures (20°C) at normal discharge rates.
b Based on fuel consumption only.
c Weight of air not considered in computation of watt hours.
d Water-activated
e Automatically activated; high rate discharge; 2- to 10-min rate.
f Fused salt; heat-activated; high rate discharge; 2- to 10-min rate.
g Four-minute discharge rate.
h β-alumina electrolyte, 300°C operation.
i Fused salt; 350°C operation.
j Solid $RbAg_4I_5$ electrolyte.
k Several different cathode materials used.
l Fuel consumption is based on source of H_2.
m Based on methanol battery-fuel supply in situ.

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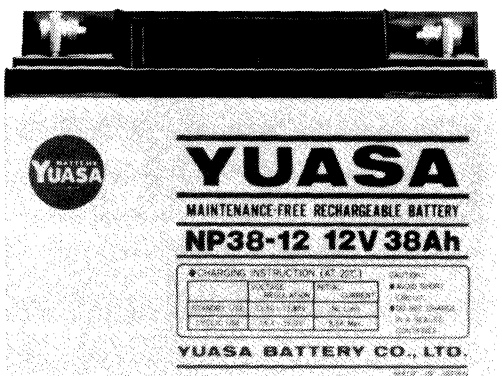

NP SERIES

Type	Nominal Capacity 20 AMP Hour Rate	Length	Width	Height (Including Terminals)
4 Volt				
NP3-4	3.0	3.56	1.33	2.51
NP4.2-4H	4.2	1.89	1.40	4.68
NP10-4	10.0	4.02	1.97	3.86
6 Volt				
NP1-6	1.0	2.00	1.67	2.15
NP1.2-6	1.2	3.82	0.98	2.15
NP2.6-6	2.6	5.27	1.33	2.52
NP3-6	3.0	5.27	1.33	2.52
NP4-6	4.0	2.76	1.85	4.15
NP4-6W	4.0	2.76	1.85	4.01
NP4.2-6	4.2	2.03	1.88	4.67
NP7-6	7.0	5.95	1.33	3.84
NP8-6	8.0	5.95	1.97	3.84
NP10-6	10.0	5.95	1.97	3.84
12 Volt				
NP0.8-12	0.8	3.78	0.98	2.42
NP1.2-12	1.2	3.82	1.89	2.15
NP1.9-12	1.9	7.01	1.33	2.52
NP2-12	2.0	5.90	7.79	3.50
NP2.6-12	2.6	5.27	2.64	2.52
NP4-12	4.0	3.54	2.75	4.17
NPG5.4-12*	5.4	3.54	2.75	4.17
NP6-12	6.0	5.95	2.56	3.84
NP7-12	7.0	5.95	2.56	3.84
NPG12-12*	12.0	5.95	3.86	3.84
NPG18-12*	18.0	7.12	2.99	6.57
NP24-12	24.0	6.54	6.89	4.92
NP24-12B	24.0	6.54	6.89	4.92
NP38-12	38.0	7.75	6.50	6.69
NP65-12	65.0	13.78	6.53	6.85

UXL SERIES

Type	Nominal Capacity 10 AMP Hour Rate	Length	Width	Height (Including Terminals)
12 Volt				
UXL33-12	30	9.25	5.04	8.54
UXL44-12	40	11.87	5.04	8.54
UXL55-12	50	14.39	5.04	8.54
6 Volt				
UXL66-6	60	8.54	5.04	8.54
UXL88-6	80	11.10	5.04	8.54
UXL110-6	100	13.60	5.04	8.54
2 Volt				
UXL220-2	200	6.69	4.17	14.35
UXL330-2	300	6.69	5.90	14.35
UXL550-2	500	9.49	6.73	14.35
UXL1100-2	1000	18.50	6.73	14.35
UXL1550-2	1500	18.70	13.36	14.35
UXL2200-2	2000	18.70	13.36	14.35
UXL3300-2	3000	27.40	13.30	14.35

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YOUR POWER SUPPLY ANSWER STARTS ON PAGE 1661

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POWER CONVERSION AMERICA

POWER SUPPLIES, DC

Manufacturer	Catalog EEM Page No.	Output: Volts (V) <28	Volts (V) 28.01-1000	Volts (V) >1000	Current (A) <1	Current (A) 1-1000	Current (A) >1000	Dual	Triple or More	Programmable	DC/DC Converter	Linear	Switching	Open Frame	Enclosed	Enclosed/Modular	Lab or System
AAK Corp.	D•1507	√	√		√	√		√	√		√	√	√	√	√	√	√
Abbott Transistor Labs	D•1523	√*	√*		√*	√*		√*	√*		√*	√*	√*		√*	√*	
ACME Electric	D•1544	√			√	√		√	√			√	√	√		√	
Acopian Corp.	D•1549	√*	√*	√	√*	√*		√*	√	√	√	√*	√		√	√*	√
Adtech Power	D•1580		√			√		√	√	√	√	√	√	√			√
Advanced Analog	D•1548	√*	√*		√*	√*					√*	√			√	√	√
Advanced High Voltage	D•1579		√	√	√					√	√				√	√	
A.L.E. Systems Inc.	D•1604		√	√	√	√							√	√			√
Apex Microtechnology	D•1598	√				√					√						
Applied Power Conversions Div.	D•1588	√*	√		√*	√*		√*	√*		√*	√*	√*	√		√*	
APX/Arstan Products Int'l Inc.	D•1594	√	√					√	√	√		√		√	√	√	√
Arnold Magnetics	D•1599	√*	√*	√*	√*	√*		√*	√*		√*	√*	√*		√*	√*	√*
Ascent Power Technology	D•1605	√*	√*	√*	√*	√*		√*	√*	√*	√*		√*	√	√*	√*	
Aslan Computer	D•1585	√				√			√				√				
Astec America	D•1606	√			√	√	√	√	√		√	√	√	√	√	√	
AT&T Microelectronics	D•1614	√	√		√	√					√						
Ault Inc.	D•1618	√	√		√	√		√	√			√	√				
Avel-Lindberg Inc.	D•1625	√	√			√					√		√		√		
Autec	D•1620	√	√		√	√		√	√			√	√	√	√	√	
B & K Precision	D•1626	√	√		√	√		√	√							√	√
Basler Electric	D•1627	√				√		√	√				√	√			
Bel Fuse Inc.	D•1629	√			√						√						
Bertan Associates Inc.	D•1631	√	√	√	√	√		√	√	√	√	√	√		√	√	√
Burr-Brown	D•1637	√				√		√	√		√						
Cableform Inc.	D•1640	√				√					√		√			√	
Calex Mfg. Co. Inc.	D•1641	√			√	√			√		√	√			√		
CCP/Technical Devices	D•1649	√			√	√						√			√		
CEC Electric Corp.	D•1650	√*	√*			√*		√*	√*		√*		√*				
Cherokee International	D•1653	√	√		√	√			√		√		√	√		√	
Chloride Electro Networks	D•1658	√*	√*	√*				√	√	√*		√*	√*	√*	√*	√*	√*
Collmer Semiconductor	D•1659			√	√			√			√		√	√	√		
Computer Products Inc.	D•1661	√	√		√	√		√	√		√		√	√	√	√	
Condor Inc.	D•1680	√	√		√			√	√			√	√	√		√	
Conversion Devices	D•1690	√				√		√	√		√				√		

POWER SUPPLIES, DC (cont'd)

Manufacturer	Starting EEM Page No.	Output						Dual	Three or More	Pro-gram-mable	DC-DC Con-verter	Linear	Switch-ing	Open Frame	Encap-sulated	En-closed/ Modular	Lab or System
		Volts (V)			Current (A)												
		<28	28.01-1000	>1000	<1	1-1000	>1000										
Converter Concepts Inc.	D•1692	√	√		√	√		√	√		√		√	√		√	
Criterion Instruments	D•1694	√	√		√	√				√		√					√
CUI/Stack, Inc.	D•1695	√															
Custom Power Systems	D•1697	√*	√*		√*	√*		√*	√*	√*	√*	√*	√*	√*	√*	√*	√*
D & B Power Inc.	D•1698	√*	√*		√*	√*		√	√			√*		√	√*	√*	
Del Electronics Corp.	D•1700		√*	√*	√*	√*		√*	√*	√*	√*		√*		√*	√*	√*
Dynage Power and Magnetics	D•1708	√*	√*	√*	√*	√*		√*	√*	√*	√*	√*	√*	√*	√*	√*	
Dynapower	D•1712	√	√			√	√	√		√		√	√	√			√
EG & G Power Sys. Inc.	D•1714	√*	√*		√*	√*		√	√		√*		√*		√*	√*	
Electromech	D•1717	√	√	√	√	√		√	√			√		√		√	
Electronic Measurements	D•1718	√	√	√	√	√	√			√	√	√	√	√	√	√	√
Elgar	D•1728			√		√				√		√				√	√
Elpac Power Systems	D•1731	√				√		√	√			√	√				
Emco High Voltage Co.	D•1732		√*	√*	√*			√*	√*	√*	√*	√*	√*		√*	√*	
Endicott Research Grp.	D•1740	√	√	√							√	√			√		
EPD Electronics	D•1742	√									√					√	
Epsco, Inc.	D•1743	√	√		√	√						√				√	√
Ericsson Comps. Inc.	D•1744	√	√		√	√		√	√		√		√	√	√	√	
Farnell Advance Power	D•1749	√	√			√			√	√	√		√	√		√	
Ferranti Venus Inc.	D•1752			√*	√*	√*		√	√	√*	√*	√*	√*		√*	√*	√*
FRIWO	D•1755	√					√	√	√			√	√			√	
Gamma High Voltage Research	D•1758		√	√	√	√	√	√		√	√	√	√		√	√	√
Glassman High Voltage Inc.	D•1762			√	√					√			√				√
Globtek Inc.	D•1775	√	√		√	√		√	√		√	√	√	√	√	√	√
Golden Pacific Electronics	D•1776	√	√		√	√		√	√			√	√	√		√	
Hauman Inc.	D•1782	√	√		√	√		√	√			√				√	√
HC Power Inc.	D•1784	√	√			√		√	√		√		√			√	
Hewlett - Packard/ New Jersey Div.	D•1786	√	√		√	√		√	√	√		√	√				√
High Voltage Technology Inc.	D•1788			√	√	√				√	√		√		√	√	√
Hipotronics Inc.	D•1792			√	√	√	√	√						√	√		√
Hitran Corp.	D•1794	√	√		√	√										√	
Interelectronics Corp.	D•1795	√*	√*	√*	√*	√*	√*		√		√*						
International Power D.C. Power Supplies	D•1796	√	√		√	√		√	√			√		√			

POWER SUPPLIES, DC (cont'd)

Manufacturer	Starting EEM Page No.	Output: Volts (V) <28	Volts (V) 28.01-1000	Volts (V) >1000	Current (A) <1	Current (A) 1-1000	Current (A) >1000	Dual	Three or More	Programmable	DC-DC Converter	Linear	Switching	Open Frame	Encapsulated	Enclosed/Modular	Lab or System
International Power Devices	D•1799	√	√		√	√		√	√		√				√	√	
International Power Sources Inc.	D•1807	√			√	√		√	√		√		√	√	√	√	
Interpoint Corp.	D•1810	√*			√*	√*		√*	√*		√*		√*		√		
Jerome Industries Corp.	D•1822	√	√		√	√		√	√		√	√	√	√		√	
Jeta Power Systems	D•1826	√	√			√	√		√				√			√	
Joule Power Inc.	D•1829	√*	√*		√*	√*		√*	√*		√*		√*	√*		√*	√*
Kaiser Systems Inc.	D•1830		√	√	√	√				√		√	√	√		√	√
Kappa Networks	D•1836										√						
Kepco Inc.	D•1837	√	√	√	√	√		√	√	√	√	√	√	√		√	√
KGS Electronics	D•1871	√				√		√	√		√*	√	√				
Kikusui International	D•1873							√	√	√	√	√	√			√	√
LH Research	D•1874	√	√			√		√	√				√	√		√	
Logitek Inc.	D•1877	√*				√*			√*		√*		√*			√*	
LZR Electronics	D•1878	√	√		√	√		√	√		√	√	√	√	√	√	
Magna-Power	D•1891	√	√						√	√		√	√			√	√
Melcher Inc.	D•1892	√*	√*		√*	√*		√*	√*		√*		√*		√*	√*	√*
Mid-Eastern Industries	D•1896	√	√	√	√	√				√		√	√			√	√
Modular Devices Inc.	D•1901	√*	√*	√*	√*	√*		√*	√*	√*	√*	√*	√*		√*		
Modupower	D•1908	√			√	√					√		√		√	√	
MPC Systems	D•1911	√			√	√		√			√	√			√	√	
Multipower Inc.	D•1912	√	√	√	√	√			√		√	√	√	√			
Multi Products Intl. Inc.	D•1913	√	√		√	√				√	√	√	√			√	
Northern Ampower Corp.	D•1914	√	√			√	√			√		√					√
NWL Transformers	D•1915		√	√		√	√			√		√	√	√		√	√
Oram High Voltage Systems	D•1916	√	√	√	√	√	√			√		√	√	√	√	√	√
Penn-Tran Corp.	D•1918			√*	√*			√*	√*		√*						
Pico Electronic	D•1919	√	√		√	√		√			√						
Pillar Industries	D•1960	√			√			√								√	
Pioneer Magnetics Inc.	D•1963	√	√		√	√		√	√		√		√			√	
Polytron Devices Inc.	D•1966	√	√		√	√		√	√	√	√	√	√	√	√	√	√
Potrans	D•1974	√	√		√	√		√	√			√	√	√	√		
Power Designs Inc.	D•1978	√	√	√	√	√		√	√	√	√	√	√			√	√
Power General	D•1987	√			√	√		√	√		√		√		√		
Power-One Inc.	D•1988	√	√	√	√	√		√	√			√	√	√			

POWER SUPPLIES, DC (cont'd)

Manufacturer	Starting EEM Page No.	Output						Dual	Three or More	Programmable	DC-DC Converter	Linear	Switching	Open Frame	Encapsulated	Enclosed/ Modular	Lab or System
		Volts (V)			Current (A)												
		<28	28.01-1000	>1000	<1	1-1000	>1000										
Power Supply Concepts	D•2004	√*	√*	√*	√*	√*		√*	√*	√*	√*	√*	√*	√*	√*	√*	√*
Power Switch Corp.	D•2007	√			√	√		√	√			√		√			
Power Systems Inc.	D•2012	√	√	√	√	√		√	√		√		√	√		√	
Power Ten Inc.	D•2013	√*	√*			√*		√*		√*			√*			√*	√*
Qualidyne Systems Inc.	D•2014	√	√			√	√	√	√		√		√	√		√	√
Rantec	D•2020			√*	√*			√*	√*		√*			√*	√*		
Resonant Power Tech.	D•2024	√	√		√	√		√	√	√			√	√		√	
Ritz/Relco	D•2027	√*	√*	√	√	√*	√	√	√	√	√	√*	√	√*	√	√*	√*
Ro Associates Inc.	D•2028	√*				√*		√*	√*		√*	√	√*		√*	√*	
Shindengen America	D•2034	√	√			√		√	√				√	√		√	
Shogyo Int'l Corp.	D•2037	√	√		√	√	√	√	√		√	√	√	√	√		
Sorensen	D•2038	√	√		√	√		√	√	√	√	√	√	√	√	√	√
Spellman High Voltage	D•2047			√	√	√		√	√	√	√		√		√	√	√
Switching Systems Int'l	D•2056	√	√			√		√	√		√		√	√		√	
Tamura Corp. of America	D•2058	√				√			√				√			√	
TDK Corp.	D•2069										√						
Tectrol Inc.	D•2071		√		√	√		√	√		√		√	√		√	
Texmate	D•2075	√	√	√	√	√		√	√	√		√				√	√
Todd Products Corp.	D•2077	√	√		√			√		√			√	√			
Total Power Inc.	D•2107	√	√		√	√		√	√		√	√	√	√	√	√	
Transistor Devices	D•2108								√	√	√	√	√	√	√	√	√
Tri-Mag Inc.	D•2110	√*	√*	√	√*	√*		√	√		√*		√*	√*	√*	√*	√*
Unipower Corp.	D•2116	√	√			√		√	√		√		√			√	√
Universal Voltronics	D•2131		√	√		√	√			√	√	√	√	√	√	√	√
Valor Electronics	D•2134										√						
Voltex Co. Inc.	D•2135	√	√		√	√		√	√		√		√	√	√	√	
Wilmore Electronics Co.	D•2136	√	√	√	√	√		√	√		√	√	√	√	√	√	√
Xentek	D•2140	√			√	√			√		√	√	√	√		√	√
Zenith Magnetics	D•2145	√				√			√				√	√			

* Mil. Spec.

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EEM MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

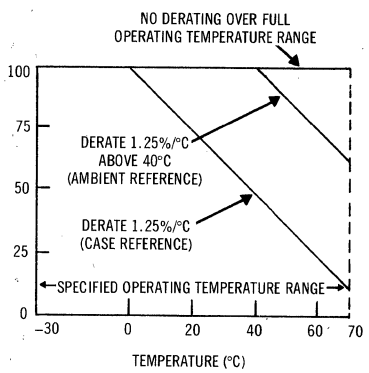

Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

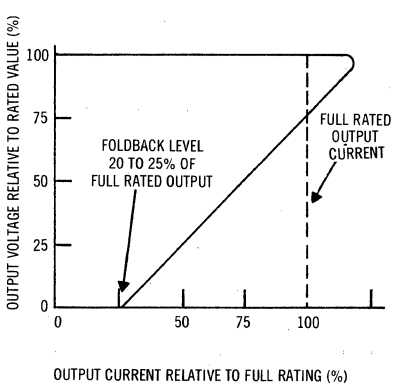

Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

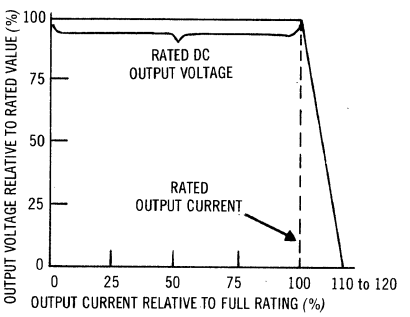

Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

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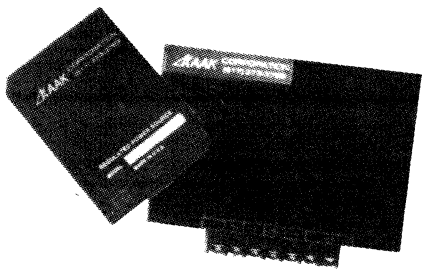
uP MULTI-OUTPUT POWER SUPPLIES

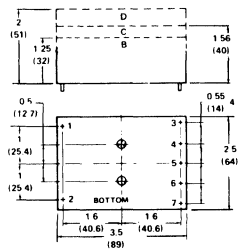
New higher power triple MT series and T series are perfect for uP's process controllers, shift registers, RAM and ROM arrays. The common outputs are floating when complete isolation is required. Both plug-in for PC Board applications and chassis mounts on 7 terminal pin modules are available.

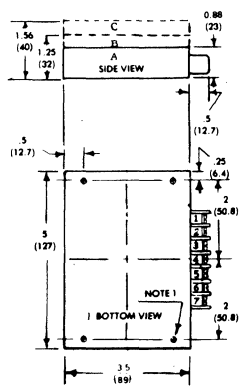


OUTPUT VOLT/CURR (Vdc) (mA) Single	OUTPUT VOLT/CURR (Vdc) (mA) Dual	REGULATION Line/Load % Single	REGULATION Line/Load % Dual	PARD mV rms	CASE	MODEL SERIES	PRICING 1-9	PRICING 10-Up
TRIPLE OUTPUT (T) SERIES								
5/500	±12/100	0.1/0.1	.05/.05	1	1B	T12.1-.5	$107.00	$ 96.00
5/1000	±12/250	0.1/0.1	.05/.05	1	1C	T12.25-1	117.00	105.00
5/1500	±12/350	0.1/0.1	.05/.05	1	1D	T12.35-1.5	127.00	114.00
5/2000	±12/450	0.1/0.2	.05/.1	1.5	1D	T12.45-2	137.00	123.00
5/500	±15/100	0.1/0.1	.05/.05	1	1B	T15.1-.5	107.00	96.00
5/1000	±15/200	0.1/0.1	.05/.05	1	1C	T15.2-1	117.00	105.00
5/1500	±15/300	0.1/0.1	.05/.05	1	1D	T15.3-1.5	127.00	114.00
5/2000	±15/400	0.1/0.2	.05/.1	1.5	1D	T15.4-2	137.00	123.00
TRIPLE OUTPUT (MT) SERIES								
5/500	±12/100	0.1/0.1	0.5/0.5	1	2A	MT12.1-5	99.00	89.00
5/1000	±12/250	0.1/0.1	.05/.05	1	2B	MT12.25-1	109.00	98.00
5/1500	±12/350	0.1/0.1	.05/.05	1	2C	MT12.35-1.5	119.00	107.00
5/2000	±12/450	0.1/0.2	.05/.1	1.5	2C	MT12.45-2	129.00	116.00
5/2500	±12/500	0.1/0.2	.05/.1	1.5	2D	MT12.5-2.5	139.00	125.00
5/3000	±12/550	0.1/0.2	.05/.15	1.5	2D	MT12.55-3	149.00	134.00
5/3500	±12/600	0.1/0.2	.05/.2	1.5	2D	MT12.6-3.5	159.00	143.00
5/4000	±12/650	0.1/0.25	.05/.25	1.5	2D	MT12.65-4	169.00	152.00
5/500	±15/100	0.1/0.1	.05/.05	1	2A	MT15.1-.5	99.00	89.00
5/1000	±15/200	0.1/0.1	.05/.05	1	2B	MT15.2-1	109.00	98.00
5/1500	±15/300	0.1/0.1	.05/.05	1	2C	MT15.3-1.5	119.00	107.00
5/2000	±15/400	0.1/0.2	.05/.1	1.5	2C	MT15.4-2	129.00	116.00
5/2500	±15/450	0.1/0.2	.05/.1	1.5	2D	MT15.45-2.5	139.00	125.00
5/3000	±15/500	0.1/0.2	.05/.15	1.5	2D	MT15.5-3	149.00	134.00
5/3500	±15/550	0.1/0.2	.05/.2	1.5	2D	MT15.55-3.5	159.00	143.00
5/4000	±15/600	0.1/0.25	.05/.25	1.5	2D	MT15.6-4	169.00	152.00

Four mount inserts 4.40×0.1 (2.5) dp. min. Seven pins, 0.040 (1.0) dia.×0.2 (5.1) lg. min. 5V Common A isolated from ±V Common B.

All Dimensions are in inches and (mm).





GENERAL SPECIFICATIONS	
Input Voltage	105 to 125 VAC @ 50-400HZ
Output Voltage Accuracy	1% Fixed
Operating Temp.	−25°C to 71°C
Temp. Coefficient	0.015% per °C
Storage Temp.	−25°C to 85°C
Input Isolation	50 Megohms

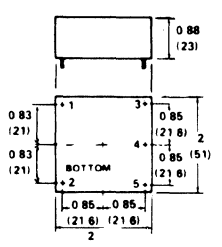
MINIATURIZED PC MOUNT POWER SUPPLIES

The mini-sized modules conserve PC board space with a small 2"×2" area. Pins may be inserted from the side to obtain a smaller 2"×.88" PC board area at no extra charge. M series are priced below all competitors with equivalent specifications.'

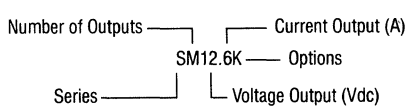
OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	REGULATION LINE %	REGULATION LOAD %	PARD mV rms	CASE	MODEL SERIES	PRICING 1-9	PRICING 10-Up
MICRO (M) SERIES Single Output								
5	200	0.2	0.3	2	7	MM5.2	$35.00	$32.00
6	150	0.2	0.3	2	7	MM6.15	38.00	34.00
12	120	0.2	0.3	2	7	MM12.12	38.00	34.00
15	100	0.15	0.2	2	7	MM15.1	38.00	34.00
24	30	0.1	0.15	2	7	MM24.03	38.00	34.00
30	30	0.1	0.15	2	7	MM30.03	38.00	34.00
Dual Output								
±5	50	0.2	.25	2	7	MD5.05	39.00	35.00
±6	50	0.2	.25	2	7	MD6.05	39.00	35.00
±12	30	0.1	.15	2	7	MD12.03	37.00	33.00
±12	50	0.1	.20	2	7	MD12.05	39.00	35.00
±15	30	0.1	.15	2	7	MD15.03	37.00	33.00
±15	50	0.1	.20	2	7	MD15.05	39.00	35.00

For Chassis Mount version of M Series add C before M and add $3.50 to unit price.

100% current fold-back on all 1 amp or greater single output models current limiting on all dual output models from ±V to common.



SAMPLE MODEL NO.



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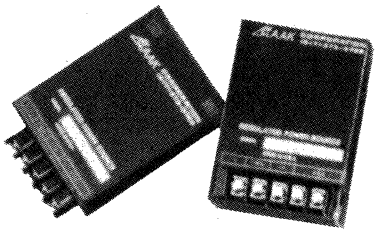
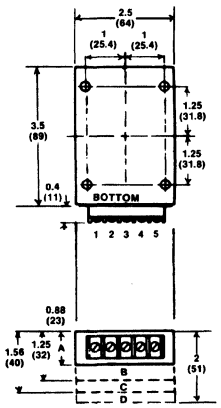
CHASSIS MOUNT POWER SUPPLIES

OUTPUT VOLTAGE Vdc	OUTPUT CURRENT (mA)	REGULATION LINE %	REGULATION LOAD %	PARD mV rms	CASE	MODEL SERIES	PRICING 1-9	PRICING 10-Up
CHASSIS MOUNTING BUDGET-PRICED (B) SERIES								
Single Output								
5 to 6	500	.1	.2	2	4A	CBM(5 to 6).5	$ 45.70	$ 39.40
	1000	.1	.2	2	4B	CBM(5 to 6)1	55.60	49.30
Dual Output								
±12 to ±15	±100	.1	.1	1	4A	CBD(12 to 15).1	49.10	45.70
	±200	.1	.1	1	4B	CBD(12 to 15).2	59.00	54.50
CHASSIS MOUNTING STANDARD (C) SERIES								
Single Output								
2 to 4	500	.05	.05	1	4A	CM(2 to 4).5	52.00	47.00
	1000	.05	.1	1	4B	CM(2 to 4)1	66.00	59.00
	2000	.1	.2	1.5	4C	CM(2 to 4)2	92.00	83.00
5 to 6	300	.05	.05	1	4A	CM(5 to 6).3	42.00	38.00
	500	.05	.1	1	4A	CM(5 to 6).5	52.00	47.00
	1000	.05	.1	1	4B	CM(5 to 6)1	66.00	59.00
	2000	.08	.15	2	4C	CM(5 to 6)2	92.00	83.00
	3000	.1	.2	2.5	4D	CM(5 to 6)3	116.00	104.00
	4000	.15	.25	2.5	4E	CM(5 to 6)4	138.00	124.00
7 to 11	200	.05	.05	1	4A	CM(7 to 11).2	53.00	48.00
	400	.05	.05	1	4A	CM(7 to 11).4	66.00	59.00
	800	.05	.1	1	4B	CM(7 to 11).8	78.00	70.00
	1500	.05	.15	1.5	4C	CM(7 to 11)1.5	88.00	79.00
	2500	.1	.2	2	4D	CM(7 to 11)2.5	106.00	95.00
12 to 14	200	.05	.05	1	4A	CM(12 to 14).2	54.00	49.00
	600	.05	.1	1	4B	CM(12 to 14).6	73.00	66.00
	1000	.05	.1	1	4C	CM(12 to14)1	85.00	77.00
	2000	.08	.15	2	4D	CM(12 to 14)2	95.00	86.00
15 to 17	200	.05	.05	1	4A	CM(15 to 17).2	68.00	61.00
	600	.05	.05	1	4C	CM(15 to 17).6	80.00	72.00
	1000	.05	.1	1	4D	CM(15 to 17)1	90.00	81.00
	2000	.08	.15	2	4D	CM(15 to 17)2	105.00	95.00
18 to 23	200	.05	.08	1	4A	CM(18 to 32).2	69.00	62.00
	600	.05	.08	1	4C	CM(18 to 23).6	81.00	73.00
	1000	.05	.1	1	4D	CM(18 to 23)1	91.00	82.00
24 to 29	100	.05	.08	1	4A	CM(24 to 29).1	52.00	47.00
	200	.05	.08	1	4C	CM(24 to 29).2	70.00	63.00
	800	.05	.08	1	4D	CM(24 to 29).8	82.00	74.00
30 to 35	100	.05	.08	1	4A	CM(30 to 35).1	53.00	48.00
	400	.05	.08	1	4C	CM(30 to 35).4	71.00	64.00
	800	.05	.08	1	4D	CM(30 to 35).8	83.00	75.00
36 to 41	100	.05	.08	1	4A	CM(36 to 41).1	54.00	49.00
	400	.05	.08	1	4C	CM(36 to 41).4	72.00	65.00
	800	.05	.08	1	4D	CM(36 to 41).8	84.00	76.00
42 to 48	100	.05	.08	1	4A	CM(42 to 48).1	55.00	50.00
	200	.05	.08	1	4B	CM(42 to 48).2	60.00	54.00
	600	.05	.08	1	4D	CM(42 to 48).6	79.00	71.00
Dual Output								
±5 to ±10	60	.02	.02	1	4A	CD(5 to 10).06	51.00	46.00
	200	.02	.02	1	4B	CD(5 to 10).2	71.00	64.00
	600	.05	.05	1	4C	CD(5 to 10).6	108.00	97.00
	1000	.05	.1	1	4D	CD(5 to 10)1	131.00	118.00
±11 to ±18	60	.02	.02	1	4A	CD(11 to 18).06	62.00	56.00
	200	.05	.05	1	4B	CD(11 to 18).2	80.00	72.00
	500	.05	.1	1	4D	CD(11 to 18).5	109.00	98.00
	800	.05	.15	1.5	4D	CD(11 to 18).8	124.00	112.00
±19 to±24	60	.02	.02	1	4A	CD(10 to 24).06	62.00	56.00
	200	.05	.05	1	4B	CD(19 to 24).2	81.00	73.00
	400	.05	.05	1	4D	CD(19 to 24).4	102.00	92.00
	600	.05	.1	1.5	4D	CD(19 to 24).6	116.00	104.00

NOTE: Insert the exact voltage required in place of the bracketed voltage ranges in MODEL SERIES column.
For top mounted barrier strip, add suffix—T.
For ±1 Volt Variable, add suffix—V.

The Chassis (C) series uses a low profile front mounted or Top (T suffix) mounted, 5-terminal barrier strip.

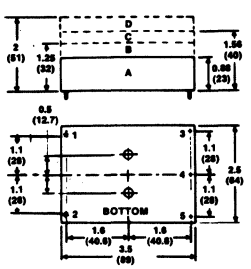




PC BOARD MOUNT POWER SUPPLIES

NOTE: PC Board Mount (S) series identical to Chassis Mount (C) series. To order replace C with S and subtract with $2.00 from C series pricing.

ACOPIAN, COMPUTER PRODUCTS, DATEL, MIL, LAMBDA, WALL, etc. configurations and mounting available at lower pricing.



GENERAL SPECIFICATIONS	
Input Voltage	105 to 132 VAC @ 47-420Hz
Output Voltage Accuracy	1% Fixed
Operating Temp.	−25°C to 71°C
Temp. Coefficient	0.015% per °C
Storage Temp.	−55°C to 85°C
Input Isolation	50 Megohms

100% current fold-back on all 1 amp or greater single output models current limiting on all dual output models from ±V to common.

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The L-Line of field proven rugged encapsulated Lab units still remain the lowest priced of any competitive line.

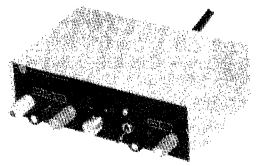
LABORATORY POWER SUPPLIES

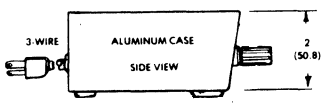
OUTPUT VOLT/CURR (Vdc) (mA) Single	OUTPUT VOLT/CURR (Vdc) (mA) Dual	REGULATION Line/Load % Single	REGULATION Line/Load % Dual	PARD mV rms	CASE TYPE	MODEL SERIES NO.	PRICING 1-9
TRIPLE OUTPUT (ALT) SERIES							
5/2000	±12/450	0.1/0.2	.05/0.1	1	AL	ALT12.45-2	$139.00
5/2500	±12/500	0.1/0.2	.05/0.1	1.5	AL	ALT12.5-2.5	149.00
5/3000	±12/550	0.1/0.2	.05/.15	1.5	AL	ALT12.55-3	155.00
5/3500	±12/600	0.1/0.2	.05/0.2	1.5	AL	ALT12.6-3.5	161.00
5/4000	±12/650	0.1/.25	.05/.25	1.5	AL	ALT12.65-4	166.00
5/4500	±12/700	0.1/.25	.05/.25	1.5	AL	ALT12.7-4.5	171.00
5/5000	±12/750	0.1/.25	.05/.25	1.5	AL	ALT12.75-5	176.00
5/2000	±15/400	0.1/0.2	.05/0.1	1.5	AL	ALT15.4-2	139.00
5/2500	±15/450	0.1/0.2	.05/0.1	1.5	AL	ALT15.45-2.5	149.00
5/3000	±15/500	0.1/0.2	.05/.15	1.5	AL	ALT15.5-3	156.00
5/3500	±15/550	0.1/0.2	.05/0.2	1.5	AL	ALT15.55-3.5	161.00
5/4000	±15/600	0.1/.25	.05/.25	1.5	AL	ALT15.6-4	166.00
2-WAY DUAL							
5 ±12/15	1000 ±200	0.01	0.05	1	AL	ALT12/15-1	129.00
5 ±12/15	2000 ±360	0.01	0.05	1	AL	ALT12/15-2	135.00
New ±12/15 volt models include Toggle Control ±12V to ±15V, 1% fixed.							
TRIPLE OUTPUT (LT) SERIES FIXED 1%							
5/1000	±12/250	0.5/0.1	.05/0.1	1	5B	LT12.25-1	109.00
5/1500	±12/300	.05/.15	.05/0.1	1	5C	LT12.3-1.5	119.00
5/2000	±12/350	0.1/0.2	.05/0.1	1	5C	LT12.35-2	129.00
5/2500	±12/400	0.1/0.2	.05/0.1	1.5	5D	LT12.4-2.5	139.00
5/3000	±12/450	0.1/0.2	.05/.15	1.5	5D	LT12.45-3	149.00
5/3500	±12/500	0.1/0.2	.05/0.2	1.5	5D	LT12.5-3.5	159.00
5/1000	±15/200	.05/0.1	.05/0.1	1	5B	LT15.2-1	109.00
5/1500	±15/250	.05/0.1	.05/0.1	1	5C	LT15.25-1.5	119.00
5/2000	±15/300	0.1/.15	.05/0.1	1	5C	LT15.3-2	129.00
5/2500	±15/350	0.1/0.2	.05/0.1	1.5	5D	LT15.35-2.5	139.00
5/3000	±15/400	0.1/0.2	.05/.15	1.5	5D	LT15.4-3	149.00
5/3500	±15/450	0.1/0.2	.05/0.2	1.5	5D	LT15.45-3.5	159.00

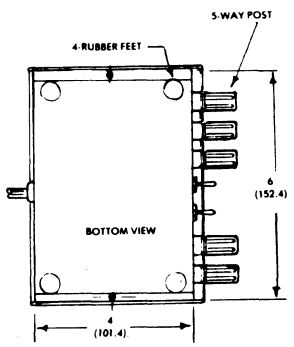
All LT MODELS include: 3 wire 6 ft. AC lind cord, LED indicator lamp

OUTPUT VOLTAGE (Vdc)	OUTPUT CURRENT (mA)	REGULATION LINE %	REGULATION LOAD %	PARD mV rms	CASE	MODEL SERIES	PRICING 1-9	PRICING 10-Up
SINGLE OUTPUT (LM) SERIES FIXED 1%								
2 to 4	500	.05	.05	1	6B	LM(2 to 4).5	$ 69.00	$ 62.00
	1000	.05	.1	1	6B	LM(2 to 4)1	79.00	71.00
	2000	.1	.2	2	6C	LM(2 to 4)2	89.00	80.00
5 to 16	1000	.05	.1	1	6B	LM(5 to 16)1	85.00	77.00
	1500	.05	.1	1	6B	LM(5 to 16)1.5	89.00	80.00
	2000	.08	.15	2	6C	LM(5 to 16)2	96.00	86.00
	2500	.1	.2	2	6D	LM(5 to 16)2.5	102.00	92.00
	3000	.1	.2	2.5	6D	LM(5 to 16)3	115.00	104.00
17 to 28	600	.05	.1	1	6B	LM(17 to 28).6	79.00	71.00
	800	.05	.1	1	6C	LM(17 to 28).8	89.00	80.00
	1000	.05	.1	1	6C	LM(17 to 28)1	96.00	86.00
	1500	.05	.1	1.5	6D	LM(17 to 28)1.5	102.00	92.00
	2000	.08	.15	2	6D	LM(17 to 28)2	115.00	109.00
Dual Output (LD) Series								
±5 to ±11	400	.05	.05	1	6C	LD(5 to11).4	79.00	71.00
	600	.05	.05	1	6C	LD(5 to 11).6	89.00	80.00
	800	.05	.05	1.5	6D	LD(5 to 11).8	96.00	86.00
	1000	.05	.1	2	6D	LD(5 to 11)1	102.00	92.00
±12 to ±18	100	.02	.02	1	6B	LD(12 to 18).1	79.00	71.00
	200	.05	.05	1	6B	LD(12 to 18).2	89.00	80.00
	300	.05	.05	1	6C	LD(12 to 18).3	99.00	89.00
	400	.05	.05	1	6C	LD(12 to 18).4	105.00	95.00
	600	.05	.1	1	6D	LD(12 to 18).6	112.00	101.00
	800	.05	.15	1.5	6D	LD(12 to 18).8	120.00	108.00
	1000	.05	.2	2	6D	LD(12 to 18)1	129.00	116.00
±19 to ±30	100	.0	.02	1	6C	LD(19 to 30).1	79.00	71.00
	200	.05	.05	1	6C	LD(19 to 30).2	89.00	80.00
	400	.05	.05	1	6D	LD(19 to 30).4	99.00	89.00
	500	.05	.05	1	6D	LD(19 to 30).5	109.00	98.00

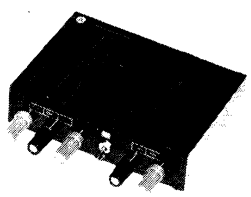
Case 5 Height in inches: B = 1.25, C = 1.50, D = 2.00

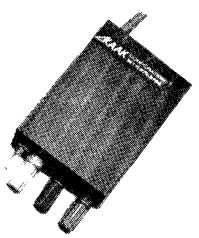


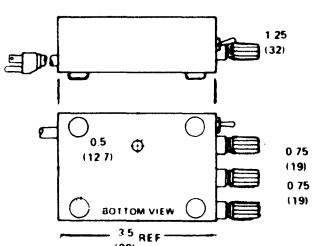




CASE AL







CASE 6
L Series

CONNECTING INSTRUCTIONS		
TERMINALS	SINGLE OUTPUTS	DUAL OUTPUTS
Red Term.	+5Vdc out	+Vdc out
Black Term.	Common Out	Common Out
Purple Term.	Not included	−Vdc Out

Earth Ground Connected to Threaded Insert on L Series.

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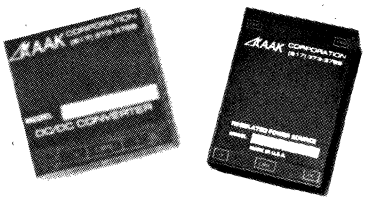
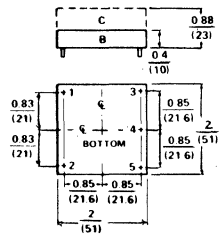
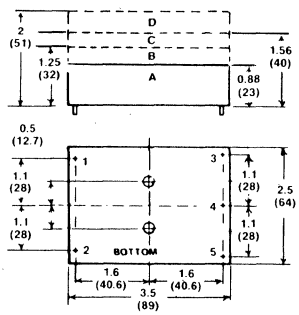
DC/DC CONVERTERS U SERIES, UNREGULATED

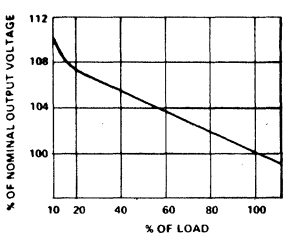


The U Series mini-high powered single and dual output DC/DC converters deliver unregulated outputs. Efficiency up to 85% is achieved and all outputs are short circuit protected.

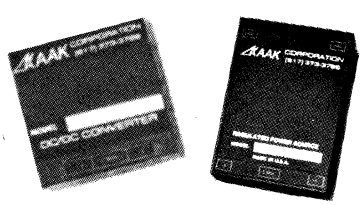
INPUT VOLT 10%	OUTPUT VOLT (Vdc)	OUTPUT CURR. (mA)	CASE	MODEL	PRICING 1-9	PRICING 10-Up
SINGLE OUTPUT (U) UNREGULATED 5Vdc input reduce all output currents by 20%						
5 to 28	5	500	8C	U*S5.5	$ 69.00	$ 62.00
		1000	9A	U*S51	84.00	76.00
		1500	9A	U*S51.5	98.00	88.00
	12	300	8B	U*S12.3	69.00	62.00
		800	8C	U*S12.8	99.00	89.00
	15	250	8B	U*S15.25	69.00	62.00
		750	8C	U*S15.75	100.00	90.00
	24	200	8B	U*S24.2	69.00	62.00
		600	8C	U*S24.6	101.00	91.00
	28	100	8B	U*S48.1	69.00	62.00
		400	9A	U*S48.4	102.00	92.00
DUAL OUTPUT						
6 to 28	±5	450	8C	U*D5.45	79.00	71.00
		1000	9B	U*D51	119.00	107.00
	±12	350	8C	U*D12.35	79.00	71.00
		900	9B	U*D12.9	119.00	107.00
	±15	300	8C	U*D15.3	79.00	71.00
		800	9B	U*D15.8	119.00	107.00
TRIPLE OUTPUT						
	VOLT/CURR	**VOLT/CURR**				
6 to 28	5/500	±12/125	9C	U*T12.12-1	125.00	113.00
	5/1000	±12/250	9D	U*T12.25-1	125.00	139.00







R, SERIES, REGULATED



The R Series high regulation, low noise DC/DC converters feature 65-75% efficiency, Pi-input filter to reduce input reflected ripple.

SINGLE OUTPUT (R) REGULATED
5Vdc input reduce all output currents by 20%

5V to 28	5	250	8B	R*S5.25	$ 79.00	$ 71.00
		500	8C	R*S5.5	89.00	80.00
		1000	9A	R*S51	109.00	98.00
	12	300	8B	R*S12.3	79.00	71.00
		800	9A	R*S12.8	109.00	98.00
	15	250	8B	R*S15.25	79.00	71.00
		750	9A	R*S15.75	109.00	98.00
	24	200	8B	R*S24.2	79.00	71.00
		600	9A	R*S24.6	109.00	98.00
	28	100	8B	R*S48.1	79.00	71.00
		400	9A	R*S48.4	109.00	101.00
DUAL OUTPUT						
6 to 28	±5	250	8C	R*D5.25	79.00	71.00
		750	9A	R*D5.75	99.00	89.00
	±12	150	8B	R*D12.15	89.00	80.00
		500	9A	R*D12.5	125.00	113.00
	±15	125	8B	R*D15.12	89.00	80.00
		450	9A	R*D15.45	125.00	113.00
TRIPLE OUTPUT						
	VOLT/CURR	**VOLT/CURR**				
6 to 28	5/300	±12/100	9B	R*T12.13	139.00	125.00
	5/500	±12/200	9C	R*T12.2-5	149.00	125.00

*Insert Input Voltage from 5 Vdc to 28 Vdc
For Chassis Mount version of R Series add C before R and add $3.50 to unit price.

U SERIES SPECIFICATIONS

PARAMETERS	LIMIT
Input Voltage Tolerance	±10%
Output Ripple and Noise (PARD)	28mV rms
Line Regulation	1% Vin
Load Regualtion	See Load Curve
Input Reflected Ripple	1% Ein (max)
Output Voltage Tolerance	±4%
In/Output Isolation	10 meg Ω
Temp. Coefficient	0.5%/°C
Short Circuit Prot.	Curr. Limit
Input Operating Voltage Range	4.75-5.25V 10.8-13.2V
Operating Temp. Range	−25°C - +71°C
Storage Temp. Range	−55°C - +85°C
Efficiency	80-85%

R SERIES SPECIFICATIONS

PARAMETERS	LIMIT
Input Voltage Tolerance	±10%
Output Ripple and Noise (PARD)	1mV rms
Line Regulation	.05% Vin
Load Regualtion	.1%
Input Reflected Ripple	1% Ein (max)
Output Voltage Tolerance	±1% (fixed)
In/Output Isolation	400 VDC
Temp. Coefficient	0.02%/°C
Short Circuit Prot.	All Units
Input Operating Voltage Range	4.5-5.5 10.8-13.2
Operating Temp. Range	−25°C - +71°C
Storage Temp. Range	−55°C - +85°C
Efficiency	65-75%

Abbott TECHNOLOGIES, INC

Power Supplies

Abbott TECHNOLOGIES, INC.

THE POWERHOUSE OF QUALITY.

Abbott Technologies specializes in providing exceptionally high quality electronic power conversion products. Our power supply designs normally are based on an "industry-standard" form factor, and we make every effort to provide our customers with standard and modified-standard units which provide just the right fit for their application. We can modify our units to provide features and capabilities normally available only on custom power supplies, usually at a fraction of the engineering cost that a "custom" vendor would charge. This allows us to offer very competitive pricing even in small quantity orders of our modified as well as our standard units.

Our design philosophy is based on three fundamental principles:

1. Our standard products are designed in advance and offered for sale after they have proven their reliability.
2. Conservative design margins are used to provide added reliability to our products.
3. Published specifications are always more conservative than actual values.

Our quality system is in accordance with Mil-I-45208. Our normal warranty on all products is two years; a five year warranty is also available.

We believe Abbott can provide you with real value and service at a reasonable price.

INPUT	DESCRIPTION	MODEL	PAGE
	AC-DC SWITCHERS		
115/220 Vac 47-400 Hz	Industry Standard 150-watt Multiple Switcher	Model ESA	D•1512 D•1513
115/220 Vac	Industry Standard 250-watt Multiple Switcher;	Model CF	D•1514 D•1515
115/220 Vac 47-400 Hz	Industry Standard 180-watt Single Output Switcher	Model ND	D•1516 D•1517
115/220 Vac 50-60 Hz	Industry Standard 750-1000-watt Single Output Switcher	Model LG	D•1518 D•1519
115/220 Vac 47-400 HZ	Compact 100-watt, Single Output Compact 95-watt, Triple Output Compact 100-watt, Quad Output	Model ZB Model ZBT Model ZBQ	D•1520
	AC-DC LINEARS		
115 or 220 Vac 47-400 Hz	Open Frame Single, Multiple Outputs Enclosed High Temperature, Single and Dual Outputs	Model NL Model RN	D•1521
	DC-AC SINEWAVE INVERTERS		D•2152
14-48 Vdc (30-320 VA)	11 to 15 Vdc Input 22 to 30 Vdc Input 29 to 38 Vdc Input 42 to 54 Vdc Input	Model KN Model PN Model LN Model TN	D•2153 In AC Power Supply Section

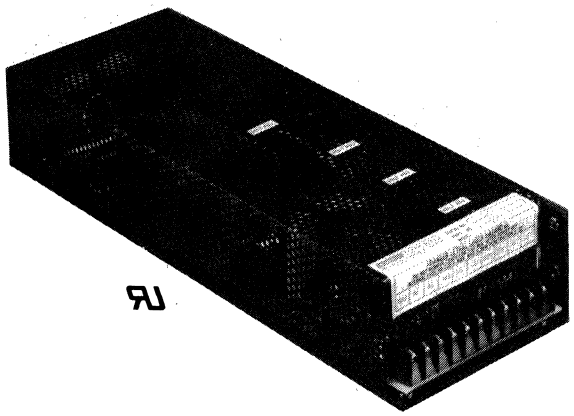
ABBOTT TECHNOLOGIES, INC.
Head Office: 8203 Vineland Avenue, Sun Valley, CA 91352, (818) 504-0644, FAX (818) 768-0395
Eastern Sales Office: 321 Commercial Avenue, Suite 304, Palisades Park, NJ 07650, (201) 461-4005, FAX (201) 461-6323

Abbott TECHNOLOGIES, INC

AC-DC Switchers

MODEL ESA

150-WATT MULTIPLE OUTPUT AC-DC POWER SUPPLY



Abbott's "ESA" model line of triple and quadruple output power supplies provides 150 watts of power with a tightly regulated 5VDC main output and fully regulated auxiliary outputs. The "ESA" model offers the OEM system designer many standard features which are usually only available as costly options. These features include overvoltage protection and foldback overcurrent protection on all outputs, input undervoltage protection, remote sense, remote inhibit, soft start circuitry, EMI filter, steel cover, and Abbott reliability. These convection cooled units have efficiencies typically greater than 75% and are situated in the popular industry standard form factor of 2.5″×4.8″×13.5″. All "ESA" models comply with the radiated and conducted portions of FCC 20780, level B, and VDE 0871, level A. The standard units are designed to UL 478, and CSA 22.2 safety standards. Standard mounting holes are present to allow for easy replacement of existing models from Kepco, Deltron, Powertec, and Boschert.

- **TIGHTER REGULATION**—0.2% on all outputs
- **EFFICIENCY**—typically 75% or greater
- **COMPETITIVELY PRICED**
- **LOW EMI**—meets FCC 20780 Class B, VDE 0871 Class A
- **UL 478 and UL 1012** recognized
- **CSA 22.2, VDE 0806, IEC Safety**
- **CONVECTION COOLING**
- **STANDARD FEATURES** include:
  - — input undervoltage protection
  - — overvoltage protection on all outputs
  - — foldback overcurrent protection
  - — remote sense
  - — remote inhibit
  - — 115/230 VAC, 50/60 Hz operation (user selectable)
  - soft start
  - cover
- **OPTIONAL** power fail warning
- **SIXTEEN HOUR** burn-in
- **TWO-YEAR WARRANTY**

STANDARD "ESA" MODELS*

Output No. 1		Output No. 2		Output No. 3		Output No. 4		Recognized by Underwriters Laboratories, Inc. Model Number	Max. Cont. Power All Outputs
Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current		
5	25A	+12	4A	−12	4A	—	—	ESA150T5/12	150W
5	25A	+15	4A	−15	4A	—	—	ESA150T5/15	150W
5	25A	+12	4A	−12	4A	−5	4A	ESA150Q5/12/5	150W
5	25A	+15	4A	−15	4A	−5	4A	ESA150Q5/15/5	150W
5	25A	+12	4A	−12	4A	+24	2A	ESA150Q5/12/24	150W
5	25A	+15	4A	−15	4A	+24	2A	ESA150Q5/15/24	150W

*Other voltage and current combinations are available. Please consult your nearest sales office. All outputs are continuously adjustable ±5%.

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Abbott TECHNOLOGIES, INC.

AC-DC Switchers

MODEL ESA

SPECIFICATIONS

AC INPUT: 90-132/180-264 VAC, 47 to 400 Hz, user selectable.

EFFICIENCY: Typically 75% or greater.

LINE REGULATION: All outputs within 0.2% over full input range.

LOAD REGULATION: All outputs within 0.2%, from 20% to 100% rated load. For proper operation of auxiliary outputs, main output must be loaded a minimum of 10% of rated load.

CROSS REGULATION: 0.1% on all outputs. Cross regulation is measured with 50% on output under test, and any other output varied 50% to 100% of rated load.

RIPPLE: Main: 25 mV peak to peak typical using a 25 MHz bandwidth, 50 mV peak to peak maximum. Auxiliary: 1% peak to peak maximum using a 25 MHz bandwidth.

STABILITY: Output voltages change less than ±0.05% for 24 hours following initial warm-up period.

LOAD TRANSIENT RESPONSE: Recovery to within 0.5% of nominal voltage set-point within 0.5 msec after 50% load change.

HOLD-UP TIME: 20 msec minimum after nominal input voltage is lost at full load.

TEMPERATURE RANGE: Operating: −0°C to70°C (Full power up to 50°, derate linearly to 50% power at 70°C) Storage −20°C to 85°C.

TEMPERATURE COEFFICIENT: 0.2%/degree centigrade for fully regulated outputs, 0.05%/degree centigrade for semi-regulated outputs.

ISOLATION VOLTAGE (STANDARD): 1500 VDC input to case, input to output, 500 VDC output to case.

ISOLATION VOLTAGE (OPTIONAL): 3500 VDC input to case, 2100 input to output, 750 output to case. (To specify this feature please place a "-1" after model number.)

SHORT CIRCUIT PROTECTION: Foldback overcurrent protection is standard on all outputs. All outputs automatically reset after short circuit is removed. Foldback will also occur when total power of unit exceeds 110% of rated power.

OVERVOLTAGE PROTECTION: Crowbar and non-crowbar overvoltage protection are standard on all outputs.

REMOTE ERROR SENSING: Standard on main output.

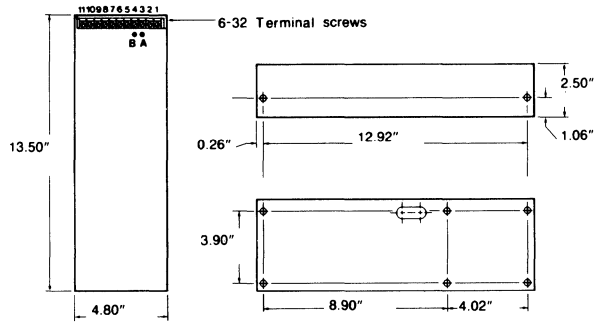
INPUT PROTECTION: Internal fuse.

LOGIC INHIBIT: Standard. All outputs shut off upon application of a TTL compatible low signal to "inhibit" terminal.

POWER FAIL WARNING (OPTIONAL): A TTL compatible "low" signal will occur at least 2 ms before the loss of main output after the loss of AC input power. (To specify this option, please place a "-2" after last digit in model number.)

WEIGHT: 4.5 lbs.

MECHANICAL DIMENSIONS



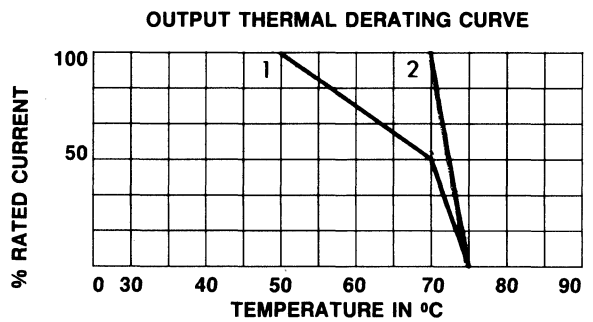
Connections

1. Chassis Gnd.	5. ±V4	10. +5V Output
2. AC Input	6. −V3	11. +5V Output
3. AC Input	7. Common	A. Inhibit
4. +V2	8. Common	B. Power fail
	9. Common	

Mounting holes 8-32
Max screw penetration — 5/32", 4 mm

Dimensions in inches and mm
Tolerance ±.02" ±.05 mm

COOLING REQUIREMENTS



CONVECTION COOLING — CURVE 1. Temperature is ambient and measures one inch from side mounting surface. 100% of rated power at 50°C.

FORCED AIR COOLING — CURVE 2. Temperature is ambient. Forced air of 20 cubic feet per minute flowing parallel to side mounting surface. 100% rated power at 70°C.

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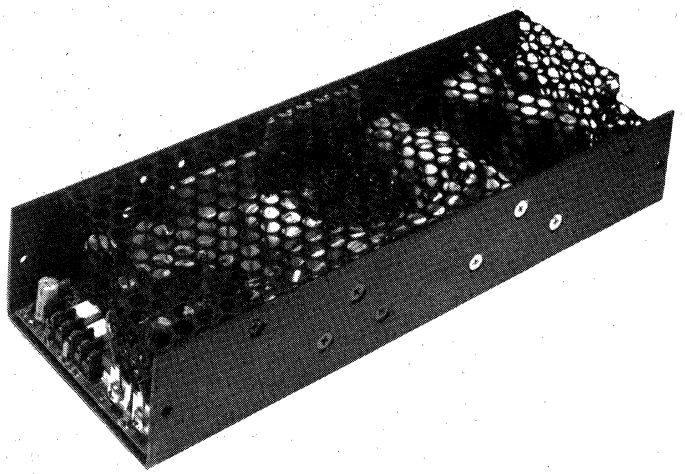
Abbott TECHNOLOGIES, INC.

AC-DC Switchers

MODEL CF

250 WATT MULTIPLE OUTPUT AC-DC POWER SUPPLY



The "CF" model of high-quality triple and quadruple output power supplies provide 250 watts of output power in an industry standard 13.6 × 5.0 × 2.5 case. The unit features a reliable, half-bridge design with flexible current ratings that offer the system designer versatility in powering his loads. The fully-regulated auxiliary outputs (± 12/15 VDC), and the semi-regulated 24 VDC output provides a nominal rating of 5 Amps with a surge capability of 7 Amps. The unit is designed to the safety standards of UL1950, VDE EN60950, IEC 950, and to the EMI standards of FCC 20780A, (with optional filter). These models are competitively priced, and come with many premium features as standard, including: OVP, short-circuit protection, user-selectable input voltage, remote-error sensing, and logic inhibit.

Abbott's twenty years of experience in power design, along with our conservative design philosophy and exclusive use of premium materials make the "CF" model the reliable choice for your mid-power system.

- **FULL OR SEMI-REGULATED OUTPUTS AVAILABLE**
- **UL1950, VDE EN60940 AND IEC 950**
- **EFFICIENCY TYPICALLY 70% OR GREATER**
- **FLEXIBLE CURRENT RATINGS**
- **OVERVOLTAGE PROTECTION**
- **SHORT-CIRCUIT PROTECTION**
- **STEEL COVER**
- **LOGIC INHIBIT**
- **OPTIONAL POWER-FAIL WARNING**

STANDARD "CF" MODELS

Output No. 1		Output No. 2		Output No. 3		Output No. 4		Model Number	Maximum Continuous Power
Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current		
5	35	+12	5/7PK	−12	5/7PK	—	—	CF250T5/12	250W
5	35	+15	5/7PK	−15	5/7PK	—	—	CF250T5/15	250W
5	35	+12	5/7PK	−12	5/7PK	5	3	CF250Q5/12/5	250W
5	35	+15	5/7PK	−15	5/7PK	5	3	CF250Q5/15/5	250W
5	35	+12	5/7PK	−12	5/7PK	24	5/7PK	CF250Q5/12/24	250W
5	35	+15	5/7PK	−15	5/7PK	24	5/7PK	CF250Q5/15/24	250W

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Abbott TECHNOLOGIES, INC.

AC-DC Switchers

MODEL CF

CF MODEL SPECIFICATIONS

AC INPUT: 90-132/180-260 VAC, 47 to 400 Hz, user selectable.

EFFICIENCY: Typically 70% or greater.

LINE REGULATION: Main output within 0.2%, Auxiliary output within 0.5%, semi-regulated output 2%, over full input range.

LOAD REGULATION: Main outputs within 1% from 10% to 100% rated load. For proper operation of auxiliary outputs, main output must be loaded a minimum of 10% of rated load. Regulated AUX outputs 2%, Semi-Regulated outputs 5%.

CROSS REGULATION: 1% on regulated outputs, 5% on semi-regulated output. Cross regulation is measured with 50% load on output under test, and any other output varied 50% to 100% of rated load.

RIPPLE: Main: 1% or 100 mv peak to peak typical using a 25-MHz bandwidth, Auxiliary: 1% peak to peak using a 25 MHz bandwidth.

STABILITY: Output voltage changes less than ±0.05% for 24 hrs following initial warm-up period.

LOAD TRANSIENT RESPONSE: Recovery to within 1% of nominal voltage set-point within 0.5 msec after 50% load change.

HOLD-UP TIME: 20 msec minimum after nominal input voltage is lost at full load.

TEMPERATURE RANGE: Operating: Standard 0°C to 70°C (Full power at 50°C, with forced air cooling of 300LFM). To derate output power for operation above 50°C, consult factory.

TEMPERATURE COEFFICIENT: 0.2%/degree centrigrade for fully regulated outputs, 0.05%/degree centrigrade for semi-regulated outputs.

ISOLATION VOLTAGE (STANDARD): 1500 VDC input to case, input to output, 500 VDC output to case.

SHORT CIRCUIT PROTECTION: Fold back over current protection is standard on all outputs. All outputs automatically resert after short circuit is removed.

OVERVOLTAGE PROTECTION: (Standard) Main: Non-crowbar.

REMOTE ERROR SENSING: Standard on main output.

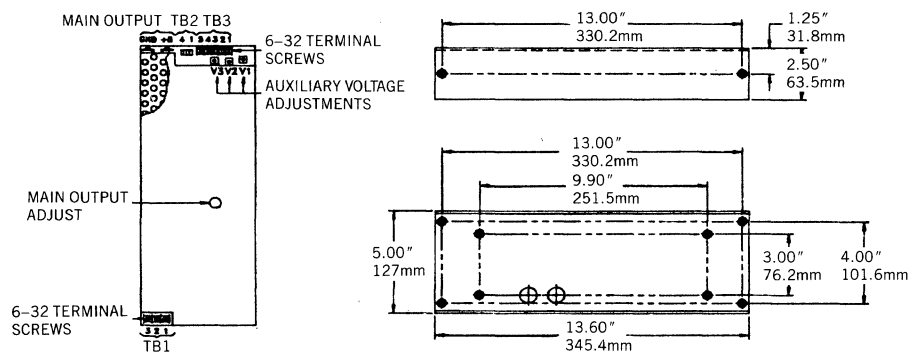
INPUT PROTECTION: Internal fuse.

LOGIC INHIBIT: Standard. All outputs shut off upon application of a TTL compatible low signal to inhibit low signal to "inhibit" terminal.

FCC EMI FILTER (OPTIONAL): Internal filter permits compliance with FCC 20780 level A. To specify this option, please place a "-1" after the model number.

POWER FAIL WARNING (OPTIONAL): A TTL compatible "low" signal will occur at least 2 ms before the loss of main output after the loss of AC in-out power. (to specify this option please place a "-2" after last digit in model number)

WEIGHT: 5 Lbs.



TERMINAL IDENTIFICATION

TB1	TB2	TB3
1 NEUTRAL VAC	1 INHIBIT	1 +V1 (+24/-5V)
2 LINE VAC	2 -SENSE	2 -V1 (+24/-5V)
3 CHASSIS GND	3 +SENSE	3 +V2 (+12/+15V)
	4 POWER FAIL	4 COM (V2 & V3)
		5 -V3 (-12/-15V)

NOTE:
ALL MTG. SCREWS #8-32 NC MUST NOT PENETRATE MORE THAN 5/32" BELOW SURFACE.
DIMENSION TOLERANCE: ±.02" ±05mm

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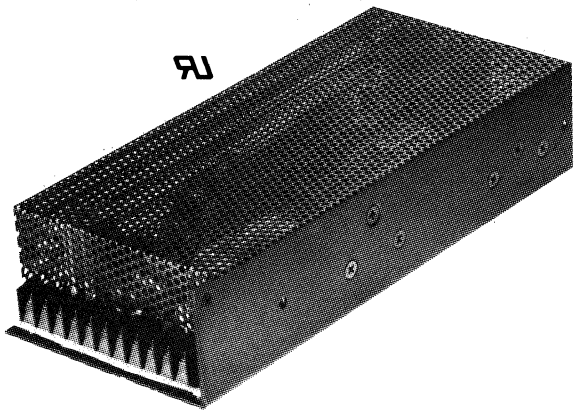
Abbott TECHNOLOGIES, INC.

AC-DC Switchers

MODEL ND

180-WATT SINGLE OUTPUT AC-DC SWITCHING POWER SUPPLY



NEW!

Abbott's "ND" model line of single output switching power supplies provide 180 watts of DC power with tight regulation and low ripple. These competitively priced units have an industry standard case size of 2.5" x 5.0" x 11.0", which allow for easy replacement of existing models from Kepco, ACDC, Boschert, Deltron, and Sierracin. The "ND" model offers the system designer many features which are normally available from our competitors as costly options. These features include: overvoltage protection, input undervoltage protection, foldback overcurrent protection, remote sense, remote inhibit, aluminum chassis and steel cover, dual AC input (user selectable), and an MTBF of 189,000 hours, (per MIL-HDBK-217D). These convection cooled power supplies comply with the radiated and conducted specifications of FCC 20780, level A, and VDE 0871, level A. The models are also designed to UL 478, UL 1012, CSA 22.2 safety standards. Typical efficiencies are greater than 75%. The "ND" line is the reliable choice for your medium power requirements when failures cannot be tolerated.

- **INDUSTRY STANDARD CASE SIZE** (2.5" x 5.0" x 11.0") Allows for easy replacement of existing models from Sierracin, Kepco, ACDC, Boschert, and Deltron.
- **UL 478, UL 1012, CSA 22.2,** (testing underway).
- **COMPETITIVELY PRICED**
- **LOW EMI** — meets FCC 20780 Class A, VDE 0871 Class A.
- **STANDARD OUTPUT VOLTAGES AVAILABLE** from 5VDC to 28VDC.
- **TIGHT REGULATION ON OUTPUT** (better than .15%).
- **LOW RIPPLE** (typically 50 mV Peak-to-Peak).
- **CONVECTION COOLED** — full power up to 50 degrees C.
- **HIGH RELIABILITY** — MTBF of 189,000 hrs per MIL HDBK 217D.
- **STANDARD FEATURES INCLUDE:**
  input undervoltage protection
  overvoltage protection
  foldback overcurrent protection
  remote sense
  remote inhibit
  115/230 VAC, user selected, 50/60/400 Hz
- **OPTIONAL** Power fail warning
- **SIXTEEN HOUR** burn-in
- **TWO-YEAR WARRANTY**

FIVE STANDARD SINGLE OUTPUT MODELS*

VOLTAGE	MAXIMUM CURRENT	TOTAL POWER	MODEL NUMBER
5	36A	180W	ND180S5
12	15A	180W	ND180S12
15	12A	180W	ND180S15
24	7.5A	180W	ND180S24
28	6.4A	180W	ND180S28

OUTPUT VOLTAGES ARE CONTINUOUSLY ADJUSTABLE ±5%.

*Other voltages available. Please contact your nearest sales office.

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Abbott TECHNOLOGIES, INC

AC-DC Switchers

MODEL ND

SPECIFICATIONS

AC INPUT: 90–132/180–264 VAC, 47 to 400 Hz, user selectable.

EFFICIENCY: Typically 75% or greater.

LINE REGULATION: Within 0.15% over full input range, holding line constant.

LOAD REGULATION: Within 0.15% from 20% to 100% rated load, holding line constant.

RIPPLE: 50mV peak to peak typical, 1% maximum using a 25 MHz bandwidth.

STABILITY: Output voltage changes less than ±0.05% for 24 hours following initial warm-up period.

LOAD TRANSIENT RESPONSE: Recovery to within 0.5% of nominal voltage set-point within 0.5 msec after 50% load change.

HOLD-UP TIME: 20 msecs minimum after nominal input voltage is lost at full load.

TEMPERATURE RANGE: Operating: –0°C to 70°C (Full power up to 50°C, derate linearally to 50% power at 70°C). Storage –20°C to 85°C.

TEMPERATURE COEFFICIENT: 0.02%/degree centigrade

ISOLATION VOLTAGE (STANDARD): 1500VDC input to case, input to output, 500VDC output to case.

SHORT CIRCUIT PROTECTION: Foldback overcurrent protection is standard. Output automatically resets after short circuit is removed. Foldback will occur when output power of unit exceeds 110% of rated load.

OVERVOLTAGE PROTECTION: Crowbar and non-crowbar overvoltage protection are standard features.

REMOTE ERROR SENSING: Standard.

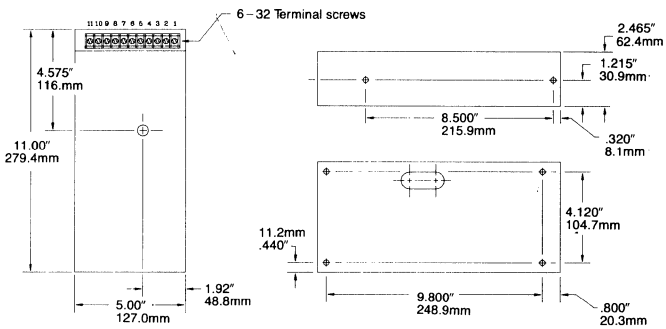
INPUT PROTECTION: Internal fuse.

LOGIC INHIBIT: Standard. Output shuts off upon application of a TTL compatible low signal to "inhibit" terminal.

POWER FAIL WARNING (OPTIONAL): A TTL compatible "low" signal will occur at least 2 ms before the loss of main output after the loss of AC input power. (To specify this option, please place a "-2" after the last digit in the model number.)

WEIGHT: 4 lbs., 1.8 kgs.

MECHANICAL DIMENSIONS



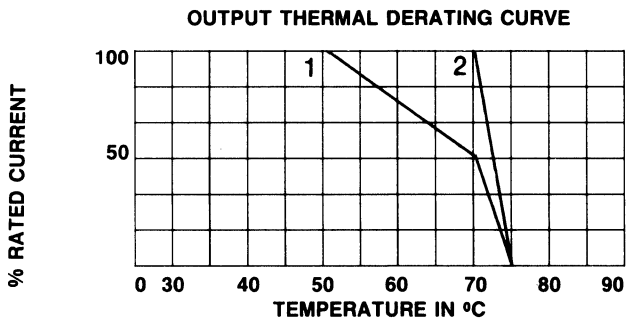
Terminal Identification

1. Chassis Gnd.	5. Inhibit	9. –V Sense
2. AC Input	6. +V Sense	10. –V Output
3. AC Input	7. +V Output	11. –V Output
4. Power Fail	8. +V Output	

Mounting holes 8–#32
Max screw penetration — 5/32" 4mm

Dimensions in inches and mm
Tolerance ± .02" ± .05mm

COOLING REQUIREMENTS



CONVECTION COOLING — CURVE 1. Temperature is ambient and measures one inch from side mounting surface. 100% of rated power at 50°C.

FORCED AIR COOLING — CURVE 2. Temperature is ambient. Forced air of 20 cubic feet per minute flowing parallel to side mounting surface. 100% rated power at 70°C.

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Abbott TECHNOLOGIES, INC.

AC-DC Switchers

MODEL **LG**

750-1000-WATT FAN-COOLED AC-DC POWER SUPPLIES

- **TIGHT REGULATION** — 0.2%
- **LOW RIPPLE** — 0.1% rms, 0.5% peak to peak
- **EFFICIENCY** — typically 75% or greater
- **COMPETITIVELY PRICED**
- **UL/CSA/VDE ISOLATION**
- **FCC/VDE EMI FILTERS**
- **STANDARD FEATURES** include:
  - — input undervoltage protection
  - — parallel operation
  - — short circuit protection
  - — output overvoltage protection
  - — remote sense
  - — logic inhibit
  - — power fail warning
  - — margining
  - — output indicator
  - — 30 msec hold-up time
- **OPTIONAL FEATURES** include:
  - — electronic soft start circuitry
  - — crowbar type output overvoltage protection
- **SIXTEEN HOUR** burn-in
- **TWO-YEAR WARRANTY**

Abbott's "LG" model line of high power, fan-cooled switchers provide 750-1000 watts of DC power with extremely tight regulation and low ripple. These current-mode controlled units are priced competitively and provide the system designer with a high performance alternative in an industry standard 5″ × 8″ × 11″ case. Other standard features include UL 478 isolation, input undervoltage protection, short circuit protection, output overvoltage protection, remote sense, logic inhibit, voltage margining, power fail warning, parallel operation, heavy-duty ball-bearing fan, output indicator, and a two year warranty. Options include VDE 0806 isolation, FCC 20780A and VDE 0871A EMI filtering, electronic soft start, and crowbar type output overvoltage protection. Abbott's long history of providing power supplies that successfully perform on some of the most demanding applications make the "LG models the reliable choice for superior systems where failures cannot be tolerated.

STANDARD "LG" MODELS*

DC Output Voltage	Output Current	Model Number	Maximum Continuous Power
2	150A	LG750S2	300W
5	150A	LG750S5	750W
12	62A	LG750S12	750W
15	50A	LG750S15	750W
24	31A	LG750S24	750W
28	27A	LG750S28	750W

DC Output Voltage	Output Current	Model Number	Maximum Continuous Power
2	200A	LG1000S2	400W
5	200A	LG1000S5	1000W
12	83A	LG1000S12	1000W
15	67A	LG1000S15	1000W
24	42A	LG1000S24	1000W
28	36A	LG1000S28	1000W

* Other voltage and current combinations are available. Please consult your nearest sales office.

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Abbott TECHNOLOGIES, INC.

AC-DC Switchers

MODEL LG

SPECIFICATIONS

AC INPUT: 92 to 132/184-264 VAC, single phase, 47 to 63 Hz.

UNDERVOLTAGE PROTECTION: Standard. Protects unit during input undervoltage.

INRUSH CURRENT (OPTIONAL): Electronic soft start limits inrush current to maximum operating current under all conditions. To specify this feature, please place a "-2" after model number.

INRUSH CURRENT (STANDARD): Inrush current is limited to four times the maximum operating input current on turn-on, providing unit has been off for thirty minutes.

INPUT PROTECTION: Internal fuse.

EFFICIENCY: Typically greater than 75%.

LINE REGULATION: 0.2% maximum over full input range.

LOAD REGULATION: 0.2% maximum from no load to full load.

OUTPUT VOLTAGE ADJUSTMENT: ±10%.

OUTPUT INDICATOR: An LED provides a green light when output is within set limits.

RIPPLE AND NOISE: 0.1% rms maximum, 0.5% peak to peak maximum measured with a 20 MHz bandwidth.

LOAD TRANSIENT RESPONSE: Recovery to within 0.1% of nominal voltage set-point within 400 msec after a 50% load change.

HOLD-UP TIME: 30 msec minimum at full load and nominal line.

ISOLATION VOLTAGE (STANDARD): 1500 VDC input to case, input to output, 500 VDC output to case.

ISOLATION VOLTAGE (OPTIONAL): 3500 VDC input to output, 2100 VDC input to case, 750 VDC output to case. To specify this feature, please place a "-5" after model number.

SHORT CIRCUIT PROTECTION: Foldback overcurrent protection is standard. Output automatically recovers upon removal of short circuit. Current limiting occurs when load exceeds 110% of rated load.

OVERVOLTAGE PROTECTION (STANDARD): Non-crowbar type overvoltage protection turns off unit when output voltage exceeds set point. Unit input power must be recycled to restore output.

OVERVOLTAGE PROTECTION (OPTIONAL): Crowbar type overvoltage protection reduces output voltage to less than 1 volt when output voltage exceeds set point. Unit input power must be recycled to restore output. To specify this feature, please place a "-1" after model number.

OVERSHOOT: No turn-on/off overshoot.

REMOTE ERROR SENSING: Standard. Sense terminals provided on J1-1 (+sense) and J1-4 (−sense) will adjust for up to 0.5 VDC drop in load cables.

LOGIC INHIBIT: Standard. Output shuts off upon application of TTL compatible "high" signal to inhibit terminal (J1-5).

TEMPERATURE RANGE: Operating −0°C to 70°C (Full power up to 50°C, derate linearly to 50% power at 70°C). Storage −20°C to 80°C.

PARALLEL OPERATION: Standard.

MARGINING: Standard. Allows adjustment of ±10% of the output voltage (not available on 2V).

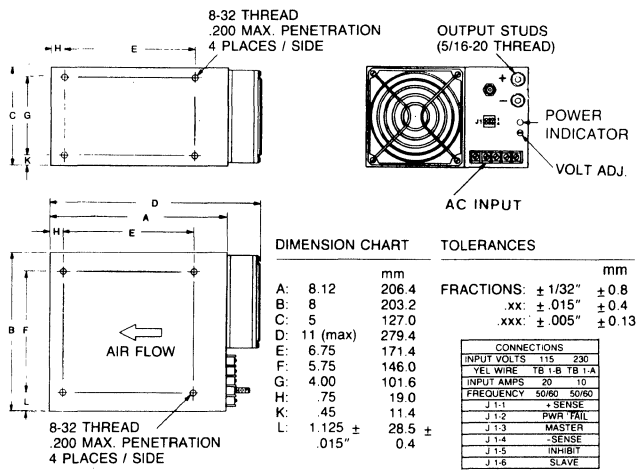
POWER FAIL WARNING: Standard. A TTL compatible "low" signal will occur at least 2 msec before loss of output after loss of AC power.

FCC EMI FILTER (OPTIONAL): Internal filter permits compliance with FCC 20780 level A. To specify this feature, please place a "-3" after model number.

VDE EMI FILTER (OPTIONAL): Internal filter permits compliance with VDE 0871 level A. To specify this feature, please place a "-4" after model number.

WEIGHT: LG 750 — 11.0 pounds.
LG 1000 — 11.5 pounds.

MECHANICAL DIMENSIONS



DIMENSION CHART

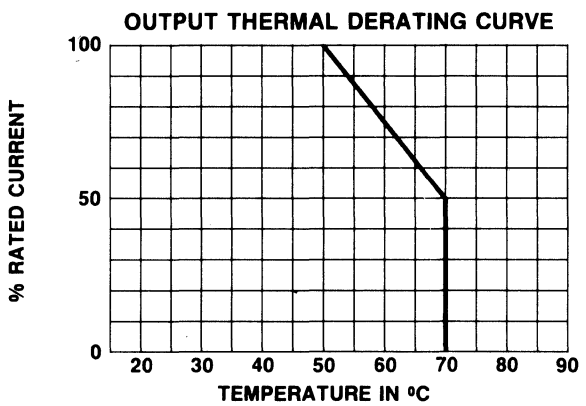
		mm
A:	8.12	206.4
B:	8	203.2
C:	5	127.0
D:	11 (max)	279.4
E:	6.75	171.4
F:	5.75	146.0
G:	4.00	101.6
H:	.75	19.0
K:	.45	11.4
L:	1.125 ± .015"	28.5 ± 0.4

TOLERANCES

		mm
FRACTIONS:	± 1/32"	±0.8
.xx:	± .015"	±0.4
.xxx:	± .005"	±0.13

CONNECTIONS		
INPUT VOLTS	115	230
YEL WIRE	TB 1-B	TB 1-A
INPUT AMPS	20	10
FREQUENCY	50/60	50/60
J 1-1	+ SENSE	
J 1-2	PWR "FAIL"	
J 1-3	MASTER	
J 1-4	−SENSE	
J 1-5	INHIBIT	
J 1-6	SLAVE	

COOLING REQUIREMENTS



FAN-COOLING — Temperature is ambient and measured 1 inch from front of cooling fan.

Specifications subject to change without notice.

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Abbott TECHNOLOGIES, INC.

AC to DC Single & Multiple Output Switchers

MODELS ZB ZBT ZBQ

SPECIFICATIONS

AC INPUT RANGE: 90 to 132 and 180 to 265 VRMS, 47 to 440 Hz, single phase. Dual input selectable.

EFFICIENCY: 75% typical on single output models, 65% typical on others.

LINE REGULATION: 0.12% for full input change on singles, 0.2% on multiples.

LOAD REGULATION: 0.2% for main outputs, 1% on other outputs.

RIPPLE: 50 mV typical on single output models (100 mV max) 200 mV max on other outputs.

STABILITY: Output voltages change less than ±.05% for 24 hours following an initial warmup period.

TEMPERATURE RANGE: Operating: 0°C to +85°C 100% rated power at 75°C conduction cooling. Storage: −40°C to +85°C. Units may be operated with convection cooling, operating temperature: −20°C to +85°C at extra cost. Consult factory for cooling curves.

TEMPERATURE COEFFICIENT: 0.01% per degree centigrade typical, 0.03% per degree centigrade maximum.

OUTPUT VOLTAGE ADJUSTMENT: Voltages are continuously adjustable ±5% by means of an externally accessible screwdriver adjustment potentiometer.

ISOLATION VOLTAGE: 1000 VDC input to output and input to case, 500 VDC output to case. (1750 VDC optional at additional cost).

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 VDC.

LOAD TRANSIENT RESPONSE: On regulated outputs, recovery to within 1% of nominal within 0.5 msecs for 50% load change. On semi-regulated outputs, recovery occurs within 1.5 msecs.

LOAD TRANSIENT OVERSHOOT: Maximum voltage deviation: 5% from nominal voltage set point.

HOLD-UP TIME: 20 milliseconds minimum on single output units, 16 milliseconds on multiple output units.

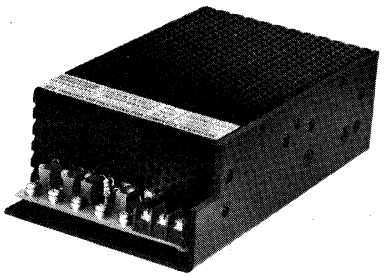
SHORT CIRCUIT PROTECTION: Each unit is completely protected against a short circuit of any duration. The output voltage automatically restores to normal when the short is removed.

OVER VOLTAGE PROTECTION: Standard. Non Crowbar OVP.

REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "sensing" leads. The resulting circuit action compensates for a DC voltage drop up to 0.3 volts in the load leads.

INPUT POWER PROTECTION: Internal fuse standard on single output units, external fuse recommended on multiple output units.

WEIGHT: 2 lbs., (0.9 Kgs.)



FEATURES

- High power density, up to 2 watts per cu. in.
- High reliability MTBF of 135,540 hrs. per MIL-HDBK-217 (Model Z5820).
- High efficiency. Up to 80%. 65% Minimum.
- Dual input 90 to 132 and 180 to 265 VRMS standard.
- Conduction or convection cooled.
- 100% power at 75°C with conduction cooling.
- Meets FCC 20780 Class A for EMI emissions.
- UL Recognition applied for on selected models.
- Special models can meet MIL-STD 810.
- 2-year warranty.

SINGLE OUTPUT

Model Number	*Voltage	Maximum Load	
		Current	Power
Z5B20	5	20A	100W
Z6B18	6	18A	108W
Z10B12	10	12A	120W
Z12B10	12	10A	120W
Z15B8	15	8A	120W
Z18B7	18	6.7A	120W
Z20B6	20	6A	120W
Z22B6	22	5.5A	120W
Z24B5	24	5A	120W
Z28B4	28	4.3A	120W
Z30B4	30	4A	120W

* Voltage is continuously adjustable ±5% by means of an externally accessible screwdriver adjustment potentiometer.

TRIPLE OUTPUT

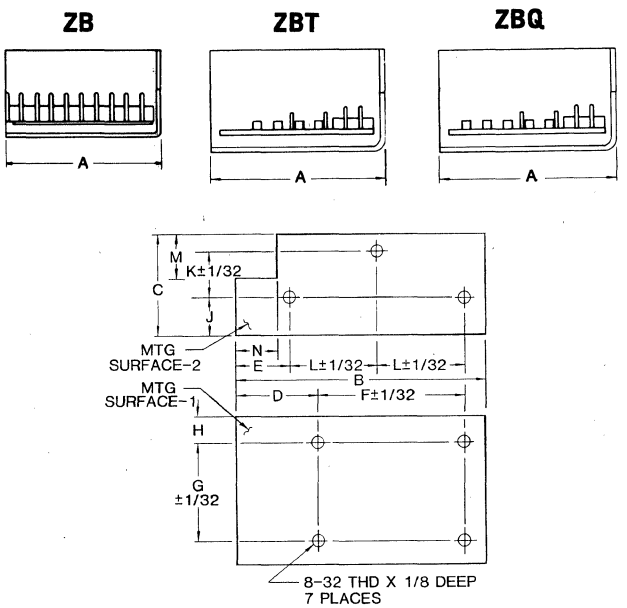
Model Number	Output No. 1		Output No. 2		Output No. 3		Maximum Continuous Power
	Voltage*	Max. Cur.	Voltage*	Max. Cur.	Voltage*	Max. Cur.	
ZB95T5/12	5	13A	+12	1.0A	−12	1.0A	90W
ZB95T5/15	5	13A	+15	1.0A	−15	1.0A	95W
ZB90T5/12	5	11A	+12	1.3A	−12	1.3A	85W
ZB90T5/15	5	10A	+15	1.3A	−15	1.3A	90W

* All outputs are continuously adjustable ±5%. External adjustment accessible by a screwdriver to potentiometer.

QUAD OUTPUT

Model Number ZB100Q5/	Output No. 1		Output No. 2		Output No. 3		Output No. 4		Max. Cont. Power All Outputs
	Voltage*	Max. Cur.	Voltage*	Max. Cur.	Voltage*	Max. Cur.	Voltage*	Max. Cur.	
12/24	5	10A	+12	1.0A	−12	1.0A	24	2.0A	100W
15/24	5	10A	+15	1.0A	−15	1.0A	24	2.0A	100W
12/5	5	10A	+12	1.0A	−12	1.0A	−5	1.0A	79W
15/5	5	10A	+15	1.0A	−15	1.0A	−5	1.0A	85W
12/12	5	10A	+12	1.0A	−12	1.0A	12	2.0A	98W
15/12	5	10A	+15	1.0A	−15	1.0A	12	2.0A	100W

* All outputs are continuously adjustable ±5%. External adjustment accessible by a screwdriver to potentiometer.



Our quality system is in accordance with Mil-I-45208.
Our normal warranty on all products is two years; a five year warranty is also available.

A	B	C	D	E	F	G	H	J	K	L	M	N
4	6.75	2.25	1.875	1	4.125	2.5	.75	.875	.875	2.5	1	.75

Model ZB: Terminal functions left to right: 230 AC input, AC common, 115 AC input, ground, + out, + out, + sense, − out, − out, − sense.

Model ZBT: Output terminal functions right to left: 5V + sense, +5V, common return, 5V return sense, ± Output 2, NC ± Output 3. Input terminal functions right to left: 230 VAC, AC common, 115 VAC, chassis ground.

Model ZBQ: Output terminal functions right to left: 5V + sense, +5V, common return, 5V return sense, ± Output 2, ± Output 3, ± Output 4. Input terminal functions right to left: 230 VAC, AC common, 115 VAC, chassis ground.

Dimensional tolerance: ±0.0625 In. except as specified.

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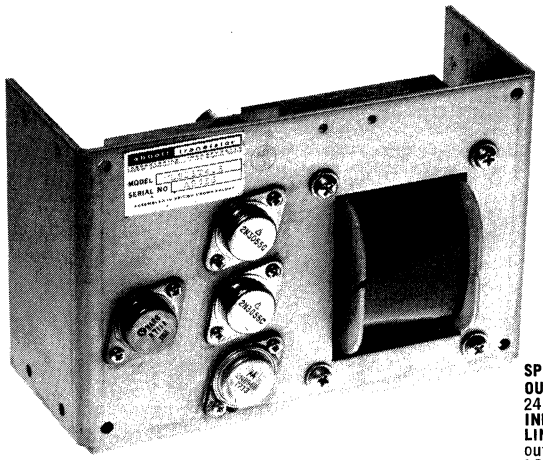
Abbott TECHNOLOGIES, INC. 60 Hz to DC Power Modules

MODELS NL, RN



MODEL NL

SINGLE, DUAL AND TRIPLE OUTPUTS 5 to 28 VDC, ±12 and ±15 VDC

- Low cost
- Non-standard voltages available
- 2-year warranty

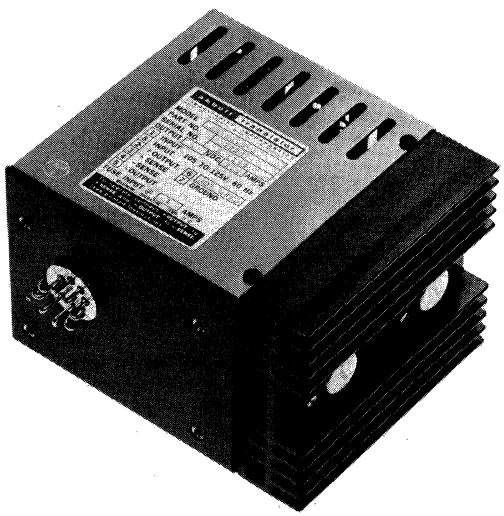
SPECIFICATIONS
OUTPUTS: Single output models: 5 through 28 VDC, 15 to 168 watts. Dual output models: ±12 and ±15, 24 to 80 watts. Triple output models 5, ±12 and 5, ±15, 22 watts to 105 watts
INPUT: 105-125, 210-250 VRMS, 47-440 Hz
LINE REGULATION: 0.02% for 10% input change single output, 0.1% for 10% input change multiple output
LOAD REGULATION: 0.1% for no load to full load change with line constant single output, 0.2% for no load to full load change with line constant multiple output
RIPPLE: 1.0 mv RMS maximum, 1.5 mv peak-to-peak typical. 5 mv peak-to-peak maximum
LOAD TRANSIENT RECOVERY TIME: 50 μSec typical after a 50% step change in load current
SHORT CIRCUIT PROTECTION: Each unit is completely protected against a short circuit of any duration. The output voltage automatically restores to normal in approximately 5 mSec after removal of the short
REVERSE VOLTAGE PROTECTION: Provided on output and on pass element
REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra sensing leads. The resulting circuit action compensates for a DC voltage drop of up to 0.5 VDC in the load leads. Open sense lead protection is built in. Not included on units in case size "A".
STABILITY: Typically, ±0.05% for 24 hours after warm-up (single output), and ±0.3% for 24 hours after warm-up (dual and triple output).
TEMPERATURE: Operating: 0°C to +50°C, derated to 40% at +71°C. Storage: −40°C to +85°C
TEMPERATURE COEFFICIENT: ±0.04% per degree Celsius maximum, ±0.002% per degree Celsius typical
EFFICIENCY: Typically 45% to 60%
OVERVOLTAGE PROTECTION: Additional circuitry will reduce the output voltage to approximately 1 VDC within 25 μSec typ. If the output voltage rises to 10% or 2 VDC (whichever is greater) above nominal. Available as an optional feature by adding **"-1"** to the model number

For dimensions, see our catalog or call factory.

MODEL RN

HIGH QUALITY LINEAR POWER SUPPLY SINGLE OUTPUT: 5 to 30 VDC, 1.5 to 150 WATTS DUAL OUTPUT: ±12, ±15, 28 to 150 WATTS

- 5-year warranty
- Full power at 71°C operating temperature
- Extreme ruggedness and high reliability
- Non-standard voltages available



SPECIFICATIONS
OUTPUT: Single output models 5 through 30 VDC, 1.5 to 150 watts. Dual output models ±12, ±15, 28 to 150 watts
INPUT: 105-125, 210-250 VRMS 50-420 Hz
LINE REGULATION: 0.1% or 10 mv (whichever is greater) for input change of 105-125 VRMS
LOAD REGULATION: 0.1% or 10 mv (whichever is greater) for change from no load to full load
RIPPLE: 0.02% or 5 mv RMS (whichever is greater)
OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in table by means of an externally accessible screwdriver adjustment potentiometer
ADJUSTMENT RESOLUTION: 30 mv max.
ISOLATION VOLTAGE: 300 VDC between output terminals and chassis ground
INSULATION RESISTANCE: 50 megohms between output terminals and chassis ground when measured at 50 VDC
POLARITY: Inputs and outputs are isolated; either positive or negative side may be grounded
TEMPERATURE: Operating: −4°F (−20°C) to +160°F (+71°C) without derating, forced air, or heat-sinking. Storage: −40°F (−40°C) to +185°F (+85°C)
TEMPERATURE COEFFICIENT: 0.03% per degree Celsius
ALTITUDE: 10,000 feet above sea level
LOAD TRANSIENT RECOVERY TIME: Output voltage typically returns to regulation limits within 75 microseconds after a 50% step change in load current
REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "sensing" leads. The resulting circuit action compensates for a DC voltage drop up to 0.5 volts in the load leads
TURN ON/TURN OFF OVERSHOOT: The output voltage overshoot during "turn on" or "turn off" typically will not exceed 0.1% of the output voltage, or 20 mv, (whichever is greater)
MOUNTING: Threaded inserts are provided for mounting of cases

For dimensions, see our catalog or call factory.

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Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

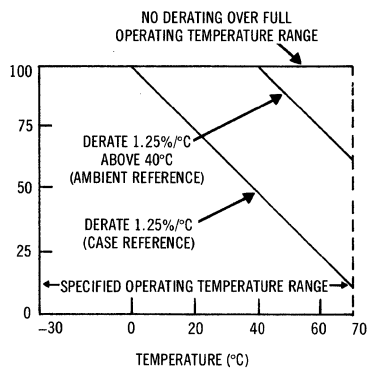

Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

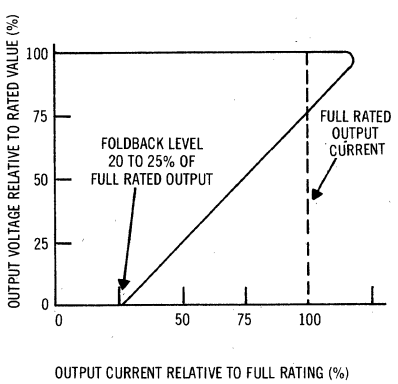

Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

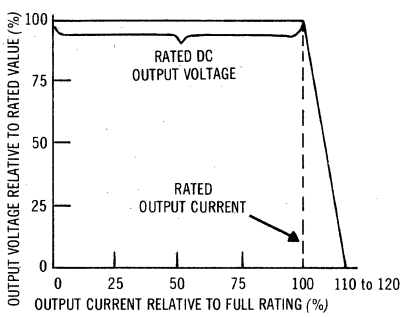

Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

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MILITARY POWER SUPPLIES

Power Supply Modules

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WHEN RELIABILITY IS IMPERATIVE.®

For MIL SPEC and critical industrial applications where reliability is the prime consideration, Abbot Power Supplies have been the predominant choice for the past 30 years. This enduring acceptance has been earned through sound design, dependable components, meticulous workmanship, exhaustive quality control and proven performance in the field under severe operating conditions. Whatever your demanding requirements, you will find the correct Abbott Power Supply module in the next 19 pages.

A member of the ADWEST Group.

Military Power Supplies

FUNCTION	DESCRIPTION	MODEL	PAGE
60/400 Hz and 100 to 300 Vdc	High density switchers, single and triple output; 50 watts	Model AM50	D•1525
14-32 Vdc to 5-28 Vdc	High density switchers, single output; 20, 35 and 50 Watts	Model AB 50, AB 35, AB 20	D•1524 D•1524
60/400 Hz to 5-28 Vdc	High power switcher, low EMI	Model MH500	D•1526
60/400 Hz to DC	High efficiency, low EMI, single and triple outputs	Model M300	D•1527
60 Hz to DC	Low EMI, 200 kHz switcher, single and triple outputs	Model MB100	D•1528
60 Hz to DC	Low EMI, 200 kHz 60-watt switcher, single and triple outputs	Model MB60	D•1529
50-60 Hz to 5-28 Vdc	High efficiency low EMI switcher	Model M100, M50 Model M25	D•1530 D•1531
60/400 Hz to 5-28 Vdc	High density single/dual outputs	Model LV	D•1532
400 Hz to DC	Low EMI, 200 kHz switcher, single and triple outputs	Model WM100	D•1533
400 Hz to DC	Low EMI, 200 kHz 60-watt switcher, single and triple outputs	Model WM60	D•1529
400 Hz to 5-100 Vdc	High performance single and dual outputs	Model W, WW	D•1534
400 Hz to 5-28 Vdc	High density 3ϕ single/dual output	Model WL, WWL	D•1535
28 Vdc to DC	High efficiency, 100 kHz switcher, single and triple outputs	Model BC200	D•1536
28 Vdc to DC	High efficiency, 200 kHz switcher, single and triple outputs	Model BC100	D•1537
28 Vdc to DC	High efficiency, 200 kHz switcher, single and triple outputs	Model BC60	D•1538
20-32 Vdc to 5-28 Vdc	High efficiency switcher, single output	Model BA	D•1539
20-32 Vdc to 5-50 Vdc	High performance single and dual outputs	Mocel C, CC	D•1540
24-30 Vdc to 5-500 Vdc	High reliability linear	Model B	D•1541
22-32 Vdc to 400-1600 Hz	Sine Wave Inverter	Model S	D•1542
24-30 Vdc to 400-1600 Hz	Sine Wave Inverter	Model SN	D•1543

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MILITARY POWER SUPPLIES

New MIL/PAC Series 20/35/50 Watt DC-DC Converters

MODEL AB 20/35/50

SPECIFICATIONS & FEATURES

Input: 14-32 Vdc.

Input Transient Protection: Unit will withstand 50 Vdc for 0.1 second in accordance with MIL-STD-704D.

Efficiency: Typically (nominal input, full load, room ambient) 71-80%.

Line Regulation: Input change of 14 to 32 Vdc with constant load. 0.1% or 10mV, whichever is greater.

Load Regulation: No load to full load with constant line: 10mV or 0.1%, whichever is greater.

Load Transient Recovery: Output voltage returns to regulation limits within 0.5 milliseconds after a 50% change in load current.

Load Transient Overshoot: 0.5V from nominal voltage set point.

Pard (Noise and Ripple): 25mV rms, 100mV P-P at 25 MHz bandwidth, measured at room ambient.

Temperature Range: Operating: −55° C to 100° C maximum, at center of baseplate. Storage, −65° C to 125° C, ambient.

Temperature Coefficient: 0.01%° C maximum over entire temperature range.

Isolation Voltage: 500 Vdc, input to output; 400 Vdc, input to case; 100 Vdc, output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, output and case, when measured at 50 Vdc.

Remote Sensing: Compensates for up to 0.5 volt drop in leads.

Short Circuit Protection: Competely protected against a short circuit of any duration. Output automatically restores to normal when overload is removed.

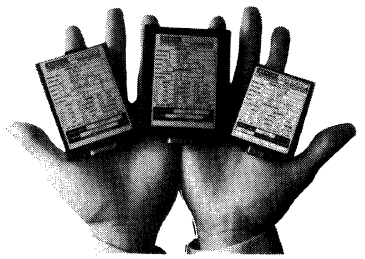
EMI: Meets MIL-STD-461C (Test report available upon request.)

Reliability: All MTBF's per MIL-HDBK-217E, 50° C baseplate, high line and full load.

Environment: Units meet MIL-STD-810C, altitude, shock, acceleration, vibration and MIL-S-901C, high-impact shock conformance. Hermetically sealed units available. Please consult factory.

Hook Up: Via D-Subminiature connectors.

Remote Inhibit: Provides for remote turn on/off with TTL logic signal. Application of TTL Signal (logic 1) will inhibit the output.



- All New Wireless Submodular Construction
- Extra Wide Input Range
- Current Mode Control
- MIL-STD-2000 Version Available
- Standard Current Limiting
- Inherent Over Voltage Control
- Qualified by rigorous Environmental Stress Screening

RELIABILITY DATA — MTBF (Hours)

	Product	Ground Benign	Naval Sheltered	Cargo Air Inhabited	Ground Mobile
MIL/PAC STD	AB20S	428,000	80,000	118,000	45,000
	AB35S	353,000	67,000	96,000	37,000
	AB50S	258,000	50,000	75,000	28,000
MIL/PAC MIL-STD-2000	AB20S-M	1,444,000	276,000	404,000	145,000
	AB35S-M	1,387,000	265,000	385,000	140,000
	AB50S-M	1,338,000	256,000	377,000	136,000

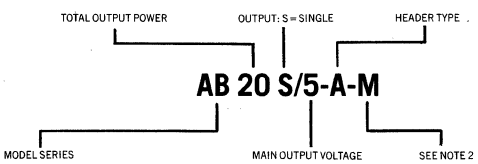
Note: MTBF per MIL-HDBK–217E @ 50°C baseplate, high line, full load.

PRODUCT SELECTION GUIDE

	CURRENT (AMPS)		
Output Voltage	AB20S	AB35S	AB50S
5V	4.00	7.00	10.00
12V	1.66	2.91	4.16
15V	1.33	2.33	3.33
24V	.83	1.45	2.08
28V	.71	1.25	1.78
Weight			
Ounces	7.00	9.00	11.50
Grams	198.45	255.15	326.03

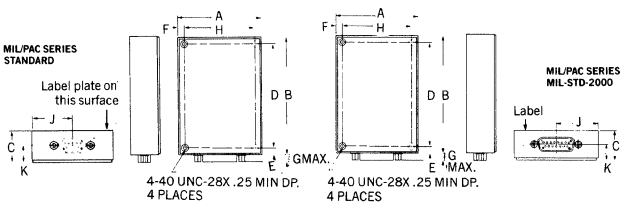
(+5% weight differential between standard and MIL-STD-2000 models.)

HOW TO ORDER



Auxiliary Output Voltages
1. Single = 20W, 35W or 50W
2. MIL-STD-2000: Add "M" after "A" in P/N, i.e. AB20S/5-DM

MECHANICAL DRAWINGS (AB20/35/50)



Standard Dimensions											
Model #	SYM	A	B	C	D	E	F	G	H	J	K
AB20S	IN	2.20	2.80	.85	2.450	.18	.18	.25	1.850	1.10	.46
	MM	55.9	71.1	21.6	62.13	4.5	4.5	6.4	46.99	27.9	11.7
AB35S	IN	2.50	3.50	.85	3.100	.20	.20	.25	2.100	1.25	.46
	MM	63.5	88.9	21.6	78.74	5.1	5.1	6.4	53.34	31.8	11.7
AB50S	IN	3.00	3.85	.85	3.450	.20	.20	.25	2.600	1.50	.46
	MM	76.2	97.8	21.6	87.63	5.1	5.1	6.4	66.04	38.1	11.7

PIN DESIGNATIONS (Model AB20)

1. −input
2. −TTL
3. +TTL
4. +Sense
5. +Output
6. +Input
7. Ground
8. −Sense
9. −Output

Tolerances: (Inches) (MM)
.XXX = ±0.015
.XX = ±0.03
.XX = ±0.04
.X = ±0.8

AB20S
Connector: DEM9PR
Mate: DEM9S

AB20S-M
Connector: M24308/24-49
Mate: M24308/1-1

MIL-STD-2000 Dimensions											
Model #	SYM	A	B	C	D	E	F	G	H	J	K
AB20S-M	IN	2.50	3.50	.85	3.100	.20	.20	.25	2.100	1.25	.46
	MM	63.5	88.9	21.6	78.74	5.1	5.1	6.4	53.34	31.8	11.7
AB35S-M	IN	3.00	3.85	.85	3.450	.20	.20	.25	2.600	1.50	.46
	MM	76.2	97.8	21.6	87.63	5.1	5.1	6.4	66.04	38.1	11.7
AB50S-M	IN	3.25	4.25	.85	3.850	.20	.20	.25	2.850	1.63	.46
	MM	82.6	108.0	21.6	97.79	5.1	5.1	6.4	72.39	41.3	11.7

PIN DESIGNATIONS (Model AB35 and AB50)

1. −input
2. N/C
3. −TTL
4. +TTL
5. N/C
6. +Sense
7. +Output
8. +Output
9. +Input
10. N/C
11. Ground
12. N/C
13. −Sense
14. −Output
15. −Output

Tolerances: (Inches) (MM)
.XXX = ±0.015
.XX = ±0.03
.XX = ±0.04
.X = ±0.8

AB35S and AB50S
Connector: DAM15PA
Mate: DAM15S

AB35S-M and AB50S-M
Connector: M24308/24-38
Mate: M24308/1-2

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MILITARY POWER SUPPLIES

New MIL/PAC Series DC/AC to DC Converters

MODEL AM

SPECIFICATIONS

Input: 90 to 130 V ac, 47 to 440 Hz, 1 phase, 3 phase (Delta, Wye); 180 to 260 V ac, 47 to 440 Hz, 1 phase, 3 phase (Delta); 100 to 300 V dc.

Efficiency: 65% minimum.

Line Regulation: 90 to 130 V ac, 180 to 260 V ac and 100 V dc to 300 V dc. Single and Main: .1% or 10 mV, whichever is greater. Triple ±15 V: 100 mV or .5% maximum; 12 V: 60 mV or .5% maximum.

Load Regulation: Single and Triple: 10 mV or 0.1%, whichever is greater. Auxiliary Outputs: 150 mV over the temperature range.

Pard (Noise and Ripple): 25 mV rms, 100 mV P-P at 25 MHz bandwidth for 5 V outputs and 200 mV for other voltages; measured over temperature range.

Isolation Voltage: 1000 V dc, input to output; 1000 V dc, input to case; 200 V dc, output to case.

Insulation Resistance: 50 megohms minimum between input and outputs, input and case, outputs and case, when measured at 50 V dc.

Temperature Range: Operating: −55°C to +100°C maximum, at center of the baseplate. Storage: −55°C to +125°C, ambient.

Temperature Coefficient: 0.01% °C maximum over entire temperature range.

Input Transient Protection: Unit will not be damaged or exhibit degradation of performance when subjected to input transients in accordance with MIL-STD-704A, MIL-STD-704D and MIL-STD-1399, as applicable to corresponding input configurations. Consult your nearest sales office if further details are needed.

Load Transient Recovery: Main output voltage returns to regulation limits within 0.5 milleseconds after 50% change in load current.

Load Transient Overshoot: 0.5 V from nominal voltage set point, single and triple outputs.

Short Circuit Protection: All outputs are completely protected against a short circuit of any duration. Outputs automatically restore to normal when overload is removed.

Remote Sensing: Compensates for up to 0.5 volt drop in output leads. (Single and main output only.)

Remote Inhibit: Provides for remote turn on/off with TTL logic signal. Application of TTL Signal (logic 1) will inhibit the outputs.

Electromagnetic Interference: Units, when tested in accordance with MIL-STD-462, meet the majority of the requirements of MIL-STD-461C for conducted and rediated, emission and susceptibility, for Part 2, Class A1B equipment, for input power leads. For further details regarding levels and extent of compliance in each class, input configuration, or requirement, consult your nearest sales office.

Reliability: The Mean Time Between Failure (MTBF) per MIL-HBDK-217E calculated for standard model AM50S under operating conditions of 50°C baseplate, maximum operating input voltage and maximum rated output power, is 160,300 hours for a ground benign environment and 20,200 hours for a naval sheltered environment. With "-ER" option MTBF was calculated to be 240,000 hours for a ground benign environment and 25,000 for naval sheltered environment. Please consult factory for additional environments and models.

Environment: Units meet MIL-STD-810D, altitude, shock, acceleration, vibration and MIL-S-901C, high-impact shock conformance. Hermetically sealed units available. Please consult factory.

Hook Up: Via D—Subminiature Connectors.

- Customer Selectable, Multi-inputs.
- Wireless Submodular Construction for High Reliability
- Current Mode Control
- Standard Current Limiting

PRODUCT SELECTION GUIDE

Single Output Standard Models

Nominal Output Voltage	Output Current (Amps)	Weight[1] (Oz.)	Weight[1] (Grams)	Model Number
5.0	10.0	12	340	AM50S/5-A
12.0	4.2	12	340	AM50S/12-A
15.0	3.34	12	340	AM50S/15-A
24.0	2.1	12	340	AM50S/24-A
28.0	1.8	12	340	AM50S/28-A

1. Maximum weight, not including options.

Triple Output Standard Models

Output Voltage (Main)	Output Current Main	Output Voltage (Aux)	Output Current (Aux)	Weight[1] (Oz.)	Weight[1] (Grams)	Model Number
5	7.0	±12	0.64	14.5	410	AM50T/5/12-A
	7.0	±15	0.5	14.5	410	AM50T/5/15-A

1. Maximum weight, not including options.

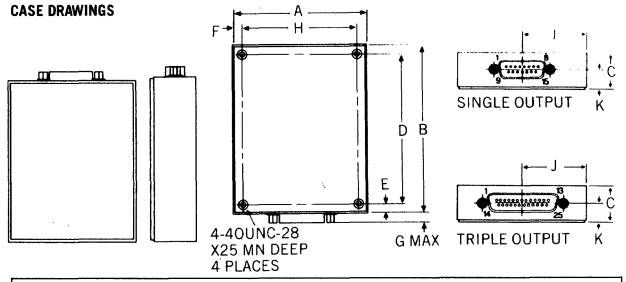
HOW TO ORDER

AM 50 T/5/12-A-ER

- AM — Model Series
- 50 — Total Output Power
- T — Number of Outputs
- 5 — Main Output Voltage
- 12 — Auxiliary Output Voltage
- A — Header Type
- ER — Options

MECHANICAL DRAWINGS (AM50S + T)

CASE DRAWINGS



Model		A	B	C	D	E	F	G	H	J	K
AM50S	IN.	3.25	4.25	.85	3.850	.20	.20	.25	2.850	1.63	.46
	MM	82.6	108.0	21.6	97.79	5.1	5.1	6.4	72.39	41.4	11.7
AM50T	IN.	3.50	4.50	.85	4.100	.20	.20	.25	3.100	1.75	.46
	MM	88.9	114.3	21.6	104.14	5.1	5.1	6.4	78.74	44.5	11.7

Dimensions

Tolerances: Inches - .XXX = ±0.015 or .XX = ±0.03; MM - .XX = ±0.4 or .X = ±0.8.
Material: Base - Aluminum 5052-H32, Case - Steel.
Finish: Black flat per FED-STD-595, Color 37038.
Mounting: 4-40 THD inserts .25" minimum depth are provided in baseplate. Steel4-40 bolts American standard. unified national coarse series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

PIN DESIGNATIONS
(Standard model, not including options. Consult factory for details.)

Single Output

1.	+Input	6.	+Output	11.	Ground
2.	±Input	7.	+Output	12.	−Sense
3.	−TTL	8.	+Output	13.	−Output
4.	+TTL	9.	−Input	14.	−Output
5.	+Sense	10.	−Input	15.	−Output

Connectors and Mates
Connectors: DAMME15PF
Mate: DAMM15S
Note: ± input connection is only for DC input

Triple Output

1.	+Input	6.	+AUX	11.	+Output	16.	N/C	21.	N/C
2.	±Input	7.	+AUX CM	12.	+Output	17.	GND	22.	−Sense
3.	N/C	8.	−AUX CM	13.	+Output	18.	N/C	23.	−Output
4.	−TTL	9.	−AUX	14.	−Input	19.	N/C	24.	−Output
5.	+TTL	10.	+Sense	15.	−Input	20.	N/C	25.	−Output

Connectors and Mates
Connectors: DBMME25PF
Mate: DBMM25S
Note: ± input connection is only for DC input

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MILITARY POWER SUPPLIES

60 Hz to DC

MODEL **MH**

SPECIFICATIONS

Input: 103.5 to 126.5 V rms standard, 47 to 440 Hz, single phase. For 207 to 253 V rms input, add "(230)" to model number, i.e., MH500S/15-DE(230). Other inputs available (Option H and Option -3).

Efficiency: 65% minimum.

Line Regulation: Within 0.2% or 25 mV (whichever is greater) for input change of 103.5 to 126.5 V ac with load constant.

Load Regulation: Within 0.2% or 25 mV (whichever is greater) for change from no load to full load with line constant.

Pard (Noise and Ripple): 50 mV rms, 100 mV peak-to-peak maximum at 25 MHz bandwidth.

Isolation Voltage: 500 V dc input to output and input to case, 100 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 V dc.

Polarity: Inputs and outputs are isolated. Either positive or negative side of output may be grounded.

Temperature Range: Operating: 0°C to +71°C maximum at center of mounting base. Storage: −55°C to +85°C.

Temperature Coefficient: 0.03%/°C maximum over entire temperature range.

Input Transient Protection: Unit will withstand 180 V ac for 0.1 second in accordance with MIL-STD-704.

Load Transient Recovery Time: Output voltage returns to regulation limits within 300 microseconds after a 50% change in load current.

Holdup Time: 20 ms after nominal input is lost at full load.

Short Circuit Protection: Completely protected against an overload or short circuit of any duration. Output automatically restores to normal when the overload is removed. (Foldback to 60%.)

Output Overvoltage Protection: A non-crowbar type OVP. Input must be recycled to restore output.

Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.3 volt in the load leads.

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to radiated and conducted interference.

Reliability: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of 50°C baseplate temperature, maximum operating input voltage and maximum rated output power was calculated to be 54,530 hrs. for a ground benign environment.

Environment: Encapsulated and hermetically sealed to meet the environmental requirements of MIL-STD-810C, MIL-S-901C and MIL-E-5400P, Class 2, including altitude (to 70,000 ft.), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

Maintainability: Units are repairable at depot level.

Connectors: Standard unit is provided with an input solder pin header and an output "hermetic seal" stud-type connector.

FEATURES

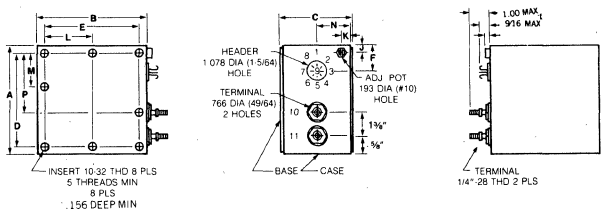
- 500-Watt Switching 100 kHz Power Supply
- High Efficiency, 65% Minimum
- Meets MIL-STD-461B, MIL-STD-810C and MIL-S-901C
- Standard Soft-start and Short Circuit Protection

Output Voltage Range[1]	Output Current (amps)	Weight[2] (Lbs.)	Model Number
4.75—5.25	100	15	MH500S/5-DE
11.40—12.60	41.67*	15	MH500S/12-DE
14.25—15.75	33.33*	15	MH500S/15-DE
22.80—25.20	20.83*	15	MH500S/24-DE
26.60—29.40	17.86*	15	MH500S/28-DE

* Rounded figures. Total watts equal 500.

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 50 mV for nominal output voltages 5 to 15 V dc and 60 mV for outputs 24 to 28 V dc.
2. Weights are ±5%.

MECHANICAL DIMENSIONS



A	B	C	D	E	F	J	K	L	M	N	P
7	10	3½	6.46	9.45	2 3/32	¼	⅜	4.73	2.14	1 11/16	4.32

Tolerances: If a fraction, ±1/32 in, a decimal, ±.015 in.

Material: Base—Aluminum 6061-T6, Case—Steel.

Finish: Black flat lacquer per FED-STD-595. Color 37038.

Mounting: 10-32 THD inserts 5/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

OPTIONAL FEATURES

Special Connectors: A military-type hermetically sealed connector is provided as **Option A** in place of our standard input header. (To order, replace the "D" in the model number with "A", i.e., MH500S/5-AE.)

Wide Input Voltage: With **Option H,** the units operate either from 115 V ac ±15% or 230 V ac ±15%. (To order, add an "H" after the "E" in the model number, i.e., MH500S/5-DEH or MH500S/5-DEH (230).)

Remote Turn On/Off: Option L provides isolated terminals to turn output(s) on/off with TTL logic signal. (To order, add "L" after "E" in model number, i.e., MH500S/5-DEL.)

Remote Output Adjustment: With **Option R,** an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "E" in model number, i.e., MH500S/5-DER.)

Wider Operating Temperature: −20°C to +71°C is available with **Option T.** (To order, add "T" after "E" in model number, i.e., MH500S/5-DET.)

Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military-grade components. (To order, add "-ER" after model number, i.e., MH500S/5-DE-ER.)

WYE Input: Option -3 changes input to 3-phase, 4-wire "WYE". (To order, add "-3" to the end of the model number, i.e., MH500S/5-DE-3.)

PIN DESIGNATIONS

1. AC Input
2. AC Input
3. Not Used
4. −Sense
5. +Sense
6. Not Used
7. Not Used
8. Not Used
9. Ground
10. +Output DC
11. −Output DC

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MILITARY POWER SUPPLIES

60 Hz to DC

MODEL **M300**

SPECIFICATIONS

Input: 103.5 to 126.5 V rms standard, 47 to 440 Hz, single phase. Other inputs available (Options H and -3).

Efficiency: 60% minimum at full load.

Line Regulation: Within 0.2% or 25 mV (whichever is greater) for change from low line to high line with load constant.

Load Regulation: Within 0.2% or 25 mV (whichever is greater) for change from no load to full load with line constant.

Auxiliary Output Tracking Accuracy: The negative output will track the positive output within 200 mV for all rated conditions. (M300T).

Pard (Noise and Ripple) for Main and Auxiliary Outputs: 30 mV rms, 100 mV peak to peak (maximum) at 25 MHz bandwidth, over the entire temperature range.

Isolation Voltage: 500 V dc input to output. 500 V dc input to case. 100 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 V dc.

Temperature Range: Operating: 0°C to +71°C maximum at center of baseplate. Storage: −55°C to +85°C ambient.

Temperature Coefficient: 0.1%/°C maximum for main and auxiliary outputs over the entire temperature range.

Input Transient Protection: Unit will withstand 143.8 V ac to 0.3 second in accordance with MIL-STD-1399.

Load Transient Recovery Time: Output voltage returns to regulation limits within 1.5 millisecond for main and 100 microseconds for auxiliary outputs after a 50% change in load current.

Holdup Time: 10 ms after nominal input is lost at full load.

Short Circuit Protection: Completely protected against a short circuit of any duration. Outputs automatically restore to normal when the overload is removed. All outputs will foldback for overload.

Current Limiting: Output current is limited to 120% on main and auxiliary outputs (±10%) under overload conditions.

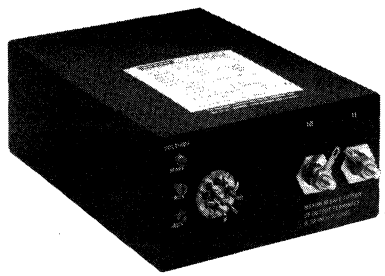
Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.5 volt in the load leads.

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to conducted interference (meets CE03, CS01, CS02 and CS06).

Reliability: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of 50°C baseplate temperature, maximum operating input voltage and maximum rated output power was calculated to be 77,455 hours for a ground benign environment and 11,642 hours for a naval sheltered environment. With Enhanced Reliability Option -ER ground benign is 119,771 hours; naval sheltered is 16,233 hours. (M300T).

Environment: Encapsulated and hermetically sealed to meet the environmental requirements of MIL-STD-810C and MIL-S-901 including altitude (to 70,000 ft.), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

Connectors: Standard unit is provided with solder-pin input header and a hermetic seal, stud-type, output connector.



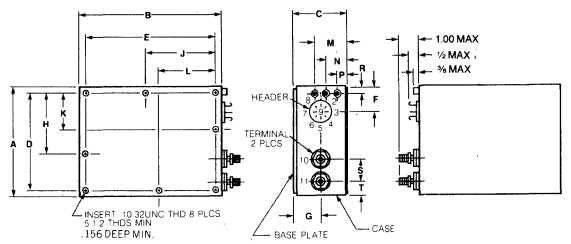
FEATURES

- 300-Watt Single and Triple Output, Switching Power Supply
- High Efficiency, 60% Minimum
- Short Circuit Protection Standard
- Meets MIL-STD-461B, MIL-STD-810C and MIL-S-901C

Output Voltage Range[1] (Main)	Output Voltage Range[1] (Aux)	Output Current[2] (Main)	Output Current[2] (Aux)	Wt.[3] (Lbs.)	Model Number
4.75- 5.25		60		8.0	M300S/ 5-D
11.40-12.60		25		8.0	M300S/12-D
14.25-15.75		20		8.0	M300S/15-D
22.80-25.20		12.5		8.0	M300S/24-D
26.60-29.40		10.7		8.0	M300S/28-D
4.8 - 5.3	±11.4-±12.6	48	2.5	8.2	M300T/5/12-D
4.8 - 5.3	±14.3-±15.8	48	2.0	8.2	M300T/5/15-D

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 35 mV.
2. Maximum output power equals 300 Watts.
3. Weights are ±5%.

MECHANICAL DIMENSIONS (M300T)



A	B	C	D	E	F	G	H	J
6	8	3	5.50	7.50	1 13/32	1½	3.411	4.113

K	L	M	N	P	R	S	T
2.089	3.387	1 11/16	1 3/32	½	⅜	1¼	¾

Tolerances: If a fraction, ±1/32 inch, a decimal, ±.015 inch.

Material: Base—Aluminum 6061-T6, Case—Steel.

Finish: Black flat lacquer per FED-STD-595. Color 37038.

Mounting: 10-32 THD inserts 5/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

OPTIONAL FEATURES

Special Connectors: A military-type hermetically sealed connector is provided as **Option A** in place of our standard header. (To order, replace the "D" in the model number with "A," i.e., M300T/5/15-A or M300S/5-A.)

Severe Shock, Acceleration and Vibration: Special encapsulation, **Option E,** enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration. (To order, add "E" after "D" in model number, i.e., M300T/5/15-DE or M300S/5-DE.)

Wide Input Voltage: With **Option H** the units will operate from 90 to 126.5 V ac, with 20% derating in output power. (To order, add an "H" after the "D" in the model number, i.e., M300T/5/15-DH or M300S/5-DH.)

Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" after "D" in model number, i.e., M300T/5/15-DL or M300S/5-DL.)

Remote Output Adjustment: With **Option R** an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number, i.e., M300T/5/15-DR or M300S/5-DR.)

Wider Operating Temperature: −20°C to +71°C is available with **Option T. Pard** (noise and ripple) specification increases to 200 mV peak-to-peak. (To order, add a "T" after "D" in model number, i.e., M300T/5/15-DT or M300S/5-DT.)

WYE Input: Option -3 changes input to 3-phase, 4 wire "WYE". (To order, add **"-3"** to the end of the model number, i.e., M300T/5/15-3 or M300S/5-D-3).

Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military grade components. (To order, add "-ER" after model number, i.e., M300T/5/15-ER or M300S/5-ER.)

PIN DESIGNATIONS

1. AC Input
2. AC Input
3. Not Used
4. −Sense (Main)
5. +Sense (Main)
6. +Aux. Output
7. Aux. Com.
8. −Aux. Output
9. Case Ground
10. +Main Output
11. −Main Output

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MILITARY POWER SUPPLIES

60 Hz to DC

MODEL
MB100

SPECIFICATIONS

Input: 103.5 to 126.5 V rms standard, 47 to 65 Hz, single phase. Other inputs available (Option H).

Efficiency: 65% minimum at full load.

Line Regulation: 10 mV input change of 103.5 to 126.5 V ac with load constant.

Load Regulation: 10 mV for main output, 0.5% for auxiliary outputs for change from no load to full load with line constant.

Auxiliary Output Tracking Accuracy: The negative output will track the positive output within 100 mV for all rated conditions.

Pard (Noise and Ripple) for Triple Output: 100 mV p-p (Max.); Single Output 5 V: 100 mV p-p; 28 V: 200 mV p-p (Max.).

Isolation Voltage: 700 V dc input to output. 500 V dc input to case, 200 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 V dc.

Temperature Range: Operating: −20°C to +71°C maximum at center of baseplate. Storage: −55°C to +85°C ambient.

Temperature Coefficient: 0.01%/°C maximum for main and auxiliary outputs over the entire temperature range.

Input Transient Protection: Unit will withstand 143.8 V ac for 0.3 second in accordance with MIL-STD-1399, Sec. 103.

Load Transient Recovery Time: Output voltage returns to regulation limits within 0.5 millisecond for main and auxiliary outputs after a 50% change in load current.

Load Transient Over/Undershoot: 0.8 V or 3% (whichever is greater) from nominal voltage set point.

Short Circuit Protection: Completely protected against a short circuit of any duration. Outputs automatically restore to normal when the overload is removed. Auxiliary outputs will fold back for overload.

Current Limiting: Output current is limited to 120% on main, 150% on auxiliary outputs (±10%) under overload conditions.

Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.5 volt in the load leads (on 5 V main output).

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to radiated and conducted interference.

Reliability: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of 50°C baseplate temperature, maximum operating input voltage and maximum rated output power was calculated to be 97,930 hours for a ground benign environment and 17,632 hours for naval sheltered (MB100T).

Environment: Encapsulated and hermetically sealed to meet the environmental requirements of MIL-STD-810C and MIL-S-901 including altitude (to 70,000 ft.), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

Connectors: Standard unit is provided with solder-type, single-pin input terminals and a solder-type, multiple-pin output header.

OPTIONAL FEATURES

Special Connectors: A military-type hermetically sealed connector is provided as **Option A** in place of our standard header. (To order, replace the "D" in the model number with "A," i.e., MB100T/5-12-A or MB100S/5-A.)

Severe Shock, Acceleation and Vibration: Special encapsulation, **Option E,** enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration. (To order, add "E" after "D" in model number, i.e., MB100T/5/12-DE or MB100S/5-DE.)

Wide Input Voltage: With **Option H,** the units will operate from 90 to 130 V ac, with 20% derating in output power. (To order, add an "H" after the "D" in the model number, i.e., MB100T/5/12-DH or MB100S/5-DH.)

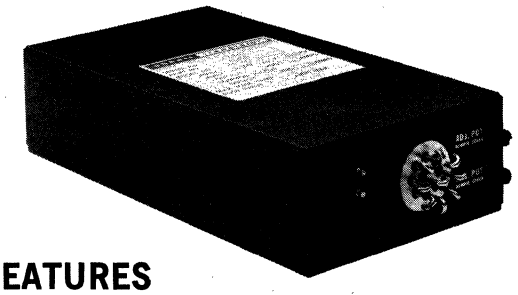
Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" after "D" in model number, i.e., MB-100T/5/12-DL or MB100S/5-DL.)

Remote Output Adjustment: With **Option R,** an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number, i.e., MB100T/5/12-DR or MB100S/5-DR.)

Internal Overvoltage Protection: Option -1 provides a non-crowbar internal OVP on the main output (Output 1). Input must be recycled to restore output. (To order, add "-1" afer "D" in model number, i.e., MB100T/5/12-D-1 or MB100S/5-D-1.)

50/50 Distributed Power: Option -7 distributes 50 watts to the main and 50 watts to the auxiliaries. (To order, add "-7" to the end of the model number, i.e., MB100T/5/12-D-7.)

Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military-grade components. (To order, add "-ER" after model number, i.e., MB100T/5/12-D-ER or MB100S/5-D-ER.)



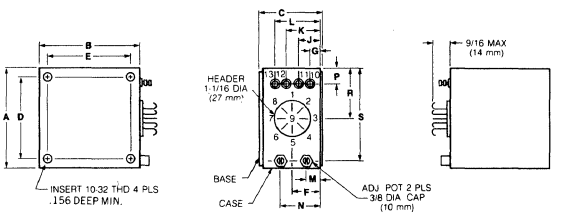
FEATURES

- 100-Watt Single and Triple Output, 200 kHz Switching Power Supply
- High Efficiency, 65% Minimum
- −20°C to +71°C Temperature Range
- Meets MIL-STD-461B, MIL-STD-810C and MIL-S-901C
- Low Profile

Output Voltage Range[1] (Main)	Output Current[2] (Main)	Output Voltage Range[1] (Aux)	Output Current[2] (Aux)	Wgt.[3] (Lbs.)	Wgt.[3] (Kgs.)	Model Number
4.75- 5.25	20.0			3.0	1.5	MB100S/ 5-D
11.40-12.60	8.3			3.0	1.5	MB100S/12-D
14.25-15.75	6.6			3.0	1.5	MB100S/15-D
22.80-25.20	4.2			3.0	1.5	MB100S/24-D
26.60-29.40	3.6			3.0	1.5	MB100S/28-D
4.8 - 5.8	15	±14.5-±15.5	0.8	3.5	1.6	MB100T/5/15-D
4.8 - 5.8	15	±11.5-±12.5	1	3.5	1.6	MB100T/5/12-D

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 35 mV.
2. Maximum output power equals 100 Watts.
3. Weights are ±5%.

MECHANICAL DIMENSIONS (MB100T)



A	B	C	D	E	F	G	J
4	7½	1⅞	3.44	6.94	⅞	⅜	11/16

K	L	M	N	P	R	S
1	1 5/16	9/16	1 9/32	13/16	2 3/32	3¾

Tolerances: If a fraction, ±1/32 inch, if a decimal, ±.015 inch.
Material: Base—Aluminum 6061-T6, Case—Steel.
Finish: Black flat lacquer per FED-STD-595. Color 37038.
Mounting: 10-32 THD inserts 5/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

PIN DESIGNATIONS

1. Ground
2. 5V Common
3. +5V Output
4. +Sense
5. Internal Connection
6. −Sense
7. +V (Aux)
8. −V (Aux)
9. V Common (Aux)
10. AC Input (Hot)
11. AC Input (Neutral)
12. Not Used
13. Not Used

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Eastern Office
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Telex: 13-5332
Fax: (201) 461-2936

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Tel: 0233 638132
Fax: 0233 638134

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MILITARY POWER SUPPLIES

60 Hz/400 Hz to DC

MODEL MB60 WM60

SPECIFICATIONS:

Input: 103.5 to 126.5 V rms standard, MB: 47-440 Hz, single phase; WM: 320 to 480 Hz, single phase.

Input Transient Protection: Unit will withstand 180 Vac for 0.1 second in accordance with MIL-STD-704A, Category B.

Efficiency: Minimum at full load: 65%.

Line Regulation: Input change of 103.5 to 126.5 V rms, with load held constant.
Single: 0.1% or 10mV, whichever is greater.
Triple: 0.1%, all outputs.

Load Regulation: No load to full load, with line held constant.
Single: 10 mV or 0.1%, whichever is greater.
Triple: Main output, 0.2%; Auxiliaries, 0.5%.

Load Transient Recovery: Output voltage returns to regulation limits within 0.5 mS after a 50% change in load current.

Load Transient Overshoot: 0.8V or 3% (whichever is greater) from nominal voltage set point.

Pard (Noise and Ripple): Measured at 25 MHz bandwidth. Single Output Unit: 30mV rms; P-P: 5V – 2.0%, 12 or 15V – 1.0%, 24 or 28V – 0.7%. Triple Output Unit: 30mV rms; 100mV P-P for main and auxiliary outputs. Note: Turn on at low temperature extreme can result in increased PARD measurements prior to unit warm up (1-3) minutes. Consult nearest sales office for applications details.

Temperature Range: MB (single and triple): Operating, –20°C to +85°C maximum, at center of baseplate. Storage, –55°C to +105°C ambient.
WM (single and triple): Operating, –55°C to –100°C maximum, at center of baseplate. Storage, –65°C to +125°C ambient.

Temperature Coefficient: 0.03%/°C maximum over entire temperature range.

Auxiliary Output Tracking: Negative output tracks positive within 100 mV for all rated conditions of line and load at ambient conditions, with positive set at nominal, ±50 mV (250 mV for all rated conditions of line, load, temperature or set point).

Isolation Voltage: 700 VDC, input to output; 500 VDC, input to case; 200 VDC, output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, output and case, when measured at 50 VDC.

Overvoltage Protection: Electronic overvoltage protection standard for singles and main output of triples.

Short Circuit Protection: Completely protected against a short circuit of any duration. Output automatically restores to normal when overload is removed.

Current Limiting: Foldback current limiting standard for all outputs, 120%, ±10% limit for singles and main, 160% for auxiliary outputs, ±30% under overload conditions.

Remote Sensing: On single output units, main output on triple. Compensates for up to 0.5 V drop in load leads.

EMI: Units meet MIL-STD-461C for select curves, please consult factory for detailed information.

Environment: Encapsulated and hermetically sealed units meet MIL-STD-810C altitude, shock and acceleration.

Hook Up: Standard unit is provided with a solder-type multiple-pin output header, and solder turrets.

OPTIONS

"A" – Hermetic Connectors: Replaces solder header/turret with military connectors:
Input: MS3113H10-6P
Output: MS3113H14-12P
Other hermetic, MIL connectors available on special order.

"E" – Severe Shock, Vibration, Acceleration: Extra encapsulent to meet 60g shock, 30g vibration, 50g acceleration and MIL-S-901C, High Impact Shock.

"L" – Remote Enable/Inhibit: Provides for remote turn on/off with TTL logic signal. (Logic 1 will enable).

"ER" – Enhanced Reliability: Provides increased reliability via higher level MIL grade components.

PRODUCT SELECTION GUIDE

Model MB	Main Output/ Current[1]	Output #2[1]	Output #3[1]	Weight[2] (lbs) (kgs)	Model WM
MB60S/5-D	5V@12A			2.10 0.95	WM60S/5-D
MB60S/12-D	12V@5A			2.10 0.95	WM60S/12-D
MB60S/15-D	15V@4A			2.10 0.95	WM60S15-D
MB60S/24-D	24V@2.5A			2.10 0.95	WM60S/24-D
MB60S/28-D	28V@2.14A			2.10 0.95	WM60S/28-D
MB60T/5/12-D	5V@6A	+12V@1.25A	–12V@1.25A	2.16 0.98	WM60T/5/12-D
MB60T/5/15-D	5V@6A	+15V@1A	–15V@1A	2.16 0.98	WM60T/5/15-D

1. Single/Main Output adjust range ±5%, 35 mV resolution. Auxiliary Output adjust ±0.5V.
2. Typical, not including options, weight ±5%.

FEATURES

- Sub-modular internal construction, wireless board to board connections.
- Field proven, 200 kHz, MOS-FET, forward converter topology.
- Input transient protection per MIL-STD-704A, Category B.
- Short circuit protection, foldback current limiting and OVP.
- Meets comprehensive MIL-STD-810C environmental conditions.
- Built in EMI filter to MIL-STD-461C.

RELIABILITY DATA – MTBF

MB Series

Environment:	Ground Benign	Naval Sheltered	Air Inhabited (Attack)	Ground Mobile
MB60S-STD	177,533 hrs	27,289 hrs	23,357 hrs	16,240 hrs
MB60S-ER	290,620 hrs	38,654 hrs	38,802 hrs	23,233 hrs
MB60T-STD	125,901 hrs	21,655 hrs	17,420 hrs	12,960 hrs
MB60T-ER	259,829 hrs	37,236 hrs	37,242 hrs	22,547 hrs

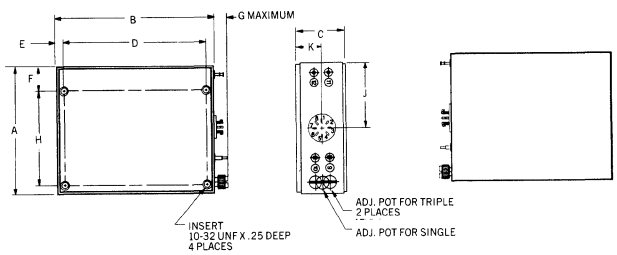
RELIABILITY DATA – MTBF

WM Series

Environment:	Ground Benign	Naval Sheltered	Air Inhabited (Attack)	Ground Mobile
WM60S-STD	91,636 hrs	20,863 hrs	19,500 hrs	13,221 hrs
WM60S-ER	149,839 hrs	28,477 hrs	31,049 hrs	18,142 hrs
WM60T-STD	60,613 hrs	17,283 hrs	15,021 hrs	11,120 hrs
WM60T-ER	117,137 hrs	26,737 hrs	28,839 hrs	17,350 hrs

All MTBF's per MIL-HDK-217E, 50°C baseplate, high line and full load.

MECHANICAL DIMENSIONS



SYM	A	B	C	D	E	F	G	H	J	K
INCHES	4.00	5.00	1.50	4.450	.28	.78	.45	2.950	2.00	.78
MM	101.6	127.0	38.1	113.03	7.1	19.8	11.4	74.93	50.8	19.8

PIN DESIGNATIONS (Single)

1. Not Used	5. Ground	9. +5V
2. Not Used	6. – Sense	10. 5V COM
3. Not Used	7. Not Used	11. + Input
4. + Sense	8. Not Used	12. – Input

Tolerances
(Inches) .XXX = ±0.015 .XX = ±0.03
(MM) .XX = ±0.4 .X = ±0.8

PIN DESIGNATIONS (Triple)

1. COM (Aux)	5. Ground	9. +5V
2. +V (Aux)	6. – Sense	10. 5V COM
3. Not Used	7. Not Used	11. + Input
4. + Sense	8. – V (Aux)	12. – Input

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Fax: (201) 461-2936

European Office
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Tel: 0233 638132
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MILITARY POWER SUPPLIES

60 Hz to DC

MODEL **M** 50 & 100

SPECIFICATIONS

INPUT VOLTAGE: 103.5 to 126.5 Vac, (Vrms) single phase, 47 to 440 Hz. Wide input option is available.
INPUT TRANSIENT PROTECTION: Unit will withstand 143.8 Vac for 0.3 seconds in accordance with MIL-STD-1399. Sec. 103.

INRUSH CURRENT:

MAXIMUM:
(M-50) 16 times the peak input current at low line, full load output, and nominal output voltage, with source impedance of no less than 0.25 ohm.
(M-100) 8 times the peak input current at low line, full load output, and nominal output voltage, with source impedance of no less than 0.25 ohm.

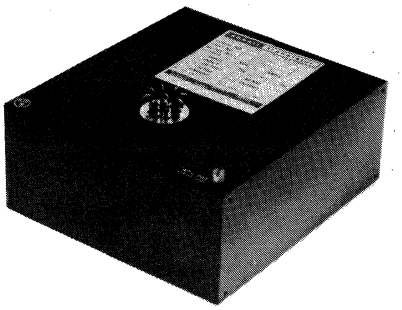
TYPICAL:
(M-50) 8 times the peak input current under the same conditions.
(M-100) 4 times the peak input current under the same conditions.

EFFICIENCY: Minimum 65% @ FL, 25°C baseplate temperature and nominal output. Typical efficiency is 75-81% under same conditions.
LINE REGULATION: Within 0.2% or 25mV, whichever is greater for input change of 103.5 to 126.5 Vac, (Vrms) with load constant.
LOAD REGULATION: Within 0.2% or 25mV, whichever is greater for load change of NL to FL with line constant.
RIPPLE & NOISE: 30mVrms, 100mV, whichever is greater for load change of NL to FL with line constant.
LOAD TRANSIENT RECOVERY TIME: Output Voltage returns to regulation limits within 3 msec after a 50% change in load current. Maximum over/under shoot is less than 0.4 Vdc or 3% of the output voltage, whichever is greater.
BROWNOUT HOLDUP-TIME: 15 msec. minimum at low line and maximum output current, 30 msec. typical at nominal line and maximum output current.
OPERATING TEMPERATURE RANGE: 0°C to 71°C. Wider temperature range is available.

STORAGE TEMPERATURE: −55°C to +85°C.
TEMPERATURE COEFFICIENT: 0.03% per degree Celsius maximum.
ISOLATION: 500 Vdc input to output and input to case. 100 Vdc output to case.
INSULATION RESISTANCE: 50 megohms minimum between input and output, input to case, and output to case when measured at 50 Vdc (Input pins tied together, Output pins tied together).
POLARITY: Input and outputs are isolated, either positive or negative side may be grounded.
OUTPUT VOLTAGE ADJUSTMENT: Output continuously adjustable between the limits shown by means of an externally accessible adjustment potentiometer.

ADJUSTMENT RESOLUTION:	NOMINAL OUTPUT VOLTAGE	RESOLUTION
	5, 12, 15 Vdc units	35 millivolts
	24, 24 Vdc units	60 millivolts

REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "Sensing" leads. The resulting circuit action compensates for a dc voltage drop up to 0.3 volts in the load leads.
OUTPUT IMPEDANCE: dc to 1 KHz; .03 R_L* or 0.5 ohm, whichever is greater. 1 KHz to 10 KHz; 0.5 R_L or 0.1 ohm, whichever is greater. 10 KHz to .100 KHz: 0.7 R_L to 0.3 ohm, whichever is greater. * Rate loaded.
SHORT CIRCUIT PROTECTION: Each unit is completely protected against a short circuit of any duration. Unit automatically recovers to normal when short circuit is removed.
ENVIRONMENT: Unit is hermetically sealed to meet MIL-STD-810C. Unit meets MIL-S-901 (5 foot hammer drop). Certified test reports are available.
EMI: Units meet MIL-STD-461A, CE01, CE03 with optional filter.
JUNCTION TEMPERATURE: Maximum Junction Temperature of the power transistors is 85°C. Complies with NAVMAT NOTE 3080.



103.5-126.5 VAC to 4.7-29.7 VDC 47 to 440 Hz. 1 ∅

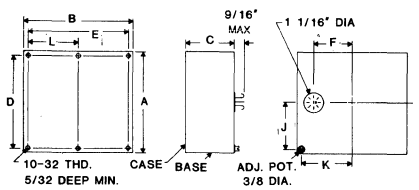
- Tight line and load regulation.
- Wide temperature range.
- High reliability.
- Encapsulated and hermetically sealed Meets MIL-STD-810C and MIL-S-901C.
- Low EMI. Meets MIL-STD-461A, (Radiated C.E. and C.S. specs) with F option.
- High efficiency. 75% to 81% typical.
- Internal OVP available.
- Remote programming optional.
- TTL compatibility available.

OPTIONAL FEATURES

TTL: (L Option) Abbott provides an isolated pair of terminals used to turn on and turn off the regulator portion of the power supply. The unit remains in an idling state while the output is off. The power supply will turn-on with TTL logic "I", and turn-off with TTL logic "0". To specify this feature, please add an "L" to the character preceding the first dash of the model number. EXAMPLE: M100DL-5A, M50DL-5A
OVER-VOLTAGE PROTECTION: (-1 Option) An internal non-crowbar type OVP is available. Power supply turns off when output voltage exceeds set point. Unit input power must be recycled to restore output. To specify this feature, please add a "-1" after the "A" in the model number, EXAMPLE: M100DT-5A-1, M50D-5A-1
WIDER OPERATING TEMPERATURE RANGE: (T Option) −20°C to +71°C peak to peak output ripple spec increases to 200mV. To specify this option, please add a "T" to the character preceding the dash of the model number. EXAMPLE: M100DT-5A, M50DT-5A
SPECIAL CONNECTORS: A hermetically sealed military-type connector is available for the M Series. Please consult your nearest Abbott Sales Office for details.
WIDER INPUT VOLTAGE RANGE: (H Option) The standard input voltage range of the "M" line is 103.5 to 126.5 Vac. For the wider input voltage range of 90-126.5 Vac; output current is derated by 20%. To specify this feature, please add an "H" to the character preceding the first dash in the model number. EXAMPLE: M100DH-5A, M50DH-5A
REMOTE PROGRAM OPTION: (R Option) Units can be modified so that their output voltage can be adjusted from a remote location. This is accomplished by adding an additional pin to the header on the unit. To specify this option, please add an "R" after the character preceding the first dash of the model number. EXAMPLE: M100DR-5A, M50DR-5A
EMI FILTER: (F option) An internal EMI filter is available to reduce conducted interference on the input leads. With these filters the model M's will comply with MIL-STD-461A notice 3, CE01 an CE03 on the input leads. The addition of this filter alters the isolation of the input to case to 200 Vdc. To specify this feature, please add an "F" after the "D" in the model number. EXAMPLE: M100DF-5A, M50DF-5A

ENHANCED RELIABILITY: (ER Option) This option provides increased reliability by using higher levels of Mil. grade components. This feature allows the power supply to meet customer specific requirements as to "Hi Rel" components, environmental testing and extended Thermal Cycling. Please consult your nearest Abbott Sales Office for details.
SPECIAL ENCAPSULATION: (E Option) All of our hermetically sealed power modules are encapsulated to meet or exceed the shock, acceleration, and vibration requirements of MIL-STD-810C. Special encapsulation to enable these modules to withstand higher shock levels of 60g's, acceleration levels of 50g's, and vibration levels of 30g's, is available. To specify this feature, please add an "E" after the character preceding the first dash in the model number. EXAMPLE: M100DE-5A, M50DE-5A

MECHANICAL DIMENSIONS



MODEL	A	B	C	D	E	F	J	K	L
M100	5¾	6¼	2¾	5.25	5.75	2 3/16	2 5/8	2 7/8	2.88
M50	3 7/8	6¼	2¾	3.38	5.75	2 3/16	1 1/16	2 7/8	—

TOLERANCES: FRACTION — ±1/32, DECIMAL — ±.015
MATERIAL: BASE — ALUMINUM 6061-T6, CASE-STEEL
FINISH: BLK FLAT LACQUER FED. STD. 595 COLOR 37038

RELIABILITY

RELIABILITY: MTBF for the Standard version calculated per MIL-HDBK-217D (50°C baseplate temperature, maximum operating input voltage, and maximum rated output power) is shown below.

Model Number	Baseline Temp.	Environment	MTBF
M50D-5A-1(STD)	50°C	Ground Benign	100,659 hrs.
M50D-5A-1(STD)	50°C	Naval Sheltered	16,819 hrs.
M100D-5A-1(STD)	50°C	Ground Benign	71,126 hrs.
M100D-5A-1(STD)	50°C	Naval Sheltered	11,214 hrs.

ENHANCED RELIABILITY: Abbott offers a higher MTBF unit, as shown below. (see optional features)

Model Number	Baseplate Temp.	Environment	MTBF
M50D-5A-1(ER)	50°C	Ground Benign	187,251 hrs.
M50D-5A-1(ER)	50°C	Naval Sheltered	29,261 hrs.
M100D-5A-1(ER)	50°C	Ground Benign	119,095 hrs.
M100D-5A-1(ER)	50°C	Naval Sheltered	18,350 hrs.

TEN STANDARD MODELS

Output Voltage Range	Output Current (Amps)	Weight (Lbs.)	Model Number
4.7-5.3	10.0	4.0	M50D-5A
	20.0	5.0	M100D-5A
11.25-12.75	4.15	4.0	M50D-12A
	8.3	5.0	M100D-12A
14.1-15.9	3.35	4.0	M50D-15A
	6.7	5.0	M100D-15A
22.5-25.5	2.1	4.0	M50D-24A
	4.2	5.0	M100D-24A
26.3-29.7	1.8	4.0	M50D-28A
	3.6	5.0	M100D-28A

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Tel: 0233 638132
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MILITARY POWER SUPPLIES

60 Hz to DC

MODEL **M25**

SPECIFICATIONS

Input: 103.5 to 126.5 V rms, 47 to 440 Hz, single phase. Other inputs available.

Efficiency: 75 to 81% typical. 70% minimum.

Line Regulation: 10 mV for input change of 103.5 to 126.5 V ac with load constant.

Load Regulation: Within 0.2% or 25 mV (whichever is greater) for change of no load to full load with line constant.

Pard (Noise and Ripple): 20 mV rms, 100 mV peak-to-peak measured with scope at 25 MHz bandwidth.

Isolation Voltage: 500 V dc input to output and input to case, 200 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input to case, and output to case when measured at 50 V dc.

Polarity: Inputs and outputs are isolated. Either positive or negative side of output may be grounded.

Temperature Range: Operating: −20°C to +71°C baseplate temperature; storage temperature −55°C to +85°C.

Temperature Coefficient: 0.01%/°C maximum over entire temperature range.

Input Transient Protection: In accordance with MIL-STD 1399. Section 103 (143.8 V ac for 0.3 second.)

Load Transient Response: Output voltage returns to regulation limits within 3 ms after a 50% step change in load current.

Load Transient Overshoot: ±3% or 0.4 V, whichever is greater, maximum from nominal voltage set point.

Holdup Time: 16 ms after nominal input voltage is lost at full load.

Short Circuit Protection: Completely protected against a short circuit of any duration. Output automatically restores to normal after removal of fault (constant current).

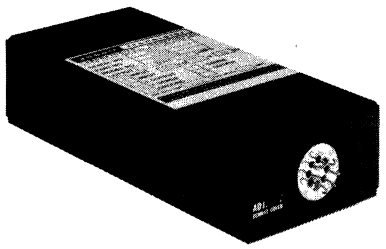
Overvoltage Protection: See Option-1.

Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.3 volt in the load leads.

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to radiated and conducted interference.

Reliability: The MTBF per MIL-HDBK-217D for Model M25D-5A, under operating conditions of 50°C baseplate temperature, maximum operating input voltage and full rated output power is 176,236 hours for ground benign and 32,699 hours for naval sheltered environments. With Enhanced Reliability (Option -ER) ground benign is 758,754 hours, naval sheltered is 124,505 hours for M25D-5A-1-(ER).

Environment: Units are encapsulated and hermetically sealed to meet the environmental requirements of MIL-STD 810C. Units meet MIL-S-901C (5 foot hammer drop).



FEATURES

- High Efficiency, 70% minimum
- 100 kHz Switching Power Supply
- 25 Watt, Single Output
- Low profile
- Meets MIL-STD-461B, MIL-STD-810C and MIL-S-901
- Short Circuit Protection Standard

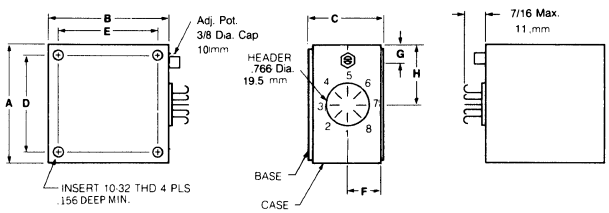
5 STANDARD MODELS

Output Voltage Range[1]	Output Current (Amps)	Weight[2] (Lbs.)	Model Number
4.75-5.3	5	1.8	M25D-5A
11.25-12.75	2.1	1.8	M25D-12A
14.1-15.9	1.7	1.8	M25D-15A
22.5-25.5	1.1	1.8	M25D 24A
26.3-29.7	0.9	1.8	M25D-28A

1 Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 35 millivolts for nominal output voltages of 5 to 15 V dc and 60 millivolts for nominal outputs of 24 to 28 V dc.

2 Weights are 5%.

MECHANICAL DIMENSIONS



Model M25

A	B	C	D	E	F	G	H
2¾	6¼	1½	2.25	5.75	11/16	½	1⅜

Tolerances: If English unit is a fraction, ±1/32 inch, (0.8 mm); if English unit is a decimal, ±.015 inch, (0.4 mm).

Material: Base — Aluminum 6061-T6. Case — Steel.

Finish: Black flat lacquer per FED-STD-595. Color 37038.

Mounting: 10-32 THD inserts 3/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

OPTIONAL FEATURES

The following standard options are available on the M25 Series power supplies.

Special Connectors: A military-type hermetically sealed connector is provided as **Option A** in place of our standard header. (To order, replace "D" in model number with "A," i.e., M25A-5A.)

Severe Shock, Acceleration and Vibration: Special encapsulation, **Option E,** enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration. (To order, add "E" after "D" in model number, i.e., M25DE-5A.)

Wide Input Voltage: Option H input range is 90 to 126.5 V rms. Output current is derated by 20%. (To order, add "H" after "D" in model number, i.e., M25DH-5A.)

Remote Output Adjustment: With **Option R** an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number, i.e., M25DR-5A.)

Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" to character preceding first dash in model number, i.e., M25DL-5A.)

Internal Overvoltage Protection: Option -1 provides non-crowbar electronic internal OVP. Input must be recycled to restore output. (To order, add "-1" after "A" in model number, i.e., M25D-5A-1.)

Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military-grade components. (To order, add "-ER" after "A" in model number, i.e., M25D-5A-ER.)

PIN DESIGNATIONS

1. AC Input
2. AC Input
3. −Sense
4. −Output (DC)
5. −Output (DC)
6. +Output (DC)
7. +Output
8. +Sense

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MILITARY POWER SUPPLIES

60 Hz to DC

MODEL LV

SPECIFICATIONS

INPUT: 105 to 125 VRMS, 55 to 65 Hz or 380 to 420 Hz single phase. May be operated down to 47 Hz with 20% derating.

EFFICIENCY: 35% typical for 5V; 65% for 28V.

LINE REGULATION: 0.05% (±1 VC for LLV model).

LOAD REGULATION: 0.10%.

PARD (NOISE & RIPPLE): 1 mVRMS or 5 mV p-p.

OUTPUT ADJUSTMENT RANGE: ±5% of nominal at output terminals.

ISOLATION VOLTAGE: 500 VDC input to output, input to case and output to case.

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case when measured at 50 VDC.

POLARITY: Inputs and outputs are isolated, either positive or negative output may be grounded.

TEMPERATURE RANGE: Operating −20°C to +71°C baseplate temperature; −40°C to +85°C (Option T); storage: −55°C to +85°C.

TEMPERATURE EFFECT COEFFICIENT: 0.015% per degree Celsius maximum.

ENVIRONMENT: Hermetically sealed to meet envimental requirements of MIL-STD-810C. Meet MIL-S-901C 5-ft. hammer drop.

ADJUSTMENT RANGE: Equipped with internal potentiometer. External adjustment potentiometer available.

SHORT CIRCUIT PROTECTION: Completely protected against short circuit of any duration. Output automatically restores to normal after removal of short.

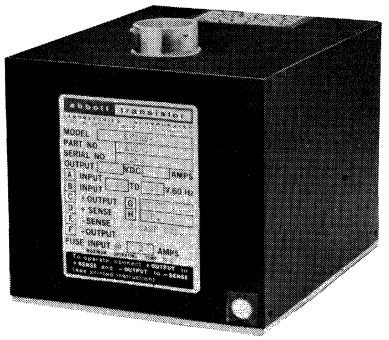
INPUT TRANSIENT PROTECTION: 143.8 VRMS, for 0.3 seconds.

REMOTE ERROR SENSING: (LV series only). Regulator monitors output voltage directly at the load using extra "sensing" leads and compensates for dc voltage drop up to 0.4 volt in load leads.

LOAD TRANSIENT: Output voltage returns to regulation limit within 100 microseconds after 50% step change in load current.

ELECTROMAGNETIC INTERFERENCE: Meets MIL-STD-461A, methods CE01 and CE03 for conducted emissions.

RELIABILITY: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of +50°C baseplate temperature, maximum rated output power for LV5DE20-1 was calculated to be 68,987 hrs. for ground benign environment and 10,384 hrs. for naval sheltered environment. MTBF for LLV12-DE0.5-1 was calculated to be 186,947 hrs. for a ground benign environment and 30,081 for naval sheltered environment. With Enhanced Reliability Option (ER) MTBF for LV5DE20-1 (ER) was calculated to be 236,033 hrs. for ground benign environment and 35,585 hrs. for naval sheltered environment. For LLV12DE0.5-1 (ER) MTBF was calculated to be 330,349 hrs. for ground benign environment and 50,682 hrs. for a naval sheltered environment.



FEATURES

- Up to 65% efficiency
- Low Output Ripple, 5 mV peak-to-peak
- 0.1% Regulation
- Single and Dual Outputs

SINGLE OUTPUT: LV SERIES				
Output Voltage Range (VDC)	**Output Current (Amps)**	**Size (see Dwg.)**	**Weight (Lbs.)**	**Model Number**
4.75 to 5.25	2.4	9A	3.7	LV5DE2.4
	6.0	11C	6.9	LV5DE6
	10.0	12A	9.2	LV5DE10
	20.0	13B	13.0	LV5DE20
11.4 to 12.6	1.7	9A	3.7	LV12DE1.7
	4.0	11C	6.9	LV12DE4
	7.5	12A	9.2	LV12DE7.5
14.2 to 15.7	1.5	9A	3.7	LV15DE1.5
	3.0	11C	7.8	LV15DE3
14.5 to 15.5	4.0	12A	9.2	LV15DE4
22.8 to 25.2	0.9	9A	3.7	LV24DE0.9
	2.5	11C	6.9	LV24DE2.5
	3.9	12A	9.2	LV24DE3.9
	7.5	13B	13.0	LV24DE7.5
26.6 to 29.4	0.75	9A	3.7	LV28DE0.75
	2.0	11C	6.7	LV28DE2
	3.15	12A	9.0	LV28DE3.15
	7.5	13B	15.6	LV28DE7.5
DUAL OUTPUT: LLV SERIES				
±11 to ±13	0.5	11N	4.9	LLV12DE0.5
	0.9	12K	6.6	LLV12DE0.9
	1.5	13D	9.1	LLV12DE1.5
±14 to ±16	0.5	11N	4.9	LLV15DE0.5
	0.9	12K	6.6	LLV15DE0.9
	1.5	13D	9.1	LLV15DE1.5

OPTIONAL FEATURES

TTL: (L Option) Abbott provides an isolated pair of terminals used to turn-on and turn-off the regulator portion of the power supply. The unit remains in an idling state while the output is off. The power supply will turn-on with TTL logic "1", and turn-off with TTL logic "0". To specify this feature, please add an "L" to the character after the character "E" in the model number. (EXAMPLE: LV5DE6 to LV5DEL5)

SPECIAL CONNECTORS: A hermetically sealed military-type connector is available for the LV series (as shown in picture). Please consult your nearest Abbott Sales Office for details.

WIDER OPERATING TEMPERATURE RANGE: (T Option) −40°C to +85°C operating temperature range available. Please consult your nearest Abbott Sales Office for details.

OVER TEMPERATURE PROTECTION: (OT Option) Removes input power when conduction surfaces exceed safe limits. Please consult your nearest Abbott Sales Office for details.

OVERVOLTAGE PROTECTION: (-1 Option) An internal crowbar type OVP is available. Unit will crowbar output when output voltage exceeds adjustable set point. Unit input power must be recycled to restore unit. To specify this feature, please add a "-1" after the last number in the model number. (EXAMPLE: LV5DE6 to LV5DE6-1)

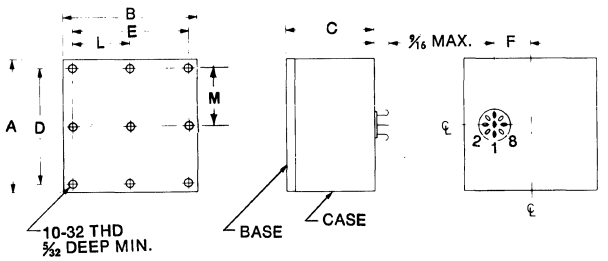
WIDER INPUT VOLTAGE RANGE: (H Option) Available at a voltage range 210 to 250 VAC. Please consult your nearest Abbott Sales Office for details.

ENHANCED RELIABILITY: (ER Option) This option provides increased reliability by using enhanced military grade components. This feature allows the power supply to meet customer specific requirements as to "Hi-Rel" components.

PIN DESIGNATIONS

Standard Header	Mil-Spec Connector	Standard Models LV	Standard Models LLV	Models with Internal OVP LV	Models with Internal OVP LLV	Models with TTL (Option L) LV	Models with TTL (Option L) LLV
1	A	AC Input	AC Input	AC Input	AC Input	AC Input	AC Input
2	B	AC Input	AC Input	AC Input	AC Input	AC Input	AC Input
3	K	Ground	Ground	Ground	Ground	+5 Logic	+5 Logic
4	J	Not Used	Not Used	OVP Trim	+OVP Trim	5V Return	5V Return
5	C	+Output	+Output	+Output	+Output	+Output	+Output
6	D	+Sense	Common Output	+Sense	Common Output	+Sense	Common Output
7	E	−Output	−Output	−Output	−Output	−Output	−Output
8	F	−Sense	Not Used	−Sense	−OVP Trim	−Sense	Not Used
9	H	Output Trim	Output Trim	Output Trim	Output Trim	Output Trim	Output Trim
—	G	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

MECHANICAL DIMENSIONS



SIZE	A	B	C	D	E	F	L	M
9A	2¾	4¾	3¾	2.25	4.25	⅞	—	—
11C	4¼	5¼	4	3.75	4.75	1⅛	2.375	—
12A	4½	6	4	4.00	5.5	2¼	2.75	—
13B	5½	6½	5	5.00	6	2	3	—
11N	3	6	3⅜	2.50	5.5	2	—	—
12K	4	6¼	3⅜	3.50	5.75	⅞	2.875	—
13D	5½	6	3⅜	5.00	5.5	1½	2.75	2.75

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MILITARY POWER SUPPLIES

400 Hz to DC

MODEL
WM100

SPECIFICATIONS

Input: 103.5 to 126.5 V rms standard, 320 to 480 Hz, single phase. Other inputs available (See Options H and -3).

Efficiency: 65% minimum at full load.

Line Regulation: 10 mV for input change of 103.5 to 126.5 V ac with load constant.

Load Regulation: 10 mV on main output. 0.5% on auxiliary outputs for change of no load to full load with line constant.

Auxiliary Output Tracking Accuracy: The negative output will track the positive output within 100 mV for all rated conditions. (WM100T).

Pard (Noise and Ripple) for Triple Output: 100 mV p-p (Max.); Single Output 5 V: 100 mV p-p; 28 V: 200 mV p-p (Max.).

Isolation Voltage: 700 V dc input to output. 500 V dc input to case, 200 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 V dc.

Temperature Range: Operating: −55°C to +100°C maximum at center of baseplate. Storage: −65°C to +125°C ambient.

Temperature Coefficient: 0.01%/°C maximum for main and auxiliary outputs over entire temperature range.

Input Transient Protection: Unit will withstand 180 V ac for 0.1 second in accordance with MIL-STD-704A category B.

Load Transient Recovery Time: Output voltage returns to regulation limits within 0.5 millisecond for main and auxiliary outputs after a 50% change in load current.

Load Transient Over/Undershoot: 0.8 V or 3% (whichever is greater) from nominal voltage set point.

Holdup Time: 2.0 ms after nominal input is lost at full load.

Short Circuit Protection: Completely protected against a short circuit of any duration. Outputs automatically restore to normal when the overload is removed. Auxiliary outputs will fold back for overload.

Current Limiting: Output current is limited to 120% on main, 150% on auxiliary outputs (± 5%) under overload conditions.

Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.5 volt in the load leads (on 5 V main output).

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to radiated and conducted interference.

Reliability: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of 50°C baseplate temperature, maximum operating input voltage and maximum rated output power was calculated to be 99,468 hours for a ground benign environment and 14,985 hours for Air Inhabited (WM100T).

Environment: Encapsulated and hermetically sealed to meet the environmental requirements of MIL-STD-810C and MIL-S-901C including altitude (to 70,000 ft.), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

Connectors: Standard unit is provided with solder-type, single-pin input terminals and a solder-type multiple-pin, output header.

Output Voltage Range[1] (Main)	Output Current[2] (Main)	Output-Voltage Range[1] (Aux)	Output Current[2] (Aux)	Wgt.[3] (Lbs.)	Wgt.[3] (Kgs.)	Model Number
4.75-5.25	20.0			3.0	1.5	WM100S/5-D
11.40-12.60	8.3			3.0	1.5	WM100S/12-D
14.25-15.75	6.6			3.0	1.5	WM100S/15-D
22.80-25.20	4.2			3.0	1.5	WM100S/24-D
26.60-29.40	3.6			3.0	1.5	WM100S/28-D
4.8-5.8	15.0	±11.5-±12.5	1	3.5	1.6	WM100T/5/12-D
4.8-5.8	15.0	±14.5-±15.5	0.8	3.5	1.6	WM100T/5/15-D

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 35 mV.
2. Maximum output power equals 100 Watts.
3. Weights are ±5%.

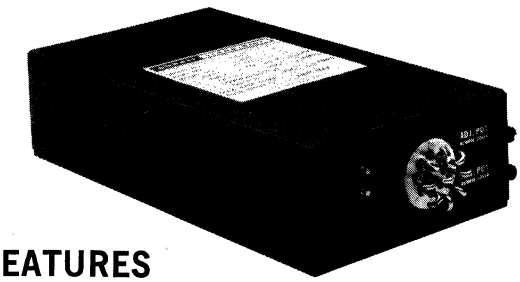
OPTIONAL FEATURES

Special Connectors: Military-type hermetically sealed connectors are provided as **Option A** in place of our standard header and the input terminals. (To order, replace the "D" in the Model number with "A," i.e., WM100T/5/12-A or WM100S/5-A.)

Severe Shock, Acceleration and Vibration: Special encapsulation, **Option E,** enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration, (To order, add "E" after "D" in model number, i.e., WM100T/5/12-DE orWM100S/5-DE.)

Wide Input Voltage: With **Option H,** the units will operate from 90 to 130 V ac, with 20% derating in output power. (To order, add an "H" after the "D" in the model number i.e., WM100T/5/12-DH or WM100S/5-DH.)

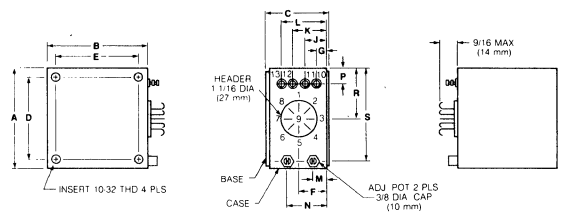
Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" after "D" in model number i.e., WM-100T/5/12-DL or WM100S/5-DL.)



FEATURES

- 100-Watt Single and Triple Output, 200 kHz Switching Power Supply
- High Efficiency, 65% Minimum
- −55°C to +100°C Temperature Range
- Meets MIL-STD-461B, MIL-STD-810C and MIL-STD-704A
- Low Profile

MECHANICAL DIMENSIONS (WM100T)



A	B	C	D	E	F	G	J
4	7½	1⅛	3.44	6.94	⅞	⅜	11/16

K	L	M	N	P	R	S
1	1 15/16	9/16	1 5/32	13/16	2 9/32	3¾

Tolerances: If a fraction, ±1/32 inch, if a decimal, ±.015 inch.

Material: Base—Aluminum 6061-T6. Case—Steel.

Finish: Black flat lacquer per FED-STD-595, Color 37038.

Mounting: 10-32 THD inserts 5/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

PIN DESIGNATIONS

1. Ground
2. 5V Common
3. +5V Output
4. +Sense
5. Internal Connection
6. −Sense
7. +V (Aux)
8. −V (Aux)
9. V Common (Aux)
10. AC Input (Hot)
11. AC Input (Neutral)
12. Not Used
13. Not Used

Remote Output Adjustment: With **Option R,** an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number i.e., WM100T/5/12-DR or WM100S/5-DR.)

Internal Overvoltage Protection: Option -1 provides a non-crowbar internal OVP on the main output (Output 1). Input must be recycled to restore output. (To order, add "-1" after "D" in model number, i.e., WM100T/5/12-D-1 or WM100S/5-D-1.)

WYE Input: Option -3 changes input to 3-phase, 4 wire "WYE." (To order, add "-3" to the end of the model number, i.e., WM100T/5/12-3 or WM100S/5-D-3.)

50/50 Distributed Power: Option -7 distributes 50 watts to the main and 50 watts to the auxiliaries. (To order, add "-7" to the end of the model number, i.e., WM100T/5/12-D-7.)

Enhanced Reliability: -ER Option provides increased reliability by using enhanced military-grade components. (To order, add "-ER" after model number, i.e., WM100T/5/12-D-ER or WM100S/5-D-ER.)

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MILITARY POWER SUPPLIES

400 Hz to DC

MODEL **W** and WW

SPECIFICATIONS

INPUT VOLTAGE RANGE: 105 to 125 VRMS

INPUT FREQUENCY RANGE: 380 to 420 Hertz, 1 phase

INPUT POWER: Per MIL-STD-704A for category B equipment

LINE REGULATION: 0.1% (0.2% for duals) or 10 mv (whichever is greater) for input change of 105 to 125 VRMS with load constant

LOAD REGULATION: 0.1% (0.2% for duals) or 20 mv (whichever is greater) for change from no load to full load with line constant

RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 25 mv peak-to-peak maximum, each output, measured with scope having 25 MHz bandwidth

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accessible screwdriver adjustment potentiometer

TRACKING ACCURACY: The negative output will track the positive output to within 1.0% or 100 mv (whichever is greater) for all rated conditions of input voltage, output current, operating temperature, and output voltage adjustment

ISOLATION VOLTAGE: 750 vdc input to output and input to case • 200 vdc output to case

INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 vdc.

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded

TEMPERATURE RANGE: Operating: −55°C to +100°C maximum at center of mounting base Storage: −65°C to +125°C

TEMPERATURE COEFFICIENT: 0.03% per degree Celsius maximum

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810C and MIL-E-5400P, Class 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, fungus, explosion, etc.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output automatically restores to normal when the overload is removed

INPUT TRANSIENT PROTECTION: MIL-STD-704A Figure 3, Limit 1 (180 VAC for 0.1 seconds)

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 100 microseconds (200 microseconds for duals) after 50% step change in load current

ELECTROMAGNETIC INTERFERENCE: Built to meet the requirements of MIL-STD-461 for generation of and susceptibility to radiated and conducted interference

High Performance

- Encapsulated and hermetically sealed to meet MIL-STD-810C and MIL-E-5400P, Class 2.
- Operating temperature range: −55°C to +100°C.
- Low Peak-to-Peak Ripple.
- Tight line and load regulation.
- High reliability. Up to 214,600 hrs. MTBF per MIL-HDBK-217C.
- Compact. Power density up to 2 watts per cu. in.
- Low EMI.

RELIABILITY: MTBF per MIL-HDBK-217C up to 214.600 Hrs.

OVER-VOLTAGE PROTECTION*: An internal, non-crowbar type OVP is available. Power supply turns off when output voltage exceeds set-point.

TTL*: Abbott provides an isolated pair of terminals used to turn-on and turn-off the regulator portion of the power supply. The unit remains in an idling state while the output is off.

* Inclusion of these optional features on these models will most likely require that the case size increases slightly. Please consult nearest Abbott sales office for further details.

Output Voltage Range	Output Curr. (Amps)	Size*	Wt. (Lbs.)	Model Number
4.5-5.5	2.5	2E	1.9	W5D2.5
	5.0	4D	2.7	W5D5.0
	10.0	10B	5.1	W5D10
	15.0	14C	8.9	W5D15
	20.0	14C	8.9	W5D20
5.5-6.5	2.5	2E	1.9	W6D2.5
	5.0	4D	2.7	W6D5.0
	10.0	10B	5.1	W6D10
	15.0	14C	8.9	W6D15
	20.0	14C	8.9	W6D20
6.5-7.5	2.5	2E	1.9	W7D2.5
	5.0	4D	2.7	W7D5.0
	10.0	10B	5.1	W7D10
	15.0	14C	8.9	W7D15
	20.0	14C	8.9	W7D20
7.5-8.5	2.5	2E	1.9	W8D2.5
	5.0	4D	2.7	W8D5.0
	10.0	10B	5.1	W8D10
	15.0	14C	8.9	W8D15
	20.0	14C	8.9	W8D20
8.5-9.5	2.5	2E	1.9	W9D2.5
	5.0	4D	2.7	W9D5.0
	10.0	10B	5.1	W9D10
	15.0	14C	8.9	W9D15
	20.0	14C	8.9	W9D20
9.5-10.5	2.5	2E	1.9	W10D2.5
	5.0	4D	2.7	W10D5.0
	10.0	10B	5.1	W10D10
	15.0	14C	8.9	W10D15
	20.0	14C	8.9	W10D20
10.5-11.5	2.5	2E	1.9	W11D2.5
	5.0	4D	2.7	W11D5.0
	10.0	10B	5.1	W11D10
	15.0	14C	8.9	W11D15
	20.0	14C	8.9	W11D20

Output Voltage Range	Output Curr. (Amps)	Size*	Wt. (Lbs.)	Model Number
11-13	2.5	2E	1.9	W12D2.5
	5.0	4D	2.7	W12D5.0
	10.0	10B	5.1	W12D10
	15.0	14C	8.9	W12D15
	20.0	14C	8.9	W12D20
13-15	1.2	2E	1.9	W14D1.2
	2.5	4D	2.7	W14D2.5
	5.0	10B	5.1	W14D5.0
	10.0	14C	8.9	W14D10
	15.0	14C	8.9	W14D15
14-16	1.2	2E	1.9	W15D1.2
	2.5	4D	2.7	W15D2.5
	5.0	10B	5.1	W15D5.0
	10.0	14C	8.9	W15D10
	15.0	14C	8.9	W15D15
15-17	1.2	2E	1.9	W16D1.2
	2.5	4D	2.7	W16D2.5
	5.0	10B	5.1	W16D5.0
	10.0	14C	8.9	W16D10
	15.0	14C	8.9	W16D15
17-19	1.2	2E	1.9	W18D1.2
	2.5	4D	2.7	W18D2.5
	5.0	10B	5.1	W18D5.0
	10.0	14C	8.9	W18D10
19-21	1.2	2E	1.9	W20D1.2
	2.5	4D	2.7	W20D2.5
	5.0	10B	5.1	W20D5.0
	10.0	14C	8.9	W20D10
21-23	1.2	2E	1.9	W22D1.2
	2.5	4D	2.7	W22D2.5
	5.0	10B	5.1	W22D5.0
	10.0	14C	8.9	W22D10
23-25	1.2	2E	1.9	W24D1.2
	2.5	4D	2.7	W24D2.5
	5.0	10B	5.1	W24D5.0
	10.0	14C	8.9	W24D10

Output Voltage Range	Output Curr. (Amps)	Size*	Wt. (Lbs.)	Model Number
25-27	1.2	2E	1.9	W26D1.2
	2.5	4D	2.7	W26D2.5
	5.0	10B	5.1	W26D5.0
	10.0	14C	8.9	W26D10
27-29	1.2	2E	1.9	W28D1.2
	2.5	4D	2.7	W28D2.5
	5.0	10B	5.1	W28D5.0
	10.0	14C	8.9	W28D10
DUAL OUTPUT				
±3.75-±4.25	0.3	8B	1.9	WW4D0.3
	0.5	9C	2.2	WW4D0.5
	1.0	9C	2.2	WW4D1.0
	2.0	9D	3.1	WW4D2.0
	4.0	11D	5.5	WW4D4.0
±4.5-±5.5	0.3	8B	1.9	WW5D0.3
	0.5	9C	2.2	WW5D0.5
	1.0	9C	2.2	WW5D1.0
	2.0	9D	3.1	WW5D2.0
	4.0	11D	5.5	WW5D4.0
±11-±13	0.3	8B	1.9	WW12D0.3
	0.5	9C	2.2	WW12D0.5
	1.0	9C	2.2	WW12D1.0
	2.0	9D	3.1	WW12D2.0
	4.0	11D	5.5	WW12D4.0
±14-±16	0.3	8B	1.9	WW15D0.3
	0.5	9C	2.2	WW15D0.5
	1.0	9C	2.2	WW15D1.0
	2.0	9D	3.1	WW15D2.0
	4.0	11D	5.5	WW15D4.0
±29-±31	0.3	9C	2.2	WW30D0.3
	0.5	9C	2.2	WW30D0.5
	1.0	9D	3.1	WW30D1.0
	2.0	11D	5.5	WW30D2.0
	4.0	14C	8.0	WW30D4.0

Other standard Models with any output up to 100 vdc are available. For complete information, please consult our nearest office. * See page D•1542 for size charts.
Other standard Models with any output between ±2.75 and ±31.0 vdc are available. For complete information, please consult our nearest office.

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MILITARY POWER SUPPLIES

400 Hz to DC

MODEL WL AND WWL

SPECIFICATIONS

INPUT VOLTAGE RANGE: 105-125 VRMS 3ϕ delta.

INPUT FREQUENCY RANGE: 380-420 Hz.

INPUT TRANSIENT PROTECTION: 180 VRMS for 0.1 seconds per MIL-STD-704, Figure 3, Limit 1.

LINE REGULATION: 0.1% or 20 mV, whichever is greater.

ELECTROMAGNETIC INTERFERENCES: Meets MIL-STD-461A, methods CE and CS for conducted emissions.

TURN-ON/TURN-OFF OVERSHOOT: 0.2% or 20 mV, whichever is greater.

LOAD REGULATION: 0.1% or 20 mV, whichever is greater. For load change of no load to full load.

RIPPLE: 0.02% or 5 mVRMS (whichever is greater) 25 mV peak-to-peak.

TRACKING ACCURACY: (WWL models only) The negative output will track the positive output to within 100 mV for all rated conditions of input voltage, output current, operating temperature, and output voltage adjustment.

POLARITY: Outputs are isolated. Either positive or negative may be grounded.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output voltage automatically restores to normal when the overload is removed.

REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "sensing" leads. The regulator circuit action compensates for a DC voltage drop up to 0.5 volts in the load leads.

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limit within 100 microseconds after 50% step change in load current for units outputting 10A or less.

ISOLATION VOLTAGE: 750 VDC between input and output, input and case, and 200 VDC between output and case.

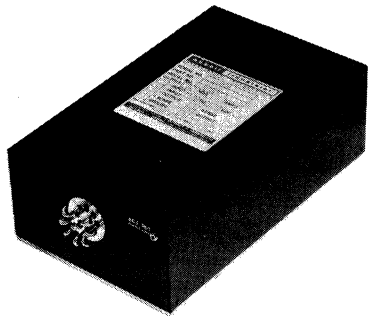
INSULATION RESISTANCE: 50 megohms minimum between input and output, input and case when measured at 50 VDC.

TEMPERATURE RANGE: −55°C to +80°C baseplate temperature. 80% rated power at −55°C to +100°C. Storage: −65°C to +125°C.

RELIABILITY: MTBF per MIL-HBK-217D under operating conditions of 50°C baseplate temperature, maximum rated output power for standard model was calculated to be 164,406 hrs. for ground benign environment and 25,633 hrs. for air inhabited transport. With Enhanced Reliability Option (ER) MTBF was calculated to be 883,580 hrs. for ground benign environment and 94,956 hrs. for air inhabited transport.

ENVIRONMENT: Hermetically sealed and encapsulated to meet MIL-STD-810C, including altitude (to 1.3 inches of Hg), acceleration, vibration, shock and temperature altitude cycling.

EFFICIENCY: Typical 55%.



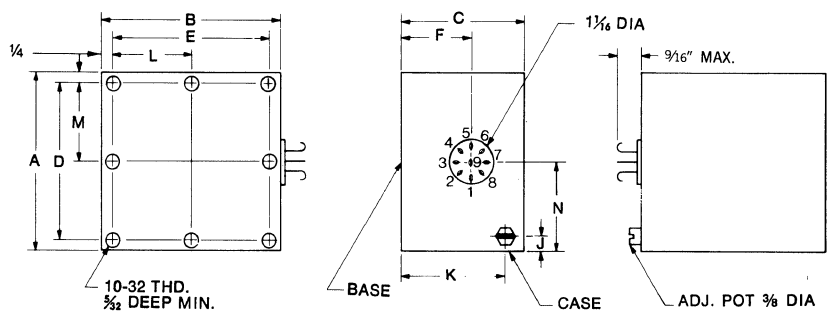
SINGLE OUTPUT: WL SERIES

Output Voltage Range (VDC)	Output Current (Amps)	Size (see Dwg.)	Model Number
4.8 to 5.8	20	12R	WL5.3D-20
5.8 to 6.8	20	12R	WL6.3D-20
11 to 13	10	12R	WL12D-10
11 to 13	20	12N	WL12D-20
14 to 16	12	12R	WL15D-12
23 to 25	7.5	12R	WL24D-7.5
23 to 25	15	12N	WL24D-15
27 to 29	10	12N	WL28D-10
27 to 29	15	12N	WL28D-15

DUAL OUTPUT: WWL SERIES

Output Voltage Range (VDC)	Output Current (Amps)	Size (see Dwg.)	Model Number
±11 to 13	2	11S	WWL12D-2
±14 to 16	2	11S	WWL15D-2

MECHANICAL DIMENSIONS



OPTIONAL FEATURES

OVERVOLTAGE PROTECTION: (−1 Option) An internal crowbar-type OVP is available. Unit will crowbar output when output voltage exceeds adjustable set point, to 10% or 2V above maximum rated output. To specify option, add "−1" to model number.

ENHANCED RELIABILITY: (ER Option) This option provides increased reliability by using a higher level of military grade components. This feature allows the power supply to meet customer specific requirements as to "Hi-Rel" components. Please consult your nearest Abbott Sales Office for details.

TTL: (L Option) Abbott provides an isolated pair of terminals used to turn-on and turn-off the regulator portion of the power supply. The unit remains in an idling state while the output is off. The power supply will turn-on with TTL logic "1" and turn-off with TTL logic "0". To specify this feature, please add an "L" to the character preceding the first dash of the model number.

3ϕ WYE: (−3 Option) This input voltage is also available as an option. To specify, add "−3" to the end of the model number.

SIZE	A	B	C	D	E	F	J	K	L	M	N
11S	3¼	6	2½	2.75	5.50	1½	¼	2⅛	2.75	—	1⅜
12N	4¾	8¾	2¾	4.25	8.25	1½	¼	2¼	4.13	—	2⅜
12R	4¾	8	2¾	4.25	7.5	1½	¼	2¼	3.75	—	1⅞

TOLERANCE: Fractions = ±1/32, Decimals = .015, ±.050
MATERIAL: Base — Aluminum 6061-T6, Case — Steel

PIN DESIGNATIONS:

	Single Output	Dual Output		Single Output	Dual Output		Single Output	Dual Output
1	AC Input	AC Input	4	+ Output	+ Output	7	− Sense	− Output
2	AC Input	AC Input	5	+ Sense	+ Sense	8	Case Gnd	− Sense
3	AC Input	AC Input	6	− Output	Com Output	9	Not Used	Case Gnd

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MILITARY POWER SUPPLIES

28 VDC to DC

MODEL **BC200**

SPECIFICATIONS

Input: 22 to 32 V dc standard, 18 to 32 V dc optional (see Option H).

Efficiency: 60% minimum at full load.

Line Regulation: 10 mV for input change of 22 to 32 V dc with load constant.

Load Regulation: 10 mV main output. 0.5% on auxiliary outputs for change of no load to full load with line constant.

Auxiliary Output Tracking Accuracy: The negative output will track the positive output within 100 mV for all rated conditions (BC200T).

Pard (Noise and Ripple) for Main and Auxiliary Outputs: 20 mV rms; 100 mV peak to peak (maximum), at 25 MHz scope bandwidth, over the entire temperature range.

Isolation Voltage: 400 V dc input to output, 200 V dc input to case, 200 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 V dc.

Temperature Range: Operating: −55°C to +100°C maximum at center of baseplate. Storage: −65°C to +125°C ambient.

Temperature Coefficient: 0.01%/°C maximum for main and auxiliary outputs over entire temperature range.

Input Transient Protection: Unit will withstand 50 V dc for 0.1 second in accordance with MIL-STD-704D.

Load Transient Recovery Time: Output voltage returns to regulation limits within 0.5 millisecond for main and auxiliary outputs after a 50% charge in load current.

Load Transient Overshoot: 0.8 V or 3% (whichever is greater) from nominal voltage set point.

Short Circuit Protection: Completely protected against a short circuit of any duration. Outputs automatically restore to normal when overload is removed. Auxiliary outputs will fold back for overload.

Current Limiting: Output current is limited to 120% on main, 150% on auxiliary outputs (±10%) under overload conditions.

Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.5 volts in the load leads (on 5 V main output).

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to radiated and conducted interference.

Reliability: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of 50°C baseplate temperature, maximum operating input voltage and maximum rated output was calculated to be 75,274 hours for a ground benign environment and 27,522 hours for an air inhabited environment. With -ER option MTBF was calculated to be 560,669 hours for a ground benign environment and 175,234 hours for an air inhabited environment.

Environment: Encapsulated and hermetically sealed to meet environmental requirements of MIL-STD-810C including altitude (to 70,000 ft.), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

Connectors: Standard unit is provided with an input and main output "hermetic seal" stud connector, for the auxiliary outputs a solder-type multiple-pin, output header.

Output Voltage Range[1] (Main)	Output Current[1] (Main)	Output Voltage Range[1] (Aux)	Output Current[2] (Aux)	Weight[3] (Lbs.)	Model Number
4.75-5.25	40.0			5.5	BC200S/5-D
11.40-12.60	17.0			5.5	BC200S/12-D
14.25-15.75	13.5			5.5	BC200S/15-D
22.80-25.20	8.5			5.5	BC200S/24-D
26.60-29.40	7.5			5.5	BC200S/28-D
4.8-5.8	30	±11.5-±12.5	2.1	5.5	BC200T/5/12
4.8-5.8	30	±14.5-±15.5	1.7	5.5	BC200T/5/15

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 35 mV.
2. Maximum output power equals 200 Watts.
3. Weights are ±5%.

OPTIONAL FEATURES

All options apply to both single and triple output units unless otherwise specified.

Special Connectors: Military-type hermetically sealed connectors are provided as **Option A** in place of our standard header and studs. (To order, replace the "D" in the model number with "A," i.e., BC200S/5/12-A.)

Severe Shock, Acceleration and Vibration: Special encapsulation, **Option E**, enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration. (To order, add "E" after "D" in model number, i.e., BC200T/5/12-DE.)

Wide Input Voltage: With **Option H**, the units will operate from 18 to 32 V dc, with 20% derating in output power. (To order, add an "H" after the "D" in the model number, i.e., BC200S/5-DH.)

Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" after "D" in model number, i.e., BC200T/5/12-DL.)

Remote Output Adjustment: With **Option R**, an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number, i.e., BC200S/5-DR.)

Flexible Current Feature: Option -5 assigns 10 watts from the 2nd and 3rd auxiliary outputs to main output. (To order, add "-5" after model number, i.e., BC200T/5/12-D-5.)

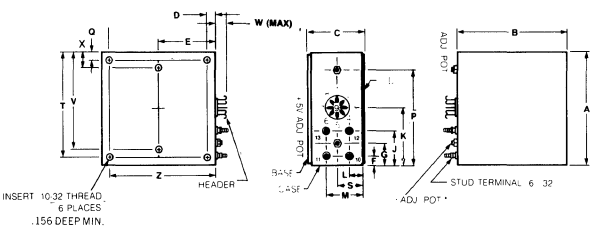
Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military-grade components. (To order, add "-ER" after model number, i.e. BC200T/5/12-D-ER.)

Internal Over Voltage Protection: Option -1 provides a non-crowbar internal OVP on single output and 5 V main on triple outputs. (To order, add "-1" after the D in model number, i.e., BC200S/5-D-1.)

FEATURES

- 200-Watt Single and Triple Output, 100 kHz Switching DC/DC Converter
- High Efficiency, 60% Minimum
- −55°C to +100°C Temperature Range
- Meets MIL-STD-461B, MIL-STD-810C and MIL-STD-704D for Input Transient Protection

MECHANICAL DIMENSIONS



* This adjustment pot used only on triple output model.

All pins appear on both models. Pins 1, 2, 8 and 9 are used for triple output.

A	B	C	D	E	F	G	J	K	L
5¾	8	1⅞	.280	3.749	½	1 1/16	1 21/32	2⅞	9/16

M	P	Q	S	T	V	W	X	Z
1 5/32	4 11/16	.280	27/32	5.470	5.120	9/16 MAX	.630	7.219

Tolerances: If a fraction, ±1/32 inch, a decimal, ±.015 inch.

Material: Base—Aluminum 6061-T6. Case—Steel.

Finish: Black flat lacquer per FED-STD-595. Color 37038.

Mounting: 10-32 THD inserts 5/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

PIN DESIGNATIONS

1. Common (Aux)
2. +V (Aux)
3. N/C
4. +Sense
5. Ground
6. −Sense
7. N/C
8. −V (Aux)
9. Internal Connection
10. +Input (DC)
11. −Input (DC)
12. +5V Output
13. 5V Return

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MILITARY POWER SUPPLIES

28 VDC to DC

MODEL **BC100**

SPECIFICATIONS

Input: 22 to 32 V dc standard, 18 to 32 V dc optional (see option H).

Efficiency: 65% minimum at full load.

Line Regulation: 10 mV for input change of 22 to 32 V dc with load constant.

Load Regulation: 10 mV main output, 0.5% on auxiliary outputs for change of no load to full load with line constant.

Auxiliary Output Tracking Accuracy: The negative output will track the positive output within 100 mV for all rated conditions. (BC100T)

Pard (Noise and Ripple) For Main and Auxiliary Outputs: 20 mV rms; 100 mV peak to peak (maximum), at 25 MHz bandwdith, over the entire temperature range.

Isolation Voltage: 400 V dc input to output. 200 V dc input to case. 200 V dc output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, and output and case when measured at 50 V dc.

Temperature Range: Operating: −55°C to +100°C maximum at center of baseplate. Storage: −65°C to +125°C ambient.

Temperature Coefficient: 0.01%/°C maximum for main and auxiliary outputs over entire temperature range.

Input Transient Protection: Unit will withstand 50 V dc for 0.1 second in accordance with MIL-STD-704D.

Load Transient Recovery Time: Output voltage returns to regulation limits within 0.5 milliseconds for main and auxiliary outputs after a 50% change in load current.

Load Transient Overshoot: 0.8 V or 3% (whichever is greater) from nominal voltage set point.

Short Circuit Protection: Completely protected against a short circuit of any duration. Outputs automatically restore to normal when overload is removed. Auxiliary outputs will fold back for overload.

Current Limiting: Output current is limited to 120% on main, 150% on auxiliary outputs (±10%) under overload conditions.

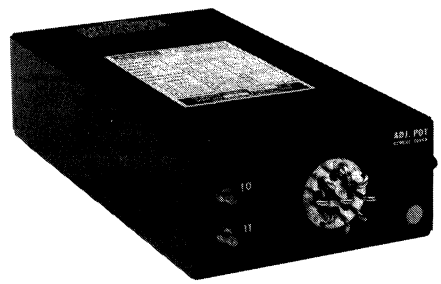
Remote Error Sensing: Regulator monitors voltage directly at the load using extra "sensing" leads and compensates for a dc voltage drop up to 0.5 volts in the load leads (on 5 V main output).

Electromagnetic Interference: Meets the requirements of MIL-STD-461B for generation of and susceptibility to radiated and conducted interference.

Reliability: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of 50°C baseplate temperature, maximum operating input voltage and maximum rated output power was calculated to be 81,690 hours for a ground benign environment and 29,771 for an air inhabited environment. With -ER option MTBF was calculated to 608,380 hours for a ground benign environment and 185,471 hours for an air inhabited environment. (BC100T)

Environment: Encapsulated and hermetically sealed to meet the environmental requirements of MIL-STD-810C including altitude (to 70,000 ft.), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

Connectors: Standard unit is provided with an input "hermetic seal" stud connector, for auxiliary and main outputs a solder-type, multiple-pin, output header.



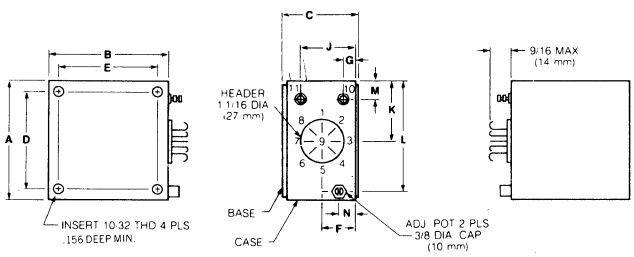
FEATURES

- 100-Watt Single and Triple Output, 200 kHz Switching DC to DC Converter
- High Efficiency, 65% Minimum
- −55°C to +100°C Temperature Range
- Meets MIL-STD-461B, MIL-STD-810C and MIL-STD-704D for Input Transient Protection

Output Voltage Range[1] (Main)	Output Current[2] (Main)	Output Voltage Range[1] (Aux)	Output Current[2] (Aux)	Wgt.[3] (Lbs.)	Wgt.[3] (Kgs.)	Model Number
4.75-5.25	20.0			3.0	1.5	BC100S/5-D
11.40-12.60	8.3			3.0	1.5	BC100S/12-D
14.25-15.75	6.6			3.0	1.5	BC100S/15-D
22.80-25.20	4.2			3.0	1.5	BC100S/24-D
26.60-29.40	3.6			3.0	1.5	BC100S/28-D
4.8-5.8	15	±11.5-±12.5	1.0	3.2	1.5	BC100T/5/12-D
4.8-5.8	15	±14.5-±15.5	0.8	3.2	1.5	BC100T/5/15-D

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer. Adjustment resolution is 35 mV.
2. Maximum output power equals 100 watts.
3. Weights are ±5%.

MECHANICAL DIMENSIONS (BC100T)



A	B	C	D	E	F	G
4	7½	1⅞	3.44	6.94	27/32	9/16

J	K	L	M	N
1 5/32	2 9/32	3¾	7/16	½

OPTIONAL FEATURES

Special Connectors: A military-type hermetically sealed connector is provided as **Option A** in place of our standard header. (To order, replace the "D" in the model number with "A" i.e., BC100T/5/12-A or BC100S/5-A.)

Severe Shock, Acceleration and Vibration: Special encapsulation, **Option E,** enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration. (To order, add "E" after "D" in model number, i.e., BC100T/5/12-DE or BC100S/5-DE.)

Wide Input Voltage: With **Option H,** the units will operate from 18 to 32 V dc with 20% derating in output power. (To order, add an "H" after the "D" in the model number, i.e., BC100T/5/12-DH or BC100S/5-DH.)

Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" after "D" in model number, i.e., BC100T/5/12-DL or BC100S/5-DL.)

Remote Output Adjustment: With **Option R,** an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number, i.e., BC100T/5/12-DR or BC100S/5-DR.)

Internal Overvoltage Protection: Option -1 provides a non-crowbar internal OVP on the main output (Output 1). Input must be recycled to restore output. (To order, add "-1" after the"D" in model number, i.e., BC100T/5/12-D-1 or BC100S/5-D-1.)

50-50 Distributed Power: Option -7 distributes 50 watts to the main and 50 watts to the auxiliaries. (To order add "-7" to the end of the model number, i.e., BC100T/5/12-D-7.)

Flexible Current Feature: Option -5 assigns 10 watts from 2nd and 3rd auxiliary outputs to main output. (To order, add "-5" after model number, i.e., BC100T/5/12-D-5.)

Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military-grade components. (To order, add "-ER" after model number, i.e., BC100T/5/12-D-ER or BC100S/5-D-ER.)

Tolerances: If English unit is a fraction, ±1/32 inch, (0.8 mm); if English unit is a decimal, ±0.15 inch, (0.4 mm).

Material: Base — Aluminum 6061-T6. Case — Steel.

Finish: Black flat lacquer per FED-STD-595. Color 37038.

Mounting: 10-32 THD inserts 5/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

PIN DESIGNATIONS

1. Auxiliary common
2. +Auxiliary
3. +5V
4. +Sense
5. Ground
6. −Sense
7. 5V Return
8. −Auxiliary
9. Int conn.
10. +Input
11. −Input

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MILITARY POWER SUPPLIES

New BC-60 Series 60 Watt DC-DC Converters

MODEL BC 60

SPECIFICATIONS:

Input: 18-36 Vdc (28 Vdc nominal)

Input Transient Protection: 50 Vdc for 0.1 second per MIL-STD-704D

Efficiency: Typical (nominal input, full load, room ambient). Single output: 72 to 79%. Triple output: 70%.

Line Regulation: Input change of 18-36Vdc, constant load. Single: 0.1% or 10mV, whichever is greater. Triple: 0.1%, all outputs.

Load Regulation: No load to full load, constant line. For singles and main output (triples): 0.1% or 10mV, whichever is greater; auxiliaries, 0.5%.

Load Transient Recovery: Output voltage returns to regulation envelope within 0.5 mS for 50% load charge.

Load Transient Overshoot: 0.5V or 3%, whichever is greater, from nominal set point at full load, for 50% load charge.

Pard (Noise and Ripple): Measured at 25 MHz bandwidth. Single Output Unit: 30mV rms; P-P: 5V-2.0%, 12 or 15V - 1.0%, 24 or 28V - 0.7%. Triple Output Unit: 30mV rms; 100mV P-P for main and auxiliary outputs.

Temperature Range: Operating, −55° C to 100° C maximum at center of baseplate. Storage, −65° C to 125° C ambient. Note: Turn on at low temperature extreme can result in increased PARD measurements prior to unit warm up (1-3 minutes). Consult nearest sales office for application details.

Temperature Coefficient: 0.03%/°C maximum over entire temperature range.

Auxiliary Output Tracking: Negative output tracks positive within 100mV for all rated conditions, with auxiliaries set at nominal output voltage (±200mV).

Isolation Voltage: 400Vdc, input to output; 200Vdc, input to case; 200Vdc, output to case.

Insulation Resistance: 50 megohms minimum between input and output, input and case, output and case when measured at 50Vdc.

Overvoltage Protection: Electronic overvoltage protection standard; 120% limit ± 10%, non-crowbar. Requires recycling of input for recovery.

Short Circuit Protection: Protected against short circuit of any duration. Automatic recovery when overload is removed.

Current Limiting: Foldback current limiting standard for all outputs, 120% (± 10%) limit for single output and main output on triples; 150% (± 10%) for auxiliary output on triples.

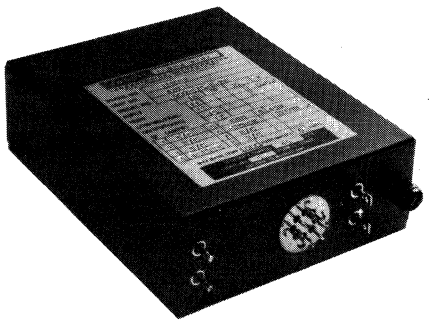
Remote Sensing: Standard on all single output units and main output of triple output units. Compensates for up to 0.5V drop in load leads.

EMI: Units qualified to MIL-STD-461C part 2; CE01, CE03*, CS01, CS02, RE02*, CE07, RS02, RS03 and CS06, for input leads. *Consult nearest sales office for additional data.

Reliability: All MTBF's per MIL-HDBK-217E, 50° C baseplate, highline and full load. See MTBF chart for your requirement.

Environment: Encapsulated and hermetically sealed units meet MIL-STD-810C, altitude, shock, acceleration, and MIL-S-901C, high impact shock conformance.

Hook Up: Via hermetic, solder-type multiple pin header and solder turrets for I/O.



FEATURES

- 60-Watt Single and Triple Output
- High Efficiency, 65% Minimum
- −55° C to +100° C Temperature Range
- Meets MIL-STD-461C, MIL-STD-810C and MIL-STD-704D for Input Transient Protection

Model	Main Output/ Current[1]	Output #2[1]	Output #3[1]	Weight (lbs)	(kgs)
BC60S/5-D	5V@12A			2.10	0.95
BC60S/12-D	12V@5A			2.10	0.95
BC60S/15-D	15V@4A			2.10	0.95
BC60S/24-D	24V@2.5A			2.10	0.95
BC60S/28-D	28V@2.14A			2.10	0.95
BC60T/5/12D	5V@6A	+12V@1.25A	−12V@1.25A	2.16	0.98
BC60T/5/12D	5V@6A	+15V@1A	−15V@1A	2.16	0.98

1. Single/Main Outputs adjust ±5%, 35 mV resolution
   Auxiliary Output adjust ±0.5V
2. Weight ±5%

OPTIONAL FEATURES

"A" Hermetic Connectors
Replaces solder header/turrets with military connectors:
Input: MS3113H10-6P (Mate Inc.)
Output: MS3113H14-12P (Mate Inc.)
Other hermetic, MIL connectors available on special order.

"E" Severe Shock, Vibration, Acceleration
Extra encapsulent to meet 60g shock, 30g vibration and 50g acceleration.

"L" Remote Enable/Inhibit
Provides for remote turn on/off with TTL logic signal.

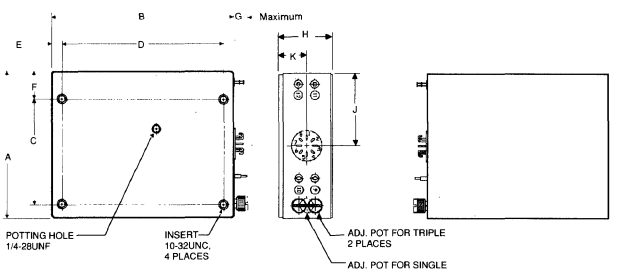
"ER" Enhanced Reliability
Provides increased reliability via higher level MIL grade components.

RELIABILITY DATA – MTBF

Environment	Ground Benign	Naval Sheltered	Air Inhabited (Attack)	Ground Mobile
BC60S-STD	250,222 hrs	48,153 hrs	42,939 hrs	28,571 hrs
BC60S-ER	748,982 hrs	149,203 hrs	137,721 hrs	81,514 hrs
BC60T-STD	168,050 hrs	32,921 hrs	27,639 hrs	19,714 hrs
BC60T-ER	596,480 hrs	126,060 hrs	125,137 hrs	71,994 hrs

Note: Calculations for other 217E environments available upon request.

MECHANICAL DIMENSIONS (BC60)



PIN DESIGNATIONS (BC60 Triple)

1. COM (Aux)	5. Ground	9. +5V
2. +V (Aux)	6. −Sense	10. 5V Com.
3. Not Used	7. Not Used	11. +Input DC
4. +Sense	8. −V (Aux)	12. −Input DC

PIN DESIGNATIONS (BC60 Single)

1. Not Used	5. Ground	9. +5V
2. Not Used	6. −Sense	10. 5V Com.
3. Not Used	7. Not Used	11. +Input DC
4. +Sense	8. Not Used	12. −Input DC

DIMENSIONS

SYM	A	B	C	D	E	F	G	H	J	K
INCHES	4	5	2.950	4.450	.275	.775	½	1½	2.00	.78
MM	101.6	127.0	74.93	113.03	6.99	19.69	12.7	38.1	50.8	19.8

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MILITARY POWER SUPPLIES

28 VDC to DC

MODEL **BA**

SPECIFICATIONS

INPUT VOLTAGE: 24-30 VDC (20-32 VDC with option)

EFFICIENCY: Typical efficiency 55-75% for 5V units, 65-85% for 12, 15, and 18V units.

IN RUSH CURRENT: Less than 8 times the peak input current at low line, full out load and nominal output voltage.

LINE REGULATION: 0.1% (or 20 mV whichever is greater)

LOAD REGULATION: 0.1% (or 20 mV whichever is greater).

PARD (NOISE & RIPPLE): 100 mV peak-to-peak, 20 mVRMS from +25°C to +100°C; 130 mV peak-to-peak, 40 mVRMS from −55°C to +25°C.

ADJUSTMENT RANGE: Output is continuously adjustable between the limits shown by means of externally accessible adjustment potentiometer.

RESOLUTION:	Nominal Output Voltage	Resolution
	5, 12, 15	35 mV
	24, 28	60 mV

INSULATION VOLTAGE: 100 VDC between input and output, and input and case; 50 VDC between output and case.

INSULATION RESISTANCE: 50 megohms between input and output, input and case when measured at 50 VDC.

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating −55°C to +100°C baseplate temperature. Derated maximum output current linearly above +85°C baseplate temperature to 80% of full load rating at +100°C baseplate temperature. Storage: −65°C to +125°C.

TEMPERATURE EFFECT (COEFFICIENT): Less than 0.01% per degree Celsius.

ENVIRONMENT: Hermetically sealed and encapsulated to meet MIL-STD-810C, including altitude (to 1.3 inches of Hg), acceleration, vibration, shock and temperature altitude cycling.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against a short circuit of any duration. Unit automatically recovers to normal when fault is removed.

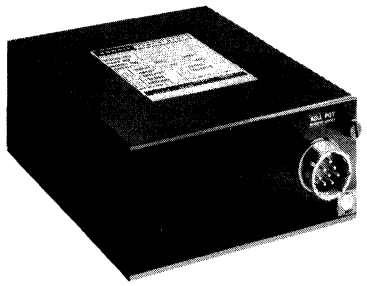
INPUT TRANSIENT PROTECTION: Unit will shut off at input voltage of 37V. Maximum voltage is 80V for one second.

REMOTE ERROR SENSING: Each unit contains a means by which the regulator circuit monitors the voltage directly at the load using extra "sensing leads." The resulting circuit action compensates for a DC voltage drop up to 0.3V in the load leads.

LOAD TRANSIENT RESPONSE: Output voltage returns to regulation limits within 2 milliseconds after 50% step change in load current. Maximum overshoot is less than 0.8V.

ELECTROMAGNETIC INTERFERENCE: Meets MIL-STD-461A, Methods CE01 and CE03 for conducting emissions (available with "F" option).

RELIABILITY: The Mean Time Between Failure (MTBF) per MIL-HDBK-217D under operating conditions of +50°C baseplate temperature, maximum rated output power for BA100D-5A-1 was calculated to be 139,899 hrs. for a ground benign environment and 16,866 hrs. for an air inhabited transport environment. With Enhanced Reliability Option (ER) MTBF was calculated to be 378,759 hrs. for ground benign environment and 51,131 hrs. for air inhabited transport environment.



FEATURES

- Up to 85% efficiency
- Meets MIL-STD-810C
- Wide DC input range available (20-32 VDC)
- Tight Regulation within 0.1%

Output Voltage Range (VDC)	Output Current (Amps)	Size (see Dwg.)	Weight (Lbs.)	Model Number
4.7 to 5.3	20.0	12F	4.7	BA100D-5A
11.25 to 12.75	8.33	12F	4.7	BA100D-12A
14.1 to 15.9	6.67	12F	4.7	BA100D-15A
22.5 to 25.5	4.17	12F	4.7	BA100D-24A
26.3 to 29.7	3.57	12F	4.7	BA100D-28A

OPTIONAL FEATURES

TTL: (L Option) Abbott provides an isolated pair of terminals used to turn-on and turn-off the regulator portion of the power supply. The unit remains in an idling state while the output is off. The power supply will turn-on with TTL logic "1", and turn-off with TTL logic "0". To specify this feature, please add an "L" to the character preceding the first dash of the model number. (EXAMPLE: BA100D-5A to BA100DL-5A)

SPECIAL CONNECTORS: A hermetically sealed military-type connector is available for the BA series (as shown in picture). Please consult your nearest Abbott Sales Office for details.

EMI FILTER: (F Option) An internal EMI filter is available to reduce conducted interference on the input leads. With these filters the Model BA will comply with MIL-STD-461A Notice 3, CE01 and CE03 on the input leads. To specify this feature, please add an "F" after "D" in the model number. (EXAMPLE: BA100D-5A to BA100DF-5A)

REMOTE PROGRAM OPTION: (R Option) Units can be modified so that their output voltage can be adjusted from a remote location. This is accomplished by adding an additional pin to the header on the unit. To specify this option, please add an "R" after this character "D" in the model number. (EXAMPLE: BA100D-5A to BA100DR-5A).

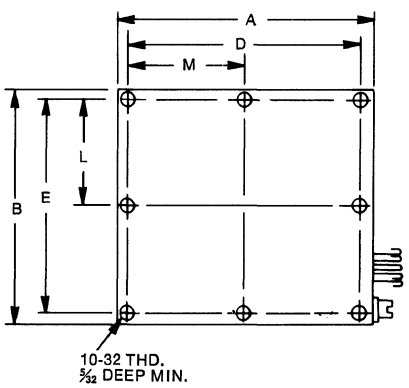
OVERVOLTAGE PROTECTION: (-1 Option) An internal non-crowbar type OVP, power supply turns off when output voltage exceeds set point (available as option by adding "-1" to model number)

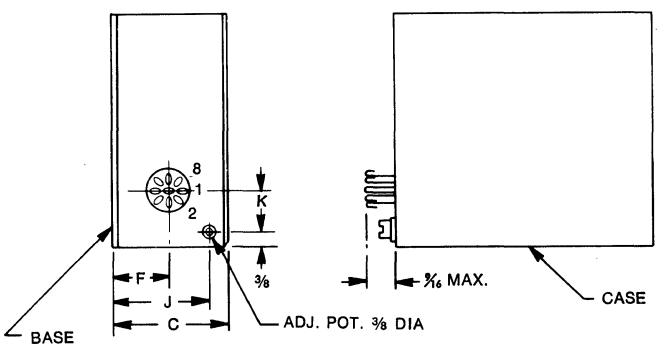
WIDER INPUT VOLTAGE RANGE: (H Option) The standard model BA operates from an input voltage range of 24 to 30 VDC. The units can be modified to operate from 20 to 32 VDC (with 20% derating). To have this feature included add an "H" after the "D" in the model number and specify the desired input voltage range in parentheses after the entire model number. (EXAMPLE: BA100D-5A to BA100DH-5A (20-26).)

ENHANCED RELIABILITY: (ER Option) This option provides increased reliability by using higher levels of military grade components. This feature allows the power supply to meet customer specific requirements as to "Hi-Rel" components, environmental testing and extended Thermal Cycling. Please consult your nearest Abbott Sales Office for details.

SPECIAL ENCAPSULATION: (E Option) All of our hermetically sealed power modules are encapsulated to meet or exceed the shock, acceleration and vibration requirements of MIL-STD-810C. Special encapsulation to enable these modules to withstand higher shock levels of 60g's, acceleration levels of 50g's and vibration levels of 30g's is available. To specify this feature, please add an "E" after the character "D" in the model number. (EXAMPLE: BA100D-5A to BA100DE-5A)

MECHANICAL DIMENSIONS





A	B	C	D	E	F	J	K	L	M
5⅞	5½	2⅝	5.37	5	1⅜	2⅛	1⅜	2.5	2.68

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MILITARY POWER SUPPLIES

28 VDC to DC

MODEL **C** and CC

SPECIFICATIONS

INPUT VOLTAGE RANGE: 24 to 30 VDC. Other input ranges available

LINE REGULATION: 0.1% (0.2% for duals) or 10 mv (whichever is greater) for input change of 24 to 30 VDC with load constant

LOAD REGULATION: 0.1% (0.2% for duals) or 20 mv (whichever is greater) for change from no load to full load with line constant

RIPPLE: 0.02% or 5 mv RMS (whichever is greater) 50 mv peak-to-peak maximum, each output, measured with scope having 25 MHz bandwidth

OUTPUT VOLTAGE ADJUSTMENT: Voltage is continuously adjustable between the limits shown in the table by means of an externally accessible screwdriver adjustment potentiometer

TRACKING ACCURACY: The negative output will track the positive output to within 1.0% or 100 mv (whichever is greater) for all rated conditions of input voltage, output current, operating temperature, and output voltage adjustment

ISOLATION VOLTAGE: 200 volts DC between input and output, input and case, and output and case

INSULATION RESISTANCE: 50 megohms minimum at 50 volts DC between input and output, input and case, and output and case

POLARITY: Inputs and outputs are isolated, either positive or negative side may be grounded.

TEMPERATURE RANGE: Operating: −55°C to +100°C maximum at center of mounting base
Storage: −65°C to +125°C

TEMPERATURE COEFFICIENT: 0.03% per degree Celsius maximum

ENVIRONMENT: Encapsulated to meet the environmental requirements of MIL-STD-810C and MIL-E-5400P, Class 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, salt spray, fungus, explosion, etc.

SHORT CIRCUIT PROTECTION: Each unit is completely protected against an overload or short circuit of any duration. The output automatically restores to normal when the overload is removed

INPUT TRANSIENT PROTECTION: MIL-STD-704A, Fig. 9, Limt 1 (80 VDC for 0.1 sec.).

LOAD TRANSIENT RECOVERY TIME: Output voltage returns to regulation limits within 100 microseconds (200 microseconds for duals) after 50% step change in load current

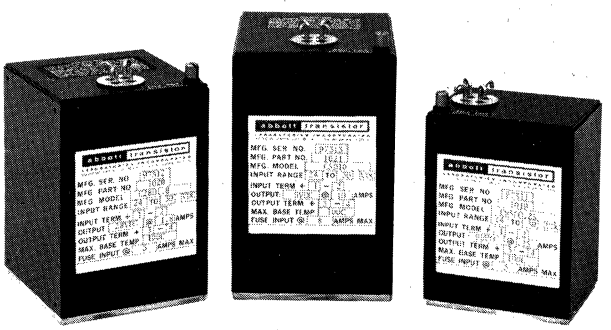
RELIABILITY: MTBF per MIL-HDBK-217D up to 277,200 hrs.

ELECTROMAGNETIC INTERFERENCE: Units meet EMI requirements of MIL-STD 461 conducted and radiated.

OVER-VOLTAGE PROTECTION*: An internal, crowbar type OVP is available. Power supply turns off when output voltage exceeds set-point.

TTL*: Abbott provides an isolated pair of terminals used to turn-on and turn-off the regulator portion of the power supply. The unit remains in an idling state while the output is off.

* Inclusion of these optional features on these models will most likely require that the case size increases slightly. Please consult nearest Abbott sales office for further details.



High Performance

- Operating temperature range: −55°C to +100°C.
- Low Peak-to-Peak Ripple.
- Compact. Power density up to 2 watts per cu. in.
- High reliability. Up to 277,200 hrs. MTBF per MIL-HDBK-217D
- Low EMI. To MIL-STD-461.
- Encapsulated and hermetically sealed to meet MIL-STD-810C and MIL-E-5400P, Class 2.
- 0.1% Line and Load regulation.
- TTL compatibility available.
- Internal OVP optional.

Output Voltage Range	Output Curr. (Amps)	Size†	Wt. (Lbs.)	Model Number
4.5-5.5	2.5	2D	1.2	C5D2.5
	5.0	6B	1.7	C5D5.0
	10.0	7A	2.6	C5D10
5.5-6.5	2.5	2D	1.2	C6D2.5
	5.0	6B	1.7	C6D5.0
	10.0	7A	2.6	C6D10
6.5-7.5	2.5	2D	1.2	C7D2.5
	5.0	6B	1.7	C7D5.0
	10.0	7A	2.6	C7D10
7.5-8.5	1.8	2D	1.2	C8D1.8
	3.5	6B	1.7	C8D3.5
	7.5	7A	2.6	C8D7.5
8.5-9.5	1.8	2D	1.2	C9D1.8
	3.5	6B	1.7	C9D3.5
	7.5	7A	2.6	C9D7.5
9.5-10.5	1.8	2D	1.2	C10D1.8
	3.5	6B	1.7	C10D3.5
	7.5	7A	2.6	C10D7.5
10.5-11.5	1.8	2D	1.2	C11D1.8
	3.5	6B	1.7	C11D3.5
	7.5	7A	2.6	C11D7.5
11-13	1.2	2D	1.2	C12D1.2
	2.5	6B	1.7	C12D2.5
	5.0	7A	2.6	C12D5.0
13-15	1.2	2D	1.2	C14D1.2
	2.5	6B	1.7	C14D2.5
	5.0	7A	2.6	C14D5.0
14-16	1.2	2D	1.2	C15D1.2
	2.5	6B	1.7	C15D2.5
	5.0	7A	2.6	C15D5.0
15-17	1.2	2D	1.2	C16D1.2
	2.5	6B	1.7	C16D2.5
	5.0	7A	2.6	C16D5.0
17-19	1.2	2D	1.2	C18D1.2
	2.5	6B	1.7	C18D2.5
	5.0	7A	2.6	C18D5.0
19-21	0.8	2D	1.2	C20D0.8
	1.8	6B	1.7	C20D1.8
	3.5	7A	2.6	C20D3.5
21-23	0.8	2D	1.2	C22D0.8
	1.8	6B	1.7	C22D1.8
	3.5	7A	2.6	C22D3.5
23-25	0.8	2D	1.2	C24D0.8
	1.8	6B	1.7	C24D1.8
	3.5	7A	2.6	C24D3.5
25-27	0.8	2D	1.2	C26D0.8
	1.8	6B	1.7	C26D1.8
	3.5	7A	2.6	C26D3.5
27-29	0.8	2D	1.2	C28D0.8
	1.8	6B	1.7	C28D1.8
	3.5	7A	2.6	C28D3.5
29-31	0.6	2D	1.2	C30D0.6
	1.2	6B	1.7	C30D1.2
	2.5	7A	2.6	C30D2.5
31-33	0.6	2D	1.2	C32D0.6
	1.2	6B	1.7	C32D1.2
	2.5	7A	2.6	C32D2.5
33-35	0.6	2D	1.2	C34D0.6
	1.2	6B	1.7	C34D1.2
	2.5	7A	2.6	C34D2.5
35-37	0.6	2D	1.2	C36D0.6
	1.2	6B	1.7	C36D1.2
	2.5	7A	2.6	C36D2.5

DUAL OUTPUT

Output Voltage Range	Output Curr. (Amps)	Size†	Wt. (Lbs.)	Model Number
±2.75-±3.25	0.5	10C	2.3	CC3D0.5
	1.0	10C	2.3	CC3D1.0
	2.0	10D	2.5	CC3D2.0
	3.5	11E	3.9	CC3D3.5
±4.5-±5.5	0.5	10C	2.3	CC5D0.5
	1.0	10C	2.3	CC5D1.0
	2.0	10D	2.5	CC5D2.0
	3.5	11E	3.9	CC5D3.5
±11-±13	0.5	10C	2.3	CC12D0.5
	1.0	10C	2.3	CC12D1.0
	2.0	10D	2.5	CC12D2.0
	3.5	11E	3.9	CC12D3.5
±14-±16	0.5	10C	2.3	CC15D0.5
	1.0	10C	2.3	CC15D1.0
	2.0	10D	2.5	CC15D2.0
	3.5	11E	3.9	CC15D3.5
±19-±21	0.5	10C	2.3	CC20D0.5
	1.0	10D	2.5	CC20D1.0
	2.0	11E	3.9	CC20D2.0
	3.5	14D	7.9	CC20D3.5
±23-±25	0.5	10C	2.3	CC24D0.5
	1.0	10D	2.5	CC24D1.0
	2.0	11E	3.9	CC24D2.0
	3.5	14D	7.9	CC24D3.5

*See page D•1542 for size charts.

Other standard Models with any output up to 100 vdc are available. For complete information, please consult our nearest office.
Other standard Models with any output between ±2.75 and ±31.0 vdc are available. For complete information, please consult our nearest office.

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MILITARY POWER SUPPLIES

28 VDC to DC

MODEL **B**

SPECIFICATIONS

Input Voltage Range
24 to 30 volts DC Other ranges available

Line Regulation
Within 0.4% for input 24 to 30 VDC

Combined Line and Load Regulation
Within 3.0% for input 24 to 30 VDC and from ½ load to full load on Model B's
Within 5.0% for input 24 to 30 VDC and from ½ load to full load on Model BL's

Ripple
0.5 RMS — Model B's
1.0% RMS — Model BL's

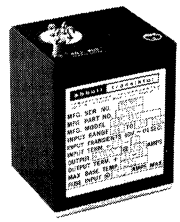
Voltage Adjustment Range
12% by screwdriver adjustment

Input Transient Protection
In accordance with MIL-STD-704A, Fig. 9, Limit 1, (80 VDC for 0.1 sec.)

Environment
+212°F max. at mounting base using adequate heat sink
−65°F min. at mounting surface
Altitude: To vacuum (true hermetic seal). Vibration, shock, sand, dust, humidity, salt-spray, fungus, sunshine, rain, and explosion to MIL-STD-810C and MIL-E-5400P, Class 2

Output Voltage and Current
See specific models listed
(Outputs and inputs are isolated)

Reliability: MTBF per MIL-HDBK-217C up to 626,400 hrs.



High Reliability

- Operating temperature range −55°C to +100°C.
- Small size.
- High reliability. Up to 626,400 hrs. MTBF per MIL-HDBK-217C.
- Encapsulated and hermetically sealed. Meets MIL-STD-810C and MIL-E-5400P, Class 2.

Output Voltage Range	Output Current (Amps)	Size*	Wt. lbs.	Model Number
4.7-5.3	0.400	1B	0.5	BL02D-5A
	1.0	1A	0.9	BL05D-5A
	2.0	1	1.0	BL1D-5A
	4.0	2	1.1	BL2D-5A
	6.0	4	1.3	BL3D-5A
	10.0	6A	2.5	BL5D-5A
5.3-5.9	0.357	1B	0.5	BL02D-5.6A
	0.9	1A	0.9	BL05D-5.6A
	1.8	1	1.0	BL1D-5.6A
	3.6	2	1.1	BL2D-5.6A
	5.4	4	1.3	BL3D-5.6A
	8.91	6A	2.5	BL5D-5.6A
5.9-6.6	0.318	1B	0.5	BL02D-6.3A
	0.8	1A	0.9	BL05D-6.3A
	1.6	1	1.0	BL1D-6.3A
	3.2	2	1.1	BL2D-6.3A
	4.8	4	1.3	BL3D-6.3A
	7.92	6	1.9	BL5D-6.3A
6.6-7.4	0.286	1B	0.5	BL02D-7A
	0.7	1A	0.9	BL05D-7A
	1.4	1	1.0	BL1D-7A
	2.8	2	1.1	BL2D-7A
	4.2	4	1.3	BL3D-7A
	7.15	6	1.9	BL5D-7A
7.4-8.3	0.253	1B	0.5	BL02D-7.9A
	0.63	1A	0.9	B05D-7.9A
	1.26	1	1.0	BL1D-7.9A
	2.52	2	1.1	BL2D-7.9A
	3.78	4	1.3	BL3D-7.9A
	6.32	6	1.9	BL5D-7.9A
8.3-9.3	0.227	1B	0.5	BL02D-8.8A
	0.57	1A	0.9	B05D-8.8A
	1.14	1	1.0	BL1D-8.8A
	2.28	2	1.1	BL2D-8.8A
	3.42	4	1.3	BL3D-8.8A
	5.68	6	1.9	BL5D-8.8A
9.3-10.4	0.202	1B	0.5	B02D-9.9A
	0.50	1A	0.9	B05D-9.9A
	1.00	1	1.0	BL1D-9.9A
	2.00	2	1.1	BL2D-9.9A
	3.00	4	1.3	BL3D-9.9A
	5.05	6	1.9	BL5D-9.9A
	10.10	11	3.7	BL10D-9.9A
10.4-11.6	0.182	1B	0.5	B02D-11A
	0.45	1A	0.9	B05D-11A
	0.91	1	1.0	BL1D-11A
	1.82	2	1.1	BL2D-11A
	2.73	4	1.3	BL3D-11A
	4.55	6	1.9	BL5D-11A
	9.10	11	3.7	BL10D-11A
11.6-13.0	0.163	1B	0.5	B02D-12.3A
	0.40	1A	0.9	B05D-12.3A
	0.81	1	1.0	BL1D-12.3A
	1.62	2	1.1	BL2D-12.3A
	2.43	4	1.3	BL3D-12.3A
	4.06	6	1.9	BL5D-12.3A
	8.12	11	3.7	BL10D-12.3A
	13.83	14	10.3	BL17D-12.3A
13.0-14.8	0.145	1B	0.5	B02D-13.8A
	0.36	1A	0.9	B05D-13.8A
	0.72	1	1.0	BL1D-13.8A
	1.44	2	1.1	BL2D-13.8A
	2.15	4	1.3	BL3D-13.8A
	3.62	6	1.9	BL5D-13.8A
	7.24	11	3.7	BL10D-13.8A
	12.31	14	10.3	BL17D-13.8A
14.8-16.6	0.127	1B	0.5	B02D-15.7A
	0.32	1A	0.9	B05D-15.7A
	0.64	1	1.0	BL1D-15.7A
	1.28	2	1.1	BL2D-15.7A
	1.92	4	1.3	BL3D-15.7A
	3.18	6	1.9	BL5D-15.7A
	6.36	11	3.7	BL10D-15.7A
	10.81	14	10.3	BL17D-15.7A
16.6-18.6	0.114	1B	0.5	B02D-17.6A
	0.28	1A	0.9	B05D-17.6A
	0.57	1	1.0	BL1D-17.6A
	1.14	2	1.1	BL2D-17.6A
	1.71	4	1.3	BL3D-17.6A
	2.84	6	1.9	BL5D-17.6A
	5.68	11	3.7	BL10D-17.6A
	9.65	14	10.3	BL17D-17.6A
18.6-20.8	0.101	1B	0.5	B02D-19.7A
	0.255	1A	0.9	B05D-19.7A
	0.510	1	1.0	BL1D-19.7A
	1.02	2	1.1	BL2D-19.7A
	1.63	4	1.3	BL3D-19.7A
	2.54	6	1.9	BL5D-19.7A
	5.08	11	3.7	BL10D-19.7A
	8.62	14	10.3	BL17D-19.7A
20.8-23.3	0.091	1B	0.5	B02D-22A
	0.230	1A	0.9	B05D-22A
	0.460	1	1.0	BL1D-22A
	0.920	2	1.1	BL2D-22A
	1.38	4	1.3	BL3D-22A
	2.27	6	1.9	BL5D-22A
	4.54	11	3.7	BL10D-22A
	7.72	14	10.3	BL17D-22A
23.3-26.1	0.081	1B	0.5	B02D-24.7A
	0.205	1A	0.9	B05D-24.7A
	0.410	1	1.0	BL1D-24.7A
	0.820	2	1.1	BL2D-24.7A
	1.23	4	1.3	BL3D-24.7A
	2.02	6	1.9	BL5D-24.7A
	4.04	11	3.7	BL10D-24.7A
	6.88	14	10.3	BL17D-24.7A
26.1-29.2	0.073	1B	0.5	B02D-27.6A
	0.180	1A	0.9	B05D-27.6A
	0.360	1	1.0	BL1D-27.6A
	0.720	2	1.1	BL2D-27.6A
	1.08	4	1.3	BL3D-27.6A
	1.81	6	1.9	BL5D-27.6A
	3.62	11	3.7	BL10D-27.6A
	6.16	14	10.3	BL17D-27.6A
29.2-32.6	0.065	1B	0.5	B02D-31A
	0.160	1A	0.9	B05D-31A
	0.320	1	1.0	B1D-31A
	0.640	2	1.1	B2D-31A
	0.960	4	1.3	BL3D-31A
	1.61	6	1.9	BL5D-31A
	3.22	11	3.7	BL10D-31A
	5.48	14	10.3	BL17D-31A
32.6-36.5	0.058	1B	0.5	B02D-34.6A
	0.145	1A	0.9	B05D-34.6A
	0.290	1	1.0	B1D-34.6A
	0.580	2	1.1	B2D-34.6A
	0.870	4	1.3	BL3D-34.6A
	1.44	6	1.9	BL5D-34.6A
	2.88	11	3.7	BL10D-34.6A
	4.91	14	10.3	BL17D-34.6A
36.5-40.9	0.052	1B	0.5	B02D-38.7A
	0.130	1A	0.9	B05D-38.7A
	0.260	1	1.0	B1D-38.7A
	0.520	2	1.1	B2D-38.7A
	0.780	4	1.3	BL3D-38.7A
	1.29	6	1.9	BL5D-38.7A
	2.58	11	3.7	BL10D-38.7A
	4.39	14	10.3	BL17D-38.7A
40.9-45.8	0.046	1B	0.5	B02D-43.3A
	0.155	1A	0.9	B05D-43.3A
	0.230	1	1.0	B1D-43.3A
	0.460	2	1.1	B2D-43.3A
	0.690	4	1.3	BL3D-43.3A
	1.15	6	1.9	BL5D-43.3A
	2.30	11	3.7	BL10D-43.3A
	3.92	14	10.3	BL17D-43.3A
45.8-51.4	0.041	1B	0.5	B02D-48.6A
	0.103	1A	0.9	B05D-48.6A
	0.206	1	1.0	B1D-48.6A
	0.412	2	1.1	B2D-48.6A
	0.618	4	1.3	B3D-48.6A
	1.03	6	1.9	BL5D-48.6A
	2.06	11	3.7	BL10D-48.6A
	3.49	14	10.3	BL17D-48.6A
51.4-59.0	0.036	1B	0.5	B02D-55.2A
	0.091	1A	0.9	B05D-55.2A
	0.182	1	1.0	B1D-55.2A
	0.364	2	1.1	B2D-55.2A
	0.546	4	1.3	B3D-55.2A
	0.905	6	1.9	BL5D-55.2A
	1.81	11	3.7	BL10D-55.2A
	3.07	14	10.3	BL17D-55.2A
59.0-66.0	0.032	1B	0.5	B02D-63A
	0.080	1A	0.9	B05D-63A
	0.160	1	1.0	B1D-63A
	0.320	2	1.1	B2D-63A
	0.480	4	1.3	B3D-63A
	0.795	6	1.9	BL5D-63A
	1.59	11	3.7	BL10D-63A
	2.69	14	10.3	BL17D-63A
66.0-74.0	0.029	1B	0.5	B02D-70A
	0.071	1A	0.9	B05D-70A
	0.143	1	1.0	B1D-70A
	0.286	2	1.1	B2D-70A
	0.429	4	1.3	B3D-70A
	0.715	6	1.9	BL5D-70A
	1.43	11	3.7	BL10D-70A
	2.42	14	10.3	BL17D-70A
74.0-83.0	0.025	1B	0.5	B02D-79A
	0.063	1A	0.9	B05D-79A
	0.127	1	1.0	B1D-79A
	0.254	2	1.1	B2D-79A
	0.381	4	1.3	B3D-79A
	0.634	6	1.9	BL5D-79A
	1.27	11	3.7	BL10D-79A
	2.15	14	10.3	BL17D-79A
83.0-514	**Other standard models are available with output voltages between 83.0 and 514 Vdc at output power ratings of 2, 5, 10, 20, 30, 50, 100 or 170 watts. For complete information, please consult one of the offices listed below.**			

*See page D•1542 for size charts.

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Suite 300
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Tel: 0233 638132
Fax: 0233 638134

abbott
MILITARY POWER SUPPLIES

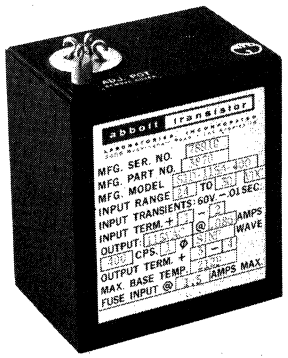
28 VDC to AC Sine Wave

MODEL **S**

SPECIFICATIONS

Input Voltage Range: 24 to 30 volts DC. Other input ranges are available.
Load Regulation: ±1.0% from ½ to full load.
Frequency Stability: ±1.0%
Voltage Adjustment Range: 12% by screwdriver adjustment.
Reliability: Up to 340,600 Hrs. MTBF per MIL-HDBK-217C.
Input Transient Protection: In accordance with MIL-STD-704A, Limit 1, Fig. 9 (80 volts for 0.1 seconds).
Environment: +212°F max. at mtg. base using adequate heat sink. −65°F min. at mounting base. Encapsulated to meet the environmental requirements of MIL-STD 810C and MIL-E 5400P, Class 2, including: altitude (to a vacuum), vibration, shock, acceleration, sand, dust, humidity, saltspray, fungus, explosion, etc.

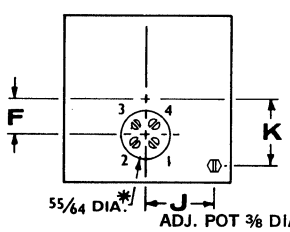
Input Voltage Range	Output Frequency (Hertz)	Output Voltage Range	Output Power (Volt-Amps)	Harmonic Distortion (%)	Size (See Below)	Weight (Lbs.)	Model Number
24-30	400	25.4-28.6	5	2.0	4	1.6	S05D-27A-400
			10	2.5	4C	1.7	S1D-27A-400
			20	2.5	4B	2.3	S2D-27A-400
			30	2.5	6A	2.4	S3D-27A-400
			60	3.0	12	4.8	S6D-27A-400
			120	4.0	14	9.1	S12D 27A-400
24-30	400	108-122	5	2.0	4	1.6	S05D-115A-400
			10	2.5	4C	1.7	S1D-115A-400
			20	2.5	4B	2.3	S2D-115A-400
			30	2.5	6A	2.4	S3D-115A-400
			60	3.0	12	4.8	S6D-115A-400
			120	4.0	14	9.1	S12D-115A-400
24-30	800	25.4-28.6	5	2.0	4	1.6	S05D-27A-800
			10	2.5	4C	1.7	S1D-27A-800
			20	2.5	4B	2.3	S2D-27A-800
			30	2.5	6A	2.4	S3D-27A-800
			60	3.0	12	4.8	S6D-27A-800
			120	4.0	14	9.1	S12D-27A-800
24-30	800	108-122	5	2.0	4	1.6	S05D-115A-800
Output frequencies up to 1600 Hz available as standard models. Contact our nearest office for information.			10	2.5	4C	1.7	S1D-115A-800
			20	2.5	4B	2.3	S2D-115A-800
			30	2.5	6A	2.4	S3D-115A-800
			60	3.0	12	4.8	S6D-115A-800
			120	4.0	14	9.1	S12D-115A-800

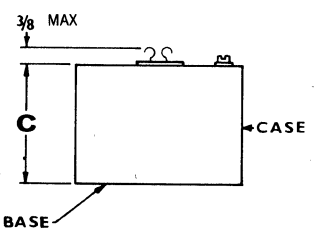


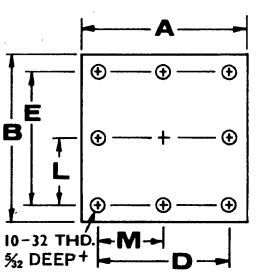
Sine Wave — 1 Ø 400 to 1600 Hz

- Operating temperature range: −55°C to +100°C.
- High reliability. Up to 340,600 hrs. MTBF per MIL-HDBK-217C.
- Encapsulated and hermetically sealed per MIL-STD-810C and MIL-E-5400P.

CASE DIMENSIONS FOR ABBOTT MODELS W, WW, C, CC, B AND S







* Models CC and WW use special 8 pin header. Size of special headers is 1 1/16 dia. by 3/16 high.
† 6-32 Thd, 3/16 deep on case size 1B.

Size	A	B	C	D	E	F	J	K	L	M
1	1½	2¾	3	1.00	2.25	3/16	½	1⅛	—	—
1A	1½	2¾	2¾	1.00	2.25	3/16	½	1⅛	—	—
1B	1½	2	2	1.00	1.50	0	½	¾	—	—
2	1⅞	2¾	3¼	1.37	2.25	¾	11/16	1⅛	—	—
2C	2	2¾	2⅛	1.50	2.25	0	¾	1⅛	—	—
2D	2	3	3½	1.50	2.50	¾	¾	1¼	—	—
2E	2⅛	3¼	3¼	1.62	2.75	⅞	13/16	1⅜	—	—
3	2¾	2¾	3	2.25	2.25	¾	1⅛	1⅛	—	—
3A	2¾	2¾	2¾	2.25	2.25	¾	1⅛	1⅛	—	—
4	2¼	2¾	3¼	1.75	2.25	¾	⅞	1⅛	—	—
4B	2½	3	3¾	2.00	2.50	¾	1	1¼	—	—
4C	2¼	2¾	3½	1.75	2.25	¾	⅞	1⅛	—	—
4D	2½	3½	3½	2.00	3.00	0	1	1½	—	—
5	2¾	2¾	3¼	2.25	2.25	¾	1⅛	1⅛	—	—
6	2¾	3	3¼	2.25	2.50	¾	1⅛	1¼	—	—
6A	2¾	3	4	2.25	2.50	¾	1⅛	1¼	—	—
6B	2¾	3⅛	3⅝	2.25	2.62	¾	1⅛	15/16	—	—
7	2¾	2¾	4	2.25	2.25	¾	1⅛	1⅛	—	—
7A	2⅞	3⅜	4½	2.37	2.87	¾	13/16	17/16	—	—
8B	2⅝	3½	2⅞	2.12	3.00	¾	1⅛	1½	—	—
9A	2¾	4¾	3¾	2.25	4.25	0	1⅛	2⅛	—	—
9B	2¾	4¾	3½	2.25	4.25	0	1⅛	2⅛	—	—
9C	2½	4⅜	3⅛	2.00	3.87	1	1	1 3/16	—	—
9D	2⅝	4¾	3⅝	2.12	4.25	1	1⅛	2⅛	—	—
10A	3	5	4	2.50	4.50	0	1¼	2¼	—	—

Size	A	B	C	D	E	F	J	K	L	M
10B	2⅞	4¼	4⅜	2.37	3.75	1⅜	1¾	1⅞	—	—
10C	3⅜	3⅜	3¾	2.87	2.87	¾	1¾	1¾	—	—
10D	3½	3½	4	3.00	3.00	¾	1½	1½	—	—
10G	3½	5½	2½	3.00	3.50	**	**	**	—	—
10H	4	5½	2⅝	3.50	3.50	**	**	**	—	—
11	3	5½	3¼	2.50	5.00	2⅛	1¼	2½	2.50	—
11C	4¼	5¼	4	3.75	4.75	0	1⅞	2⅜	2.37	—
11D	4	4⅞	3⅞	3.50	4.37	1⅜	1¾	2 3/16	—	—
11E	3¾	4½	4¼	3.25	4.00	¾	1⅝	2	—	—
11F	2¾	6¼	2¾	2.25	5.75	1	1⅛	2⅞	2.87	—
11K	3⅝	8 13/16	2⅝	2.55	4.31	**	**	**	—	—
12	3	5½	4	2.50	5.00	2⅛	1¼	2½	2.50	—
12A	4½	6	4	4.00	5.50	0	2	2¾	2.75	—
12C	3⅞	6¼	2¾	3.37	5.75	1½	1 11/16	2⅞	2.87	—
12G	5⅛	8¾	2⅝	4.62	6.56	**	**	**	3.28	—
13A	5½	6½	4½	5.00	6.00	0	2½	3	3.00	2.50
14	6	6	4	5.50	5.50	2⅜	2¾	2¾	2.75	2.75
14C	5½	5½	3⅝	5.00	5.00	1⅞	2½	2½	2.50	2.50
14D	6	6¼	3⅞	5.50	5.75	1¼	2¾	2⅞	2.87	2.75
14E	5¾	6¼	2¾	5.25	5.75	1¼	2⅝	2⅞	2.87	2.62
16A	6¾	7½	4¼	6.25	7.00	2¾	3⅛	3½	3.50	3.12

DIMENSIONAL TOLERANCES: FRACTIONS ±1/32; DECIMALS .XX ±0.015.

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Tel: 0233 638132
Fax: 0233 638134

abbott
MILITARY POWER SUPPLIES

28 VDC to AC Sine Wave

SN

SPECIFICATIONS:

Input: 24 to 30 V dc. Other inputs available. (See Option H.)

Efficiency: 55% minimum at 27 V dc input and full load.

Line Regulation: Within 0.5% for full input change 24 V dc to 30 V dc with load constant.

Load Regulation: Within 1.0% for load change of one half to full load with line constant.

Wave Form: Sinusoidal with a maximum harmonic distortion into a resistive load of 4%.

Frequency Stability: ± 1% drift with time (within 8 hours after 30 seconds warm-up).

Frequency Accuracy: ± 0.5% is initial setting tolerance.

Load Power Factor: Derate linearly from 100% rated power at unity to 70% rated power at 0.7 power factor lagging or leading.

Isolation Voltage: 200 V dc input to case, 750 V dc output to case and input to output.

Insulation Resistance: 50 megohms minimum between input and output, input and case, output and case when measured at 50 V dc.

Temperature Range: Operating – 55°C to + 100°C baseplate temperature; storage temeprature – 65°C to + 125°C ambient.

Temperature Coefficient: 0.06% / °C from – 55°C to + 100°C, voltage change, frequency change, 1% maximum.

Input Transient Protection: In accordance with MIL-STD-704A, Figure 9, Limit 1 (80 V dc for 0.1 second).

Load Transient Response: Output voltage returns to regulation limits within 5 cycles for a load change of no load to full load.

Load Transient Overshoot: 10% maximum from nominal voltage set point.

Short Circuit Protection: Completely protected against short circuit of any duration. Unit must be recycled to restore output to normal.

Reliability: The MTBF calculated per MIL HDBK-217D, under operating conditions of 50°C baseplate temperature, maximum operating input voltage and full rated output power is 156,366 hours for ground benign and 15,722 hours for air inhabited transport environments. With Enhanced Reliability Option (-ER) ground benign is 907,070 hours; air inhabited transport is 93,030 hours.

Environment: Hermetically sealed and encapsulated to meet the environmental requirements of MIL-STD-810C.

Maintainability: Units are repairable at depot level.

OPTIONAL FEATURES

The following standard options are available on the SN Series inverters. Please refer to option section of this catalog for detailed information.

Special Connectors: A military-type hermetically sealed connector is provided as **Option A** in place of our standard header to extend out the top surface. (To order, replace "D" in model number with "A", i.e., SN180A-27A-400.)

Severe Shock, Acceleration and Vibration: Special encapsulation, **Option E**, enables all units to withstand 60 g's shock, 50 g's acceleration and 30 g's vibration. (To order, add "E" after "D" in model number, i.e., SN180DE-27A-400).

Wide Input Voltage: Option H recenters the input voltage to provide alternate inputs from 18 V dc to 32 V dc. Call an Abbott Sales Office for output current derating. (To order, add "H" after the "D" in model number and specify input voltage range in parentheses after the entire model number, i.e., SN180DH-27A-400 (18-30).)

Remote Turn On/Off: Option L provides isolated terminals to turn outputs on/off with TTL logic signal. (To order, add "L" to character preceding first dash in model number, i.e. SN180DL-27A-400.)

Remote Output Adjustment: With **Option R**, an adjustment potentiometer can be remotely located to adjust the output voltage. (To order, add "R" after "D" in model number, i.e., SN180DR-27A-400.)

Frequency Adjustment: Option -4 enables output frequency to be adjusted ± 5% by means of an external potentiometer. (To order, add "-4" at the end of the entire model number, i.e., SN180D-27A-400-4.)

Enhanced Reliability: -ER Option provides increased reliability by using higher levels of military-grade components. (To order, add "-ER" at the end of the entire model number, i.e., SN180D-27A-400-ER.)

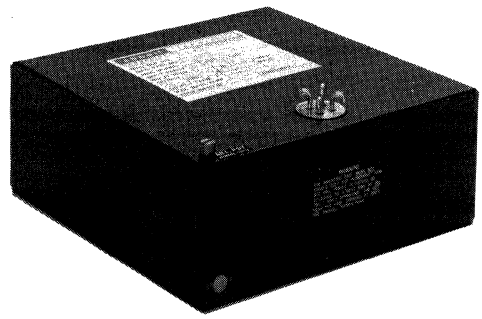
6 Standard Models

Output Frequency (Hertz)	Output[1] Voltage Range	Output Amps (Resistive Load) Continuous	Harmonic Distortion (%)	Size (See Dwg.)	Weight[2] lbs.)	Weight[2] (Kgs.)	Model Number
400	25.4-28.6	6.667	4.0	14H	5.5	2.5	SN180D-27A-400
	108-122	1.565	4.0	14H	5.5	2.5	SN180D-115A-400
800	25.4-28.6	6.667	4.0	14H	5.5	2.5	SN180D-27A-800
	108-122	1.565	4.0	14H	5.5	2.5	SN180D-115A-800
1600	25.4-28.6	6.667	4.0	14H	5.5	2.5	SN180D-27A-1600
	108-122	1.565	4.0	14H	5.5	2.5	SN180D-115A-1600

1. Output voltage is continuously adjustable between the limits shown by means of an externally accessible screwdriver adjustment potentiometer.
2. Weights are ± 5%.

Model Numbering System

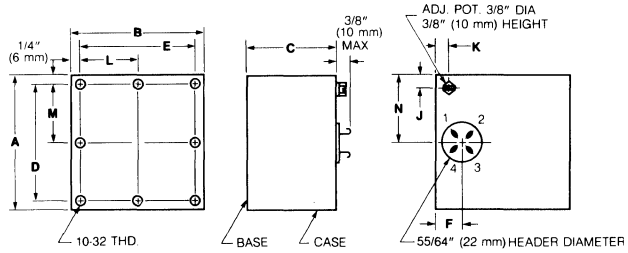
Product Line Series	Output Power Watts	Header Type	Options	Dash	Output Voltage AC	A	Dash	Frequency Hz
SN	180	D		–	27	A	–	400



Sine Wave - 1ϕ 400 to 1600 Hz

- High Density 2 w/in³ 180-Watt Inverter
- Operating temperature range: – 55°C to + 100°C.
- High reliability. Up to 907,070 hrs. MTBF per MIL-HDBK-217D.
- Encapsulated and hermetically sealed per MIL-STD-810C and MIL-E-5400P.

CASE DRAWINGS



CASE DIMENSIONS

Model	Case Size	A	B	C	D	E	F	J	K	L	M	N
SN180	14H	6	6	2½	5.50	5.50	¾	¼	¼	2.75	2.75	3
		152	152	64	139.7	139.7	19	6	6	69.8	69.8	76.2

Tolerances: If English unit is a fraction, ± 1/32 inch (0.8 mm); if English unit is a decimal, ± .015 inc. (0.4 mm).

Material: Base – Aluminum 6061-T6, Case – Steel

Finish: Black flat lacquer per FED-STD-595. Color 37038.

Mounting: 10-32 THD inserts
3/32" minimum depth are provided in baseplate. Steel 10-32 bolts American Standard, unified national fine series, slotted studs are supplied with each unit. Metric hardware and inserts available as a special order.

INPUT CURRENT (Amps)

Load	24V Input	30V Input
100%	12A	12A
75%	9A	9.1A
50%	6A	6.1A

abbott
When Reliability is Imperative.

Western Office
2727 S. La Cienega Blvd.
Los Angeles, CA 90034
Tel: (213) 202-8820
Fax: (213) 836-1027

Southwest Office
275 W. Campbell Road
Suite 227
Richardson, TX 75080
(214) 437-0697
Telex: 73-5153
Fax: (214) 437-0698

Eastern Office
520 Main St.
Suite 300
Fort Lee, NJ 07024
(201) 461-4411
Telex: 13-5332
Fax: (201) 461-2936

European Office
Ashford, Kent, England
Tel: 0233 623404
Tel: 0233 638132
Fax: 0233 638134

STANDARD POWER™ Power Supplies

Acme Electric's nationwide network of electronic distributors stock catalog Standard Power linear and switch-mode power supplies.

Standard Power is a trademark of Acme Electric Corporation that identifies all of Acme's catalog power supplies.

Acme Electric is proud to offer a new series of switch-mode power supplies with power factor corrections and a high reliability 400 watt switcher with automatic input voltage range.

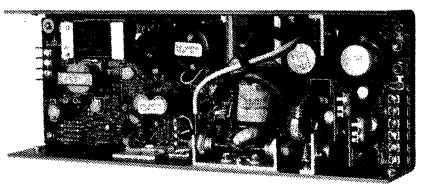
A leader in power products since 1917, Acme Electric offers standard, modified and custom DC power supplies - all-made in the USA.

Rely on Standard Power for your off-the-shelf catalog requirements or call 1-800-247-7507 with your modified or custom requirements.

Acme Electric† Corporation
20 Water Street Cuba, NY 14727
Telephone (716) 968-2400,
FAX (716) 968-3948

SWS Series High-Efficiency Switcher

1, 3 or 4 outputs give you a total of 150 watts of switch-mode power.

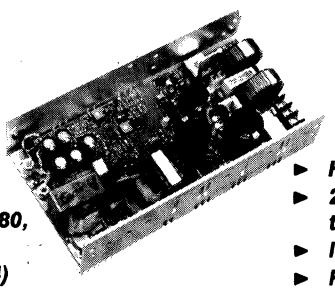


- ***Low component count for low cost and optimum efficiency.***
- ***Soft start and logic inhibit standard.***
- ***Remote sense and built-in OVP on output 1.***
- ***All outputs adjustable, minimum 10%.***
- ***All outputs floating and current limited.***
- ***Field-switchable input 90-132/180-264 Vac.***
- ***In-rush current limiting.***

Outputs and Power Rating (Watts)	Catalog No.	Output 1		Output 2		Output 3		Output 4	
		Vdc Nom.	Amps Max.	Vdc Nom.	Amps Max.	Vdc Nom.	Amps Max.	Vdc Nom.	Amps Max.
Single-150	SWS-152-5*	5	30						
Single-150	SWS 152-12*	12	12.5						
Single-150	SWS 152-15*	15	10						
Single-150	SWS 152-24*	24	6.5						
Single-150	SWS 152-28*	28	5.5						
Triple-150	SWS 152T-5/12/12*	5	20	12	4	12	4		
Triple-150	SWS 152T-5/15/15*	5	20	15	4	15	4		
Quad-150	SWS 152Q-10*	5	20	12	4	12	4	24	4

*Special Order

"YLE" Series High Reliability 250 Watt Switcher



- ***MTBF 200,000 hours calculated per MIL-217E***
- ***Compact size - 2.5" x 5.0" x 10.5"***
- ***Meets FCC and VDE Levels A and B emission standards***
- ***Certified to UL 478, 1459 and 1950, CSA 22.2-220, IEC 380, 435 and 950 EN60950 licensed, VDE 0805 and 0806***
- ***Automatic input voltage range selection (90-132/180-264)***
- ***Fully regulated outputs***
- ***AC Power fail/remote inhibit***
- ***All outputs current limited and floating***
- ***High temperature burn-in***
- ***20 millisecond minimum hold-up time at low line, full load***
- ***In-rush current limiting***
- ***Remote sense and built-in OVP on output 1***
- ***300 Vdc input operation - consult factory***

Mfr.'s Type	Output 1 Vdc/Amp	Output 2 Vdc/Amp	Output 3 Vdc/Amp	Output 4 Vdc/Amp
25A1-9100002-10	3.3 @ 50A			
25A1-9100002	5V @ 50A			
25A1-9200002	12V @ 21A			
25A1-9300002*	15V @ 17A			
25A1-9400002	24V @ 11A			
25A1-9500002	48V @ 5.5A			
25A3-9122002	5V @ 35A	12V @ 5A		12V @ 1.5A
25A4-9122102	5V @ 35A	12V @ 5A	12V @ 5A	5V @ 1.5A
25A4-9133102*	5V @ 35A	15V @ 5A	15V @ 5A	5V @ 1.5A
25A4-9122402	5V @ 35A	12V @ 5A	12V @ 5A	24V @ 2A

*Special Order

Acme Electric† Corporation

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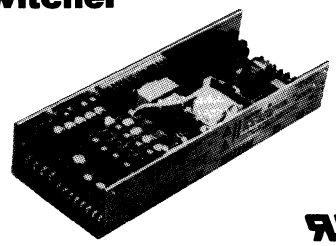
Switch-Mode Power Supplies — STANDARD POWER™

400 A "Spectrum Series" Output Adjustable Switcher

- **4-Wide Band Adjustable Outputs Plus 5V Primary**
- **Perfect for R & D Work and Product Use!**
- **120 Power Supplies In One**

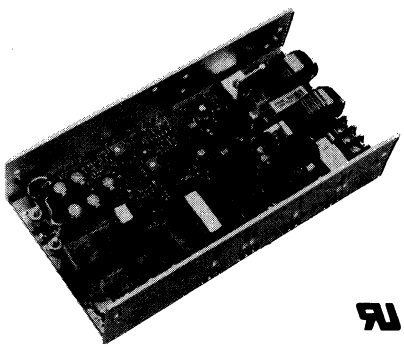


- ► *All auxiliaries wide band adjustable*
- ► *AC Power fail/remote inhibit*
- ► *Compact size 2.5" x 5.0" x 13.0"*
- ► *All outputs current limited and floating*
- ► *Worldwide input capability 95-132/190-264 Vac, 47-63 Hz*
- ► *300 Vdc operation - consult factory*
- ► *Field selectable for 115/230 Vac input*
- ► *High temperature burn-in*
- ► *20 millisecond minimum hold-up time at low line, full load*
- ► *In-rush current limiting*
- ► *Remote sense and built-in OVP on main 5V output*
- ► *Meets UL 478; CSA 22.2, Nos. 143 and 154, TUV licensed to IEC 380 and 435; VDE 0805 and 0806*

Mfr.'s Type	V_1	V_2	V_3	V_4	V_5
400A-9142214	5V @ 40A convection; 5V @ 50A forced air	12-24V @ 6A	5-15V @ 6A	5-15V @ 6A	5-15V @ 6A

Note: 400W air-cooled maximum output (derate 25% for convection). Outputs factory set a 5/24/12/12/5 for above manufacturers type

"Hi-Rel" Series 400 Watt Switcher

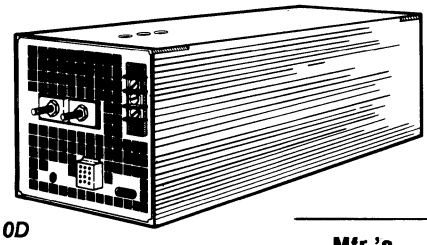


- ► *MTBF 150,000 hours calculated per MIL-217E*
- ► *Compact Size - 2.5" x 5.0" x 10.5"*
- ► *Meets FCC and VDE Level A emissions standards*
- ► *Meets UL 478, 1459 and 1950, CSA 22.2-950, IEC 380, 435, and 950, EN60950 licensed, VDE 0805 and 0806*
- ► *Optional automatic input voltage range selection (90-132/180-264)*
- ► *Fully regulated output*
- ► *Remote sense on main 5V output*
- ► *Power fail/remote inhibit*
- ► *Output current limited and floating*
- ► *High temperature burn-in*
- ► *20 millisecond minimum hold-up time at low line, full load*
- ► *Available in Fall 1991*

Catalog Number	Output 1 Vdc/Amp
40A1-9100000	5V @ 80A
40A1-9400000	24V @ 17A

For other voltages contact factory

1000 Watt Switcher



- ► *High density 1000 Watt supply 5" x 8" x 12.5"*
- ► *Meets IEC 555-2*
- ► *Power factor up to 0.99*
- ► *Load sharing on all outputs*
- ► *Shock & vibration to MIL-STD-810D*
- ► *Stable within 0.1% (after warmup)*
- ► *Wide range input (90-264 Vac)*
- ► *Meets FCC and VDE Levels A*
- ► *Meets UL 478 and 1950, CSA 22.2-220, 950, IEC 380, 435, AND 950, EN60950 licensed, VDE 0805 and 0806*

Mfr.'s Type	DC Outputs		
	V_1	V_2	V_3
10K1-9100000 10K1-9400000 10K3-9122000	5V @ 200A 24V @ 40A 5V @ 150A	+12V @ 15A	-12V @ 15A

Acme Electric† Corporation

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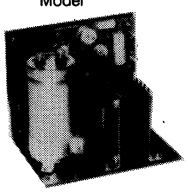
STANDARD POWER™ Power Supplies

Blue-Line "Open-Frame" Series

Standard Features

- *15 to 350 Watts of linear power*
- *Adjustable output voltage*
- *Floating outputs - most models*
- *Selectable power input*
- *Ac input 115/230 Vac selectable*
- *Most models UL recognized*
- *Triple output models available on "Open-Frame" Series*
- *Covered series for safety*



Open Frame Single Output Model

SINGLE OUTPUT

Stock Models		
Mfr.'s Type	Output	
	Vdc	Amp
SPS 15-5	5	1.5
SPS 30-5	5	3.0
SPS 30-8	8	2.0
SPS 15-12	12	0.8
SPS 30-12	12	1.8
SPS 15-24/28	24/28	0.5/0.4
SPS 30-24/28	24/28	1.2/0.8
SPS 40-24/28	24/28	1.8/1.6
SPS 60-24/28	24/28	2.5/2.5
SPS 120-24/28	24/28	6.0/6.0
SPS 220-24/28	24/28	12.0/12.0
SPS 30-48	48	0.6
Special Order Models		
SPS 40-5	5	5.0
SPS 40-12	12	3.5
SPS 60-12	12	5.0
SPS 120-12	12	10.0
SPS 15-15	15	0.7
SPS 30-15	15	1.6
SPS 60-15	15	4.0
SPS 120-15	15	8.0
SPS 30-120	120	0.15

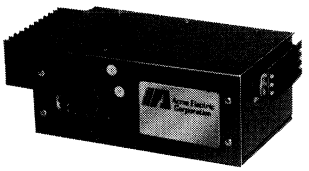
DUAL OUTPUT

Stock Models	Output		
	No.	Nominal Voltage (Vdc)	Maximum Current (Adc)
SPS 60D-5/12	1	5.0	3.0
	2	10 to 12	1.5/1.8
SPS 40D-12/15	1	12 to 15	1.2/1.2
	2	12 to 15	1.2/1.2
SPS 60D-12/15	1	12 to 15	1.6/1.8
	2	12 to 15	1.6/1.8
Special Order Models			
SPS 30D-12/15	1	12 to 15	0.7/0.7
	2	-12 to -15	0.7/0.7
SPS 30DA-12/15	1	12 to 15	0.7/0.7
	2	12 to 15	0.7/0.7

TRIPLE OUTPUT

Stock Models	Output		
	No.	Nominal Voltage (Vdc)	Maximum Current (Adc)
SPS 40T-5/12/12	1	5.0	2.5
	2	+12.0	0.75
	3	-12.0	0.75
SPS 50TA-5/12/15	1	5.0	3.0
	2	12 to 15	0.7/0.7
	3	12 to 15	0.7/0.7
SPS 80T-5/12/15	1	5.0	5.0
	2	12 to 15	1.6/1.6
	3	12 to 15	1.6/1.6
Special Order Model			
SPS 40T-5/15/15	1	5.0	2.5
	2	+15.0	0.75
	3	-15.0	0.75

"Covered" Series CPS

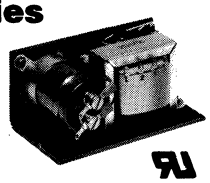


Covered CPS

Single Output Stock Models		
Mfr's Type	Output	
	Vdc	Amp
CPS 30-12	12	1.8
CPS 30-24/28	24/28	1.2/0.8
CPS 60-24/28	24/28	2.5/2.5
CPS 120-24/28	24/28	6.0/6.0
CPS 220-24/28	24/28	12.0/12.0
Single Output Special Order Models		
CPS 30-5	5	3.0
CPS 220-12	12	20.0

"Black-Line" Series Unregulated DC Supplies

- *Low cost*
- *Raw DC power...*
- *Run your motors, solenoids and fans with our inexpensive, low part count power supplies*



Stocked Units		
Mfr's. Type	Voltage (Vdc)	Full Amp
15B12H	12	1.2
30B12H	12	2.4
100B12H	12	7.0
200B12H	12	15.0
15B16H	16	0.9
60B20H	20	3.0
100B20H	20	5.0
200B20H	20	10.0
30B24H	24	1.2
60B24H	24	2.4
100B24H	24	3.5
200B24H	24	7.5
500B24H	24	20.0
200B48H	48	4.0
500B48H	48	10.0
Special Order Units		
15B7H	7	1.8
30B7H	7	3.0
60B7H	7	6.0
100B7H	7	10.0
200B7H	7	20.0
60B12H	12	4.8
100B16H	16	6.0
200B16H	16	12.5
30B20H	20	1.5
15B24H	24	0.6
750B24H	24	30.0
15B48H	48	0.3
30B48H	48	0.6
60B48H	48	1.2
100B48H	48	1.8

Acme Electric† Corporation

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Custom Power Supplies STANDARD POWER™

When Standard Power product offerings do not meet your particular requirements, contact with confidence, the leader in custom power supplies since 1917...Acme Electric Corporation.

Today's electronic equipment has specialized power requirements. AC/DC switch-mode power supplies, DC to DC converters and customer linear power supplies, all need focused engineered solutions to provide power factor correction, hot pluggability, N + 1 redundancy, stress screening, automatic input voltage selection and world-wide agency approvals when required.

A recognized power supply expert, Acme Electric is a BABT certified manufacturer, has an in-house self-certified category program for CSA, and a UL client's test data program.

Acme Electric designs and manufactures high power (250 watts and above) switch-mode power supplies to meet your OEM requirements. Acme Electric has developed strong working relationships with its customers - aiding in maximizing cost-effective product throughput, timely deliveries and overall program efficiencies.

We welcome the opportunity to serve your power supply needs. In order to help you with your custom power supply requirements, fill out the questionnaire below and mail to:

Acme Electric Corporation†
Acme Electric Corporation
20 Water Street
Cuba, New York 14727
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Call us at 800-247-7507 or fax your requirements directly to Acme Electric's Power Products sales office at **716-968-1420.**

Acme Electric, Power Professionals since 1917.

CUSTOM POWER SUPPLY REQUIREMENTS

Name: _____ Company Name: _____

Address: _____ City, State, Zip: _____

Telephone Number: _____ Fax Number: _____

POWER SUPPLY REQUIREMENTS: Wattage: _____

	VOLTS	AMPS		VOLTS	AMPS
OUTPUT #1:	_____	_____	OUTPUT #4:	_____	_____
OUTPUT #2:	_____	_____	OUTPUT #5:	_____	_____
OUTPUT #3:	_____	_____			

Physical Dimensions: Height:_____ Width:_____ Length:_____ Covered:_____ or Open:_____

Output Regulation: Line:_____ Load:_____ Ripple: _____

Operating Temperature:_____ °C Storage Temperature: _____ °C

Safety Agency Approvals Needed: _____

SPECIAL FEATURES NEEDED: Power Fail: _____ Remote On/Off: _____ Hold-Up Time:_____ Efficiency:_____

Transient Response: _____ Other (specify with outputs): _____

OTHER SPECIAL FEATURES: (load sharing, etc): _____

Number of Pieces Need: _____ Per Year: _____

Prototypes Needed by:_____ (date) Number of Prototypes: _____

THIS POWER SUPPLY WILL BE USED IN THE FOLLOWING APPLICATION: _____

SAMPLE DO NOT REMOVE

DC/DC Converters

Model	Total Output Power(W)	Output Voltage (V), Current(A)	Input Voltage Range (V)	Number of Outputs	Line & load regulation	Ripple/noise (DC to 1 MHz)	Temp range	Package
AHE2805S	15	5V, 0-3A	17 - 40	1	±1%	20mV p-p	-55°C to +85°C	A, B
AHE2812S	20	12V, 0-1.67A	17 - 40	1	±1%	30mV p-p		
AHE2812D	15	±12V, 0-625mA	17 - 40	2	±1%	25mV p-p		
AHE2815S	20	15V, 0-1.33A	17 - 40	1	±1%	30mV p-p		
AHE2815D	15	±15V, 0-500mA	17 - 40	2	±1%	25mV p-p		
AHE2805S/ES	15	5V, 0-3A	17 - 40	1	±1%	20mV p-p	-55°C to +105°C	A, B
AHE2812S/ES	20	12V, 0-1.67A	17 - 40	1	±1%	30mV p-p		
AHE2812D/ES	15	±12V, 0-625mA	17 - 40	2	±1%	25mV p-p		
AHE2815S/ES	20	15V, 0-1.33A	17 - 40	1	±1%	30mV p-p		
AHE2815D/ES	15	±15V, 0-500mA	17 - 40	2	±1%	25mV p-p		
AHE2805S/HB	15	5V, 0-3A	17 - 40	1	±1%	20mV p-p	-55°C to +125°C	A, B
AHE2812S/HB	20	12V, 0-1.67A	17 - 40	1	±1%	30mV p-p		
AHE2812D/HB	15	±12V, 0-625mA	17 - 40	2	±1%	25mV p-p		
AHE2815S/HB	20	15V, 0-1.33A	17 - 40	1	±1%	30mV p-p		
AHE2815D/HB	15	±15V, 0-500mA	17 - 40	2	±1%	25mV p-p		
ATW2805S	30	5V, 6A	19 - 40	1	±1.0%	10mV p-p	-55°C to +85°C	C
ATW2812S	30	12V, 2.5A	18 - 40	1	±1.0%	30mV p-p		
ATW2812D	30	±12V, 2.5A[1]	18 - 40	2	±1.0%	50mV p-p		
ATW2815S	30	15V, 2A	18 - 40	1	±1.0%	30mV p-p		
ATW2815D	30	±15V, 2A[1]	18 - 40	2	±1.0%	50mV p-p		
ATW2805S/ES	30	5V, 6A	19 - 40	1	±1.0%	10mV p-p	-55°C to +105°C	C
ATW2812S/ES	30	12V, 2.5A	18 - 40	1	±1.0%	30mV p-p		
ATW2812D/ES	30	±12V, 2.5A[1]	18 - 40	2	±1.0%	50mV p-p		
ATW2815S/ES	30	15V, 2A	18 - 40	1	±1.0%	30mV p-p		
ATW2815D/ES	30	±15V, 2A[1]	18 - 40	2	±1.0%	50mV p-p		
ATW2805S/HB	30	5V, 6A	19 - 40	1	±1.0%	10mV p-p	-55°C to +125°C	C
ATW2812S/HB	30	12V, 2.5A	18 - 40	1	±1.0%	30mV p-p		
ATW2812D/HB	30	±12V, 2.5A[1]	18 - 40	2	±1.0%	50mV p-p		
ATW2815S/HB	30	15V, 2A	18 - 40	1	±1.0%	30mV p-p		
ATW2815D/HB	30	±15V, 2A[1]	18 - 40	2	±1.0%	50mV p-p		
ATO2812T	15	5V, 2A ±12V, ±208mA	16 - 40	3	±0.3% ±0.5%	50mV p-p 25mV p-p	-55°C to +85°C	C
ATO2815T	15	5V, 2A ±15V, ±167mA	16 - 40	3	±0.3% ±0.5%	50mV p-p 25mV p-p		
ATO2812T/ES	15	5V, 2A ±12V, ±208mA	16 - 40	3	±0.3% ±0.5%	50mV p-p 25mV p-p	-55°C to +105°C	D, E
ATO2815T/ES	15	5V, 2A ±15V, ±167mA	16 - 40	3	±0.3% ±0.5%	50mV p-p 25mV p-p		
ATO2812T/HB	15	5V, 2A ±12V, ±208mA	16 - 40	3	±0.3% ±0.5%	50mV p-p 25mV p-p	-55°C to +125°C	D, E
ATO2815T/HB	15	5V, 2A ±15V, ±167mA	16 - 40	3	±0.3% ±0.5%	50mV p-p 25mV p-p		

/ES and /HB devices have optional military screening. 1. Specifications are typical values. Input-to-output isolation @500VDC is 100MΩ minimum. This Series has an industry standard pinout. A cross reference to other manufacturers is available upon request. The /HB devices are a higher temperature device with military screening.

1. Up to 90% of full power is available from either output provided the total output does not exceed 30 watts.

Package

A. Standard - 2.12 x 1.12 x 0.495
B. Flange - 2.89 x 1.12 x 0.495
C. 1.345 x 2.700 x 0.500
D. standard - 1.950 x 1.345 x 0.500
E. flange - 2.700 x 1.345 x 0.500

An optional EMI filter will reduce the input ripple current to levels below the limits imposed by Condition CEO3 of MIL-STD-461B. The AF461 Series has 1.75 or 3.8 amp max. input current.

MIL-STD-1772
Certified and Qualified

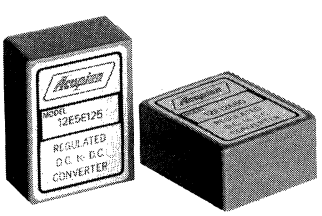
Advanced Analog
a division of Intech
2270 Martin Avenue, Santa Clara, CA 95050-2781
(408) 988-4930 • FAX (408) 988-2702

WE SHIP POWER SUPPLIES IN 3 DAYS

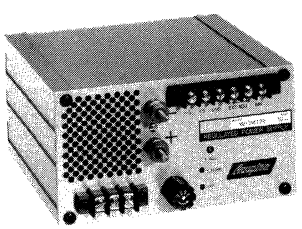
Any time you order Acopian power modules selected from the thousands of models described on the following pages, shipment will be made within 3 days after your purchase order is received. To save more time, telephone your order. We'll ship within 3 days after you've put down the phone.

Miniaturized Single Output	2	Dual Output for Op Amps	18
Miniaturized Dual Output	4	Triple Output	19
Miniaturized Chassis Mounting	6	Series U Unregulated	20
Series A High Performance, Series B General Purpose	8	Rack Mounting	22
Narrow Profile	12	Multiple Output Power Systems	24
Broad Adjustment Range	14	Redundant Output Power Systems	25
Dual Output General Purpose	16	High Voltage	28

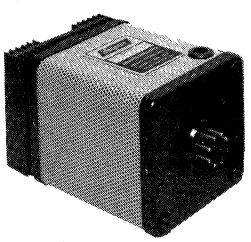
OTHER ACOPIAN PRODUCTS INCLUDE:



DC-DC Converters
For mounting on printed circuit boards. Single and dual output.



Switching Power Supplies
Outputs to 48 Vdc, to 150 A. Small size, low noise.



Plug-in Power Supplies
Single, dual and triple output. Regulated and unregulated.

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Call toll free: (800) 327-6817 (Except from Florida)

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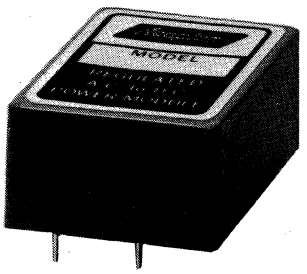
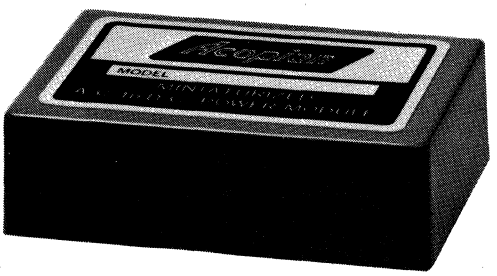
MINIATURIZED REGULATED SINGLE OUTPUT





SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED

Conserve space with mini-modules as small as 2.3" x 1.8" x 1.0". Models with outputs ranging from 1 to 75 volts, and from 30 ma to 2.5 amps are available. All feature excellent regulation and ripple parameters, and are short circuit protected.

Rugged encapsulated construction and generously derated components insure years of reliable operation. Mini-modules are also available with multiple outputs—see pages 4 and 5.

STANDARD FEATURES

- May be used in series
- No derating or heat sinking required
- Short circuit protected
- Small, lightweight

SPECIFICATIONS

Input Voltage: 105–125 VAC, 47 to 420 Hz, single phase.

Output Specifications: See table.

Output Voltage Trim Adjustment: Output is factory preset to ±2% (1 to 9 volt models) or ±1% (10 to 75 volt models) of nominal output voltage. Output may be trimmed to the nominal voltage rating with an external trim resistor.

Polarity: Output is floating. Either positive or negative terminal may be grounded.

Ambient Operating Temperature: −20 to +71°C. (Model 5E150, 0 to +71°C.) No derating required.

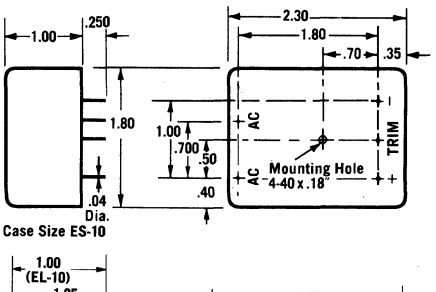
Storage Temperature: −55 to +85°C.

Temperature Coefficient: From 9 to 75 volts, approximate TC is .015%/°C; 1 to 8 volts, .03%/°C.

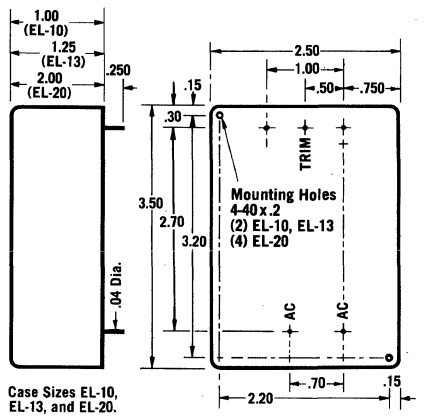
Impedance: 0.07 ohms at 1 kHz and 0.2 ohms at 10 kHz (approx.).

Weight: 7 oz. (Case size ES-10.)
1 lb. (Case size EL-10.)
1 lb. 3 oz. (Case size EL-13.)
2 lb. (Case size EL-20.)

Optional 230 Volt Input: All models can be alternately furnished for operation on an input of 210 to 250 VAC, 47-420 Hz. To order, add suffix "–230" to model number and $10.00 to price.



Case Size ES-10



Case Sizes EL-10, EL-13, and EL-20.

High voltage displays such as NIXIE* indicators may be powered with the Model NX-25A or NX-50. With an input of 115 VAC 47-420 Hz, they provide nominal (unregulated) outputs of 185 VDC.

*Registered trademark of Burroughs Corp.

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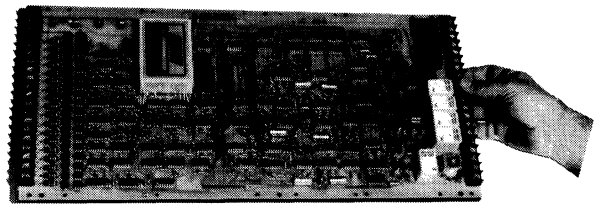
3-DAY SHIPMENT GUARANTEED

Placement of a mini-module on a printed circuit assembly eliminates the need for an outboard power supply, as well as all the associated wiring, connectors and hardware. Layout and construction are simplified, equipment size can be reduced, and system reliability is improved. The assembly shown is used in a control system manufactured by JB Systems Inc.



Output Voltage	Output Current Amps.	Regulation Load ±%	Regulation Line ±%	Ripple mv RMS	Price	Model	Case Size
1	.250	.1	.05	0.5	$ 59	1E25	ES-10
1	.500	.2	.05	1	75	1E50A	EL-10
1.5	.250	.1	.05	0.5	59	1.5E25	ES-10
1.5	.500	.2	.05	1	75	1.5E50A	EL-10
1.5	1.0	.3	.05	1	98	1.5E100	EL-13
1.5	2.5	.3	.05	1	130	1.5E250	EL-20
2	.200	.1	.05	0.5	59	2E20	ES-10
2	.400	.2	.05	1	75	2E40A	EL-10
3	.250	.1	.05	0.5	59	3E25	ES-10
3	.500	.2	.05	1	75	3E50A	EL-10
3.6	.250	.05	.05	0.5	59	3.6E25	ES-10
3.6	.500	.1	.05	1	75	3.6E50A	EL-10
3.6	1.0	.3	.05	1	98	3.6E100	EL-13
3.6	2.5	.3	.05	1	130	3.6E250	EL-20
4	.200	.05	.05	0.5	59	4E20	ES-10
4	.400	.1	.05	1	75	4E40A	EL-10
5	.250	.05	.05	0.5	59	5E25	ES-10
5	.500	.1	.05	1	69	5E50A	EL-10
5	1.0	.2	.05	1	85	5E100	EL-13
5	1.5	.3	.1	1	98	5E150	EL-13
5	2.0	.15	.05	1	115	5E200	EL-20
5	2.5	.15	.05	1	130	5E250	EL-20
6	.200	.05	.05	0.5	59	6E20	ES-10
6	.400	.1	.05	1	75	6E40A	EL-10
6	.550	.2	.05	1	89	6E55	EL-10
6	1.0	.2	.05	1	105	6E100	EL-13
6	1.75	.15	.05	1	125	6E175	EL-20
7	.170	.05	.05	0.5	59	7E17	ES-10
7	.340	.1	.05	1	75	7E34A	EL-10
7	.450	.2	.05	1	89	7E45	EL-10
7	.900	.2	.05	1	105	7E90	EL-13
7	1.15	.15	.05	1	125	7E115	EL-20
8	.150	.05	.05	0.5	59	8E15	ES-10
8	.300	.1	.05	1	75	8E30A	EL-10
8	.700	.2	.05	1	105	8E70	EL-13
8	1.1	.15	.05	1	125	8E110	EL-20
9	.130	.05	.05	0.5	59	9E13	ES-10
9	.260	.1	.05	1	75	9E26A	EL-10
9	.450	.15	.05	1	89	9E45	EL-10
9	.850	.15	.05	1	105	9E85	EL-13
9	1.5	.15	.05	1	130	9E150	EL-20
10	.120	.02	.02	0.5	49	10E12	ES-10
10	.240	.05	.05	1	75	10E24A	EL-10
10	.400	.15	.05	1	89	10E40	EL-10
10	.750	.15	.05	1	105	10E75	EL-13
10	1.2	.1	.05	1	130	10E120	EL-20
11	.110	.02	.02	0.5	59	11E11	ES-10
11	.220	.05	.05	1	75	11E22A	EL-10
11	.350	.15	.05	1	89	11E35	EL-10
11	.600	.15	.05	1	105	11E60	EL-13
11	1.0	.1	.05	1	130	11E100	EL-20
12	.100	.02	.02	0.5	49	12E10	ES-10
12	.150	.05	.05	0.5	65	12E15	ES-10
12	.200	.05	.05	1	75	12E20A	EL-10
12	.400	.1	.05	1	89	12E40	EL-10
12	.700	.1	.05	1	110	12E70	EL-13
12	1.2	.15	.05	1	130	12E120	EL-20
13	.100	.02	.02	0.5	59	13E10	ES-10
13	.200	.05	.05	1	75	13E20A	EL-10
13	.350	.1	.05	1	89	13E35	EL-10
13	1.0	.1	.05	1	130	13E100	EL-20
14	.100	.02	.02	0.5	59	14E10	ES-10
14	.200	.05	.05	1	75	14E20A	EL-10
14	.300	.1	.05	1	89	14E30	EL-10
14	.500	.1	.05	1	105	14E50	EL-13
14	1.0	.1	.05	1	130	14E100	EL-20
15	.100	.02	.02	0.5	49	15E10	ES-10
15	.150	.05	.05	0.5	65	15E15	ES-10
15	.200	.05	.05	1	75	15E20A	EL-10
15	.400	.1	.05	1	89	15E40	EL-10
15	.600	.1	.05	1	105	15E60	EL-13
15	1.0	.1	.05	1	130	15E100	EL-20
16	.080	.02	.02	0.5	59	16E08	ES-10
16	.160	.05	.05	1	75	16E16A	EL-10
16	.350	.1	.05	1	95	16E35	EL-10
16	.500	.1	.05	1	110	16E50	EL-13
16	.900	.1	.05	1	130	16E90	EL-20
17	.070	.02	.02	0.5	59	17E07	ES-10
17	.140	.05	.05	1	75	17E14A	EL-10

Output Voltage	Output Current Amps.	Regulation Load ±%	Regulation Line ±%	Ripple mv RMS	Price	Model	Case Size
17	.450	.1	.05	1	$110	17E45	EL-13
17	.750	.1	.05	1	130	17E75	EL-20
18	.060	.02	.02	0.5	49	18E06	ES-10
18	.120	.05	.05	1	75	18E12A	EL-10
18	.270	.1	.05	1	89	18E27	EL-10
18	.400	.1	.05	1	105	18E40	EL-13
18	.550	.1	.05	1	125	18E55	EL-20
19	.060	.02	.02	0.5	59	19E06	ES-10
19	.120	.05	.05	1	75	19E12A	EL-10
19	.250	.1	.05	1	89	19E25	EL-10
19	.400	.1	.05	1	105	19E40	EL-13
19	.700	.1	.05	1	130	19E70	EL-20
20	.060	.02	.02	0.5	59	20E06	ES-10
20	.120	.05	.05	1	75	20E12A	EL-10
20	.200	.1	.05	1	89	20E20	EL-10
20	.400	.1	.05	1	105	20E40	EL-13
20	.700	.1	.05	1	130	20E70	EL-20
21	.060	.02	.02	0.5	59	21E06	ES-10
21	.120	.05	.05	1	75	21E12A	EL-10
21	.175	.1	.05	1	89	21E18	EL-10
21	.375	.1	.05	1	105	21E38	EL-13
21	.600	.1	.05	1	125	21E60	EL-20
22	.050	.02	.02	0.5	59	22E05	ES-10
22	.100	.05	.05	1	75	22E10A	EL-10
22	.150	.1	.05	1	89	22E15	EL-10
22	.300	.1	.05	1	105	22E30	EL-13
22	.500	.1	.05	1	125	22E50	EL-20
23	.050	.02	.02	0.5	59	23E05	ES-10
23	.100	.05	.05	1	75	23E10A	EL-10
23	.200	.1	.05	1	89	23E20	EL-10
23	.300	.1	.05	1	105	23E30	EL-13
23	.600	.1	.05	1	130	23E60	EL-20
24	.050	.02	.02	0.5	49	24E05	ES-10
24	.100	.05	.05	1	75	24E10A	EL-10
24	.200	.1	.05	1	89	24E20	EL-10
24	.350	.1	.05	1	110	24E35	EL-13
24	.600	.1	.05	1	130	24E60	EL-20
25	.050	.02	.02	0.5	59	25E05	ES-10
25	.100	.05	.05	1	75	25E10A	EL-10
25	.190	.1	.05	1	89	25E19	EL-10
25	.325	.1	.05	1	110	25E33	EL-13
25	.550	.1	.05	1	130	25E55	EL-20
26	.040	.02	.02	0.5	59	26E04	ES-10
26	.080	.05	.05	1	75	26E08A	EL-10
26	.170	.1	.05	1	89	26E17	EL-10
26	.300	.1	.05	1	105	26E30	EL-13
26	.450	.1	.05	1	125	26E45	EL-20
27	.040	.02	.02	0.5	59	27E04	ES-10
27	.080	.05	.05	1	75	27E08A	EL-10
27	.160	.1	.05	1	89	27E16	EL-10
27	.300	.1	.05	1	105	27E30	EL-13
27	.500	.1	.05	1	130	27E50	EL-20
28	.040	.02	.02	0.5	49	28E04	ES-10
28	.080	.05	.05	1	75	28E08A	EL-10
28	.150	.1	.05	1	89	28E15	EL-10
28	.300	.1	.05	1	110	28E30	EL-13
28	.500	.1	.05	1	130	28E50	EL-20
30	.080	.02	.02	1	79	30E08A	EL-13
32	.070	.02	.02	1	79	32E07A	EL-13
34	.060	.02	.02	1	79	34E06A	EL-13
35	.050	.02	.02	1	79	35E05A	EL-13
36	.050	.02	.02	1	79	36E05A	EL-13
38	.040	.02	.02	1	79	38E04A	EL-13
40	.030	.02	.02	1	79	40E03A	EL-13
40	.060	.02	.02	1	98	40E06A	EL-13
42	.030	.02	.02	1	79	42E03A	EL-13
44	.030	.02	.02	1	79	44E03A	EL-13
45	.030	.02	.02	1	79	45E03A	EL-13
48	.030	.02	.02	1	79	48E03A	EL-13
48	.050	.02	.02	1	98	48E05A	EL-13
50	.030	.02	.02	1	79	50E03A	EL-13
50	.050	.02	.02	1	98	50E05A	EL-13
55	.040	.02	.02	1	98	55E04A	EL-13
60	.050	.02	.02	1	98	60E05A	EL-13
65	.050	.02	.02	1	98	65E05A	EL-13
70	.040	.02	.02	1	98	70E04A	EL-13
75	.030	.02	.02	1	98	75E03A	EL-13
185	.025	Unregulated		2V	49	NX-25A	EL-10
185	.050	Unregulated		3.5V	69	NX-50	EL-13

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3-DAY SHIPMENT GUARANTEED

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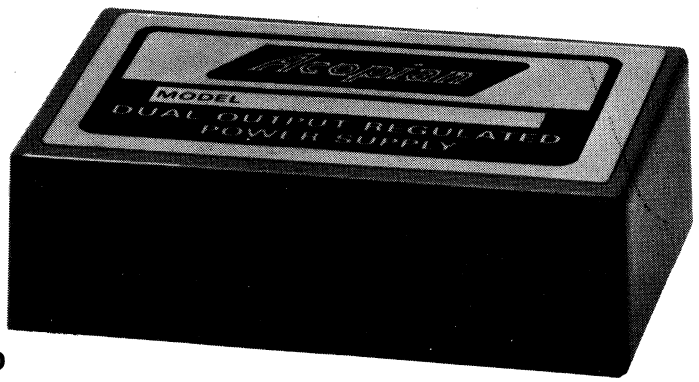
MINIATURIZED REGULATED MULTIPLE OUTPUT



SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED

These dual and triple output mini-modules are compact and convenient sources of the voltages required to power operational amplifiers and related circuits. They may be mounted directly on printed circuit board assemblies, simplifying system layout and minimizing the connectors and wiring required.

STANDARD FEATURES

- May be used in series
- No derating or heat sinking required
- Short circuit protected
- Compact, lightweight

SPECIFICATIONS

Input Voltage: 105–125 VAC, 47 to 420 Hz, single phase.

Output Specifications: See table.

Output Voltage Setting: Each output is factory preset to ±2% (1 to 9 volt outputs) or ±1% (10 to 28 volt outputs) of the nominal output voltage. Outputs of Case Size END modules, except those marked (*), may be trimmed to the nominal voltage rating with an external trim resistor.

Polarity: Single output sections may be used in either polarity. Dual output sections, marked (*), are provided with a plus/common/minus output connection configuration.

Ambient Operating Temperature: −20 to +71°C. No derating required.

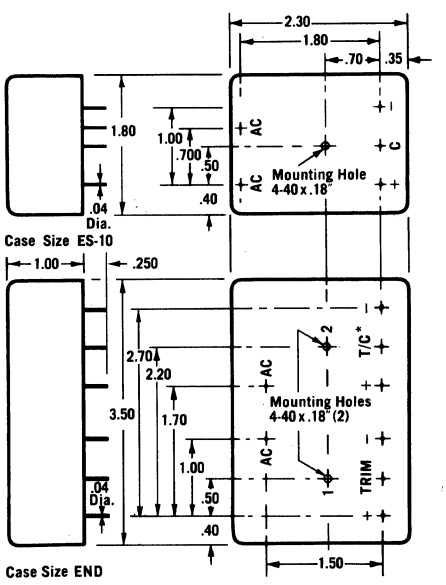
Storage Temperature: −55 to +85°C.

Temperature Coefficient: From 9 to 28 volts, approximate TC is .015%/°C; 1 to 8 volts, .03%/°C.

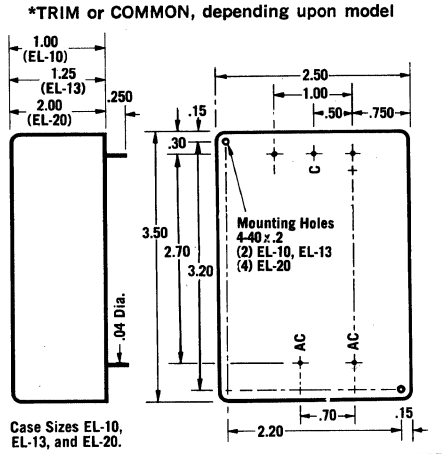
Impedance: 0.07 ohms at 1 kHz and 0.2 ohms at 10 kHz (approx.).

Weight: 7 oz. (Case size ES-10.)
13 oz. (Case size END.)
1 lb. (Case size EL-10.)
1 lb. 3 oz. (Case size EL-13.)
2 lb. (Case size EL-20.)

Optional 230 Volt Input: All models can be alternately furnished for operation on an input of 210 to 250 VAC, 47-420 Hz. To order, add suffix "–230" to model number and $10.00 to price.



*TRIM or COMMON, depending upon model



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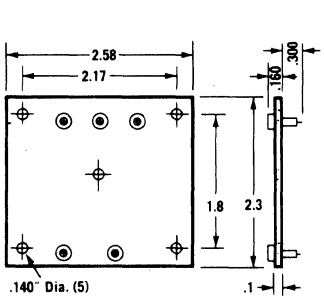
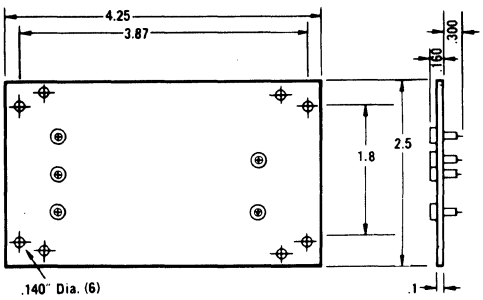
ACCESSORY SOCKETS

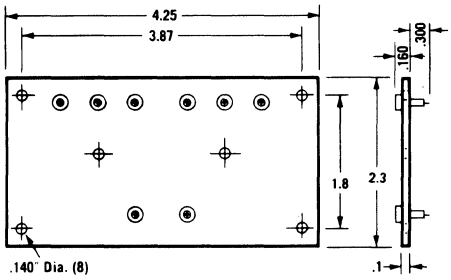
Each of these sockets has a sturdy phenolic base with gold plated teflon-insulated contacts.



Model ES-1 (for case size ES-10).....$15.00 ea.



Model EL-1 (for case sizes EL-10, EL-13 and EL-20).....$15.00 ea.



Model END-1 (for case size END).....$15.00 ea.

HOW TO ORDER:

Any two of the sections listed below, or two of the same section, can be combined into a multiple-output module. The complete model number is the combination of the two section numbers selected. Note that some sections provide two outputs; combination with a single output section results in a triple-output module.

Example: The combination of sections 6E20D and 15E10D is the Model 6E20D-15E10D. Always assign the lower voltage section first. For pricing purposes, add the costs of the sections selected. Example: The price of the Model 6E20D-15E10D is $52.00 plus $45.00, or $97.00 total.

Output Voltage	Output Current Amps.	Regulation Load ±%	Regulation Line ±%	Ripple mv RMS	Price per Section	Section (See "How to order")	Case Size
1	.250	.1	.05	0.5	$52	1E25D	END
1.5	.250	.1	.05	0.5	52	1.5E25D	END
2	.200	.1	.05	0.5	52	2E20D	END
3	.250	.1	.05	0.5	52	3E25D	END
3.6	.250	.05	.05	0.5	52	3.6E25D	END
4	.200	.05	.05	0.5	52	4E20D	END
5	.250	.05	.05	0.5	52	5E25D	END
6	.200	.05	.05	0.5	52	6E20D	END
7	.170	.05	.05	0.5	52	7E17D	END
8	.150	.05	.05	0.5	52	8E15D	END
9	.130	.05	.05	0.5	45	9E13D	END
10	.120	.02	.02	0.5	45	10E12D	END
±12*	.050	.10	.05	1.0	52	D12E05	END
12	.100	.02	.02	0.5	45	12E10D	END
12	.150	.05	.05	0.5	55	12E15D	END
13	.100	.02	.02	0.5	45	13E10D	END

Output Voltage	Output Current Amps.	Regulation Load ±%	Regulation Line ±%	Ripple mv RMS	Price per Section	Section (See "How to order")	Case Size
14	.100	.02	.02	0.5	$45	14E10D	END
±15*	.050	.10	.05	1.0	52	D15E05	END
15	.100	.02	.02	0.5	45	15E10D	END
15	.150	.05	.05	0.5	55	15E15D	END
16	.080	.02	.02	0.5	45	16E08D	END
17	.070	.02	.02	0.5	45	17E07D	END
18	.060	.02	.02	0.5	45	18E06D	END
20	.060	.02	.02	0.5	45	20E06D	END
21	.060	.02	.02	0.5	45	21E06D	END
22	.050	.02	.02	0.5	45	22E05D	END
23	.050	.02	.02	0.5	45	23E05D	END
24	.050	.02	.02	0.5	45	24E05D	END
25	.050	.02	.02	0.5	45	25E05D	END
26	.040	.02	.02	0.5	45	26E04D	END
27	.040	.02	.02	0.5	45	27E04D	END
28	.040	.02	.02	0.5	45	28E04D	END

*Dual output section. Combination with a single output section results in a triple output module.

DUAL OUTPUT SUPPLIES FOR OP AMPS

(These model numbers are complete as shown.)

Nominal Output Voltages	Current per Output Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mv RMS	Price	Model	Case Size
±5	.150	.1	.05	1.5	$ 79	D5-15	EL-10
±5	.250	.1	.05	1.5	98	D5-25	EL-10
±5	.500	.1	.05	1.5	135	D5-50	EL-20
±12	.025	.1	.05	1	49	D12-03	ES-10
±12	.050	.1	.05	1	59	D12-05	ES-10
±12	.100	.05	.05	1	69	D12-10A	EL-10
±12	.150	.05	.05	1	79	D12-15A	EL-10
±12	.200	.05	.05	1	89	D12-20	EL-10
±12	.300	.05	.05	1	105	D12-30	EL-13
±12	.350	.05	.05	1	115	D12-35	EL-13
±12	.500	.1	.05	1	135	D12-50	EL-20

Nominal Output Voltages	Current per Output Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mv RMS	Price	Model	Case Size
±15	.025	.1	.05	1	$ 49	D15-03	ES-10
±15	.050	.1	.05	1	59	D15-05	ES-10
±15	.100	.05	.05	1	69	D15-10A	EL-10
±15	.150	.05	.05	1	79	D15-15A	EL-10
±15	.200	.05	.05	1	89	D15-20	EL-10
±15	.300	.05	.05	1	105	D15-30	EL-13
±15	.350	.05	.05	1	115	D15-35	EL-13
±15	.500	.1	.05	1	135	D15-50	EL-20

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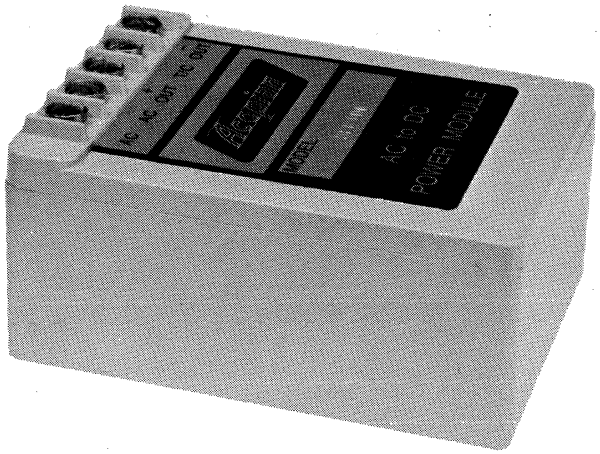
MINIATURIZED REGULATED

Terminal Strip Connections

SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED



Although small in size, these mini-modules offer high performance at modest prices. All models, with series regulated outputs ranging from 1 to 75 volts and as high as 2.5 amps, may be mounted in an area only 3.5″ x 2.5″. Dual output models are available with the ratings commonly required for driving op amps and other balanced loads. Terminal strip input/output connections eliminate all need for sockets or soldering. Short circuit protection, encapsulated construction, and conservative design assure long term reliability.

STANDARD FEATURES

- May be used in series
- No derating or heat sinking required
- Short circuit protected
- Small, lightweight

SPECIFICATIONS

Input Voltage: 105–125 VAC, 47 to 420 Hz, single phase.

Output Specifications: See tables.

Output Voltage Trim Adjustment: Outputs factory preset to ±2% (1 to 9 volt models) or ±1% (10 to 75 volt models) of nominal output voltage. Single output models may be trimmed to the nominal voltage rating with an external trim resistor.

Polarity: Either positive or negative terminal of a single output module may be grounded. Dual output modules have a positive/common/negative output terminal configuration.

Ambient Operating Temperature: −20 to +71°C. (Model 5EB150, 0 to +71°C.) No derating required.

Storage Temperature: −55 to +85°C.

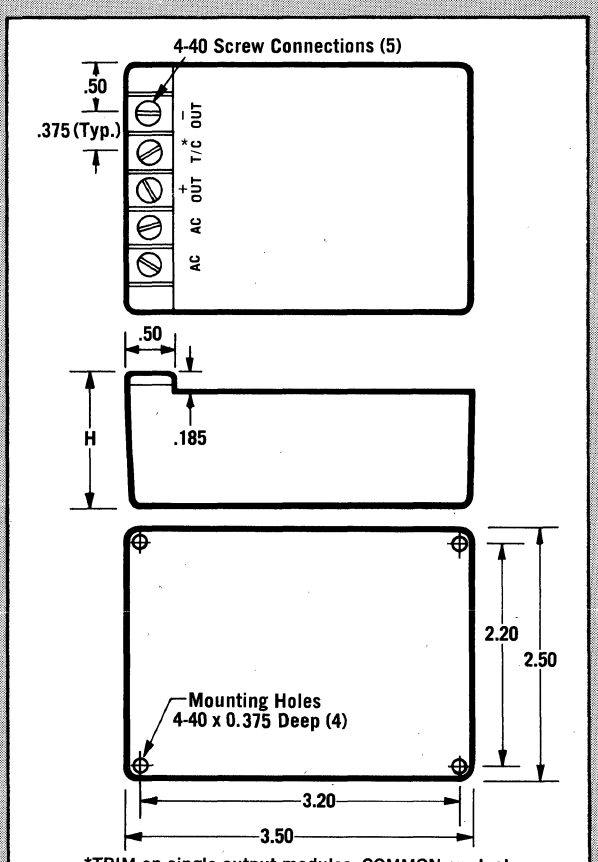
Temperature Coefficient: From 9 to 75 volts, approximate TC is .015%/°C; 1 to 8 volts, .03%/°C.

Impedance: 0.07 ohms at 1 kHz and 0.2 ohms at 10 kHz (approx.).

Optional 230 Volt Input: All models can be alternately furnished for operation on an input of 210 to 250 VAC, 47-420 Hz. To order, add suffix "–230" to model number and $10.00 to price.

High voltage displays such as NIXIE* indicators may be powered with the Model NX-25B or NX-50B. With an input of 115 VAC 47-420 Hz, they provide nominal (unregulated) outputs of 185 VDC.

*Registered trademark of Burroughs Corp.



*TRIM on single output modules; COMMON on duals

Case	H	Approx. Weight
EB-10	1.375	15oz
EB-13	1.625	1lb 5oz
EB-20	2.375	2lb 1oz

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SINGLE OUTPUT MODELS

Output Voltage	Output Current Amps.	Regulation Load ±%	Regulation Line ±%	Ripple mv RMS	Price	Model	Case Size
1	.500	.4	.05	1	$ 79	1EB50	EB-10
1.5	.500	.3	.05	1	79	1.5EB50	EB-10
1.5	1.0	.5	.05	1	105	1.5EB100	EB-13
1.5	2.5	.6	.05	1	140	1.5EB250	EB-20
2	.400	.25	.05	1	79	2EB40	EB-10
3	.500	.25	.05	1	79	3EB50	EB-10
3.6	.500	.15	.05	1	79	3.6EB50	EB-10
3.6	1.0	.4	.05	1	105	3.6EB100	EB-13
3.6	2.5	.4	.05	1	140	3.6EB250	EB-20
4	.400	.15	.05	1	79	4EB40	EB-10
5	.500	.15	.05	1	79	5EB50	EB-10
5	1.0	.25	.05	1	95	5EB100	EB-13
5	1.5	.35	.1	1	110	5EB150	EB-13
5	2.0	.25	.05	1	125	5EB200	EB-20
5	2.5	.25	.05	1	140	5EB250	EB-20
6	.400	.1	.05	1	79	6EB40	EB-10
6	.550	.25	.05	1	95	6EB55	EB-10
6	1.0	.25	.05	1	110	6EB100	EB-13
6	1.75	.2	.05	1	130	6EB175	EB-20
7	.340	.1	.05	1	79	7EB34	EB-10
7	.450	.2	.05	1	95	7EB45	EB-10
7	.900	.25	.05	1	110	7EB90	EB-13
7	1.15	.2	.05	1	130	7EB115	EB-20
8	.300	.1	.05	1	79	8EB30	EB-10
8	.700	.2	.05	1	110	8EB70	EB-13
8	1.1	.2	.05	1	130	8EB110	EB-20
9	.260	.1	.05	1	79	9EB26	EB-10
9	.450	.15	.05	1	95	9EB45	EB-10
9	.850	.2	.05	1	110	9EB85	EB-13
9	1.5	.2	.05	1	135	9EB150	EB-20
10	.240	.05	.05	1	79	10EB24	EB-10
10	.400	.15	.05	1	95	10EB40	EB-10
10	.750	.2	.05	1	110	10EB75	EB-13
10	1.2	.15	.05	1	135	10EB120	EB-20
11	.220	.05	.05	1	79	11EB22	EB-10
11	.350	.15	.05	1	95	11EB35	EB-10
11	.600	.15	.05	1	110	11EB60	EB-13
11	1.0	.15	.05	1	135	11EB100	EB-20
12	.200	.05	.05	1	79	12EB20	EB-10
12	.400	.1	.05	1	95	12EB40	EB-10
12	.700	.15	.05	1	115	12EB70	EB-13
12	1.2	.2	.05	1	135	12EB120	EB-20
13	.200	.05	.05	1	79	13EB20	EB-10
13	.350	.1	.05	1	95	13EB35	EB-10
13	.600	.1	.05	1	115	13EB60	EB-13
13	1.0	.15	.05	1	135	13EB100	EB-20
14	.200	.05	.05	1	79	14EB20	EB-10
14	.300	.1	.05	1	95	14EB30	EB-10
14	.500	.1	.05	1	110	14EB50	EB-13
14	1.0	.15	.05	1	135	14EB100	EB-20
15	.200	.05	.05	1	79	15EB20	EB-10
15	.400	.1	.05	1	95	15EB40	EB-10
15	.600	.1	.05	1	110	15EB60	EB-13
15	1.0	.15	.05	1	135	15EB100	EB-20
16	.160	.05	.05	1	79	16EB16	EB-10
16	.350	.1	.05	1	100	16EB35	EB-10
16	.500	.1	.05	1	115	16EB50	EB-13
16	.900	.15	.05	1	135	16EB90	EB-20
17	.140	.05	.05	1	79	17EB14	EB-10
17	.325	.1	.05	1	100	17EB33	EB-10
17	.450	.1	.05	1	115	17EB45	EB-13
17	.750	.15	.05	1	135	17EB75	EB-20
18	.120	.05	.05	1	79	18EB12	EB-10
18	.270	.1	.05	1	95	18EB27	EB-10

Output Voltage	Output Current Amps.	Regulation Load ±%	Regulation Line ±%	Ripple mv RMS	Price	Model	Case Size
18	.400	.1	.05	1	$110	18EB40	EB-13
18	.550	.1	.05	1	130	18EB55	EB-20
19	.120	.05	.05	1	79	19EB12	EB-10
19	.250	.1	.05	1	95	19EB25	EB-10
19	.400	.1	.05	1	110	19EB40	EB-13
19	.700	.1	.05	1	135	19EB70	EB-20
20	.120	.05	.05	1	79	20EB12	EB-10
20	.200	.1	.05	1	95	20EB20	EB-10
20	.400	.1	.05	1	110	20EB40	EB-13
20	.700	.1	.05	1	135	20EB70	EB-20
21	.120	.05	.05	1	79	21EB12	EB-10
21	.175	.1	.05	1	95	21EB18	EB-10
21	.375	.1	.05	1	110	21EB38	EB-13
21	.600	.1	.05	1	130	21EB60	EB-20
22	.100	.05	.05	1	79	22EB10	EB-10
22	.150	.1	.05	1	95	22EB15	EB-10
22	.300	.1	.05	1	110	22EB30	EB-13
22	.500	.1	.05	1	130	22EB50	EB-20
23	.100	.05	.05	1	79	23EB10	EB-10
23	.200	.1	.05	1	95	23EB20	EB-10
23	.300	.1	.05	1	110	23EB30	EB-13
23	.600	.1	.05	1	135	23EB60	EB-20
24	.100	.05	.05	1	79	24EB10	EB-10
24	.200	.1	.05	1	95	24EB20	EB-10
24	.350	.1	.05	1	115	24EB35	EB-13
24	.600	.1	.05	1	135	24EB60	EB-20
25	.100	.05	.05	1	79	25EB10	EB-10
25	.190	.1	.05	1	95	25EB19	EB-10
25	.325	.1	.05	1	115	25EB33	EB-13
25	.550	.1	.05	1	135	25EB55	EB-20
26	.080	.05	.05	1	79	26EB08	EB-10
26	.170	.1	.05	1	95	26EB17	EB-10
26	.300	.1	.05	1	110	26EB30	EB-13
26	.450	.1	.05	1	130	26EB45	EB-20
27	.080	.05	.05	1	79	27EB08	EB-10
27	.160	.1	.05	1	95	27EB16	EB-10
27	.300	.1	.05	1	110	27EB30	EB-13
27	.500	.1	.05	1	135	27EB50	EB-20
28	.080	.05	.05	1	79	28EB08	EB-10
28	.150	.1	.05	1	95	28EB15	EB-10
28	.300	.1	.05	1	115	28EB30	EB-13
28	.500	.1	.05	1	135	28EB50	EB-20
30	.080	.02	.02	1	85	30EB08	EB-13
32	.070	.02	.02	1	85	32EB07	EB-13
34	.060	.02	.02	1	85	34EB06	EB-13
35	.050	.02	.02	1	85	35EB05	EB-13
36	.050	.02	.02	1	85	36EB05	EB-13
38	.040	.02	.02	1	85	38EB04	EB-13
40	.030	.02	.02	1	85	40EB03	EB-13
40	.060	.02	.02	1	105	40EB06	EB-13
42	.030	.02	.02	1	85	42EB03	EB-13
44	.030	.02	.02	1	85	44EB03	EB-13
45	.030	.02	.02	1	85	45EB03	EB-13
48	.030	.02	.02	1	85	48EB03	EB-13
48	.050	.02	.02	1	105	48EB05	EB-13
50	.030	.02	.02	1	85	50EB03	EB-13
50	.050	.02	.02	1	105	50EB05	EB-13
55	.040	.02	.02	1	105	55EB04	EB-13
60	.050	.02	.02	1	105	60EB05	EB-13
65	.050	.02	.02	1	105	65EB05	EB-13
70	.040	.02	.02	1	105	70EB04	EB-13
75	.030	.02	.02	1	105	75EB03	EB-13
185	.025	Unregulated		2V	55	NX-25B	EB-10
185	.050	Unregulated		3.5V	75	NX-50B	EB-13

DUAL OUTPUT MODELS

Output Voltage Voltages	Current per Output Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mv RMS	Price	Model	Case Size
±5	.150	.1	.05	1.5	$ 85	DB5-15	EB-10
±5	.250	.1	.05	1.5	105	DB5-25	EB-10
±5	.500	.1	.05	1.5	145	DB5-50	EB-20
±12	.100	.05	.05	1	75	DB12-10	EB-10
±12	.150	.05	.05	1	85	DB12-15	EB-10
±12	.200	.05	.05	1	95	DB12-20	EB-10
±12	.300	.05	.05	1	115	DB12-30	EB-13
±12	.350	.05	.05	1	125	DB12-35	EB-13
±12	.500	.1	.05	1	145	DB12-50	EB-20

Output Voltage Voltages	Current per Output Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mv RMS	Price	Model	Case Size
±15	.100	.05	.05	1	$ 75	DB15-10	EB-10
±15	.150	.05	.05	1	85	DB15-15	EB-10
±15	.200	.05	.05	1	95	DB15-20	EB-10
±15	.300	.05	.05	1	115	DB15-30	EB-13
±15	.350	.05	.05	1	125	DB15-35	EB-13
±15	.500	.1	.05	1	145	DB15-50	EB-20

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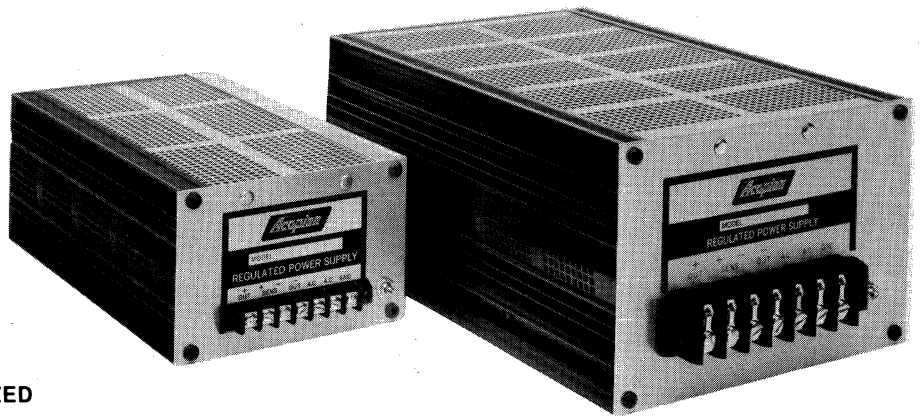
SERIES A REGULATED HIGH PERFORMANCE

SERIES B REGULATED GENERAL PURPOSE

SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED



A broad selection of power supplies offering unusually high performance – many models have regulation of ±0.005%. Electronic current limiting and provision for remote voltage sensing are standard features; overvoltage protection is available as a built-in option. Rugged extruded aluminum cases include threaded mounting holes on bottom, back, and side, permitting mounting in any position.

SERIES A HIGH PERFORMANCE POWER SUPPLIES

STANDARD FEATURES

- Provision for remote sensing and/or external output adjustment
- Short circuit proof with automatic recovery (electronic current limiting)
- Can be mounted on any of three surfaces (case sizes H8, H11 and H16, two surfaces)

SPECIFICATIONS

Input Voltage: 105–125 VAC, 50–400 Hz, single phase.

Output Specifications: See pages 12 and 13. Series A supplies have model numbers beginning with the letter A.

Remote Voltage Sensing: Provision for sensing the output voltage across the load, so that drops in the load line are compensated, is a standard feature.

Polarity: Output is floating; either positive or negative terminal may be grounded or floated up to 300 V above ground.

Ambient Operating Temperature: −20 to +71°C.

Storage Temperature: −55 to +85°C.

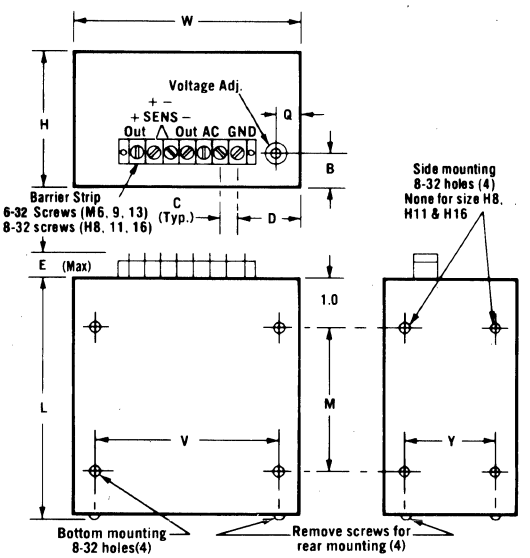
Response Time: Less than 20 microseconds.

OPTIONS

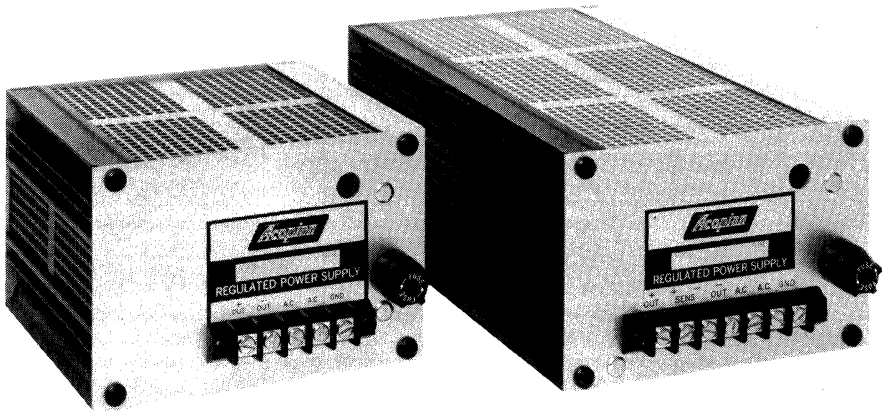
Overvoltage Protection: An internal preset overvoltage protector is available on all models with outputs of 3 to 70 volts. To order, add prefix "V" to the model number, and increase standard price as follows:

For all case sizes except H16: $25.00
Case size H16 ..... 75.00

230 Volt Input: All models can be alternately furnished for operation on inputs of 210–250 VAC, 50–400 Hz. To order, add suffix "-230" to model number and $25.00 to price. (For models in case sizes H8, H11 and H16, add $40.00.)



Size	L	W	H	M	V	Y	E	Q	B	C	D	Approx. Weight
M6	6.59	5.12	3.44	4.0	4.5	3.0	.58	.5	.75	.375	1.44	4lb 4oz
M9	9.25	5.12	3.44	6.0	4.5	3.0	.58	.5	.75	.375	1.44	7lb 4oz
M13	13.25	5.12	3.44	10.0	4.5	3.0	.58	.5	.75	.375	1.44	11lb
H8	8.75	7.37	5.12	6.0	6.75	4.56	.78	1.12	1.25	.562	2.25	15lb 8oz
H11	11.25	7.37	5.12	8.0	6.75	4.56	.78	1.12	1.25	.562	2.25	18lb 4oz
H16	16.00	7.37	5.12	11.0	6.75	4.56	.78	1.12	1.25	.562	2.25	26 lb



These versatile supplies are ideal for powering digital circuitry, test sets, instrument bridges, and process control transmitters. Many models have regulation of ±0.1% or better. All components are generously derated to insure a long and trouble-free life. And they use the same rugged construction as the Series A line. Overvoltage protection and other options are available.

SERIES B GENERAL PURPOSE POWER SUPPLIES

STANDARD FEATURES

- Short circuit proof (electronic current limiting)
- May be mounted on any of three surfaces
- Completely serviceable

SPECIFICATIONS

Input Voltage: 105–125 VAC, 50–400 Hz, single phase.

Output Specifications: See pages 12 and 13. Series B supplies have model numbers beginning with the letter B.

Remote Voltage Adjustment/Sensing: Available as an option. See below.

Polarity: Output is floating; either positive or negative terminal may be grounded or floated up to 300 V above ground.

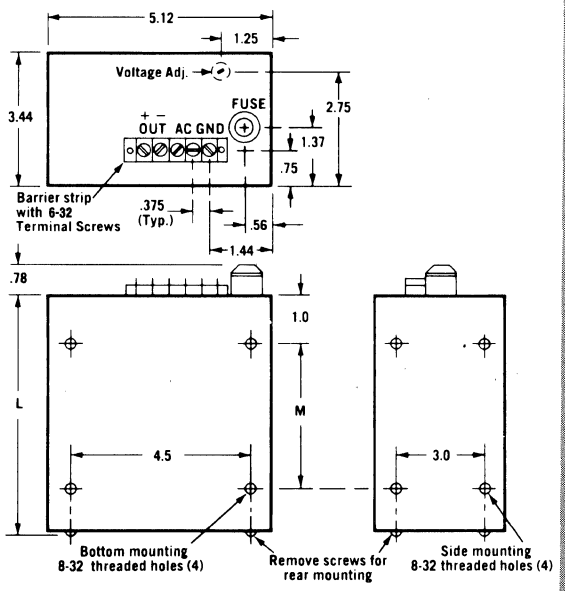
Ambient Operating Temperature: 0 to +71°C.
Storage Temperature: −55 to +85°C.

OPTIONS

Overvoltage Protection: An internal preset overvoltage protector is available on all models with outputs of 3 to 70 volts. To order, add prefix "V" to the model number and add $25.00 to the standard price.

Remote Voltage Sensing: Provision for sensing the output voltage across the load, so that drops in the load lines are compensated, is available on all models. (This option also permits the use of an externally located potentiometer to adjust output voltage.) To order, add prefix "R" to the model number. No increase in price.

230 Volt Input: All models can be alternately furnished for operation on inputs of 210–250 VAC, 50–400 Hz. To order, add suffix "-230" to model number and $25.00 to price.



Size	L	M	Approx. Weight
G3	3.71	1.62	3lb 2oz
G5	5.09	3.00	4lb 14oz
G6	6.59	4.00	5lb 8oz
G9	9.25	6.00	7lb 4oz
G13	13.25	10.00	11lb

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SERIES A
SERIES B

Nominal Output Voltage	Adjust ±V.	Output Current Amps. at 40°C	55°C	71°C	Regulation Load ±%*	Line ±%*	Ripple mv RMS	Price	Model	Size
1.5	.5	6.0	4.3	3.5	.005	.005	.250	$205	A1.5MT600	M6
1.5	.5	9.0	7.2	5.5	.005	.005	.250	235	A1.5MT900	M9
1.5	.5	12.0	10.0	8.0	.005	.005	.250	280	A1.5MT1200	M13
1.5	.5	22.0	18.5	15.5	.005	.005	.250	360	A1.5H2200	H11
1.5	.5	32.0	27.0	22.5	.005	.005	.250	440	A1.5H3200	H16
2	.5	6.0	4.3	3.5	.005	.005	.250	205	A2MT600	M6
2	.5	12.0	10.0	8.0	.005	.005	.250	280	A2MT1200	M13
3	.5	.500	.500	.500	.2	.1	1	95	B3G50	G3
3	.5	1.2	1.1	1.0	.2	.1	1	115	B3G120	G3
3	.5	2.1	2.1	2.0	.5	.1	1	135	B3G210	G5
3	.5	4.0	3.5	3.0	.5	.1	1.5	170	B3G400	G6
3	.5	6.0	4.3	3.5	.005	.005	.250	205	A3MT600	M6
3	.5	9.0	7.2	5.5	.005	.005	.250	235	A3MT900	M9
3	.5	12.0	10.0	8.0	.005	.005	.250	280	A3MT1200	M13
3	.5	17.0	14.5	12.0	.005	.005	.250	315	A3H1700	H8
3	.5	20.0	16.5	13.5	.005	.005	.250	360	A3H2000	H11
3	.5	30.0	25.0	20.0	.005	.005	.250	440	A3H3000	H16
3.6	.5	.500	.500	.500	.2	.1	1	95	B3.6G50	G3
3.6	.5	1.2	1.1	1.0	.2	.1	1	115	B3.6G120	G3
3.6	.5	2.1	2.1	2.0	.5	.1	1	135	B3.6G210	G5
3.6	.5	4.0	3.5	3.0	.5	.1	1.5	170	B3.6G400	G6
3.6	.5	6.0	4.3	3.5	.005	.005	.250	205	A3.6MT600	M6
3.6	.5	7.0	5.9	4.9	.5	.1	1.5	210	B3.6G700	G9
3.6	.5	9.0	7.2	5.5	.005	.005	.250	240	A3.6MT900	M9
3.6	.5	12.0	10.0	8.0	.005	.005	.250	280	A3.6MT1200	M13
3.6	.5	17.0	14.5	12.0	.005	.005	.250	315	A3.6H1700	H8
3.6	.5	22.0	18.5	15.5	.005	.005	.250	360	A3.6H2200	H11
3.6	.5	32.0	27.0	22.5	.005	.005	.250	440	A3.6H3200	H16
5	.5	.500	.500	.500	.1	.1	1	95	B5G50	G3
5	.5	1.2	1.1	1.0	.1	.1	1	115	B5G120	G3
5	.5	1.7	1.5	1.3	.2	.1	1.5	125	B5G170	G3
5	.5	2.1	2.1	2.0	.2	.1	1.5	135	B5G210	G5
5	.5	4.0	3.5	3.0	.3	.1	1.5	160	B5G400	G6
5	.5	5.0	4.4	3.0	.4	.1	1.5	175	B5G500	G6
5	.5	5.1	3.6	2.6	.005	.005	.250	190	A5MT510	M6
5	.5	6.0	4.3	3.5	.005	.005	.250	210	A5MT600	M6
5	.5	8.0	7.0	5.0	.4	.1	1.5	215	B5G800	G9
5	.5	9.0	7.2	5.5	.005	.005	.250	240	A5MT900	M9
5	.5	10.0	9.0	7.0	.4	.1	1.5	245	B5G1000	G13
5	.5	12.0	10.0	8.0	.005	.005	.250	280	A5MT1200	M13
5	.5	17.0	14.5	12.0	.005	.005	.250	315	A5H1700	H8
5	.5	22.0	18.5	15.0	.005	.005	.250	360	A5H2200	H11
5	.5	32.0	27.0	22.0	.005	.005	.250	440	A5H3200	H16
6	1	.500	.500	.500	.1	.1	1	95	B6G50	G3
6	.5	1.2	1.1	1.0	.1	.1	1	115	B6G120	G3
6	.5	1.7	1.5	1.3	.2	.1	1.5	125	B6G170	G3
6	.5	3.2	3.1	3.0	.3	.1	1.5	155	B6G320	G6
6	.5	4.9	3.5	2.5	.005	.005	.250	175	A6MT490	M6
6	.5	6.0	4.5	3.5	.005	.005	.250	200	A6MT600	M6
6	.5	8.5	7.5	5.2	.005	.005	.250	240	A6MT850	M9
6	.5	11.0	9.3	7.5	.005	.005	.250	280	A6MT1100	M13
6	.5	16.0	13.6	11.2	.005	.005	.250	320	A6H1600	H8
6	.5	21.0	17.0	14.0	.005	.005	.250	365	A6H2100	H11
6	.5	28.0	23.0	19.0	.005	.005	.250	440	A6H2800	H16
7	1	.500	.500	.500	.1	.05	1	100	B7G50	G3
7	1	1.0	1.0	1.0	.1	.1	1	125	B7G100	G3
7	.5	2.0	2.0	2.0	.2	.1	1.5	145	B7G200	G5
7	.5	3.0	2.7	2.5	.3	.1	1.5	165	B7G300	G6
7	.5	5.0	4.0	3.0	.005	.005	.250	200	A7MT500	M6
7	.5	6.5	5.2	4.0	.4	.1	1.0	210	B7G650	G9
7	.5	8.0	6.5	5.0	.005	.005	.250	245	A7MT800	M9
7	.5	10.0	8.0	7.0	.4	.1	1.5	255	B7G1000	G13
7	.5	10.0	8.8	7.0	.005	.005	.250	280	A7MT1000	M13
8	1	.500	.500	.500	.1	.05	1	100	B8G50	G3
8	1	1.0	1.0	1.0	.1	.1	1	125	B8G100	G3
8	.5	2.0	2.0	2.0	.2	.1	1.5	145	B8G200	G5
8	.5	3.0	2.7	2.5	.2	.1	1.5	165	B8G300	G6
8	.5	5.0	4.0	3.5	.005	.005	.250	200	A8MT500	M6
8	.5	6.5	5.2	4.0	.3	.1	1.5	220	B8G650	G9
8	.5	8.0	6.5	5.0	.005	.005	.250	245	A8MT800	M9
8	.5	10.0	8.0	7.0	.4	.1	1.5	255	B8G1000	G13
8	.5	10.5	8.8	7.0	.005	.005	.250	280	A8MT1050	M13
8	.5	20.0	16.8	13.5	.005	.005	.250	385	A8H2000	H11
8	.5	28.0	23.0	19.0	.005	.005	.250	440	A8H2800	H16
9	1	.500	.500	.500	.1	.05	1	100	B9G50	G3
9	1	1.0	1.0	1.0	.1	.1	1	125	B9G100	G3
9	.5	2.0	2.0	2.0	.2	.1	1.5	145	B9G200	G5
9	.5	3.0	2.7	2.5	.2	.1	1.5	165	B9G300	G6
9	.5	6.5	5.2	4.0	.3	.1	1.5	220	B9G650	G9
9	.5	10.0	8.3	7.0	.005	.005	.250	280	A9MT1000	M13
10	1	.500	.500	.500	.1	.05	1	$95	B10G50	G3
10	1	1.0	1.0	1.0	.1	.1	1	115	B10G100	G3
10	.5	2.0	2.0	2.0	.2	.1	1.5	145	B10G200	G5
10	.5	3.0	2.7	2.5	.2	.1	1.5	165	B10G300	G6
10	.5	4.5	3.6	2.7	.005	.005	.250	200	A10MT450	M6
10	.5	6.0	5.0	4.0	.3	.1	1.5	220	B10G600	G9
10	.5	7.5	6.0	4.5	.005	.005	.250	250	A10MT750	M9
10	.5	10.0	8.3	7.0	.4	.1	1.5	255	B10G1000	G13
10	.5	10.0	8.3	7.0	.005	.005	.250	280	A10MT1000	M13
10	.5	14.0	11.9	9.8	.005	.005	.250	335	A10H1400	H8
10	.5	18.0	15.0	12.0	.005	.005	.250	385	A10H1800	H11
10	.5	25.0	20.0	16.5	.005	.005	.250	440	A10H2500	H16
12	1	.500	.500	.500	.1	.05	1	95	B12G50	G3
12	1	1.0	1.0	1.0	.1	.1	1	115	B12G100	G3
12	1	1.5	1.4	1.3	.1	.1	1.5	130	B12G150	G3
12	.5	2.0	1.7	1.5	.2	.1	1.5	140	B12G200	G5
12	.5	3.0	2.7	2.5	.2	.1	1.5	160	B12G300	G6
12	.5	3.8	3.3	2.6	.2	.1	1.5	170	B12G380	G6
12	.5	4.0	3.3	2.6	.005	.005	.250	195	A12MT400	M6
12	.5	6.5	5.3	4.0	.3	.1	1.5	220	B12G650	G9
12	.5	6.5	5.3	4.0	.005	.005	.250	245	A12MT650	M9
12	.5	9.0	7.5	6.0	.4	.1	1.5	255	B12G900	G13
12	.5	9.0	7.5	6.0	.005	.005	.250	280	A12MT900	M13
12	.5	13.0	11.0	9.1	.005	.005	.250	335	A12H1300	H8
12	.5	17.0	14.3	11.5	.005	.005	.250	385	A12H1700	H11
12	.5	21.0	17.5	14.5	.005	.005	.250	440	A12H2100	H16
13	1	.500	.500	.500	.1	.05	1	105	B13G50	G3
13	1	1.5	1.4	1.3	.1	.1	1.5	140	B13G150	G3
13	.5	2.0	2.0	2.0	.2	.1	1.5	155	B13G200	G5
13	.5	3.0	2.7	2.5	.2	.1	1.5	175	B13G300	G6
13	.5	3.5	3.0	2.5	.005	.005	.250	200	A13MT350	M6
13	.5	5.0	4.5	4.0	.2	.1	1.5	215	B13G500	G9
13	.5	8.0	7.5	7.0	.3	.1	1.5	255	B13G800	G13
13	.5	8.0	7.5	7.0	.005	.005	.250	280	A13MT800	M13
14	1	.500	.500	.500	.1	.05	1	105	B14G50	G3
14	1	1.5	1.4	1.3	.1	.1	1.5	140	B14G150	G3
14	.5	2.0	2.0	2.0	.2	.1	1.5	155	B14G200	G5
14	.5	3.0	2.7	2.5	.2	.1	1.5	175	B14G300	G6
14	.5	3.0	2.7	2.5	.005	.005	.250	195	A14MT300	M6
14	.5	5.0	4.5	4.0	.2	.1	1.5	210	B14G500	G9
14	.5	7.0	6.5	6.0	.3	.1	1.5	255	B14G700	G13
14	.5	8.0	7.5	7.0	.005	.005	.250	280	A14MT800	M13
15	1	.750	.750	.750	.1	.1	1	110	B15G75	G3
15	1	1.0	1.0	1.0	.1	.1	1	115	B15G100	G3
15	1	1.5	1.4	1.3	.1	.1	1.5	130	B15G150	G3
15	.5	2.0	1.7	1.5	.1	.1	1.5	145	B15G200	G5
15	.5	3.0	2.8	2.5	.1	.1	1.5	165	B15G300	G6
15	.5	3.0	2.8	2.5	.005	.005	.250	180	A15MT300	M6
15	.5	4.2	3.8	3.0	.15	.1	1.5	195	B15G420	G9
15	.5	5.5	4.7	4.0	.005	.005	.250	245	A15MT550	M9
15	.5	6.0	5.0	4.0	.2	.1	1.5	235	B15G600	G9
15	.5	7.0	6.0	5.0	.2	.1	1.5	255	B15G700	G13
15	.5	8.0	6.5	5.5	.005	.005	.250	280	A15MT800	M13
15	.5	11.5	9.7	8.0	.005	.005	.250	335	A15H1150	H8
15	.5	15.0	12.8	10.5	.005	.005	.250	380	A15H1500	H11
15	.5	19.0	16.3	13.5	.005	.005	.250	440	A15H1900	H16
16	1	.300	.300	.300	.05	.05	1	80	B16G30	G3
16	.5	1.0	1.0	1.0	.1	.1	1	125	B16G100	G3
16	.5	3.0	2.5	2.0	.15	.1	1	190	B16G300	G9
16	.5	5.0	5.0	5.0	.2	.1	1.5	245	B16G500	G9
16	.5	6.5	6.0	5.5	.005	.005	.250	280	A16MT650	M13
18	1	.300	.300	.300	.05	.05	1	80	B18G30	G3
18	1	.750	.750	.750	.1	.1	1	110	B18G75	G3
18	.5	1.1	1.1	1.0	.1	.1	1	125	B18G110	G5
18	.5	2.1	2.0	1.8	.1	.1	1	155	B18G210	G5
18	.5	2.1	2.1	2.0	.005	.005	.250	175	A18MT210	M6
18	.5	3.0	2.8	2.5	.15	.1	1	190	B18G300	G9
18	.5	4.5	4.0	3.5	.005	.005	.250	235	A18MT450	M9
18	.5	6.5	6.0	5.5	.005	.005	.250	280	A18MT650	M13
18	.5	14.0	12.0	10.0	.005	.005	.250	385	A18H1400	H11
18	.5	18.0	15.5	13.0	.005	.005	.250	440	A18H1800	H16
20	1	.300	.300	.300	.05	.05	1	80	B20G30	G3
20	1	.750	.750	.750	.1	.05	1	110	B20G75	G3
20	1	1.1	1.1	1.0	.1	.1	1	125	B20G110	G5
20	.5	1.7	1.7	1.5	.1	.1	1.5	140	B20G170	G5
20	.5	2.0	2.0	2.0	.005	.005	.250	180	A20MT200	M6
20	.5	2.7	2.0	1.2	.15	.1	1.5	190	B20G270	G6
20	.5	4.0	3.5	3.0	.005	.005	.250	235	A20MT400	M9
20	.5	5.0	5.0	5.0	.15	.1	1.5	250	B20G500	G13
20	.5	6.0	5.5	5.0	.005	.005	.250	280	A20MT600	M13
20	.5	9.5	8.0	6.6	.005	.005	.250	335	A20H950	H8

*or 2 mv, whichever is greater

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3-DAY SHIPMENT GUARANTEED

Nominal Output Voltage	Adjust ±V.	Output Current Amps. at 40°C	55°C	71°C	Regulation Load ±%*	Line ±%*	Ripple mv RMS	Price	Model	Size
20	.5	13.0	11.3	9.5	.005	.005	.250	$385	A20H1300	H11
20	.5	16.0	14.0	12.0	.005	.005	.250	440	A20H1600	H16
24	1	.300	.300	.300	.05	.05	1	80	B24G30	G3
24	1	.750	.750	.750	.1	.05	1	115	B24G75	G3
24	1	1.1	1.1	1.0	.1	.1	1.5	130	B24G110	G5
24	.5	1.7	1.7	1.5	.1	.1	1.5	145	B24G170	G5
24	.5	2.1	2.0	2.0	.1	.1	1.5	160	B24G210	G5
24	.5	2.1	2.0	2.0	.005	.005	.250	185	A24MT210	M6
24	.5	3.5	3.0	2.5	.15	.1	1.5	205	B24G350	G9
24	.5	3.5	3.0	2.5	.005	.005	.250	245	A24MT350	M9
24	.5	5.0	5.0	5.0	.15	.1	1.5	255	B24G500	G13
24	.5	5.5	5.0	4.5	.005	.005	.250	280	A24MT550	M13
24	.5	8.5	7.2	5.9	.005	.005	.250	335	A24H850	H8
24	.5	12.0	10.5	9.0	.005	.005	.250	385	A24H1200	H11
24	.5	15.0	13.0	11.0	.005	.005	.250	440	A24H1500	H16
25	1	.300	.300	.300	.05	.05	1	100	B25G30	G3
25	1	.750	.750	.750	.1	.05	1	120	B25G75	G3
25	1	1.1	1.1	1.1	.1	.1	1.5	140	B25G110	G5
25	.5	1.7	1.7	1.5	.1	.1	1.5	165	B25G170	G5
25	.5	2.1	2.1	2.0	.1	.1	1.5	170	B25G210	G5
25	.5	3.5	3.0	2.5	.15	.1	1.5	210	B25G350	G9
25	.5	5.0	5.0	5.0	.15	.1	1.5	265	B25G500	G13
28	1	.300	.300	.300	.05	.05	1	100	B28G30	G3
28	1	.500	.500	.500	.05	.05	1	110	B28G50	G3
28	1	.800	.800	.800	.1	.05	1	120	B28G80	G5
28	1	1.1	1.1	1.0	.1	.05	1	135	B28G110	G5
28	.5	1.8	1.6	1.5	.1	.1	1.5	160	B28G180	G5
28	.5	2.1	2.1	2.0	.1	.1	1.5	170	B28G210	G5
28	.5	2.1	2.1	2.0	.005	.005	.250	190	A28MT210	M6
28	.5	3.0	2.7	2.5	.15	.1	1.5	200	B28G300	G9
28	.5	3.0	2.7	2.5	.005	.005	.250	225	A28MT300	M9
28	.5	5.0	5.0	5.0	.15	.1	1.5	255	B28G500	G13
28	.5	5.0	5.0	5.0	.005	.005	.250	280	A28MT500	M13
28	.5	8.0	6.8	5.6	.005	.005	.250	335	A28H800	H8
28	.5	11.0	9.5	8.0	.005	.005	.250	385	A28H1100	H11
28	.5	14.0	12.0	10.0	.005	.005	.250	440	A28H1400	H16
30	1	.300	.300	.300	.05	.05	1	100	B30GT30	G3
30	1	.500	.500	.500	.05	.05	1	115	B30GT50	G3
30	1	1.1	1.1	1.0	.1	.1	1	145	B30GT110	G5
30	.5	1.7	1.6	1.5	.1	.1	1.5	160	B30GT170	G5
30	.5	2.1	2.1	2.0	.1	.1	1.5	175	B30G210	G6
30	.5	2.1	2.1	2.0	.005	.005	.250	195	A30MT210	M6
30	.5	3.0	2.7	2.5	.005	.005	.250	230	A30MT300	M9
30	.5	5.0	5.0	5.0	.15	.1	1.5	260	B30GT500	G13
30	.5	5.0	5.0	5.0	.005	.005	.250	280	A30MT500	M13
30	.5	7.5	6.3	5.2	.005	.005	.250	340	A30H750	H8
30	.5	10.0	9.0	8.0	.005	.005	.250	395	A30H1000	H11
30	.5	14.0	12.0	10.0	.005	.005	.250	455	A30H1400	H16
32	1	.300	.300	.300	.05	.05	1	100	B32GT30	G3
32	1	.500	.500	.500	.05	.05	1	115	B32GT50	G3
32	1	1.0	1.0	1.0	.1	.1	1	145	B32GT100	G5
32	1	1.5	1.5	1.5	.1	.1	1.5	170	B32GT150	G5
32	.5	1.8	1.6	1.3	.005	.005	.250	205	A32MT180	M6
32	.5	2.5	2.1	1.7	.005	.005	.250	245	A32MT250	M9
32	.5	9.0	7.5	6.0	.005	.005	.250	410	A32HT900	H11
34	1	.300	.300	.300	.05	.05	1	100	B34GT30	G3
34	1	.800	.800	.800	.1	.1	1	145	B34GT80	G5
34	1	1.5	1.5	1.5	.1	.1	1.5	175	B34GT150	G5
35	1	.100	.100	.100	.05	.05	1	90	B35GT10	G3
35	1	.300	.300	.300	.05	.05	1	100	B35GT30	G3
35	1	.500	.500	.500	.05	.05	1	120	B35GT50	G3
35	1	.600	.600	.600	.1	.05	1	135	B35GT60	G3
35	1	.800	.800	.800	.1	.1	1.5	145	B35GT80	G5
36	1	.100	.100	.100	.05	.05	1	90	B36GT10	G3
36	1	.500	.500	.500	.05	.05	1	120	B36GT50	G3
36	1	.800	.750	.700	.1	.05	1	145	B36GT80	G5
36	.5	1.3	1.3	1.3	.1	.1	1.5	160	B36GT130	G6
36	.5	1.3	1.3	1.3	.005	.005	.250	200	A36MT130	M6
36	.5	2.3	2.0	1.8	.1	.1	1.5	225	B36GT230	G9
36	.5	2.3	2.0	1.8	.005	.005	.250	245	A36MT230	M9
36	.5	4.0	3.2	2.5	.005	.005	.250	290	A36MT400	M13
36	.5	8.0	6.6	5.3	.005	.005	.250	410	A36HT800	H11
36	.5	11.0	9.1	7.2	.005	.005	.250	510	A36HT1100	H16
40	1	.200	.200	.200	.05	.05	1	105	B40GT20	G3
40	1	.400	.400	.400	.05	.05	1	130	B40GT40	G3
40	1	.500	.500	.500	.1	.05	1	145	B40GT50	G5
40	1	1.0	1.0	1.0	.1	.1	1.5	165	B40GT100	G6
45	1	.200	.200	.200	.05	.05	1	105	B45GT20	G3
45	1	.400	.400	.400	.05	.05	1	140	B45GT40	G3
48	1	.200	.200	.200	.05	.05	1	$105	B48GT20	G3
48	1	.400	.400	.400	.05	.05	1	145	B48GT40	G3
48	1	.600	.600	.600	.1	.1	1	175	B48GT60	G5
48	1	1.1	1.0	.600	.1	.1	1.5	190	B48GT110	G6
48	1	1.2	1.0	.800	.005	.005	.250	215	A48MT120	M6
48	1	1.8	1.6	1.2	.005	.005	.250	250	A48MT180	M9
48	.5	3.0	2.6	2.1	.005	.005	.250	290	A48MT300	M13
48	.5	6.0	5.0	4.0	.005	.005	.250	410	A48HT600	H11
48	.5	8.5	7.2	5.5	.005	.005	.250	510	A48HT850	H16
50	1	.400	.400	.400	.05	.05	1	155	B50GT40	G3
50	1	.500	.500	.500	.05	.05	1	180	B50GT50	G5
50	1	1.0	.800	.700	.005	.005	.250	225	A50MT100	M6
50	1	1.5	1.3	1.0	.005	.005	.250	265	A50MT150	M9
50	1	2.7	2.3	1.8	.005	.005	.250	305	A50MT270	M13
50	1	6.0	5.0	4.0	.005	.005	.250	420	A50HT600	H11
50	1	8.0	6.6	5.2	.005	.005	.250	510	A50HT800	H16
55	1	.300	.300	.300	.05	.05	1	155	B55GT30	G3
55	1	.500	.500	.500	.05	.05	1	185	B55GT50	G5
60	1	.200	.200	.200	.05	.05	1	130	B60GT20	G3
60	1	.300	.300	.300	.05	.05	1	160	B60GT30	G3
60	1	.400	.400	.400	.05	.05	1	185	B60GT40	G5
60	1	.850	.720	.600	.005	.005	.250	230	A60MT85	M6
60	1	1.2	1.0	.800	.005	.005	.250	265	A60MT120	M9
60	1	2.5	2.1	1.7	.005	.005	.250	305	A60MT250	M13
60	1	5.0	4.1	3.3	.005	.005	.250	425	A60HT500	H11
60	1	7.0	5.8	4.6	.005	.005	.250	515	A60HT700	H16
65	1	.300	.300	.300	.05	.05	1	160	B65GT30	G3
70	1	.100	.100	.100	.05	.05	1	120	B70GT10	G3
70	1	.300	.300	.300	.05	.05	1	160	B70GT30	G3
75	1	.050	.050	.050	.05	.05	1	105	B75GT05	G3
75	1	.200	.200	.200	.05	.05	1	155	B75GT20	G3
75	1	.600	.500	.400	.005	.005	.250	230	A75MT60	M6
75	1	1.0	.830	.660	.005	.005	.250	270	A75MT100	M9
75	1	2.0	1.8	1.5	.005	.005	.250	305	A75MT200	M13
75	1	4.0	3.3	2.6	.01	.01	1	425	A75HT400	H11
75	1	5.6	4.6	3.6	.01	.01	1	520	A75HT560	H16
80	1	.100	.100	.100	.05	.05	1	135	B80GT10	G3
80	1	.200	.200	.200	.05	.05	1	160	B80GT20	G3
85	1	.200	.200	.200	.05	.05	1	160	B85GT20	G3
90	1	.200	.200	.200	.05	.05	1	160	B90GT20	G3
90	1	.500	.400	.300	.005	.005	.250	230	A90MT50	M6
90	1	.800	.700	.600	.005	.005	.250	270	A90MT80	M9
90	1	1.5	1.3	1.0	.005	.005	.250	305	A90MT150	M13
90	1	3.3	2.7	2.1	.01	.01	1	435	A90HT330	H11
90	1	4.4	3.6	2.9	.01	.01	1	525	A90HT440	H16
95	1	.200	.200	.200	.05	.05	1	165	B95GT20	G3
100	1	.100	.100	.100	.05	.05	1	150	B100GT10	G3
100	1	.200	.200	.200	.05	.05	1	165	B100GT20	G3
100	1	.460	.460	.340	.1	.1	1.5	200	B100GT46	G6
100	1	.650	.650	.650	.1	.1	1.5	225	B100G65	G6
100	1	.700	.600	.500	.005	.005	.250	265	A100M70	M6
100	1	1.3	1.2	1.0	.005	.005	.250	305	A100MT130	M13
100	1	3.0	2.5	2.0	.01	.01	1	435	A100HT300	H11
100	1	4.0	3.3	2.6	.01	.01	1	525	A100HT400	H16
110	1	.200	.200	.200	.05	.05	1	170	B110GT20	G3
120	1	.100	.100	.100	.05	.05	1	155	B120GT10	G3
120	1	.200	.200	.200	.05	.05	1	170	B120GT20	G3
120	1	.400	.400	.300	.1	.1	1.5	195	B120GT40	G6
120	1	.550	.550	.550	.1	.1	1.5	235	B120GT55	G6
120	1	.600	.500	.400	.005	.005	.250	275	A120M60	M6
120	1	1.2	1.1	1.0	.005	.005	.250	305	A120MT120	M13
120	1	2.5	2.0	1.6	.01	.01	1	445	A120HT250	H11
120	1	3.5	2.9	2.3	.01	.01	1	535	A120HT350	H16
125	1	.200	.200	.200	.05	.05	1	190	B125GT20	G3
130	1	.200	.200	.200	.05	.05	1	195	B130GT20	G3
135	1	.200	.200	.200	.05	.05	1	195	B135GT20	G3
140	1	.200	.200	.200	.05	.05	1	195	B140GT20	G3
150	1	.100	.100	.100	.05	.05	1	160	B150GT10	G3
150	1	.200	.200	.200	.05	.05	1	190	B150GT20	G3
150	1	.320	.320	.250	.1	.1	1.5	210	B150GT32	G6
150	1	.420	.420	.420	.1	.1	1.5	225	B150GT42	G9
150	1	1.0	.900	.800	.005	.005	.250	335	A150MT100	M13
150	1	3.0	2.5	2.0	.01	.01	1	555	A150HT300	H16
200	1	.100	.100	.100	.1	.05	1.5	190	B200GT10	G3

*or 2 mv, whichever is greater

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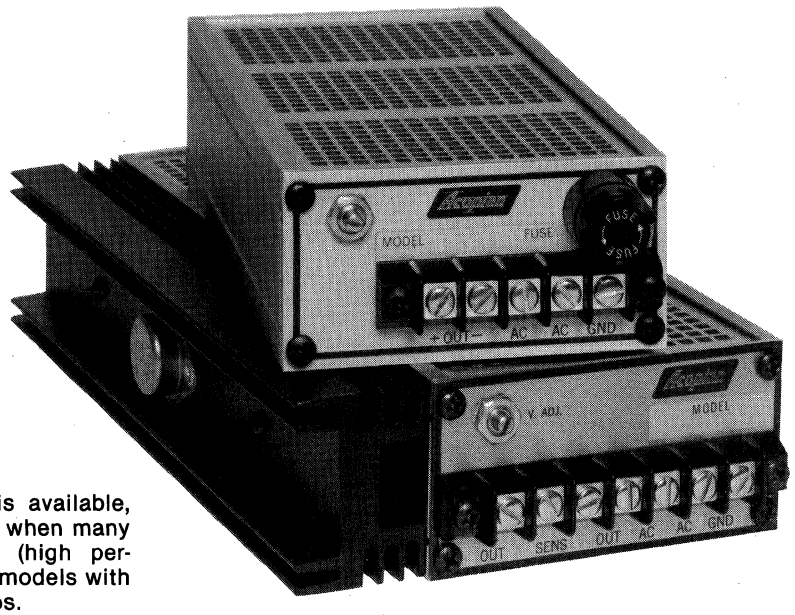
3-DAY SHIPMENT GUARANTEED

Acopian

NARROW PROFILE REGULATED



SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED

Where only a narrow mounting space is available, Acopian narrow profile power supplies fit when many others cannot. Choose from Series A (high performance) and Series B (general purpose) models with output ratings up to 150 volts, up to 3.5 amps.

SPECIFICATIONS

Input Voltage: 105–125 VAC, 50–400 Hz, single phase.

Output Specifications: See table. Series A supplies have model numbers beginning with the letter A; Series B, with the letter B.

Remote Voltage Adjustment/Sensing: Standard in Series A, not available in Series B.

Polarity: Output is floating; either positive or negative terminal may be grounded or floated up to 300 V above ground.

Ambient Operating Temperature: Series A, −20 to +71°C; Series B, 0 to 71°C.

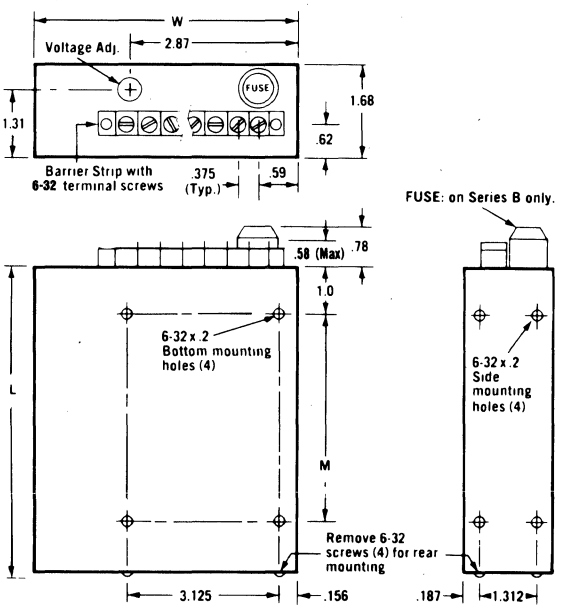
Storage Temperature: −55 to +85°C.

Short Circuit and Overload Protection: Series A, electronic current limiting with automatic recovery; Series B, fused—delivers current surges without damage.

OPTIONS

Overvoltage Protection: An internal preset overvoltage protector is available on all models with outputs of 3 to 70 V. To order, add prefix "V" to the model number and add $25.00 to the standard price.

230 Volt Input: All models can be alternately furnished for operation on inputs of 210–250 VAC, 50–400 Hz. To order, add suffix "-230" to model number and $25.00 to price.



Size	L	W	M	Approx. Weight
F6T	6.59	3.84	4.0	2 lb. 4 oz.
F8T	8.47	3.84	5.0	3 lb. 2 oz.
N8T	8.47	3.84	5.0	3 lb. 2 oz.
N8H	8.47	4.68	5.0	3 lb. 14 oz.

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3-DAY SHIPMENT GUARANTEED

Nominal Output Voltage	Adjust ±V.	Output Current Amps. at 40°C	55°C	71°C	Regulation Load ±%*	Line ±%*	Ripple mv RMS	Price	Model	Size
1	.5	2.2	2.1	2.0	.005	.005	.250	$150	A1NT220	N8T
1	.5	3.5	3.5	3.0	.005	.005	.250	180	A1NT350	N8H
1.5	.5	2.2	2.1	2.0	.005	.005	.250	150	A1.5NT220	N8T
1.5	.5	3.5	3.5	3.0	.005	.005	.250	180	A1.5NT350	N8H
2	.5	2.2	2.1	2.0	.005	.005	.250	150	A2NT220	N8T
2	.5	3.0	3.0	3.0	.005	.005	.250	180	A2NT300	N8H
3	.5	1.0	1.0	1.0	.5	.1	1	125	B3TN100	F6T
3	.5	2.2	2.1	2.0	.005	.005	.250	150	A3NT220	N8T
3	.5	3.5	3.5	3.0	.005	.005	.250	180	A3NT350	N8H
3.6	.5	1.0	1.0	1.0	.5	.1	1	125	B3.6TN100	F6T
3.6	.5	2.2	2.1	2.0	.005	.005	.250	150	A3.6NT220	N8T
3.6	.5	3.5	3.5	3.0	.005	.005	.250	180	A3.6NT350	N8H
5	.5	1.0	1.0	1.0	.1	.1	1	120	B5TN100	F6T
5	.5	1.1	1.0	1.0	.005	.005	.250	130	A5TN110	N8T
5	.5	2.2	2.1	2.0	.005	.005	.250	150	A5NT220	N8T
5	.5	3.5	3.5	3.0	.005	.005	.250	180	A5NT350	N8H
6	.5	1.0	1.0	1.0	.1	.1	1	125	B6TN100	F6T
6	.5	2.2	2.1	2.0	.005	.005	.250	150	A6NT220	N8T
6	.5	2.7	2.7	2.7	.005	.005	.250	180	A6NT270	N8H
7	1	1.0	1.0	1.0	.1	.1	1	125	B7TN100	F6T
7	.5	1.1	1.0	1.0	.005	.005	.250	145	A7TN110	N8T
7	.5	2.0	2.0	2.0	.005	.005	.250	170	A7NT200	N8H
8	1	1.0	1.0	1.0	.1	.1	1	125	B8TN100	F6T
8	.5	1.1	1.0	1.0	.005	.005	.250	145	A8TN110	N8T
8	.5	2.0	2.0	2.0	.005	.005	.250	170	A8NT200	N8H
9	1	1.0	1.0	1.0	.1	.1	1	125	B9TN100	F6T
9	.5	1.1	1.0	1.0	.005	.005	.250	145	A9TN110	N8T
9	.5	2.0	2.0	2.0	.005	.005	.250	170	A9NT200	N8H
10	1	1.0	1.0	1.0	.1	.1	1	130	B10TN100	F6T
10	.5	1.1	1.0	1.0	.005	.005	.250	145	A10TN110	N8T
10	.5	2.0	2.0	2.0	.005	.005	.250	170	A10NT200	N8H
11	1	1.0	1.0	.750	.1	.1	1	130	B11TN100	F6T
11	.5	1.1	1.0	1.0	.005	.005	.250	145	A11TN110	N8T
11	.5	2.0	2.0	2.0	.005	.005	.250	170	A11NT200	N8H
12	1	1.0	1.0	.750	.1	.1	1	130	B12TN100	F6T
12	.5	1.1	1.0	1.0	.005	.005	.250	145	A12TN110	N8T
12	.5	2.0	2.0	2.0	.005	.005	.250	170	A12NT200	N8H
13	1	1.0	1.0	.750	.1	.1	1	130	B13TN100	F6T
13	.5	1.1	1.0	1.0	.005	.005	.250	145	A13TN110	N8T
13	.5	2.0	2.0	2.0	.005	.005	.250	170	A13NT200	N8H
14	1	1.0	1.0	.750	.1	.1	1	130	B14TN100	F6T
14	.5	1.1	1.0	1.0	.005	.005	.250	145	A14TN110	N8T
14	.5	2.0	2.0	2.0	.005	.005	.250	170	A14NT200	N8H
15	1	1.0	1.0	.750	.1	.1	1	130	B15TN100	F6T
15	.5	1.1	1.0	1.0	.005	.005	.250	145	A15TN110	N8T
15	.5	2.0	2.0	2.0	.005	.005	.250	170	A15NT200	N8H
16	1	1.0	1.0	.750	.1	.1	1	130	B16TN100	F6T
16	.5	1.0	1.0	1.0	.005	.005	.250	145	A16TN100	N8T
16	.5	1.75	1.75	1.75	.005	.005	.250	170	A16NT175	N8H
18	1	.750	.750	.750	.1	.1	1	130	B18TN75	F6T
18	.5	1.0	1.0	1.0	.005	.005	.250	145	A18TN100	N8T
18	.5	1.5	1.5	1.5	.005	.005	.250	170	A18NT150	N8H
20	1	.500	.500	.500	.1	.1	1	115	B20TN50	F6T
20	.5	.900	.900	.900	.005	.005	.250	145	A20TN90	N8T
20	.5	1.25	1.25	1.25	.005	.005	.250	170	A20NT125	N8H
24	1	.750	.750	.750	.1	.1	1	130	B24TN75	F6T
24	.5	1.0	1.0	1.0	.005	.005	.250	150	A24TN100	N8T
24	.5	1.25	1.25	1.25	.005	.005	.250	175	A24NT125	N8H
25	1	.750	.750	.750	.1	.05	1	130	B25TN75	F6T
25	.5	.750	.750	.750	.005	.005	.250	150	A25TN75	N8T
25	.5	1.25	1.25	1.25	.005	.005	.250	175	A25NT125	N8H
26	1	.750	.750	.750	.1	.05	1	$130	B26TN75	F6T
26	.5	1.2	1.25	1.25	.005	.005	.250	175	A26NT125	N8H
28	1	.700	.700	.700	.1	.05	1	130	B28TN70	F6T
28	.5	.800	.800	.800	.005	.005	.250	150	A28NT80	N8T
28	.5	1.25	1.25	1.25	.005	.005	.250	175	A28NT125	N8H
30	1	.500	.500	.500	.05	.05	1	130	B30TN50	F6T
30	.5	.750	.750	.750	.005	.005	.250	155	A30NT75	N8T
30	.5	1.1	1.1	1.1	.005	.005	.250	180	A30NT110	N8H
32	1	.400	.400	.400	.05	.05	1	125	B32TN40	F6T
32	.5	.600	.600	.600	.005	.005	.250	150	A32TN60	N8T
34	1	.400	.400	.400	.05	.05	1	125	B34TN40	F6T
34	.5	1.1	1.1	1.1	.005	.005	.250	180	A34NT110	N8H
35	1	.400	.400	.400	.05	.05	1	125	B35TN40	F6T
35	.5	.600	.600	.600	.005	.005	.250	150	A35TN60	N8T
35	.5	1.1	1.1	1.1	.005	.005	.250	180	A35NT110	N8H
36	1	400	.400	.400	.05	.05	1	125	B36TN40	F6T
36	.5	.600	.600	.600	.005	.005	.250	150	A36TN60	N8T
36	.5	1.0	1.0	1.0	.005	.005	.250	180	A36NT100	N8H
38	1	.200	.200	.200	.05	.05	1	115	B38TN20	F6T
40	1	.400	.400	.400	.05	.05	1	135	B40TN40	F6T
40	.5	.750	.750	.750	.005	.005	.250	170	A40NT75	N8T
45	1	.400	.400	.400	.05	.05	1	145	B45TN40	F6T
45	.5	.600	.600	.600	.005	.005	.250	175	A45NT60	N8T
48	1	.400	.400	.400	.05	.05	1	150	B48TN40	F6T
48	.5	.500	.500	.500	.005	.005	.250	180	A48NT50	N8T
50	1	.400	.400	.400	.05	.05	1	160	B50FT40	F6T
50	1	.450	.450	.450	.005	.005	.250	185	A50NT45	N8T
55	1	.200	.200	.200	.05	.05	1	135	B55FT20	F6T
55	1	.400	.400	.400	.005	.005	.250	185	A55NT40	N8T
60	1	.150	.150	.150	.05	.05	1	135	B60FT15	F6T
60	1	.350	.350	.350	.005	.005	.250	185	A60NT35	N8T
65	1	.100	.100	.100	.05	.05	1	130	B65FT10	F6T
65	1	.250	.250	.250	.05	.05	1	165	B65FT25	F8T
65	1	.270	.270	.270	.005	.005	.250	185	A65NT27	N8T
67	1	.100	.100	.100	.05	.05	1	130	B67FT10	F6T
70	1	.100	.100	.100	.05	.05	1	130	B70FT10	F6T
70	1	.250	.250	.250	.005	.005	.250	185	A70NT25	N8T
75	1	.200	.200	.200	.05	.05	1	160	B75FT20	F8T
75	1	.250	.250	.250	.005	.005	.250	185	A75NT25	N8T
80	1	.100	.100	.100	.05	.05	1	140	B80FT10	F6T
80	1	.200	.200	.200	.05	.05	1	160	B80FT20	F8T
80	1	.250	.250	.250	.005	.005	.250	185	A80NT25	N8T
85	1	.250	.250	.250	.005	.005	.250	185	A85NT25	N8T
90	1	.100	.100	.100	.05	.05	1	145	B90FT10	F6T
90	1	.200	.200	.200	.05	.05	1	165	B90FT20	F8T
90	1	.250	.250	.250	.005	.005	.250	190	A90NT25	N8T
95	1	.200	.200	.200	.05	.05	1	170	B95FT20	F8T
95	1	.200	.200	.200	.005	.005	.250	185	A95NT20	N8T
100	1	.100	.100	.100	.05	.05	1	160	B100FT10	F6T
100	1	.200	.200	.200	.05	.05	1	175	B100FT20	F8T
100	1	.200	.200	.200	.005	.005	.250	195	A100NT20	N8T
110	1	.100	.100	.100	.05	.05	1	160	B110FT10	F6T
115	1	.100	.100	.100	.05	.05	1	160	B115FT10	F6T
120	1	.050	.050	.050	.05	.05	1	155	B120FT05	F6T
120	1	.200	.200	.200	.05	.05	1	180	B120FT20	F8T
120	1	.200	.200	.200	.005	.005	.250	195	A120NT20	N8T
125	1	.050	.050	.050	.05	.05	1	155	B125FT05	F6T
125	1	.200	.200	.200	.05	.05	1	180	B125FT20	F8T
125	1	.200	.200	.200	.005	.005	.250	195	A125NT20	N8T
150	1	.100	.100	.100	.05	.05	1	175	B150FT10	F8T
150	1	.100	.100	.100	.005	.005	.250	195	A150NT10	N8T

*or 2 mv, whichever is greater

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3-DAY SHIPMENT GUARANTEED

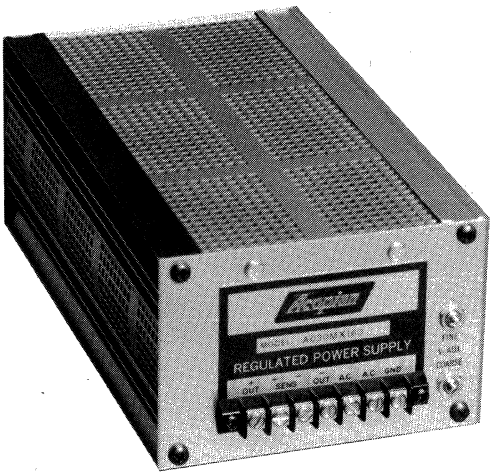
Acopian

BROAD ADJUSTMENT RANGE

Adjustable Current Limiting

SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED



Power supplies with the broad adjustment capability required for analog instrumentation and circuitry, electronic system development; basic research, and similar applications.

For applications requiring a constant current or adjustable current limiting, a power supply with a true constant current characteristic, such as those with model numbers beginning with the letter P, should be used.

SPECIFICATIONS

Input Voltage: 105-125 VAC, 50-400 Hz, single phase.

Regulation, Ripple (constant voltage operation):
Line Regulation: ±0.005% or 2 mv, whichever is greater.
Load Regulation: ±0.005% or 2 mv, whichever is greater.
Ripple: 0.25 mv rms.

Regulation, Ripple (constant current operation):
Line Regulation: ±0.1% or 2 ma.
Load Regulation: ±0.2% or 5 ma.
Ripple: 0.1% rms.

Remote Voltage Sensing: Provision for sensing the output voltage across the load, to compensate voltage drops in output wiring, is a standard feature.

Remote Voltage Programming: The output voltage of all models may be controlled by means of external resistance connected in series with the −S lead.

Voltage Programming Coefficient: See table. Calibration tolerance, ±2%.

Current Limiting: Models with fixed current limiting have a foldback-type characteristic with automatic recovery. All others have current limiting with a constant-voltage/constant-current crossover characteristic.

Polarity: Output is floating; either positive or negative terminal may be grounded or floated up to 300 V above ground.

Ambient Operating Temperature Range: −20 to +71°C.
Storage Temperature Range: −55 to +85°C.

OPTIONS

Remote Current Limiting Adjustment: All models having numbers beginning with the letter P have a built in (front panel) current limit control. Provision for control of the current limit setting by adjustment of an external resistance is available as an option. To order, add the prefix letter "E" to the model number, and add $10.00 to the standard price.

The current limit setting is inversely related to resistance. Use a 200 ohm ½ W potentiometer.

Overvoltage Protection: An internally mounted overvoltage protection circuit, fixed set approximately 20% above the maximum output voltage rating of the supply, is available on all models with maximum outputs of 60 volts or less. To order, add prefix "V" to the model number, and increase standard price by $25.00. (For models in case size H16, add $75.00.)

230 Volt Input: All models can be alternately furnished for operation on inputs of 210-250 VAC, 50-400 Hz. To order, add suffix "-230" to model number and $25.00 to price. (For models in case sizes H11 and H16, add $40.00.)

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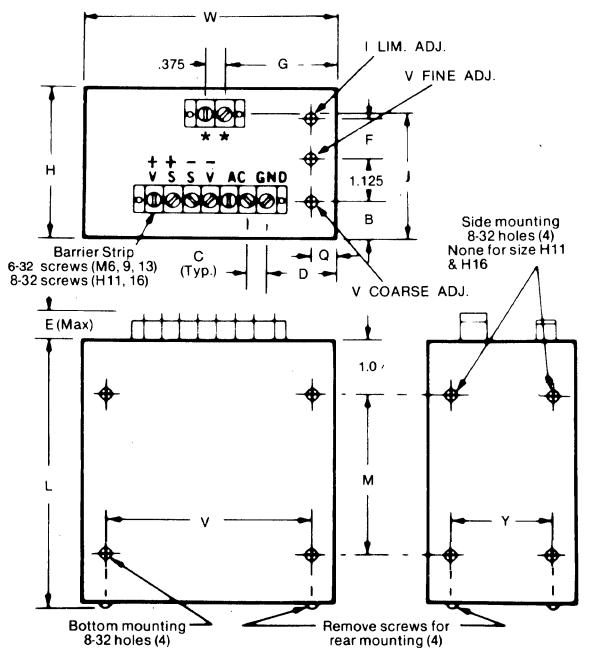
Output Voltage Range	Output Current Amps. at 40°C	55°C	71°C	Voltage Prgmg. Coeff. (/V)	Case Size	Voltage Programmable Fixed Current Limiting Model	Price	Voltage Programmable Adjustable Current Limiting Model	Price
0-6	1.2	1.2	1.2	820	M6	A06MX120	$165	P06MX120	$185
0-6	2.0	2.0	2.0	820	M6	A06MX200	185	P06MX200	205
0-6	3.0	2.5	2.0	820	M6	A06MX300	215	P06MX300	235
0-6	5.0	4.0	3.0	820	M9	A06MX500	260	P06MX500	280
0-6	8.0	7.0	6.0	820	M13	A06MX800	300	P06MX800	320
0-6	12.0	10.0	7.0	820	H11	A06HX1200	385	P06HX1200	405
0-6	16.0	13.0	10.0	820	H16	A06HX1600	460	P06HX1600	480
0-15	1.0	1.0	1.0	330	M6	A015MX100	155	P015MX100	175
0-15	2.0	1.6	1.2	330	M6	A015MX200	205	P015MX200	225
0-15	3.0	2.4	1.8	330	M9	A015MX300	260	P015MX300	280
0-15	5.0	4.0	2.5	330	M13	A015MX500	300	P015MX500	320
0-15	8.0	6.0	4.0	330	H11	A015HX800	400	P015HX800	420
0-15	10.0	8.0	6.0	330	H16	A015HX1000	460	P015HX1000	480
0-30	.50	.50	.50	160	M6	A030MX50	175	P030MX50	195
0-30	1.0	1.0	1.0	160	M6	A030MX100	205	P030MX100	225
0-30	1.6	1.4	1.2	160	M9	A030MX160	245	P030MX160	265
0-30	2.5	2.0	1.5	160	M13	A030MX250	295	P030MX250	315
0-30	4.0	3.0	2.0	160	H11	A030HX400	410	P030HX400	430
0-30	5.0	4.0	3.0	160	H16	A030HX500	475	P030HX500	495
0-50	.35	.34	.33	1000	M6	A050MX35	195	P050MX35	215
0-50	.60	.50	.40	1000	M6	A050MX60	245	P050MX60	265
0-50	.85	.75	.65	1000	M9	A050MX85	285	P050MX85	305
0-100	.10	.09	.08	500	M6	A0100MX10	245	P0100MX10	265
0-100	.25	.20	.15	500	M6	A0100MX25	285	P0100MX25	305

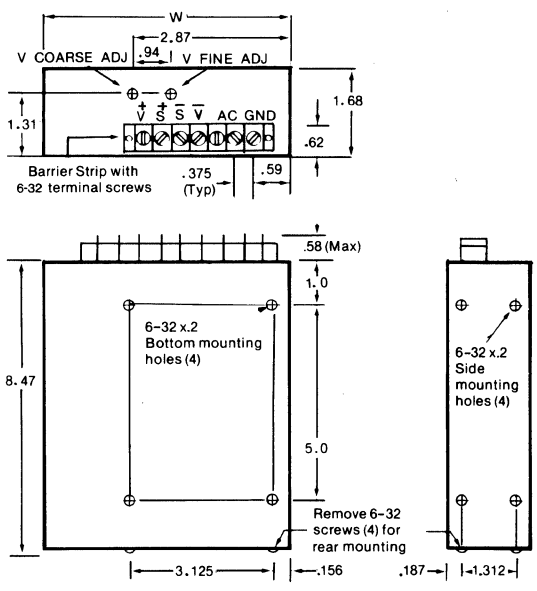
NARROW PROFILE MODELS FOR LIMITED SPACE APPLICATIONS

Output Voltage Range	Output Current Amps. (To + 71°C)	Voltage Prgmg. Coeff. (Ω/V)	Case Size	Model	Price
0-7	1.0	700	N8T	A07XN100	$155
0-7	2.1	700	N8H	A07NX210	190
0-18	.400	270	N8T	A018XN40	150
0-18	1.0	270	N8H	A018NX100	180
0-32	.250	150	N8T	A032XN25	135
0-32	.600	150	N8H	A032NX60	180
0-60	.125	820	N8T	A060NX12	160
0-60	.250	820	N8H	A060NX25	200
0-150	.050	330	N8T	A0150NX05	190
0-150	.100	330	N8H	A0150NX10	230



*To external current limit control (optional)

Case Size	L	W	H	M	V	Y	E	Q	B	C	D	F	G	J	Approx. Weight
M6	6.59	5.12	3.44	4.0	4.5	3.0	.58	.5	.75	.375	1.44	.75	2.37	3.09	4lb 4oz
M9	9.25	5.12	3.44	6.0	4.5	3.0	.58	.5	.75	.375	1.44	.75	2.37	3.09	7lb 4oz
M13	13.25	5.12	3.44	10.0	4.5	3.0	.58	.5	.75	.375	1.44	.75	2.37	3.09	11lb
H11	11.25	7.37	5.12	8.0	6.75	4.56	.78	1.12	1.25	.562	2.25	1.12	3.75	4.72	18lb 4oz
H16	16.00	7.37	5.12	11.0	6.75	4.56	.78	1.12	1.25	.562	2.25	1.12	3.75	4.72	23lb



Case Size	W	Approx. Weight
N8T	3.84	3lb 2oz
N8H	4.68	3lb 14oz

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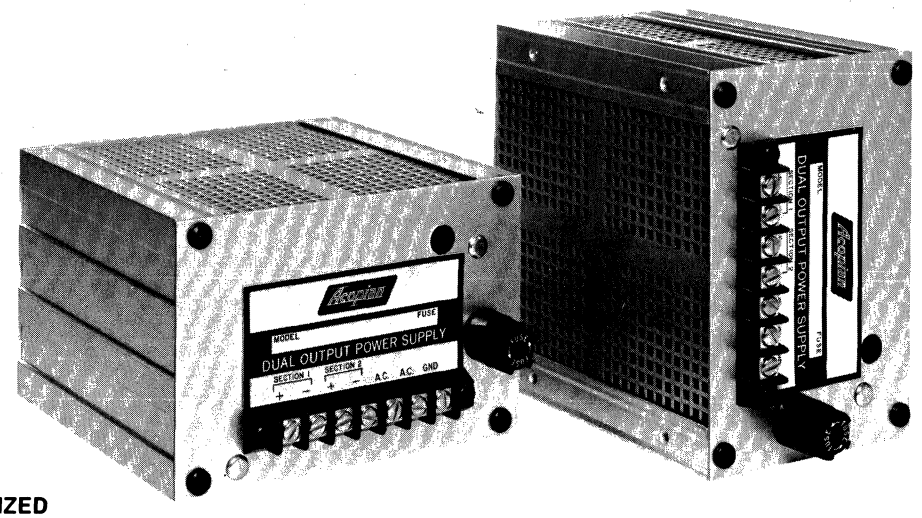
3-DAY SHIPMENT GUARANTEED

Acopian

DUAL OUTPUT General Purpose



SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED

Acopian general purpose duals furnish two completely independent outputs, either identical or different, in less space and at less cost than two equivalent single output supplies. Thousands of output voltage/current rating combinations are available. Mounting and system wiring are simplified. Quality components, generously derated, insure long-term reliability.

HOW TO ORDER: Select two sections from one of the three tables on page 17. The complete model number is the combination of the two sections selected. Example: The combination of section 5GT20D and section 8GT50D is Model 5GT20D-8GT50D. Always assign the lower voltage section first. For pricing purposes, add the cost of the individual sections selected.

SPECIFICATIONS

Input Voltage: 105—125 VAC, 50—400 Hz, single phase.

Output Specifications: See page 17. No derating required through ambient temperature range of −10 to +71°C.

Short Circuit Protection: Delivers current surges without damage—built-in fuse protects supply against prolonged overloads and shorts.

Polarity: Outputs are floating. Each output may be independently connected to provide any combination of positive and negative voltages. Outputs may be floated up to 300 V above ground.

Ambient Operating Temperature: — 10 to + 71°C.

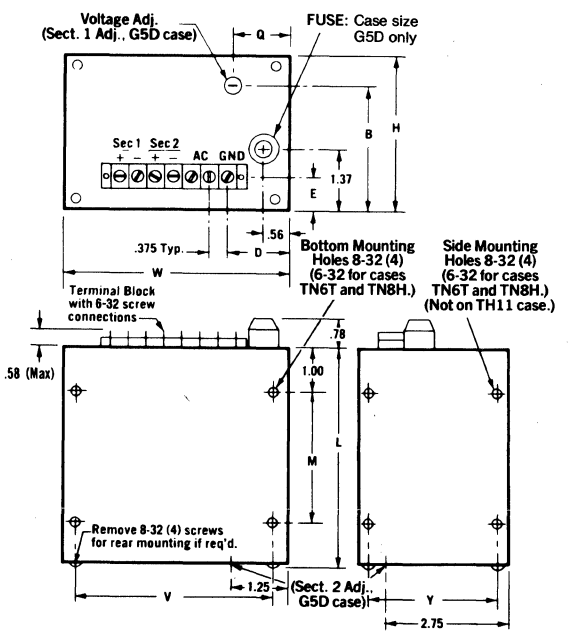
Storage Temperature: —55 to + 85°C.

Dimensions and Weight: Case size G5D.

OPTIONS

Overvoltage Protection: Two separate, preset overvoltage protection circuits, one for each output. To order, add prefix "V" to model number and add $30.00 to the standard price. Not available for outputs over 70 V.

230 Volt Input: All models can be alternately furnished for operation on inputs of 210-250 VAC, 50-400 Hz. To order, add suffix "-230" to the model number and $25.00 to the standard price.



Size	L	W	H	M	V	Y	E	Q	B	D	Approx. Weight
G5D	5.09	5.12	3.44	3.00	4.50	3.00	.75	1.25	2.73	1.44	4 lb
TG5	5.09	5.12	3.44	3.00	4.50	3.00	.75	1.25	2.73	1.44	3 lb 4 oz
TG6	6.59	5.12	3.44	4.00	4.50	3.00	.75	1.25	2.73	1.44	4 lb 4 oz
TG9	9.25	5.12	3.44	6.00	4.50	3.00	.75	1.25	2.73	1.44	6 lb 8 oz
TG13	13.25	5.12	3.44	10.00	4.50	3.00	.75	1.25	2.73	1.44	12 lb
TH11	11.25	7.37	5.12	8.00	6.75	4.56	.75	2.73	4.36	2.38	18 lb 4 oz
TN6T	6.59	3.84	1.68	4.00	3.12	1.31	.62	2.87	1.31	.59	2 lb 4 oz
TN8H	8.47	4.68	1.68	5.00	3.12	1.31	.62	2.87	1.31	.59	3 lb 14 oz

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(500 MA MAXIMUM)

Nominal Output Voltage	Adjust ± V.	Output Current Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mV RMS	Price per Section	Section (See "How to Order")
1.5	.5	.200	.4	.05	1	$70	1.5GT20D
1.5	.5	.400	.5	.1	1	85	1.5GT40D
2.5	.5	.200	.4	.05	1	70	2.5GT20D
2.5	.5	.400	.5	.1	1	85	2.5GT40D
3	.5	.200	.3	.05	1	70	3GT20D
3	.5	.400	.5	.1	1	85	3GT40D
3.6	.5	.200	.2	.05	1	70	3.6GT20D
3.6	.5	.400	.3	.1	1	85	3.6GT40D
5	.5	.200	.2	.05	1	70	5GT20D
5	.5	.500	.3	.05	1	85	5GT50D
6	1	.200	.05	.05	1	70	6GT20D
6	1	.500	.15	.05	1	85	6GT50D
7	1	.200	.05	.05	1	70	7GT20D
7	1	.500	.15	.05	1	85	7GT50D
8	1	.200	.05	.05	1	70	8GT20D
8	1	.500	.1	.05	1	85	8GT50D
9	1	.200	.05	.05	1	70	9GT20D
9	1	.500	.1	.05	1	85	9GT50D
10	1	.250	.05	.05	1	70	10GT25D
10	1	.500	.1	.05	1	85	10GT50D
12	1	.250	.05	.05	1	70	12GT25D
12	1	.500	.1	.05	1	85	12GT50D
13	1	.250	.05	.05	1	70	13GT25D
13	1	.500	.1	.05	1	85	13GT50D
15	1	.150	.05	.05	1	65	15GT15D
15	1	.250	.05	.05	1	70	15GT25D
15	1	.500	.1	.05	1	85	15GT50D
18	1	.250	.05	.05	1	70	18GT25D
18	1	.500	.1	.05	1	85	18GT50D
20	1	.250	.05	.05	1	70	20GT25D
20	1	.500	.1	.05	1	85	20GT50D
24	1	.250	.05	.05	1	70	24GT25D
24	1	.500	.05	.05	1	85	24GT50D
25	1	.250	.05	.05	1	70	25GT25D
25	1	.500	.05	.05	1	85	25GT50D
28	1	.250	.05	.05	1	70	28GT25D
28	1	.400	.05	.05	1	85	28GT40D
30	1	.250	.05	.05	1	70	30GT25D
30	1	.400	.05	.05	1	85	30GT40D
35	1	.100	.05	.05	1	70	35GT10D
35	1	.200	.05	.05	1	80	35GT20D
40	1	.100	.05	.05	1	70	40GT10D
40	1	.200	.05	.05	1	80	40GT20D
45	1	.100	.05	.05	1	75	45GT10D
45	1	.200	.05	.05	1	85	45GT20D
48	1	.100	.05	.05	1	80	48GT10D
48	1	.200	.05	.05	1	90	48GT20D
50	1	.100	.05	.05	1	80	50GT10D
50	1	.200	.05	.05	1	90	50GT20D
55	1	.100	.05	.05	1	85	55GT10D
55	1	.200	.05	.05	1	100	55GT20D
60	1	.050	.05	.05	1	85	60GT05D
60	1	.100	.05	.05	1	95	60GT10D
65	1	.050	.05	.05	1	85	65GT05D
65	1	.100	.05	.05	1	95	65GT10D
70	1	.050	.05	.05	1	85	70GT05D
70	1	.100	.05	.05	1	95	70GT10D
75	1	.050	.05	.05	1	90	75GT05D
75	1	.100	.05	.05	1	100	75GT10D
80	1	.020	.05	.05	1	85	80GT02D
80	1	.050	.05	.05	1	95	80GT05D
90	1	.020	.05	.05	1	95	90GT02D
90	1	.050	.05	.05	1	105	90GT05D
100	1	.020	.05	.05	1	105	100GT02D
100	1	.050	.05	.05	1	115	100GT05D

(2 AMP MAXIMUM)

Nominal Output Voltage	Adjust ± V.	Output Current Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mV RMS	Price per Section	Section (See "How to Order")
1.5	.5	.400	.5	.1	1	$85	1.5GT40D
2.5	.5	.400	.5	.1	1	85	2.5GT40D
3	.5	.400	.5	.1	1	85	3GT40D
3	.5	.700	.5	.1	1	95	3GT70D
3	.5	1.0	.5	.1	1	100	3GT100D
3.6	.5	.400	.3	.1	1	85	3.6GT40D
3.6	.5	.700	.4	.1	1	95	3.6GT70D
3.6	.5	1.0	.5	.1	1	100	3.6GT100D
5	.5	.500	.3	.05	1	85	5GT50D
5	.5	.700	.4	.05	1	95	5GT70D
5	.5	1.0	.5	.05	1	100	5GT100D
5*	.25	2.0	.5	.05	1	115	5GT200D
6	1	.500	.15	.05	1	85	6GT50D
6	.5	.700	.2	.05	1	95	6GT70D
6	.5	1.0	.3	.05	1	100	6GT100D
7	1	.500	.15	.05	1	85	7GT50D
7	.5	.700	.2	.05	1	95	7GT70D
7	.5	1.0	.3	.05	1	100	7GT100D
8	1	.500	.1	.05	1	85	8GT50D
8	.5	.700	.15	.05	1	95	8GT70D
8	.5	1.0	.2	.05	1	100	8GT100D
9	1	.500	.1	.05	1	85	9GT50D
9	.5	.700	.15	.05	1	95	9GT70D
9	.5	1.0	.2	.05	1	100	9GT100D
10	1	.500	.1	.05	1	85	10GT50D
10	.5	.700	.15	.05	1	95	10GT70D
10	.5	1.0	.2	.05	1	100	10GT100D
12	1	.500	.1	.05	1	85	12GT50D
12	.5	.700	.1	.05	1	95	12GT70D
12	.5	1.0	.1	.05	1	100	12GT100D
14	1	.500	.1	.05	1	85	14GT50D
14	.5	.700	.1	.05	1	95	14GT70D
14	.5	1.0	.1	.05	1	100	14GT100D
15	1	.500	.1	.05	1	85	15GT50D
15	.5	.700	.1	.05	1	95	15GT70D
15	.5	1.0	.1	.05	1	100	15GT100D
18	1	.500	.1	.05	1	85	18GT50D
18	.5	.700	.1	.05	1	95	18GT70D
18	.5	1.0	.1	.05	1	105	18GT100D
20	1	.500	.1	.05	1	85	20GT50D
20	.5	.750	.1	.05	1	95	20GT75D

*Other section chosen may not have output current rating exceeding 500 ma.

(90 TO 150 VOLTS)

Nominal Output Voltage	Adjust ± V.	Output Current Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mV RMS	Price per Section	Section (See "How to Order")
90	1	.050	.05	.05	1	$105	90GT05D
90	1	.100	.05	.05	1	120	90GT10D
95	1	.050	.05	.05	1	110	95GT05D
95	1	.100	.05	.05	1	125	95GT10D
100	1	.050	.05	.05	1	115	100GT05D
100	1	.100	.05	.05	1	130	100GT10D
110	1	.050	.05	.05	1	120	110GT05D
110	1	.100	.05	.05	1	135	110GT10D
120	1	.050	.05	.05	1	125	120GT05D
120	1	.100	.05	.05	1	140	120GT10D
125	1	.050	.05	.05	1	130	125GT05D
125	1	.100	.05	.05	1	145	125GT10D
130	1	.050	.05	.05	1	130	130GT05D
130	1	.100	.05	.05	1	145	130GT10D
140	1	.050	.05	.05	1	130	140GT05D
140	1	.100	.05	.05	1	145	140GT10D
150	1	.050	.05	.05	1	130	150GT05D
150	1	.100	.05	.05	1	145	150GT10D

Other output ratings also available. Contact factory for information.

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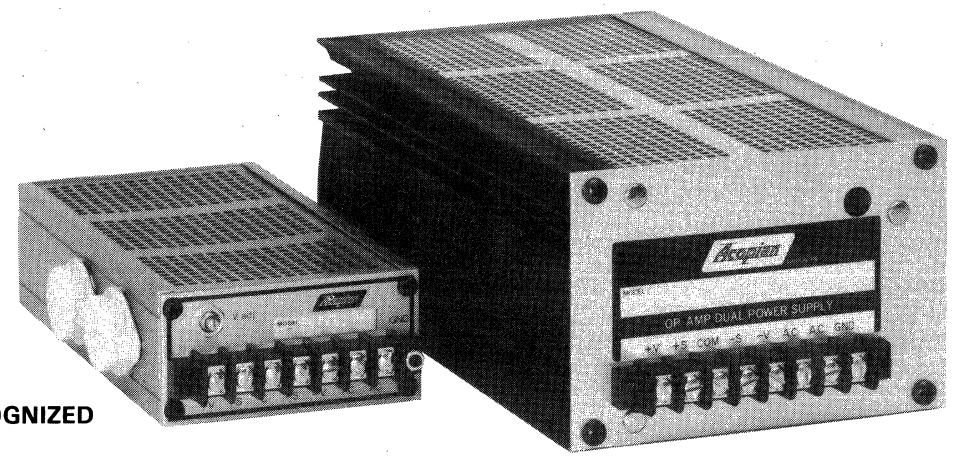
3-DAY SHIPMENT GUARANTEED

Acopian

DUAL OUTPUT For Op Amps



SHIPPED IN 3 DAYS

ALL MODELS U.L. RECOGNIZED

Series D dual output power supplies are a convenient source of the tracking voltages required for powering operational amplifiers and related circuits. Their positive/common/negative output terminal configuration minimizes system wiring. Provision for remote sensing permits compensation of load line effects. Although moderately priced, they are sturdily constructed and conservatively rated.

SPECIFICATIONS

Input Voltage: 105–125 VAC, 50–400 Hz, single phase.

Output Voltages: Tracking within 1%. } See tables. Outputs are short circuit protected.

Output Currents: }

Output Voltage Adjustment Ranges: }

Load Regulation: ±0.1%.

Line Regulation: ±0.1%.

Ripple: 1.5 mv RMS.

Polarity: Positive output, common, and negative output.

Remote Voltage Sensing: Standard.

Ambient Operating Temperature: −10 to +71°C.

Storage Temperature: −55 to +85°C.

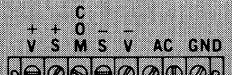
Size and Weight: See drawing on page 16.

OPTIONS

Overvoltage Protection: A built-in preset overvoltage protection circuit is available on all models. If either output fails, both outputs are "crowbarred." To order, add prefix "V" to the model number, and increase standard price by $30.00.

230 Volt Input: All models can be alternately furnished for operation on inputs of 210–250 VAC, 50–400 Hz. To order, add suffix "-230" to model number and $25.00 to price.

***Connections:** (Supplies for Op Amps)



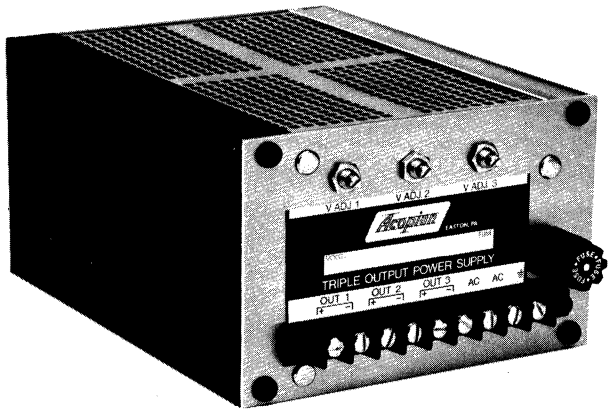
Nominal Output Voltages	Adjust ±V.	Current/Output Amps. at 40°C	55°C	71°C	Price	Model	Size*
±5	.5	.750	.650	.550	$190	TD5-75	TG5
±5	.5	1.5	1.25	1.0	225	TD5-150	TG6
±5	.5	2.5	2.0	1.5	270	TD5-250	TG9
±12	1	1.0	.900	.800	195	TD12-100	TG5
±12	1	1.6	1.4	1.0	230	TD12-160	TG6
±12	1	2.5	2.0	1.5	270	TD12-250	TG9
±12	.5	4.5	3.7	3.0	335	TD12-450	TG13
±12	.5	8.5	7.0	5.5	440	TD12-850	TH11
±15	1	.400	.400	.400	150	TD15-40	TG5
±15	1	1.0	.900	.800	195	TD15-100	TG5
±15	1	1.6	1.4	1.0	230	TD15-160	TG6
±15	1	2.5	2.0	1.5	270	TD15-250	TG9
±15	.5	4.5	3.7	3.0	335	TD15-450	TG13
±15	.5	8.5	7.0	5.5	440	TD15-850	TH11

NARROW PROFILE MODELS — for limited space applications

Nominal Output Voltage	Adjust ±V.	Current/Output Amps. at 40°C	55°C	71°C	Price	Model	Size*
±12	1	.500	.500	.400	$165	FD12-50A	TN6T
±12	.5	1.0	.900	.800	220	LD12-100	TN8H
±15	1	.500	.500	.400	165	FD15-50A	TN6T
±15	.5	1.0	.900	.800	220	LD15-100	TN8H

Acopian

TRIPLE OUTPUT For Microprocessors Isolated Outputs



SHIPPED IN 3 DAYS

Triple isolated output power supplies provide the features and characteristics of three supplies in one compact, easy-to-use package. They are available in the voltage combinations most frequently required for driving microprocessors and associated circuitry.

SPECIFICATIONS

Input Voltage: 105-125 VAC, 50-400 Hz, single phase.

Output Specifications: No derating required through ambient temperature range of −10 to +60°C.

Polarity: Outputs are floating. Each output may be independently connected to provide any combination of positive and negative voltages. Outputs may be floated up to 300 V above ground.

Ambient Operating Temperature: −10 to +60°C.

Storage Temperature: −55 to +85°C.

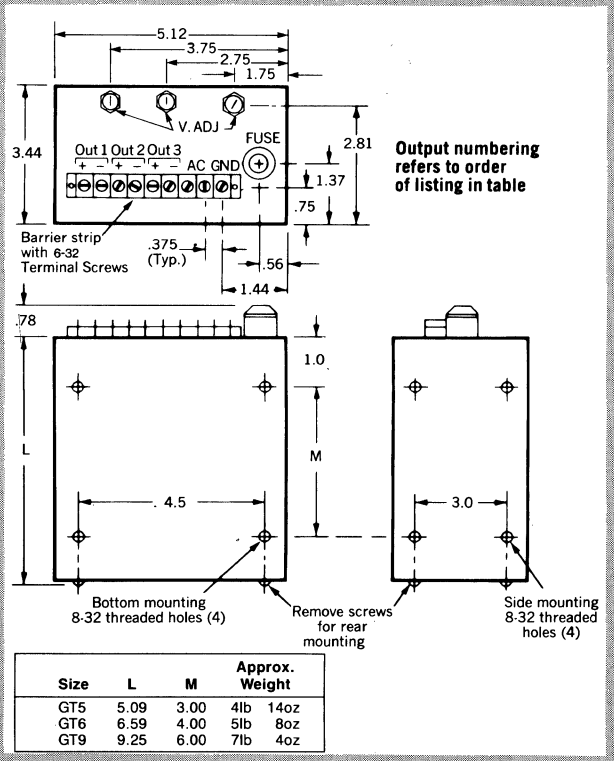
Nominal Output Voltage	Adjustment ± Volts	Output Current Amps.	Regulation Load ± %	Regulation Line ± %	Ripple mv RMS	Price	Model	Size
5 5 12	.25 .25 1	3.0 1.0 .800	.15 .15 .15	.15 .15 .15	1 1 1	$240	5512T6A	GT6
5 5 12	.25 .25 1	6.0 2.0 1.2	.15 .15 .15	.15 .15 .15	1 1 1	295	5512T9A	GT9
5 9 12	.25 1 1	6.0 1.4 1.2	.15 .15 .15	.15 .15 .15	1 1 1	295	5912T9A	GT9
5 12 12	.25 1 1	2.0 .300 .300	.15 .15 .15	.15 .15 .15	1 1 1	215	51212T5A	GT5
5 12 12	.25 1 1	3.0 .600 .600	.15 .15 .15	.15 .15 .15	1 1 1	240	51212T6A	GT6
5 12 12	.25 1 1	6.0 1.2 1.2	.15 .15 .15	.15 .15 .15	1 1 1	295	51212T9A	GT9
5 15 15	.25 1 1	2.0 .250 .250	.15 .15 .15	.15 .15 .15	1 1 1	215	51515T5A	GT5
5 15 15	.25 1 1	3.0 .500 .500	.15 .15 .15	.15 .15 .15	1 1 1	240	51515T6A	GT6
5 15 15	.25 1 1	6.0 1.0 1.0	.15 .15 .15	.15 .15 .15	1 1 1	295	51515T9A	GT9

OPTIONS

Overvoltage Protection:

Separate overvoltage protection circuit on each output. Add prefix "3V" to model number and add $30.00 to the standard price.

230 Volt Input: All models can be alternately furnished for operation on inputs of 210-250 VAC, 50-400 Hz. To order, add suffix "-230" to the model number and $25.00 to the standard price.



Size	L	M	Approx. Weight
GT5	5.09	3.00	4lb 14oz
GT6	6.59	4.00	5lb 8oz
GT9	9.25	6.00	7lb 4oz

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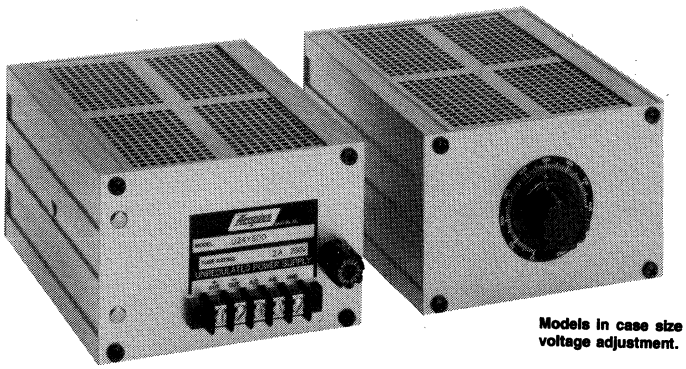
SERIES U UNREGULATED

SHIPPED IN 3 DAYS

U.L. RECOGNIZED



Models in case size YA have output voltage adjustment.

Low-cost DC power suitable for driving loads such as lamps, relays, and small motors is provided by Series U unregulated power supplies. All components are generously derated, insuring a long and trouble-free life; built-in fusing prevents damage due to prolonged overloading or short circuits. Mechanically similar to the regulated supplies shown on pages 8 and 9, they are housed in extruded aluminum cases which can be mounted in any position. Many models are U.L. Recognized.

STANDARD FEATURES

- Capacitive filtering
- Fused input
- May be used in series or parallel
- No derating or heat sinking required
- Completely serviceable

SPECIFICATIONS

Input Voltage: 0-125 VAC, 50-400 Hz, single phase.

Output Voltage:
Output Current: } See table
Ripple:

Output Voltage Adjustment: Adjustable voltage models are provided with a built-in continuously adjustable autotransformer.

Load Regulation: The nominal output voltages of fixed output models, and the maximum rated output voltages for models with adjustable outputs, are based on 115 VAC input with approximately one-half load. At no load, they will increase by approximately 10%. At full load, they will be reduced by approximately 10%.

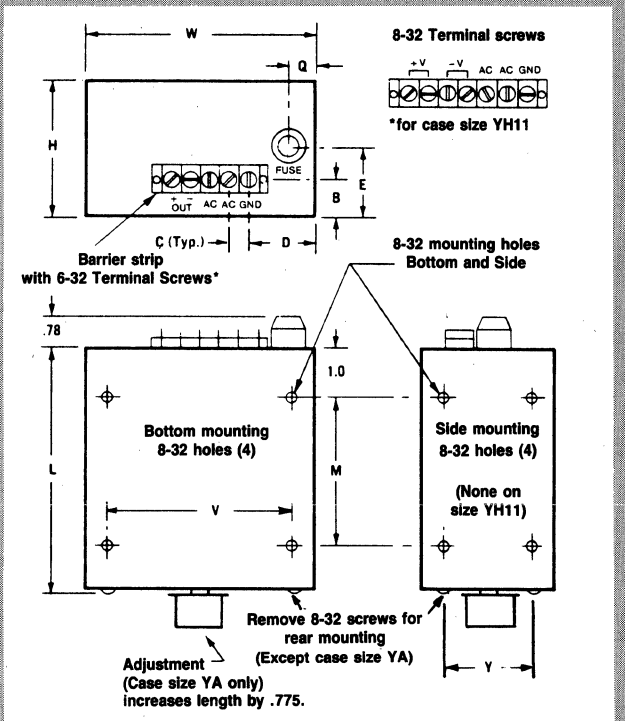
Line Regulation: Output voltage change due to line change directly proportional to input change.

Polarity: Output is floating; either positive or negative terminal may be grounded or floated up to 300 V above ground.

Ambient Operating Temperature: −10 to 65°C. No derating required.

Storage Temperature: −55 to +85°C.

Optional 230 Volt Input
Provision for inputs of 0-250 VAC, 50-400 Hz, replacing the standard of 0-125 VAC input voltage range, is available on most models. Contact factory for information.



Size	L	W	H	M	V	Y	Q	E	B	D	C	Approx. Weight
Y3	3.71	5.12	3.44	1.62	4.5	3.0	.56	1.37	.75	1.44	.375	2 lb. 8 oz.
Y5	5.09	5.12	3.44	3.00	4.5	3.0	.56	1.37	.75	1.44	.375	4 lb. 8 oz.
Y6	6.59	5.12	3.44	4.00	4.5	3.0	.56	1.37	.75	1.44	.375	7 lb. 8 oz.
YH11	11.25	7.37	5.12	8.0	6.75	4.56	1.10	2.64	1.25	2.25	.562	18 to 23 lb.
YA	6.59	5.12	3.44	4.00	4.5	3.0	.56	1.37	.75	1.44	.375	4 to 5 lb.

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FIXED MODELS

Nominal Output Voltage	Output Amps.	Output Voltage N/L-F/L	Ripple Volts RMS	Price	Model	Case Size
4	.200	4.4 to 3.6	2	$ 60	U4Y20	Y3
5	10.0 (@ 5.0)	6.7 to 3.6 (5.0)	1.8 (1.3)	95	U5Y1000	Y6
6	2.0	7.7 to 4.8	2.0	60	U6Y200	Y3
6	5.0	7.5 to 5.0	1.8	95	U6Y500	Y5
7	8.0	8.0 to 5.4	1.5	95	U7Y800	Y6
9	10.0 (@ 5.0)	11.5 to 7.5 (9.0)	2.3 (1.3)	95	U9Y1000	Y6
10	10.0 (@ 5.0)	12.4 to 8.0 (9.8)	2.3 (1.3)	95	U10Y1000	Y6
12	1.5	14.9 to 10.9	2.5	60	U12Y150	Y3
12	5.0	14.8 to 10.5	1.8	90	U12Y500	Y5
12	10.0 (@ 5.0)	14.1 to 9.8 (11.5)	2.3 (1.3)	100	U12Y1000	Y6
14	1.0	15.4 to 12.6	.7	60	U14Y100	Y3
14	10.0 (@ 5.0)	16.4 to 12.1 (14.0)	2.3 (1.3)	100	U14Y1000	Y6
15	10.0 (@ 5.0)	17.2 to 12.8 (14.5)	2.3 (1.3)	100	U15Y1000	Y6
16	1.0	17.6 to 14.4	.7	60	U16Y100	Y3
16	10.0 (@ 5.0)	18.8 to 14.2 (16.0)	2.3 (1.3)	100	U16Y1000	Y6
18	1.0	19.8 to 16.2	.7	60	U18Y100	Y3
18	10.0 (@ 5.0)	21.0 to 15.8 (18.0)	2.4 (1.4)	100	U18Y1000	Y6
20	4.0	22.0 to 17.5	2.0	90	U20Y400	Y5
20	10.0 (@ 5.0)	23.7 to 18.3 (20.4)	2.4 (1.4)	100	U20Y1000	Y6
24	1.0	26.4 to 21.6	1.7	60	U24Y100	Y3
24	3.5	26.0 to 21.0	2.0	90	U24Y350	Y5
24	5.0	26.5 to 21.0	2.5	100	U24Y500	Y6
24	10.0	26.8 to 21.4	2.4	135	U24Y1000	Y6
24	17.0	26.4 to 21.6	1.5	210	U24Y1700	YH11
24	23.0	27.0 to 21.0	1.5	240	U24Y2300	YH11
25	5.0	28.1 to 22.3	2.5	100	U25Y500	Y6
27	5.0	30.0 to 24.0	2.6	100	U27Y500	Y6
28	1.0	30.8 to 25.2	1.7	60	U28Y100	Y3
28	3.0	30.8 to 26.0	2.0	90	U28Y300	Y5
28	5.0	31.2 to 24.8	2.6	100	U28Y500	Y6
28	8.0	30.2 to 25.0	2.4	135	U28Y800	Y6
28	15.0	30.8 to 25.2	1.5	210	U28Y1500	YH11
28	20.0	30.4 to 24.5	1.5	240	U28Y2000	YH11
30	1.0	33.0 to 27.0	1.6	70	30UY100	Y3
30	2.0	33.0 to 27.0	1.5	80	U30Y200	Y5
32	.400	35.2 to 28.8	.6	60	U32Y40	Y3
32	5.0	35.5 to 28.0	3.3	100	U32Y500	Y6
35	5.0	38.0 to 30.0	3.3	100	U35Y500	Y6
37	5.0	40.5 to 32.2	3.3	100	U37Y500	Y6
38	5.0	43.0 to 34.0	3.3	100	U38Y500	Y6
40	1.0	44.0 to 36.0	1.6	70	40UY100	Y3
40	2.0	44.0 to 36.0	1.5	90	U40Y200	Y5
40	5.0	45.0 to 37.0	3.3	100	U40Y500	Y6
41	.400	45.1 to 36.9	.6	60	U41Y40	Y3
42	5.0	48.0 to 36.0	6.5	100	U42Y500	Y6

Nominal Output Voltage	Output Amps.	Output Voltage N/L-F/L	Ripple Volts RMS	Price	Model	Case Size
44	2.0	48.4 to 39.6	1.5	$ 90	U44Y200	Y5
45	1.0	49.5 to 40.5	1.6	70	45UY100	Y3
45	5.0	51.0 to 38.5	6.5	100	U45Y500	Y6
48	.400	52.8 to 43.2	.6	65	U48Y40	Y3
50	1.0	55 to 45	1.6	75	50UY100	Y3
52	.400	57.2 to 46.8	.6	70	U52Y40	Y3
55	.250	60.5 to 49.5	.4	65	U55Y25	Y3
60	1.0	65.3 to 53.0	2.8	85	U60Y100	Y5
62	.400	69.0 to 58.0	1.5	70	U62Y40	Y3
65	.250	71.5 to 58.5	.4	70	U65Y25	Y3
80	.300	88.0 to 72.0	1.0	75	U80Y30	Y3
90	.400	99.0 to 81.0	2.2	75	U90Y40	Y3
95	.150	105 to 85	1.1	75	U95Y15	Y3
100	.200	110 to 93	1.0	80	U100Y20	Y3
110	.200	121 to 100	1.0	80	U110Y20	Y3
120	.200	132 to 110	1.0	80	U120Y20	Y3
140	.200	154 to 126	1.7	80	U140Y20	Y3
150	.200	165 to 135	1.7	85	U150Y20	Y3
165	.200	176 to 144	1.7	85	U165Y20	Y3
170	.200	187 to 153	2.0	85	U170Y20	Y3
180	.200	190 to 162	2.0	85	U180Y20	Y3
200	.200	220 to 180	2.0	90	U200Y20	Y3
230	.100	252 to 207	3.0	80	U230Y10	Y3
250	.200	275 to 225	4.0	90	250UY20	Y3
275	.100	303 to 247	3.0	80	U275Y10	Y3
275	.200	303 to 247	4.0	90	U275Y20	Y5
300	.200	330 to 270	5.0	90	U300Y20	Y5
325	.200	360 to 295	6.0	90	U325Y20	Y5
340	.100	374 to 306	3.0	80	U340Y10	Y3
360	.100	396 to 324	3.0	80	U360Y10	Y3
370	.100	407 to 333	3.0	80	U370Y10	Y3
400	.200	440 to 360	6.0	95	U400Y20	Y5
420	.100	462 to 378	6.7	80	U420Y10	Y3
475	.020	523 to 426	3.1	75	U475Y02	Y3
500	.200	550 to 450	9.1	100	U500Y20	Y5
550†	.100	605 to 495	4.8	100	U550Y10	Y5
580†	.020	638 to 522	3.1	75	U580Y02	Y3
600†	.100	660 to 540	10.0	100	U600Y10	Y5
750†	.020	825 to 675	3.1	80	U750Y02	Y3
800†	.100	880 to 720	13.0	100	U800Y10	Y5
900†	.020	990 to 810	5.0	80	U900Y02	Y3
900†	.100	990 to 810	13.0	105	U900Y10	Y5
1000†	.100	1100 to 900	13.0	105	U1000Y10	Y5

ADJUSTABLE MODELS

Output Voltage Range	Output Current Amps.	Ripple Volts RMS	Price	Model	Case Size
0-8†	2.0	2	$160	U8YA200	YA
0-15†	1.5	2.5	160	U15YA150	YA
0-54†	1.0	1.6	160	U54YA100	YA
0-95†	.300	2.2	160	U95YA30	YA
0-125†	.200	1.5	160	U125YA20	YA
0-220†	.200	2	160	U220YA20	YA

Output Voltage Range	Output Current Amps.	Ripple Volts RMS	Price	Model	Case Size
0-260†	.200	4	$160	U260YA20	YA
0-370†	.100	3	160	U370YA10	YA
0-450†	.100	6.7	160	U450YA10	YA
0-800†	.020	3.1	160	U800YA02	YA
0-950†	.020	5	160	U950YA02	YA

†Not U.L. recognized when this catalog was published.

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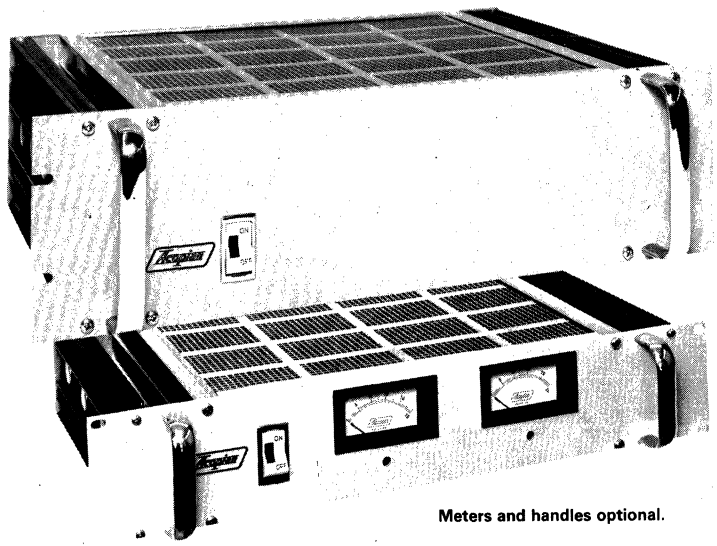
RACK MOUNTING GENERAL PURPOSE

SHIPPED IN 9 DAYS

ALL MODELS U.L. RECOGNIZED



Meters and handles optional.

Acopian rack-mounting power supplies feature excellent regulation and ripple specifications in 102 models with outputs up to 150 volts and 60 amps. Metering and overvoltage protection are available as options. These power supplies are constructed in sturdy extruded aluminum assemblies designed expressly for mounting in standard 19" wide RETMA cabinet racks. The front panels are finished in light gray enamel; sides are black; the remaining casework is finished in gold alodyne.

SPECIFICATIONS

Input Voltage: 105-125 VAC, 50-400 Hz, single phase.

Remote Voltage Sensing: Provision for sensing the output voltage across the load is a standard feature.

Output Voltage/Current:
Line Regulation:
Load Regulation:
Ripple:
Output Voltage Adjustment Range:
} See tables

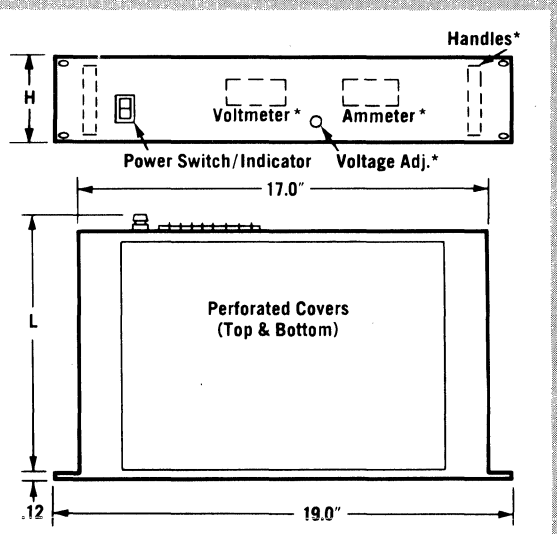
Polarity—Single Output Models: Output is floating; either positive or negative terminal may be grounded or floated up to 300V above ground.

Polarity—Dual Output Models: Positive output, common, negative output.

Storage Temperature: −55 to +85°C.

Ambient Operating Temperature—
Single Output Models: −20 to +55°C.
Dual Output Models: −10 to +55°C.

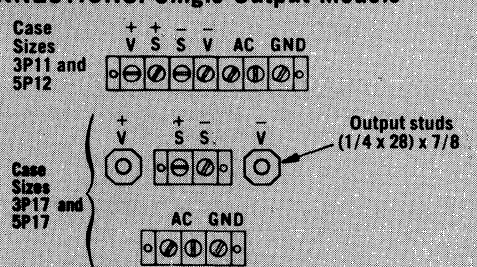
Short Circuit and Overload Protection: Electronic current limiting with automatic recovery.



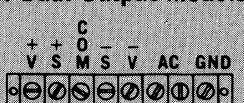
*Optional (Option positions shown are for single output models.)

Size	H	L	Approx. Weight
3P11	3½	11.0	22 lb.
3P17	3½	17.0	38 lb
5P12	5¼	12.0	28 lb
5P17	5¼	17.0	53 lb

CONNECTIONS: Single Output Models



CONNECTIONS: Dual Output Models



SINGLE OUTPUT

Nominal Output Voltage	Adjust Range ± V	Output Current Amps@ 40°C	55°C	Regulation Load* ± %	Line* ± %	Ripple mv RMS	Price	Model	Size
1.5	.5	20	20	.005	.005	.25	$495	1.5PT20	3P11
1.5	.5	32	27	.005	.005	.25	610	1.5PH32	5P12
1.5	.25	60	47	.05	.05	1	890	1.5PT60	5P17
2	.5	20	20	.005	.005	.25	495	2PT20	3P11
2	.5	30	25	.005	.005	.25	610	2PH30	5P12
3	.5	20	20	.005	.005	.25	495	3PT20	3P11
3	.5	30	25	.005	.005	.25	610	3PH30	5P12
3	.25	60	47	.05	.05	1	890	3PT60	5P17
3.6	.5	20	20	.005	.005	.25	495	3.6PT20	3P11
3.6	.5	32	27	.005	.005	.25	610	3.6PH32	5P12
3.6	.25	60	47	.05	.05	1	890	3.6PT60	5P17
5	.5	20	20	.005	.005	.25	495	5PT20	3P11
5	.5	32	27	.005	.005	.25	610	5PH32	5P12
5	.25	48	37	.05	05	1	760	5PT48	3P17
5	.25	60	47	.05	.05	1	890	5PT60	5P17
6	.5	20	20	.005	.005	.25	495	6PT20	3P11
6	.5	28	23	.005	.005	.25	610	6PH28	5P12
6	.25	47	36	.05	.05	1	760	6PT47	3P17
6	.25	58	45	.05	.05	1	890	6PT58	5P17
7	.5	20	20	.005	.005	.25	495	7PT20	3P11
8	.5	20	20	.005	.005	.25	495	8PT20	3P11
8	.5	28	23	.005	.005	.25	610	8PH28	5P12
8	.5	44	34	.05	.05	1	760	8PT44	3P17
8	.25	54	42	.05	.05	1	890	8PT54	5P17
9	.5	20	20	.005	.005	.25	495	9PT20	3P11
9	.5	41	32	.05	.05	1	760	9PT41	3P17
9	.5	52	41	.05	.05	1	890	9PT52	5P17
10	.5	20	20	.005	.005	.25	495	10PT20	3P11
10	.5	25	20	.005	.005	.25	610	10PH25	5P12
10	.5	38	30	.05	.05	1	760	10PT38	3P17
10	.5	50	39	.05	.05	1	890	10PT50	5P17
12	.5	17	17	.005	.005	.25	495	12PT17	3P11
12	.5	22	22	.005	.005	.25	610	12PH22	5P12
12	.5	33	26	.05	.05	1	760	12PT33	3P17
12	.5	45	35	.05	.05	1	890	12PT45	5P17
13	.5	16	16	.005	.005	.25	495	13PT16	3P11
13	.5	43	34	.05	.05	1	890	13PT43	5P17
14	.5	12	12	.005	.005	.25	495	14PT12	3P11
15	.5	10	10	.005	.005	.25	495	15PT10	3P11
15	.5	19	16	.005	.005	.25	610	15PH19	5P12
15	.5	25	20	.05	.05	1	760	15PT25	3P17
15	.5	40	31	.05	.05	1	890	15PT40	5P17
16	.5	10	10	.005	.005	.25	495	16PT10	3P11
18	.5	10	10	.005	.005	.25	495	18PT10	3P11
18	.5	18	15	.005	.005	.25	610	18PH18	5P12
18	.5	24	19	.05	.05	1	760	18PT24	3P17
18	.5	36	28	.05	.05	1	890	18PT36	5P17
20	.5	10	10	.005	.005	.25	495	20PT10	3P11
20	.5	16	14	.005	.005	.25	610	20PH16	5P12
20	.5	23	18	.05	.05	1	$760	20PT23	3P17
20	.5	32	25	.05	.05	1	890	20PT32	5P17
22	.5	10	10	.005	.005	.25	495	22PT10	3P11
24	.5	10	10	.005	.005	.25	495	24PT10	3P11
24	.5	15	13	.005	.005	.25	610	24PH15	5P12
24	.5	20	16	.05	.05	1	760	24PT20	3P17
24	.5	30	23	.05	.05	1	890	24PT30	5P17
25	.5	10	10	.005	.005	.25	495	25PT10	3P11
26	.5	10	10	.005	.005	.25	495	26PT10	3P11
28	.5	10	10	.005	.005	.25	495	28PT10	3P11
28	.5	14	12	.005	.005	.25	610	28PH14	5P12
28	.5	19	15	.05	.05	1	760	28PT19	3P17
28	.5	28	22	.05	.05	1	890	28PT28	5P17
30	.5	10	10	.005	.005	.25	495	30PT10	3P11
30	.5	14	12	.005	.005	.25	610	30PH14	5P12
32	.5	5	5	.005	.005	.25	425	32PT5	3P11
32	.5	10	10	.005	.005	.25	555	32PT10	5P12
34	.5	5	5	.005	.005	.25	435	34PT5	3P11
34	.5	10	10	.005	.005	.25	570	34PT10	5P12
35	.5	5	5	.005	.005	.25	445	35PT5	3P11
35	.5	10	10	.005	.005	.25	585	35PT10	5P12
36	.5	5	5	.005	.005	.25	455	36PT5	3P11
36	.5	10	10	.005	.005	.25	600	36PT10	5P12
38	.5	5	5	.005	.005	.25	465	38PT5	3P11
38	.5	10	10	.005	.005	.25	615	38PT10	5P12
40	.5	5	5	.005	.005	.25	475	40PT5	3P11
40	.5	10	10	.005	.005	.25	630	40PT10	5P12
45	.5	5	5	.005	.005	.25	485	45PT5	3P11
45	.5	10	10	.005	.005	.25	645	45PT10	5P12
48	.5	5	5	.005	.005	.25	495	48PT5	3P11
48	.5	10	10	.005	.005	.25	660	48PT10	5P12
48	.5	15	12	.005	.005	.25	790	48PT15	5P17
50	.5	5	5	.005	.005	.25	495	50PT5	3P11
50	.5	10	10	.005	.005	.25	660	50PT10	5P12
55	.5	5	3.8	.005	.005	.25	505	55PT5	3P11
55	.5	8	6	.005	.005	.25	675	55PT8	5P12
60	.5	5	3.8	.005	.005	.25	510	60PT5	3P11
60	.5	8	6	.005	.005	.25	680	60PT8	5P12
75	1	4	3	.01	.01	1	520	75PT4	3P11
75	1	5.6	4.2	.01	.01	1	690	75PT5	5P12
90	1	3.3	2.5	.01	.01	1	530	90PT3	3P11
90	1	4.4	3.3	.01	.01	1	700	90PT4	5P12
100	1	3	2.2	.01	.01	1	540	100PT3	3P11
100	1	4	3	.01	.01	1	710	100PT4	5P12
120	1	2.5	1.8	.01	.01	1	550	120PT2	3P11
120	1	3.5	2.6	.01	.01	1	720	120PT3	5P12
150	1	2.3	1.7	.01	.01	1	560	150PT2	3P11
150	1	3	2.2	.01	.01	1	730	150PT3	5P12

*or 2 mv, whichever is greater.

Other models available with broad output voltage adjustment ranges and constant voltage/constant current crossover (for applications requiring a constant current). Contact factory for information.

DUAL OUTPUT

Nominal Output Voltages	Adjust. Range ± V	Output Current Amps. 40°C	55°C	Regulation Load ± %	Line ± %	Ripple mv RMS	Price	Model	Size
± 12	.5	7	5.6	.1	.1	1.5	$530	PD12-700	3P11
± 12	.5	9	7.2	.1	.1	1.5	645	PD12-900	5P12
± 15	.5	7	5.6	.1	.1	1.5	530	PD15-700	3P11
± 15	.5	9	7.2	.1	.1	1.5	645	PD15-900	5P12

OPTIONS

EXAMPLE: The Model 5PT20 equipped with all options is designated as the Model V5PT20AFHP-230. (List suffix letters in alphabetical sequence.)

Overvoltage Protection: An internally installed and preset overvoltage protector is available for models with outputs of 3 to 70 volts. On dual output models, if either output fails, both outputs are "crowbarred." To order, add prefix "V" to the model number, and $25.00 to the price of models in case size 3P11; $75.00 to the price of models in case sizes 5P12, 3P17 and 5P17.

Metering (Single Output Models):
Ammeter: Add suffix "A" to model number and $35.00 to price.
Voltmeter: Add suffix "F" to model number and $35.00 to price.

Metering (Dual Output Models):
Ammeters: One for each output. Add suffix "A" to model number and $70.00 to price. "A" and "F" options cannot be combined in one power supply.
Voltmeters: One for each output. Add suffix "F" to model number and $70.00 to price. "A" and "F" options cannot be combined in one power supply.
Voltmeter and Ammeter: Each with switch for selecting output to be monitored. Add suffix "G" to model number and $120.00 to price.

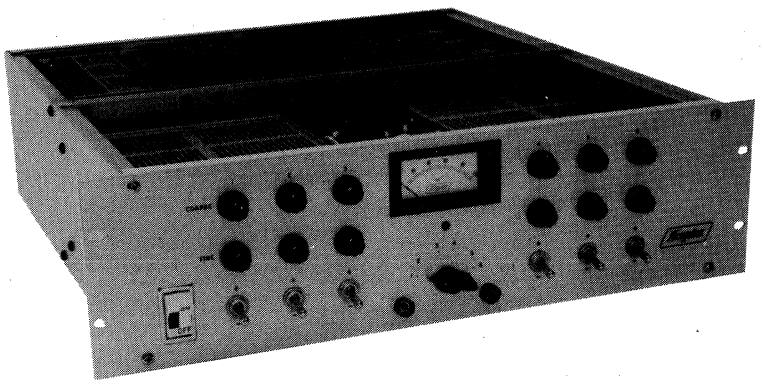
Handles: Add suffix "H" to model number and $25.00 to price.

Front Panel Voltage Adjustment: Standard models have a voltage adjustment located at the rear. A voltage control mounted on the front panel is available as an option. To order, add suffix "P" to the model number and $10.00 to price.

230 Volt Input: For operation on inputs of 210 to 250 VAC, 50-400 Hz. Add suffix "-230" to model number and $40.00 to price.

Acopian

MULTIPLE-OUTPUT POWER SUPPLY SYSTEMS



SHIPPED IN 9 DAYS

Now you can fill your requirements for completely wired multiple-output rack-mounting power supply systems, without any need to search through a catalog and prepare time-consuming mechanical layouts, item-by-item pricing and detailed purchase requisitions. Instead, simply call Acopian and specify the output voltages and currents that you require.

Each system is designed and constructed to provide an optimum mechanical and wiring configuration for the complement of power modules necessary to deliver the outputs specified. Acopian production expertise assures shipment of each system, completely wired and 100% tested, within 9 days after your order is received.

Ordering an Acopian power system is this easy: List the DC outputs that you require. (Or, select the power modules that you wish to be included.) Note the system features which you consider necessary. Then, call Acopian toll-free at (800) 523-9478 and ask for the POWER SYSTEM DEPARTMENT.

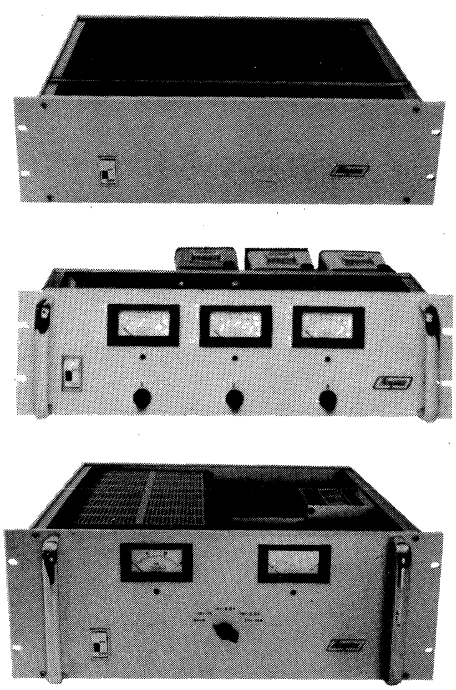
An Acopian Applications Engineer will answer—on the phone—any questions which you may have. A distinctive system model number will be assigned, and a firm price will be quoted. Your completely-wired power supply system will be shipped within 9 days.

System Description

Any of the power modules listed in this catalog can be included in a power system. Commonly required features such as voltmeters, ammeters, front panel controls, handles, and chassis slides can also be provided. The rack assembly will be designed and wired in a manner optimum for the complement of modules and operating features to be included.

Each assembly is constructed from 1/8-inch thick aluminum extrusions. The front panel is finished in oven baked light gray enamel. The rear portion is finished in gold alodyne. Input and output connections are on a screw terminal strip at the rear.

TYPICAL BUILT-TO-ORDER POWER SUPPLY SYSTEMS



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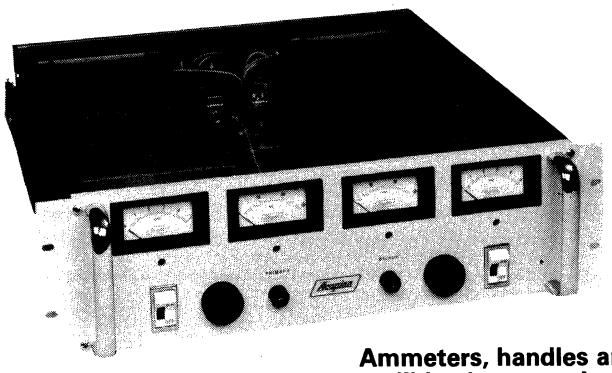
REDUNDANT OUTPUT POWER SYSTEMS

SHIPPED IN 9 DAYS



Ammeters, handles and audible alarms optional.

A redundant output power system, as its name implies, delivers output power without interruption as long as either power module of the redundant pair is functional. A "backup" supply continues to operate the system while a defective "primary" supply is removed and repaired or replaced.

FEATURES

- Specifically designed to safely permit the rapid replacement of a power supply while the system continues to furnish uninterrupted power to the load.
- Separate ac input power circuit for each power supply, permitting the use of two separate sources of input power.
- Overvoltage protection.
- Provision for control of external failure alarms or indicators (standard), or built-in audible alarms (optional).
- Foldback current limiting with automatic reset.
- Remote voltage sensing.

Redundant output power systems should be considered for any equipment where high reliability is essential and an unexpected loss of power would be disastrous. Such applications include communications systems (both voice and data types); computer systems (volatile memory systems in particular); process controls; utility, transit and municipal systems; and security/safety alarm systems.

Two identical power supplies are interconnected so that the required output is delivered to the load even when one power supply is not functioning. This is accomplished with a diode switching arrangement that senses an abnormal output, isolates it from the load being driven, and substitutes the output of the backup supply. There is no interruption of output power during the transition, or while a power supply is being removed or replaced.

The output voltage of the primary supply is set approximately 0.2V higher than that of the backup supply. Under this condition, the backup supply's diode is not forward biased; only the primary supply delivers current to the load. If the output voltage of the primary supply decreases by more than 0.2V, the situation is reversed and only the backup supply delivers load current.

Each system consists of two modular power supplies in a rack-mounting assembly. Thumbscrew mounting, and insulated connectors in the wiring to each power supply, facilitate the rapid and safe installation or removal of a module from the system without the need for tools. All input/output/alarm-contact connections are at the rear of the assembly. The chassis slide and handle options are recommended for applications where it is desired to service the system without removing it from the rack.

Each power supply contains an overvoltage protection circuit, to assure that the output will not significantly exceed the nominal output voltage rating under any condition, including incorrect application and misadjustment. Each supply also has a voltage monitor circuit that operates a relay, the contacts of which are available to control external failure alarms or other circuitry. The contact wiring of the two relays is connected in cascade, to simulate a single set of Form C contacts which switches if the output voltage of either power supply decreases by more than 2.0V (3.0V for outputs over 48V) from the nominal rating.

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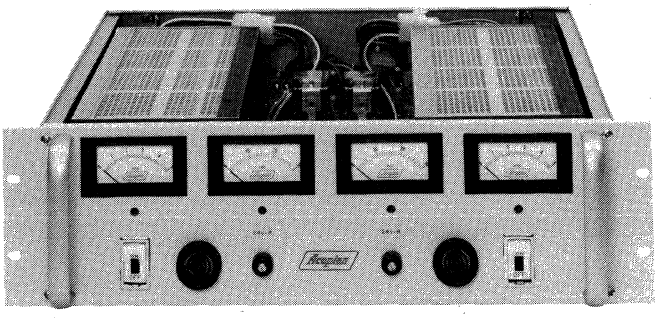
9-DAY SHIPMENT GUARANTEED

Acopian

REDUNDANT OUTPUT POWER SYSTEMS



SHIPPED IN 9 DAYS

Ammeters, handles and audible alarms optional.

SPECIFICATIONS

Input Voltage: 105-125 Vac, 50-400 Hz, single phase. A separate set of ac input terminals is provided for each power supply, so that if two sources of ac input power are available, one may be used for each supply and so reduce the possibility of output dropout due to loss of input power.

Output Voltage:
Normal mode — Nominal voltage shown in table.
Backup mode — 0.2V less than nominal voltage shown in table.

Output Regulation:
Line — ±0.05%.
Load — ±0.05%. (Dynamic regulation — does not include 0.2V shift which occurs during switchover to lower-set backup supply.)

Output Ripple: 1 mV rms.

Load Protection: Foldback current limiting with automatic reset, and overvoltage protection.

Polarity: Output is floating; either positive or negative output terminal may be grounded or floated up to 300V above ground.

Voltage Monitor Circuits: One for each power supply. Relay contacts switch when output voltage decreases by more than 2.0V from the nominal rating (3.0V for outputs over 48V), and may be used to control an external failure alarm.

Output Metering: Two voltmeters (standard). Ammeters available; see Options.

Ambient Operating Temperature Range: −20 to +71°C.

Storage Temperature Range: −55 to +85°C.

Assembly Size:

3R14	3½″ x 19″ panel, 14⅛″ deep. (15 lbs.)
5R14	5¼″ x 19″ panel, 14⅛″ deep. (23 lbs.)
5R18	5¼″ x 19″ panel, 17¾″ deep. (29 lbs.)
7R18	7″ x 19″ panel, 18½″ deep. (50 lbs.)
7R20	7″ x 19″ panel, 20½″ deep. (64 lbs.)

Assembly Finish: Front panel finished in light gray baked enamel. Remainder finished in gold alodyne.

OPTIONS

Add option suffixes in alphabetical order. Example: R5H16AH-230.

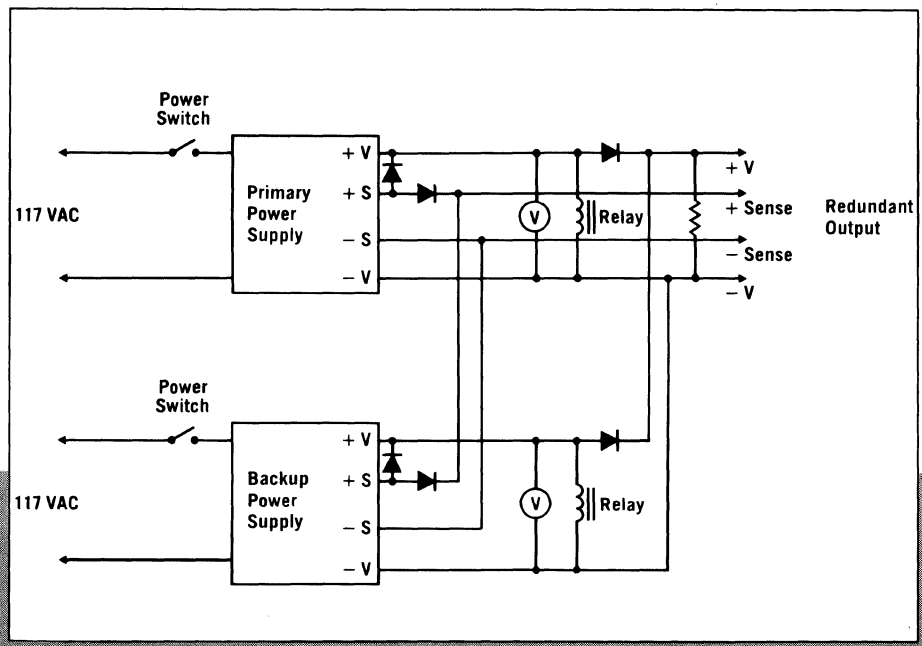
Ammeters: One for each output. (For models in case size 3R14, two volt/ammeters, each with switch, are substituted for the standard voltmeters.) Add suffix letter "A" to model number and $70.00 to system price.

Audible Alarms: Piercing whistle alerts personnel to a voltage lower than normal. Front panel mounted, one for each power supply. Systems with this option do not have provision for control of an external alarm. To order, add suffix "K" to model number and $70.00 to system price.

Handles: Add suffix "H" to model number and $25.00 to price.

Slides: For racks having rear mounting rails spaced 20″ to 22″ behind the front panel. To order, add suffix "S" to model number and $75.00 to price.

230 Volt Input: For operation on inputs of 210-250 Vac, 50-400 Hz. To order, add suffix "-230" to model number and $75.00 to system price.

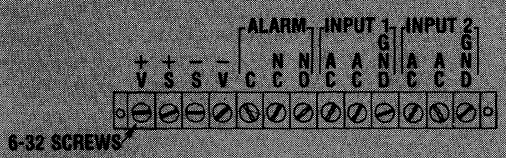


Nominal Output Voltages	Adjust Range ±V	Output Current Amps at 40°C	55°C	71°C	Price	Model	Assembly Size
5	.5	2.6	2.5	2.4	$1095	R5N8X	3R14
5	.5	5.3	4.4	3.5	1195	R5M6	5R14
5	.5	11.0	9.3	7.5	1295	R5M13	5R18
5	.5	21.0	17.0	14.0	1495	R5H11	7R18
5	.5	28.0	23.0	19.0	1695	R5H16	7R20
12	.5	1.5	1.5	1.5	1095	R12N8X	3R14
12	.5	3.5	3.0	2.5	1195	R12M6	5R14
12	.5	8.0	7.5	7.0	1295	R12M13	5R18
12	.5	16.0	13.8	11.2	1495	R12H11	7R18
12	.5	20.0	17.0	14.2	1695	R12H16	7R20
15	.5	1.5	1.5	1.5	1095	R15N8X	3R14
15	.5	4.0	3.8	3.6	1195	R15M9	5R14
15	.5	6.5	6.0	5.5	1295	R15M13	5R18
15	.5	14.7	12.5	10.3	1495	R15H11	7R18
15	.5	18.7	16.0	13.3	1695	R15H16	7R20
24	.5	.9	.9	.9	1095	R24N8X	3R14
24	.5	3.0	2.7	2.4	1195	R24M9	5R14
24	.5	5.0	5.0	5.0	1295	R24M13	5R18
24	.5	11.7	10.2	8.7	1495	R24H11	7R18
24	.5	14.7	12.7	10.7	1695	R24H16	7R20
28	.5	1.0	1.0	1.0	1095	R28N8X	3R14
28	.5	2.7	2.6	2.5	1195	R28M9	5R14

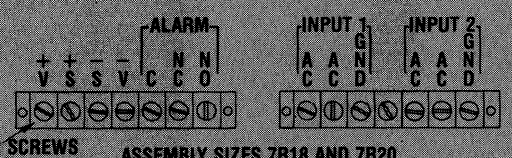
Nominal Output Voltages	Adjust Range ±V	Output Current Amps at 40°C	55°C	71°C	Price	Model	Assembly Size
28	.5	5.0	5.0	5.0	$1295	R28M13	5R18
28	.5	10.5	9.2	8.0	1495	R28H11	7R18
28	.5	14.0	12.0	10.0	1695	R28H16	7R20
48	.5	.4	.4	.4	1130	R48N8T	3R14
48	.5	1.6	1.4	1.2	1240	R48M9	5R14
48	.5	3.0	3.0	3.0	1340	R48M13	5R18
48	.5	6.0	5.0	4.0	1545	R48H11	7R18
48	.5	8.5	7.2	5.5	1835	R48H16	7R20
60	1	.25	.25	.25	1160	R60N8T	3R14
60	1	1.0	.9	.8	1270	R60M9	5R14
60	1	2.5	2.1	1.7	1370	R60M13	5R18
60	1	5.0	4.1	3.3	1575	R60H11	7R18
60	1	7.0	5.8	4.6	1845	R60H16	7R20
75	1	.17	.17	.17	1160	R75N8T	3R14
75	1	.9	.8	.7	1270	R75M9	5R14
75	1	2.0	1.8	1.5	1370	R75M13	5R18
75	1	4.0	3.3	2.6	1575	R75H11	7R18
75	1	5.6	4.6	3.6	1855	R75H16	7R20
120	1	.12	.12	.12	1180	R120N8T	3R14
120	1	.5	.5	.4	1295	R120M6	5R14
120	1	1.2	1.1	1.0	1400	R120M13	5R18
120	1	2.5	2.0	1.6	1615	R120H11	7R18
120	1	3.5	2.9	2.3	1890	R120H16	7R20

Other models with higher output current ratings are also available. Contact factory for information.

CONNECTIONS:



ASSEMBLY SIZES 3R14, 5R14 AND 5R18

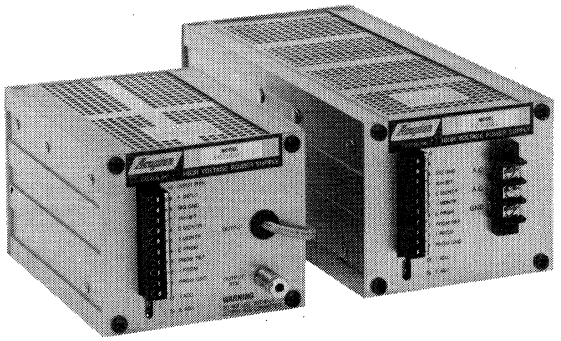


ASSEMBLY SIZES 7R18 AND 7R20

Acopian

HIGH VOLTAGE To 0-30 kV AC and DC Input

SHIPPED IN 9 DAYS



These modular high voltage supplies may be used as constant voltage or constant current sources. They may be remotely programmed by means of either voltage or resistance, and have provisions for remote monitoring and output inhibiting. All control and monitoring connections are on a pluggable terminal block that functions as a connector, providing wiring convenience and permitting easy and rapid connect/disconnect. Outputs are arc/short circuit protected.

GENERAL SPECIFICATIONS

Output Polarity: Positive output is standard. For negative output, change first letter of model number from P to N.

Regulation (constant voltage operation):
Line: ±0.05%
Load: ±0.05%

Regulation (constant current operation):
Line: ±0.1%
Load: ±0.1% plus 50 μA.

Ripple: 0.05%, peak-to-peak.

Output Controls: Voltage and current may be controlled by means of two 20-turn front panel adjustments, or by using remotely located 1000 ohm potentiometers.

Output Programming: Output voltage and current may be programmed from 0 to full rating by means of control voltage inputs of 0 to +5.1 Vdc.

Voltage Monitor Terminal: Permits monitoring output voltage, stepped down by ratio shown. Accuracy, 2%.

Current Monitor Terminal: Permits monitoring output current at mV-per-mA ratio shown. Accuracy, 2%.

Inhibit Terminal: Grounding inhibits output.

Input Protection: "Soft start" circuit minimizes startup power stresses.

Output Protection: Current regulation circuit protects power supply from short circuits, overload, and arcing.

Efficiency: Greater than 70% at full load.

Response Time: Less than 5 mS for 100 μA load step change.

Stability: 0.05% over eight hours, after 30 minute warmup.

Temperature Coefficient: 0.02%/°C (Typical).

Ambient Operating Temperature: −10 to +60°C. No derating required.

Storage Temperature: −20 to +85°C.

Humidity: Maximum of 90% relative, non-condensing.

AC INPUT MODELS

Input Voltage: 105-125 VAC, 50-400 Hz, single phase.

Input Current:
Case Size HA349: 0.6A.
Case Size HA359: 1.2A.

Connections: 24″ flying lead for high side of output and 5-way binding post for return (ground) are at the rear. Ac input connections on separate terminal strip. All other connections on pluggable terminal block.

Optional 230 Volt Input: For operation on inputs of 210-250 VAC, 50-400 Hz, single phase. To order, add suffix "-230" to model number and $40.00 to price.

DC INPUT MODELS

Input Voltage: +21.6-32.0 VDC.

Input Current:
Case Size HD345: 1.9A @ 21.6V, 1.3A @ 32.0 VDC.
Case Size HD355: 3.7A @ 21.6V, 2.6A @ 32.0 VDC.

Connections: 24″ flying lead for high side of output and 5-way binding post for return (ground). All other connections on pluggable terminal block.

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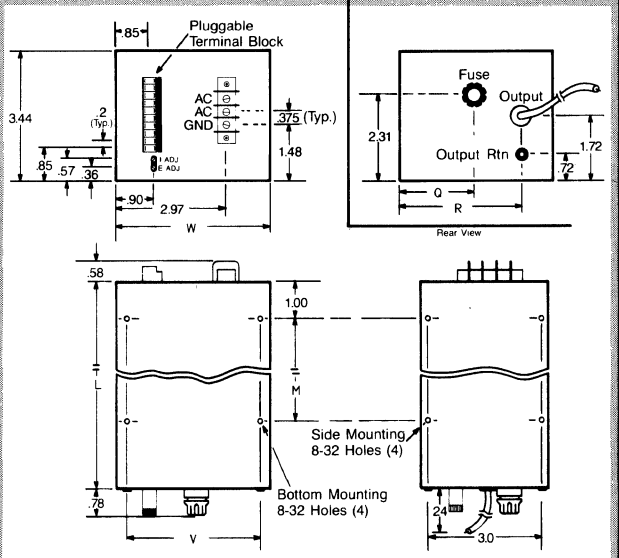
AC INPUT

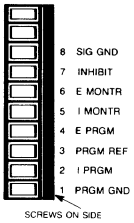
Output Range KVdc	Output Current mA	Output Monitor Ratio Voltage	Output Monitor Ratio Current mV/mA	Price	Model (Positive Output)	Case Size
0-1	30	1,000:1	100:1	$490	P01HD30	HD345
0-1	60	1,000:1	10:1	590	P01HD60	HD355
0-1.5	20	1,000:1	100:1	490	P01.5HD20	HD345
0-1.5	40	1,000:1	100:1	590	P01.5HD40	HD355
0-2	15	1,000:1	100:1	490	P02HD15	HD345
0-2	30	1,000:1	100:1	590	P02HD30	HD355
0-2.5	12	1,000:1	100:1	490	P02.5HD12	HD345
0-2.5	24	1,000:1	100:1	590	P02.5HD24	HD355
0-3.5	8.5	1,000:1	100:1	490	P03.5HD8.5	HD345
0-3.5	17	1,000:1	100:1	590	P03.5HD17	HD355
0-5	6	10,000:1	100:1	550	P05HD6	HD345
0-5	12	10,000:1	100:1	650	P05HD12	HD355
0-7.5	4	10,000:1	100:1	550	P07.5HD4	HD345
0-7.5	8	10,000:1	100:1	650	P07.5HD8	HD355
0-10	3	10,000:1	1,000:1	550	P010HD3	HD345
0-10	6	10,000:1	100:1	650	P010HD6	HD355
0-12	2.5	10,000:1	1,000:1	550	P012HD2.5	HD345
0-12	5	10,000:1	100:1	650	P012HD5	HD355
0-15	2	10,000:1	1,000:1	590	P015HD2	HD345
0-15	4	10,000:1	100:1	690	P015HD4	HD355
0-18	1.6	10,000:1	1,000:1	590	P018HD1.6	HD345
0-18	3.2	10,000:1	1,000:1	690	P018HD3.2	HD355
0-20	1.5	10,000:1	1,000:1	690	P020HD1.5	HD345
0-20	3	10,000:1	1,000:1	790	P020HD3	HD355
0-22	1.3	10,000:1	1,000:1	690	P022HD1.3	HD345
0-22	2.6	10,000:1	1,000:1	790	P022HD2.6	HD355
0-25	1.2	10,000:1	1,000:1	790	P025HD1.2	HD345
0-25	2.4	10,000:1	1,000:1	890	P025HD2.4	HD355
0-30	1	10,000:1	1,000:1	790	P030HD1	HD345
0-30	2	10,000:1	1,000:1	890	P030HD2	HD355

DC INPUT

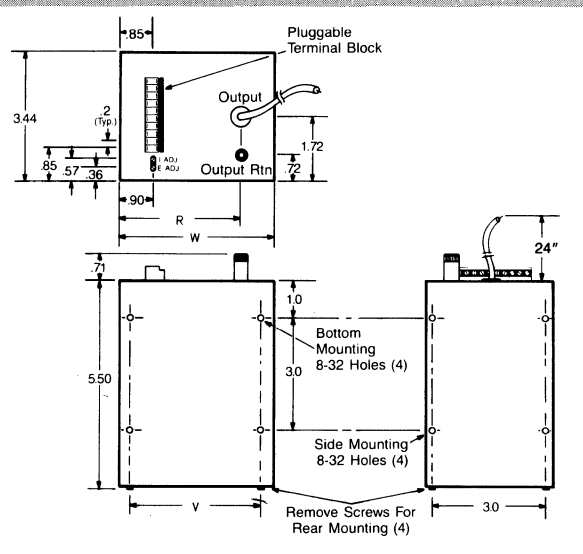
Output Range KVdc	Output Current mA	Output Monitor Ratio Voltage	Output Monitor Ratio Current mV/mA	Price	Model (Positive Output)	Case Size
0-1	30	1,000:1	100:1	$590	P01HA30	HA349
0-1	60	1,000:1	10:1	690	P01HA60	HA359
0-1.5	20	1,000:1	100:1	590	P01.5HA20	HA349
0-1.5	40	1,000:1	100:1	690	P01.5HA40	HA359
0-2	15	1,000:1	100:1	590	P02HA15	HA349
0-2	30	1,000:1	100:1	690	P02HA30	HA359
0-2.5	12	1,000:1	100:1	590	P02.5HA12	HA349
0-2.5	24	1,000:1	100:1	690	P02.5HA24	HA359
0-3.5	8.5	1,000:1	100:1	590	P03.5HA8.5	HA349
0-3.5	17	1,000:1	100:1	690	P03.5HA17	HA359
0-5	6	10,000:1	100:1	650	P05HA6	HA349
0-5	12	10,000:1	100:1	750	P05HA12	HA359
0-7.5	4	10,000:1	100:1	650	P07.5HA4	HA349
0-7.5	8	10,000:1	100:1	750	P07.5HA8	HA359
0-10	3	10,000:1	1,000:1	650	P010HA3	HA349
0-10	6	10,000:1	100:1	750	P010HA6	HA359
0-12	2.5	10,000:1	1,000:1	650	P012HA2.5	HA349
0-12	5	10,000:1	100:1	750	P012HA5	HA359
0-15	2	10,000:1	1,000:1	690	P015HA2	HA349
0-15	4	10,000:1	100:1	790	P015HA4	HA359
0-18	1.6	10,000:1	1,000:1	690	P018HA1.6	HA349
0-18	3.2	10,000:1	1,000:1	790	P018HA3.2	HA359
0-20	1.5	10,000:1	1,000:1	790	P020HA1.5	HA349
0-20	3	10,000:1	1,000:1	890	P020HA3	HA359
0-22	1.3	10,000:1	1,000:1	790	P022HA1.3	HA349
0-22	2.6	10,000:1	1,000:1	890	P022HA2.6	HA359
0-25	1.2	10,000:1	1,000:1	890	P025HA1.2	HA349
0-25	2.4	10,000:1	1,000:1	990	P025HA2.4	HA359
0-30	1	10,000:1	1,000:1	890	P030HA1	HA349
0-30	2	10,000:1	1,000:1	990	P030HA2	HA359



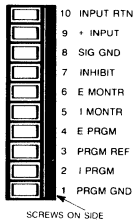
PLUGGABLE TERMINAL BLOCK CONNECTIONS



Size	L	W	M	V	Q	R	Approx. Weight
HA349	8.82	4.13	6.00	3.50	2.00	3.25	6 lbs. 8 oz.
HA359	9.33	5.13	7.00	4.50	2.78	4.25	10 lbs.



PLUGGABLE TERMINAL BLOCK CONNECTIONS



Size	W	V	R	Approx. Weight
HD345	4.13	3.50	3.25	2 lbs.
HD355	5.13	4.50	4.25	2 lbs. 12 oz.

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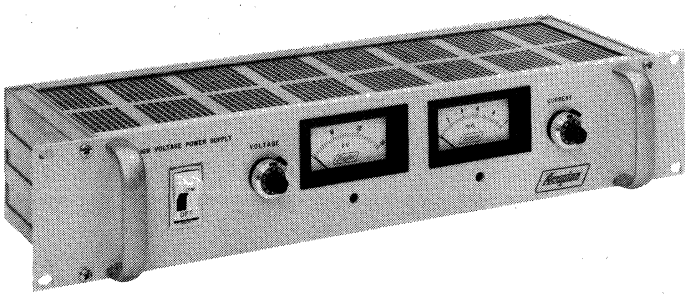
HIGH VOLTAGE Rack Mounting



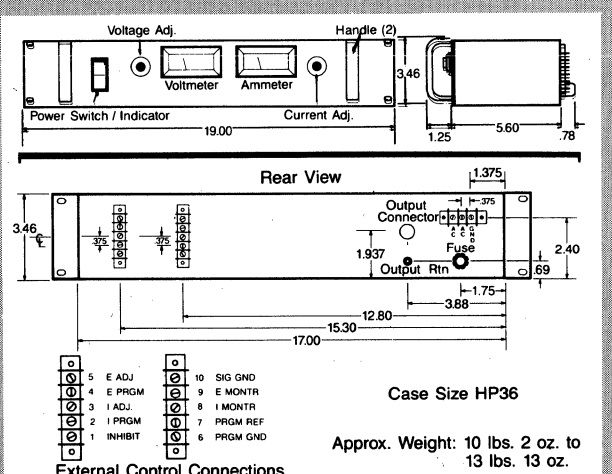
SHIPPED IN 9 DAYS

Ideal for laboratory and instrumentation applications, these rack mounting supplies have the same output ratings and specifications as the modular supplies shown on pages 28 and 29, but additionally feature calibrated ten-turn controls (with locking vernier dials) for precisely setting voltage and current. Voltmeter and ammeter are standard. An 8' long shielded output cable is included.

GENERAL SPECIFICATIONS

Input Voltage: 105-125 VAC, 50-400 Hz, single phase.
Input Current:
30 watt output ratings: 0.6A
60 watt output ratings: 1.2A
Output Polarity: Positive output is standard. For negative output, change first letter of model number from P to N.
Regulation (constant voltage operation):
Line: ±0.05%
Load: ±0.05%
Regulation (constant current operation):
Line: ±0.1%
Load: ±0.1% plus 50 µA.
Ripple: 0.05%, peak-to-peak.
Output Controls: Voltage and current may be controlled by means of two 10-turn front panel adjustments with locking vernier dials. Control linearity, 1% of full rated output. Calibration accuracy, 1% of rated output plus 1% of setting. (Remotely located 1000 ohm potentiometers may alternately be used for output control.)
Output Programming: Output voltage and current may be programmed from 0 to full rating by means of control voltage inputs of 0 to +5.1 Vdc, ±2%.
Metering: Voltmeter and ammeter are standard. Accuracy, 2%.
Voltage Monitor Terminal: Permits remote monitoring of output voltage, stepped down by ratio shown. Accuracy, 2%.
Current Monitor Terminal: Permits remote monitoring of output current, at mV-per-mA ratio shown. Accuracy, 2%.
Inhibit Terminal: Grounding inhibits output.
Output Protection: Current regulation circuit protects power supply from short circuits, overload, and arcing.
Response Time: Less than 5mS for 100 µA load step change.
Stability: 0.05% over eight hours, after 30 minute warmup.
Temperature Coefficient: 0.02%/°C (Typical).
Ambient Operating Temperature: −10 to +60°C. No derating required.
Storage Temperature: −20 to +85°C.
Humidity: Maximum of 90% relative, non-condensing.
Connections:
Input, Control and Monitoring: Screw terminals.
Output: High voltage connector (Type varies with model number). An 8' shielded output cable, with mating connector installed, is provided.
Optional 230 Volt Input: For operation on inputs of 210-250 VAC, 50-400 Hz, single phase. To order, add suffix "-230" to model number and $40.00 to price.

Output Range KVdc	Output Current mA	Output Monitor Ratio Voltage	Output Monitor Ratio Current mV/mA	Price	Model (Positive Output)
0-1	30	1,000:1	100:1	$ 995	P01HP30
0-1	60	1,000:1	10:1	1095	P01HP60
0-1.5	20	1,000:1	100:1	1095	P01.5HP20
0-1.5	40	1,000:1	100:1	1195	P01.5HP40
0-2	15	1,000:1	100:1	995	P02HP15
0-2	30	1,000:1	100:1	1095	P02HP30
0-2.5	12	1,000:1	100:1	995	P02.5HP12
0-2.5	24	1,000:1	100:1	1095	P02.5HP24
0-3.5	8.5	1,000:1	100:1	995	P03.5HP8.5
0-3.5	17	1,000:1	100:1	1095	P03.5HP17
0-5	6	10,000:1	100:1	1050	P05HP6
0-5	12	10,000:1	100:1	1150	P05HP12
0-7.5	4	10,000:1	100:1	1050	P07.5HP4
0-7.5	8	10,000:1	100:1	1150	P07.5HP8
0-10	3	10,000:1	1,000:1	1050	P010HP3
0-10	6	10,000:1	100:1	1150	P010HP6
0-12	2.5	10,000:1	1,000:1	1050	P012HP2.5
0-12	5	10,000:1	100:1	1150	P012HP5
0-15	2	10,000:1	1,000:1	1095	P015HP2
0-15	4	10,000:1	100:1	1195	P015HP4
0-18	1.6	10,000:1	1,000:1	1095	P018HP1.6
0-18	3.2	10,000:1	1,000:1	1195	P018HP3.2
0-20	1.5	10,000:1	1,000:1	1095	P020HP1.5
0-20	3	10,000:1	1,000:1	1195	P020HP3
0-22	1.3	10,000:1	1,000:1	1150	P022HP1.3
0-22	2.6	10,000:1	1,000:1	1250	P022HP2.6
0-25	1.2	10,000:1	1,000:1	1195	P025HP1.2
0-25	2.4	10,000:1	1,000:1	1295	P025HP2.4
0-30	1	10,000:1	1,000:1	1195	P030HP1
0-30	2	10,000:1	1,000:1	1295	P030HP2



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High Voltage Power Supplies and Modules

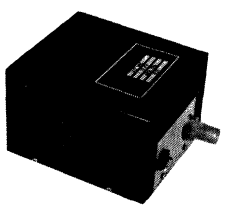
Telephone: (602) 721-2424

E_{OUT} Nom. kV	I_{OUT} Max. mA	Model No.	Features, Specifications and Options
200V	15.0	DRF 325	Miniature, fully regulated DC to DC converter with 0.05% line and load regulation. Has remote programming capability. 3 watts output. Shielded, RFI decoupled. **Input:** 28 VDC. **Output Adjustment Range:** -30% to +10%. **Ripple:** 0.1% P-P. **TC:** 100 ppm. **Operating Temperature:** -10°C to +65°C. **Dimensions:** 3.0" x 1.5" x 0.6" (Flange length is 3.625".) **Weight:** 4 oz.
400V	7.5	DRF 335	
600V	5.0	DRF 345	
800V	3.7	DRF 355	
1.1	3.0	DRF 365	
1.5	2.0	DRF 375	
2.0	1.5	DRF 385	
3.0	1.0	DRF 405	
200V	30.0	ARM 016	Line operated, 6 watt supply for photomultiplier and similar applications. Units are shielded, serviceable, short circuit proof and light weight. Input and output are RFI decoupled. Standard adjustment range is -30% to +10%. **Input:** 117 VAC, 50 to 400 Hz. **Regulation (L/L):** 0.02%, (better with less than 0 to full load changes). **Ripple and Noise:** 0.02%. **Operating Temperature:** -10°C to +65°C. **Size:** 3.04" x 2.60" x 4.23". **Weight:** 32 oz. **Options:** Negative output (-01), wide adjustment range (-04), remote program (-05).
400V	15.0	ARM 026	
600V	10.0	ARM 036	
800V	7.5	ARM 046	
1.0	6.0	ARM 056	
1.2	5.0	ARM 066	
1.5	4.0	ARM 076	
1.8	3.3	ARM 086	
2.2	2.7	ARM 096	
500V	30.0	ARA 1362	Line operated, 15 watt High Voltage Module. Adjustable and/or programmable to zero. Fully serviceable, short circuit proof and shielded. Standard adjustment range is -30% to +10%. **Input:** 117 VAC, 50 to 400 Hz. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P. **TC:** 100 ppm. **Operating Temperature:** -10°C to +65°C. **Dimensions:** 4.66" x 3.98" x 3.0". **Weight:** 3.5 lbs. **Options:** 0 to 110% voltage adjustment (-03), remote program (-05), negative output (-01), lower ripple figure (-09). Other output voltages.
3.0	5.0	ARA 106	
4.0	4.0	ARA 116	
5.0	3.0	ARA 126	
8.0	2.0	ARA 146	
10	1.5	ARA 156	
12	1.3	ARA 166	
15	1.0	ARA 176	
18	0.8	ARA 186	
22	0.7	ARA 196	
300V	50.0	DRM 1291	Fully regulated High Voltage Module, 15 or 30 watts output. Output adjustment +10%, -30%. Short-circuit proof. HV return may be floated to 500 volts from chassis. Magnetically shielded. Serviceable. **Input:** 28 VDC. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P. **TC:** 100 ppm. **Operating Temperature:** -20°C to +65°C. **Size** 2.34 x 2.7 x 3.77 (to 5 KV), 3.04 x 3.54 x 4.84 (over 5 KV). **Options:** Negative output (-01), wider adjustment range (-04), remote program (-05), 30 watts output power (-19), 15 volts input (-33). Units also available with other voltages from 2.2 volts (filament supplies) to 24 KV. Other options.
1.0	15.0	DRM 115	
1.5	10.0	DRM 125	
2.5	6.0	DRM 135	
3.5	4.0	DRM 145	
5.0	3.0	DRM 155	
7.5	2.0	DRM 165	
10	1.5	DRM 175	
12.5	1.2	DRM 185	
15	1.0	DRM 195	
18	0.8	DRM 205	
22	0.6	DRM 215	
1.0	15.0	DUM 054	28 VDC operated High Voltage Modules similar to DRM series above, except HV output is not in the regulation loop. This allows floating HV option with only 30 to 40 pf capacitance to input. More economical than DRM series where the higher internal impedance can be tolerated. Input regulation, ripple and other data per DRM series. Also available with other output voltages, from 2.2 volts (filament supplies) to 22 KV.
1.5	10.0	DUM 064	
2.5	6.0	DUM 074	
3.5	4.0	DUM 084	
5.0	3.0	DUM 094	
7.5	2.0	DUM 104	
10	1.5	DUM 114	
12.5	1.2	DUM 124	
15	1.0	DUM 134	
1.0	80.0	NRL 602	Medium power DC to DC High Voltage Converter, 80 or 160 watts. **Input:** 24 to 32 VDC. **Outputs:** to 30 KV. Adjustable constant voltage/constant current operation. Units can be paralleled for higher power. Remote program of voltage and current. **Standard Adjustment Range:** +10%, -30% of rated output voltage. Efficiency better than 70%. Optional buffered metering outputs, voltage and current. **Operating Temperature:** -20°C to +65°C **Ripple:** 0.1% P-P. **Regulation (L/L):** 0.1%. **Size:** 4.75 x 4.75 x 5.0 inches. **Weight:** approx. 6 lbs. 160 watts output, option (-19). Other options, see next block.
1.5	53.0	NRL 612	
2	40.0	NRL 622	
2.5	32.0	NRL 632	
3.5	22.0	NRL 642	
5	16.0	NRL 652	
8	10.0	NRL 662	
10	8.0	NRL 672	
15	5.3	NRL 682	
22	3.7	NRL 712	
1.0	250	NRL 1350	250 watt DC to DC converter. **Input:** 24 to 32 VDC. **Output:** 500 volts to 30 KV for this series. Adjustable constant voltage/constant current operation. Units can be paralleled for higher power. **Standard Adjustment Range:** +10, -30% for voltage, 0 to 100% for current. **Operating Temperature:** -20°C to +65°C. **Regulation (L/L):** 0.1%. **Ripple:** 0.1% P-P (0.5% for 20 KV and higher). Efficiency better than 70%. **Size:** 4.75 x 4.75 x 5.00 inches. **Weight:** Approx. 6 lbs. **Options:** Negative output (-01). Remote programming and metering (-05).
2.5	100	NRL 1177	
3.5	68	NRL 1320	
5	50	NRL 1322	
10	25	NRL 1314	
15	16	NRL 1337	
20	12	NRL 1338	
30	8	NRL 1336	

DRF

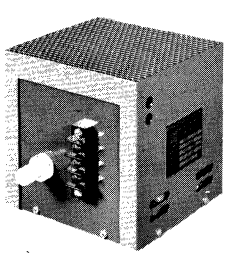
ARM

ARA



DRM/DUM

NRL



Advanced High Voltage Company makes many other types of High Voltage Supplies. REQUEST FULL CATALOG. Telephone for application assistance.

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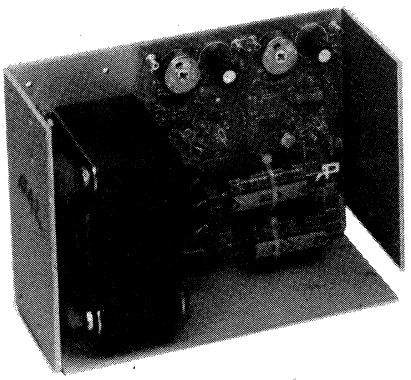
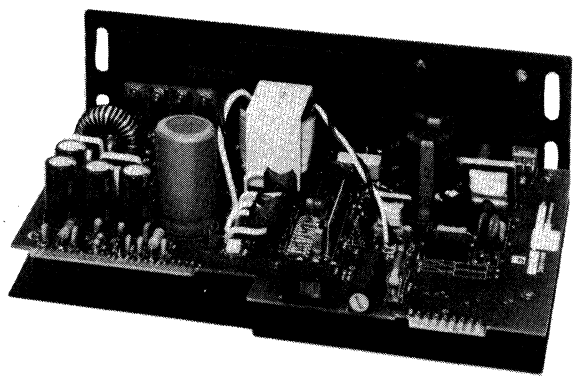
Adtech Power Incorporated

STANDARD AND CUSTOM LINEAR POWER SUPPLIES UP TO 300 WATTS



STANDARD & CUSTOM SWITCH MODE POWER SUPPLIES 50 TO 1500 WATTS



Products manufactured by Adtech Power include; AC to DC single and multiple output switch mode supplies up to 1500 watts, both voltage and current mode, for current sharing and N + 1 redundancy; DC to DC switch mode supplies up to 300 watts output; linear supplies for low noise applications and a series of Battery back-up power supplies.

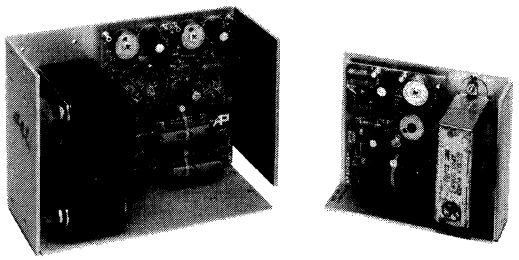
Besides the standard power supplies in the Adtech Catalog, Adtech Power would be pleased to quote a custom design to meet your exact requirements.

Adtech Power Incorporated
1620 S. Sunkist Street, Anaheim, CA 92806
Tel: (714) 634-9211 FAX (714) 634-0802

ADTECH POWER

Adtech Power Incorporated

Single, Dual and Triple Output Industry Standard Linear Power Supplies



- ☐ Industry Standard Package Sizes
- ☐ 2 Year Warranty
- ☐ Approx. 20% more heat sink area than competition

Specifications

AC Input: 115/230 VAC ± 10% 47-63HZ no derating required for 50 Hz input.
DC Output: See tables
Regulation: 0.1% for ± 10% line change 0.1% no load to full load
Ripple: 3mV p.p. 5 to 15 V models, 5mV pp 24 to 48V. models, 0.02% pp 60-250V models
Stability ± 0.2% for 24 hrs after 30 min warm up
Transient Response: Output recovers to the regulation band width in 50µS. after an instantaneous 50% load change.
Operating Temperature range: 0 to 65°C (Derate 2%/°C above 50°C) (above 40°C for 60V and greater)
Storage Temperature Range: −20°C to +80°C.

HIGH EFFICIENCY Single Output Models

MODEL	VOLTS AMPS
EMPS 5-9	5V @ 9A
EMPS 5-12	5V @ 12A
EMPS 5-18	5V @ 18A
EMPS 5-25	5V @ 25A
EMPS 5-40	5V @ 40A
EMPS 12-9	12V @ 9A
EMPS 12-12	12V @ 12A
EMPS 12-18	12V @ 18A
EMPS 15-8	15V @ 8A
EMPS 15-11	15V @ 11A
EMPS 15-16	15V @ 16A
EMPS 24-8	24V @ 8A
EMPS 24-12	24V @ 12A

Single Output Models

MODEL	VOLTS AMPS
5 VOLTS	
APS 5-3	5V @ 3A
APS 5-6	5V @ 6A
APS 5-9	5V @ 9A
APS 5-10	5V @ 10A
APS 5-12	5V @ 12A
12 VOLTS	
APS 12-1.6	12V @ 1.6A
APS 12-4	12V @ 4A
APS 12-5.1	12V @ 5.1A
APS 12-7	12V @ 7A
15 VOLTS	
APS 15-1.5	15V @ 1.5A
APS 15-3	15V @ 3A
APS 15-4.5	15V @ 4.5A
APS 15-6	15V @ 6A
APS15-8	15V @ 8A
24 VOLTS	
APS 24-1	24V @ 1A
APS 24-2.2	24V @ 2.2A
APS 24-3.5	24V @ 3.5A
APS 24-5	24V @ 5A
28 VOLTS	
APS 28-4	28V @ 4A
48 VOLTS	
APS 48-1	48V @ 1A
60 VOLTS	
APS 60-.250	60V @ .25A
150 VOLTS	
APS 150-.150	150V @ .15A
250 VOLTS	
APS 250-.100	250V @ .1A

HIGH EFFICIENCY Dual & Triple Output Models

MODEL	VOLTS AMPS
DEMPS 12-6	±12V @ 6A
DEMPS 15-5.5	±15V @ 5.5A
TEMPS 3	5V @ 12A ±12V @ 2A
TEMPS 4	5V @ 18A ±12V @ 3A

Dual Output Models

MODEL	VOLTS AMPS
±5 VOLTS	
DAPS 5-.8	±5V @ 0.8A
±12 VOLTS	
DAPS 12-.4	±12V @ 0.4A
DAPS 12-.75	±12V @ 0.75A
DAPS 12-1.5	±12V @ 1.5A
DAPS 12-3	±12V @ 3A
±15 VOLTS	
DAPS 15-.3	±15V @ 0.3A
DAPS 15-.6	±15V @ 0.6A
DAPS 15-1.3	±15V @ 1.3A
DAPS 15-3	±15V @ 3A
DAPS 5112-5	+OR−5V @ 1A +OR−12V @ 0.5A
DAPS 53121-5	+OR−5V @ 3A +OR−12V @ 1.5A
DAPS 56123	+OR−5V @ 6A +OR−12V @ 3A

Triple Output Models

MODEL	VOLTS AMPS
TEAPS-1	5V @ 3A ±12V @ 0.1A
TEAPS-2	5V @ 3A ±15V @ 0.1A
TEAPS-3	5V @ 3A ±12V @ 0.15A −5V @ 0.75A
TEAPS-4	5V @ 3A ±12V @ 1A
TAPS-1u	5V @ 4A ±12 OR ±15V @ 0.5A
TAPS-2u	5V @ 6A ±12 OR ±15V @ 1A
TAPS-3u	5V @ 9A ±12 OR ±15 @ 1.5A
TAPS-4u	5V @ 12A ±12V OR ±15V @ 3A

High Power • 300, 600 & 1200 watts • SCR Regulated Power Supplies • Brute Series

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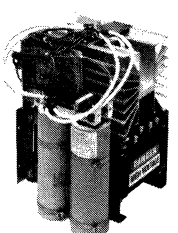
- ☐ Remote Sensing.
- ☐ Constant Voltage/Constant Current/ Automatic Crossover
- ☐ 2-25 VDC or 5-50VDC. Adjustable
- ☐ ALL MODELS
  Built in inductance/capacitor filter provides low noise.



Mechanical Specifications

DIM.& Wt. Model	Length ins	Width ins	Height ins	Weight lbs
Brute I	11.00	7.66	6.75	20
Brute II	12.00	7.66	6.75	30
Brute III	14.00	11.12	10.00	70

Specifications:

AC Input: 105-130/210-260 VAC 47-63 Hz
DC Output: Brute I, II & III 2-25VDC OR 5-50VDC at 12A/6A, 24A/12A, 50A/25A respectively
Regulation: Line & Load ± 0.1% or 50mV
Ripple: 1% or 500mV rms max
Operating Temperature range: 0 to 55°C Convection cooled. Derate 25% at 65°C

Options:

Ten turn fine volt adjust.
50% Ripple reduction kit
OVP
Circuit Breaker

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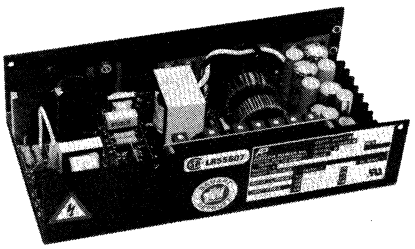
Adtech Power Incorporated

Single and Multiple Output 250 to 400 Watt Switch Mode Power Supplies

- Customized Standards 5-24VDC/5-48VDC Outputs Customer Selects Adtech Builds
- Soft-Start Circuitry
- High Efficiency/High Reliability Mag Amp Outputs
- Protection against overvoltage, overloads, reverse voltage, short circuits, over temperature and high or low line conditions.



- High Power Density
- International Safety Standards. UL1950, CSA 22.2 No. 154-1983, Bulletin 1402, VDE 0806/IEC 380-Class 1 SELV
- Hybrid Control Circuit
- Built-In FCC/VDE E.M.I. filter
- International Power Inputs (External Field Selectable): 90VAC-132VAC or 180VAC-264VAC

Output Voltage/Current Ratings

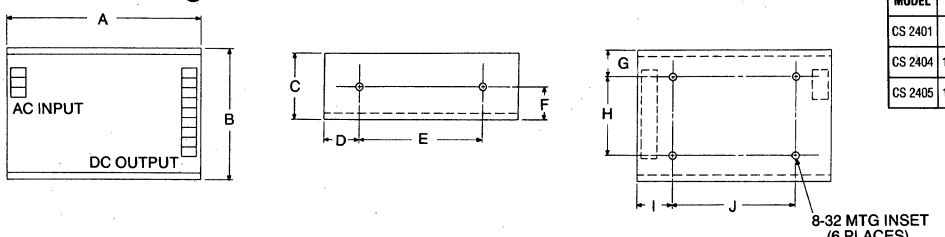
MODEL PREFIX[1]	OUTPUTS	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	TOTAL POWER[2]
CS2401	1	5 TO 48V UP TO 50A					250 W
CS2404	4	5 TO 48V UP TO 50A	5 TO 48V UP TO 15A	+5 TO 24V UP TO 5A	−5 to 24V UP TO 5A		250 W
CS2405	5	5 TO 48V UP TO 50A	5 TO 48V UP TO 15A	+5 TO 48V UP TO 15A	+5 TO 24V UP TO 5A	−5 TO 24V UP TO 5A	400 W

NOTES:
1. Consult factory for specific model number according to output voltages selected.
2. Total Power with 300 LF/M Air. Derate 20% for convection cooling.

Specifications:

AC Input Range:
90-132 or 180-264VAC 47-440Hz Single Phase.
Inrush Current:
Less than 50A peak thermistor limited for units that have been off for at least 30 minutes.
Undervoltage Protection:
Protected against malfunction due to AC undervoltage operation.
Efficiency:
Typically 75% at nominal line, full load.
Turn-On Time:
400 mS Max.
Hold-Up Time:
20 mS. Typical at nominal line, full load.
DC Outputs:
All outputs are adjustable, ±5% min. Output 2 is floating.
Output Regulation:
Line ±0.2% over input range, 90-132 or 180-264VAC. at 100% rated load.
Load ±0.5% all outputs
Cross regulation:
Each output independently regulated and effects do not apply.
Dynamic Response:
All outputs will settle to 1% of output within 400µs after a 25% load step change and will deviate no more than ±2%.
Thermal Regulation: ±0. 2%/°C
Ripple and Noise:
True differential measurement with a 20MHz scope and a ×1 probe 1% or 100mV peak to peak, whichever is greater.
Overvoltage protection:
Standard. Preset at 6.0—6.5V on 5V main output.
Consult factory for other voltages.
Overload Short Circuit Protection:
CS2401 Output 1, CS2404 Outputs 1 & 2, CS2505 Outputs 1,2, & 3 will shut down power supply in short circuit condition. CS2404 Outputs 3 & 4, CS2405 outputs 4 & 5 will go into current fold back under short circuit condition.
Remote Sense:
On Output 1 - compensates for up to 0.5V lead drop.
Operating Temperature Range:
0—50°C ambient with min. of 300LFM of air directed through power supply lengthwise. Derate linearly to 50% at 70°C
Derate 20% for convection cooling.
Power Fail:
A TTL compatible signal flag raises a minimum of 5mS prior to outputs dropping out of regulation; adjustable to 10mS. minimum at full load, nom. line. TTL low or high is selectable on P.C. board, consult factory.

Outline Mounting/Interface



Standard Chassis Dimensions (Inches)

MODEL	A	B	C	D	E	F	G	H	I	J
CS 2401	8.00	5.00	2.50	.25	7.50	1.25	1.00	3.00	1.00	6.00
CS 2404	10.00	5.00	2.50	.25	0.50	1.25	1.00	3.00	1.00	8.00
CS 2405	13.50	5.00	2.50	.25	13.00	1.40	1.00	3.00	1.00	11.50

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- ❑ Customized Standards
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  Customer Selects, Adtech Builds
- ❑ All Outputs Fully Regulated
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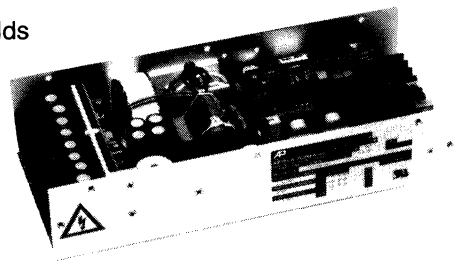


- ❑ International Safety Standards
  UL478/1012
  CSA 22.2 No. 154-1983 Bulletin 1402
  (Some Models)
- ❑ Soft Start Circuitry Standard. Triac Input Power Limit Independent of Temperature.
- ❑ Protection against Overvoltage, Overloads, Reverse Voltage, Short Circuits, Overtemperature and High or Low Line Conditions

Output Voltage/Current Ratings

MODEL PREFIX[1]	OUTPUTS	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	TTL PWR[2]
CS1401	1	5 TO 48V[3] UP TO 50A	—	—	—	—	300W
CS1402	UP TO 3	+5 TO +48V UP TO 40A UP TO 40A	+5 TO +28V UP TO 8A UP TO 4A	−5 TO −28V UP TO 1A UP TO 4A	—	—	300W
CS1403	UP TO 4	+5 TO +48V UP TO 40A	+5 TO +28V UP TO 4A	−5 TO −28V UP TO 4A	5 TO 28V[3] UP TO 8A	—	350W
CS1406	UP TO 5	+5 TO +48V UP TO 50A UP TO 50A	+5 TO +28V UP TO 8A UP TO 8A	−5 TO −28V UP TO 1A UP TO 1A	+5 TO +28V UP TO 1A UP TO 4A	5 TO 28V[3] UP TO 8A UP TO 4A	500W

NOTES:
1. Consult factory for specific model number according to output voltages selected.
2. Total Power with 300 LFM Air. Derate 20% for convection cooling.
3. Output floating. Either side may be grounded.
4. For voltage and current combinations not listed above. Consult factory.

Specifications:

AC Input Range: 90-130 or 180-260 VAC 47-63Hz single phase, contact factory for 400Hz input.

Inrush Current: Less than 30A peak incorporating triac independent of temperature.

Undervoltage Protection: Protected against malfunction due to AC undervoltage operations.

Efficiency: Typically 72% at nominal line, full load.

Turn On Time: 200mS max

Hold Up Time: 25mS min at nominal line, full load.

DC Outputs: Main loop and switch mode outputs are adjustable ±5%.

Output Regulation: Line ±0.2% over input range 90-130 or 180-260 VAC at 100% rated load. Load ±0.2% all outputs.

Dynamic Response: Output returns to within 1% in less than 500µS for a 50% load change.

Thermal Protection: Power supply shuts down if overtemperature condition is reached.

Temperature Coefficient: 0.2%/°C.

Ripple & Noise: True differential measurement with a 20MHz scope and a ×1 probe. 1% or 50mVpp whichever is greater.

Overvoltage Protection: Standard preset on main output only.

Overload Short Circuit Protection: All outputs will fold back in overload or short circuit.

Remote Sense: On main output compensates for up to 0.25V per lead drop.

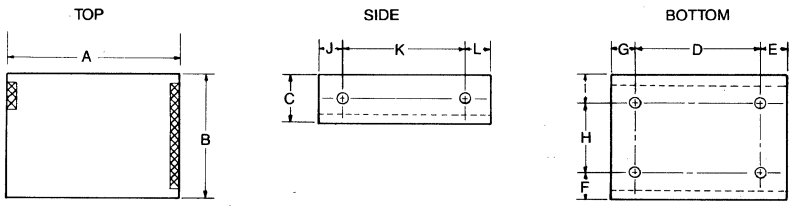
Operating Temperature Range: 0-50°C Full load output with min of 300 LFM of air directed through the power supply lengthwise, derate 20% for convection cooling.

Options:
Power Fail: A TTL compatible signal flag raises a minimum of 5mS prior to outputs dropping out of regulation, adjustable to 10mS min at full load, nom line. TTL hi or lo consult factory.

Remote On/Off: Consult factory.

Cover: Consult factory.

Outline Drawing & Mounting



Input/output connectors are 6/32" screws on terminal blocks.
For Model CS1401 and CS1406, use 6/32" screws on mounting holes.
For Model CS1402, CS1403 use 8/32" screws on mounting holes.

STANDARD CHASSIS DIMENSIONS (inches)

MODEL	A	B	C	D	E	F	G	H	I	J	K	L
CS1401	9.00	5.0	2.5	7.0	1.0	1.000	1.00	3.0	1.000	1.35	6.30	1.35
CS1402	11.25	5.0	2.5	9.7	0.3	1.125	1.25	3.0	0.875	1.30	8.65	1.30
CS1403	13.50	5.0	2.5	10.5	1.5	1.000	1.50	3.0	1.000	0.25	13.0	0.25
CS1406	15.00	6.0	2.5	12.2	1.4	1.000	1.4	4.0	1.000	2.00	11.00	2.00

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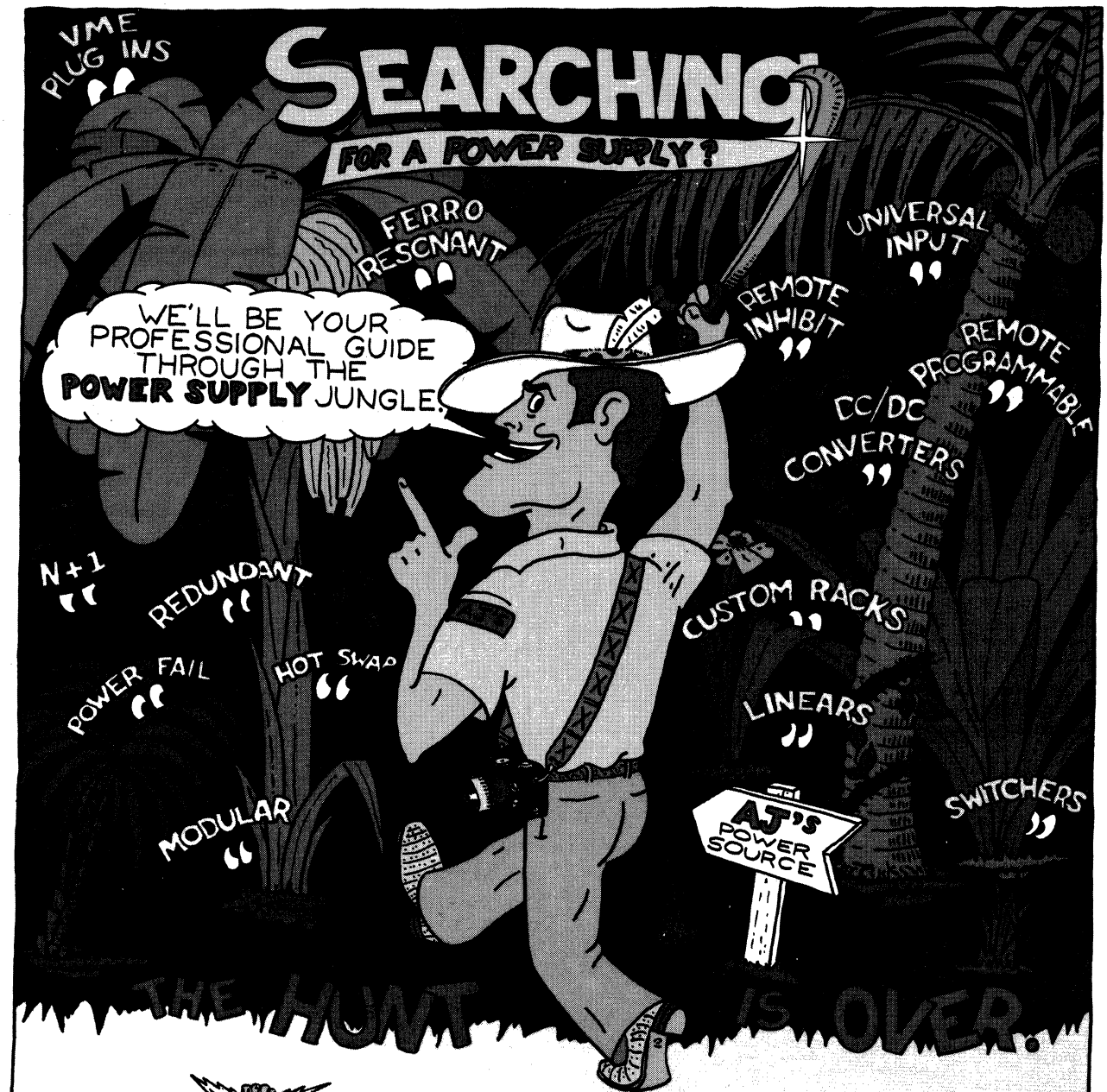

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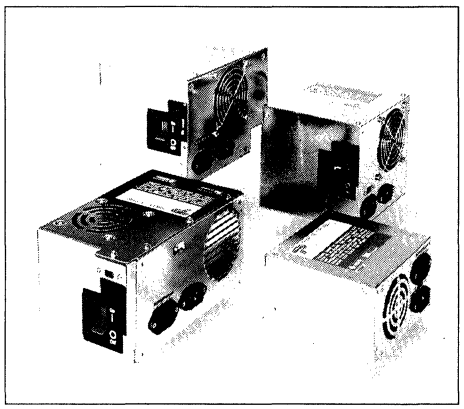

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Reliability is the single most critical factor in power supplies. It starts with conservative design and temperature cycled life tests. Then we conduct a minimum 24-hour fully loaded temperature cycling burn-in on all units. And we don't stop there. Automated test equipment measures all important parameters in our final ATP. This emphasis on reliability assures you the highest MTBFs in the industry. So if you've been feeling powerless when searching for reliable PC compatible power sources, stop looking. Power Tronic will bring you the power of proven reliability, technological innovation, state-of-the-art design, and all the features you'll find in supplies costing many times more.

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Total program support.

We maintain engineering and test functions at our California office. That gives us the capability of supporting your program through prototype production. Additional offshore manufacturing capability includes the professional management and equipment necessary for reliable production. Magnetics and coil winding are performed by skilled operators using the latest automatic equipment. Stress screening of components and assemblies is accomplished in-house, including burn-in, vibration, shock and temperature cycling.

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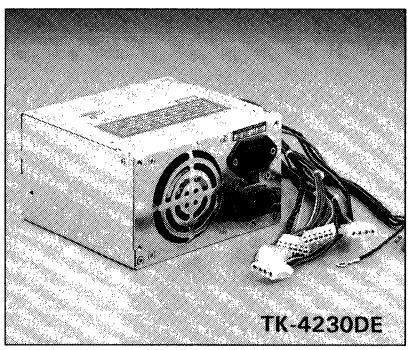
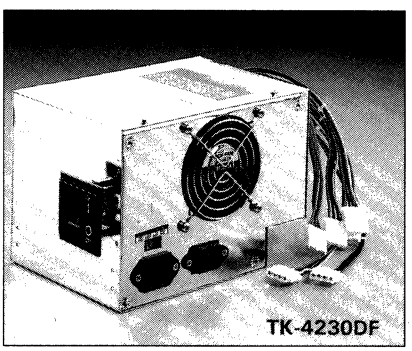
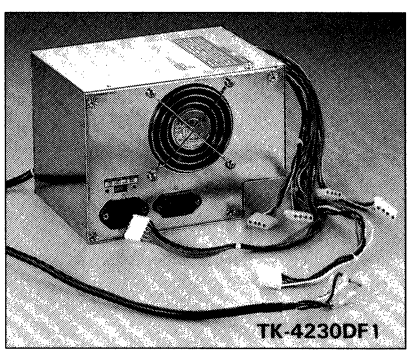
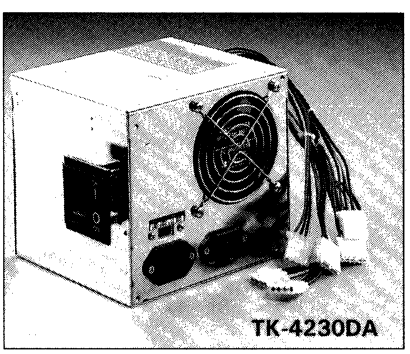
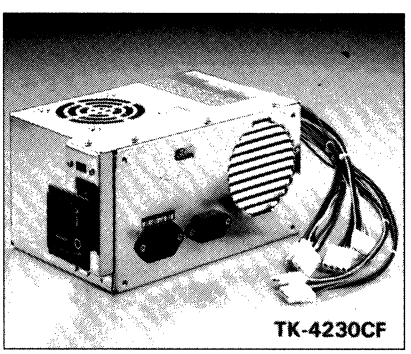
Meets UL, CSA and TUV











OUTPUT VOLTAGE	OUTPUT CURRENT (A)		OUTPUT V. TOLERANCE	REGULATION		OUTPUT RIPPLE & NOISE P-P (MAX.)
	MIN.	MAX.		LOAD	LINE	
5 VDC	4.0	20	±5 %	+4% -5 %	±1 %	50 mV
12 VDC	1.0	8	±5 %	±5 %	±1 %	100 mV
-12 VDC	0	0.3	±10 %	±10 %	±1 %	150 mV
-5 VDC	0	0.3	±10 %	±10 %	±1 %	150 mV

We want our customers to keep coming back, not our power supplies.

ASLAN COMPUTER CORPORATION

10922 Klingerman Ave. Bldg. 4, South El Monte, CA 91733

Tel: **(818) 575-5271** Fax: **(818) 575-0394**

POWER TRONIC

For PC Compatibles . . . Provides Additional Power For Add-On Cards

All Your Power Supply Needs in One Small, Low-Cost, Reliable Package

Features . . .

- High efficiency
- 90-132/180-264 VAC selectable input
- Low noise and ripple
- Short circuit, overvoltage protection
- Resettable as power shutdown
- Built-in EMI filter
- Line input fused protection
- 100% burn-in full load @ 50° C ambient
- Approved by UL, CSA, and TUV
- Vacuum impregnated transformer
- Active input surge protection (selected models)
- Internal 12 VDC fan
- 100% hi-pot test
- Complies with FCC part 15 subpart J, class B & VDE class B

Complete Specifications Available For All Units

LOW PROFILE - PS2 COMPATIBLE AT SERIES

200 W (UL/CSA version, TUV version)

OUTPUT VOLTAGE	OUTPUT CURRENT (A)		OUTPUT V. TOLERANCE	REGULATION			OUTPUT	
	MIN.	MAX.		LOAD	LINE	CROSS	RIPPLE P-P	NOISE (MAX.)
5 VDC	3	20	±5 %	±5 %	±1 %	±5 %	50 mV	100 mV
12 VDC	1.2	8	±5 %	±5 %	±1 %	±5 %	50 mV	100 mV
-12 VDC	0	0.5	±5 %	±5 %	±1 %	±5 %	50 mV	100 mV
-5 VDC	0	0.5	±5 %	±5 %	±1 %	±5 %	50 mV	100 mV

150 W Sq. Baby (UL/CSA) **220 W** Sq. AT (UL/CSA)

OUTPUT VOLTAGE	OUTPUT CURRENT (A)				OUTPUT V. TOLERANCE	REGULATION		OUTPUT	
	MIN.		MAX.			LOAD	LINE	RIPPLE P-P	NOISE (MAX.)
	PTA-4150DA	PTA-4200A	PTA-4150DA	PTA-4200A					
5 VDC	2.8	4	15	20	±5 %	±5 %	±1 %	50 mV	100 mV
12 VDC	0.5	1	5	8	±5 %	±5 %	±1 %	100 mV	100 mV
-12 VDC	0	0	0.3	0.5	±5 %	±5 %	±1 %	150 mV	150 mV
-5 VDC	0	0	0.3	0.5	±5 %	±5 %	±1 %	150 mV	150 mV

SLIM-LINE SERIES

For Slim or Compact XT, Baby AT & AT Systems
100-200 W (UL/CSA)

OUTPUT VOLTAGE	OUTPUT CURRENT (A)						OUTPUT V. TOL.	REGULATION		OUTPUT	
	MIN.			MAX.				LOAD	LINE	RIPPLE P-P	NOISE (MAX.)
	PTA-4100DE	PTA-4150DE	PTA-4200DE	PTA-4100DE	PTA-4150DE	PTA-4200DE					
5 VDC	2.8	2.8	5	10	19	2.0	±5 %	±5 %	±1 %	50 mV	100 mV
12 VDC	0.3	0.5	1	3.5	4	8	±5 %	±5 %	±1 %	100 mV	100 mV
-12 VDC	0	0	0	0.3	0.3	0.3	±5 %	±5 %	±1 %	100 mV	150 mV
-5 VDC	0	0	0	0.3	0.3	0.3	±5 %	±5 %	±1 %	100 mV	150 mV

AT & 386 SERIES

For Standard Desktop Systems (Extremely Quiet)
220 W Std AT (UL/CSA) **230 W** AT (UL/CSA/TUV)

OUTPUT VOLTAGE	OUTPUT CURRENT (A)				OUTPUT V. TOLERANCE	REGULATION		OUTPUT
	MIN.		MAX.			LOAD	LINE	RIPPLE & NOISE P-P (MAX.)
	PTA-4200CF	PTA-4200CFA	PTA-4200CF	PTA-4200CFA				
5 VDC	4	5	22	23	±5 %	±5 %	±1 %	50 mV
12 VDC	1	1	8	9	±5 %	±5 %	±1 %	100 mV
-12 VDC	0	0	0.5	0.5	±5 %	±5 %	±1 %	100 mV
-5 VDC	0	0	0.5	0.5	±5 %	±5 %	±1 %	100 mV

270 W Std AT (UL/CSA)

OUTPUT VOLTAGE	OUTPUT CURRENT (A)		OUTPUT V. TOLERANCE	REGULATION		OUTPUT	
	MIN.	MAX.		LOAD	LINE	RIPPLE P-P	NOISE (MAX.)
5 VDC	7.0	23	±5 %	±5 %	±1 %	50 mV	100 mV
12 VDC	0.5	1.2	±5 %	±5 %	±1 %	50 mV	120 mV
-12 VDC	0	0.5	±5 %	±5 %	±1 %	50 mV	120 mV
-5 VDC	0	0.5	±5 %	±5 %	±1 %	50 mV	100 mV

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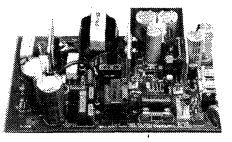
FULL LINE SWITCHING POWER SUPPLIES AND DC-DC CONVERTERS

30W-2000W COMMERCIAL • MILITARY • MILITARIZED

Off-Line Switchers
Open Frame Models
Enclosed Models
One to Four Outputs

38W • 50W • 60W

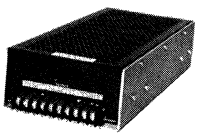
TDM-38, TDM-50
TDM60-1, 2, 3



135W

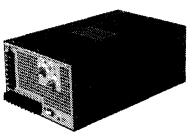
Off-Line Switchers
4 Outputs Highly Regulated,
Open Frame or Enclosed
Compact and Highly Reliable

TDM135-1
TDM135-2

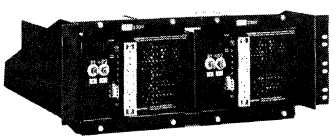


500W • 1000W • 1500W • 2000W

Off-Line Switchers — Power Factor Correction
Enclosed — Universal Input
Single Phase 3 Phase Optional — High Power Forth Output
NTDS SINGLE OUTPUT NTDM MULTIPLE OUTPUTS

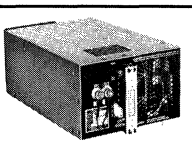


REDUNDANT AND **FAULT-TOLERANT (N + 1)**
POWER SUPPLY SYSTEMS
HOT PLUG-IN SINGLE/MULTIPLE OUTPUTS



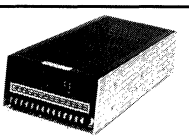
UNINTERRUPTIBLE SWITCHING POWER SUPPLIES UNITS WITH BATTERY BACKUP—DC OUTPUTS

Newly Announced, Most Advanced Design TDS & TDM Off Line Switchers are Available with Battery Backup Feature. Dual Input of 115/230V & 24 VDC or 36 VDC Unit Provide Glitch Free Transfer. Up to 1000W. Up to 3 Outputs. Eliminates the Need for UPS Inverters. Model: **TDS-UPS**

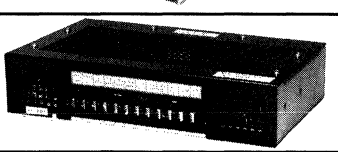


DC-DC CONVERTERS & SWITCHING REGULATORS

DC-DC Converter. UP to 5 Outputs, up to 200W. Available in Extended Military Temp Range. Inputs: 24, 36, 48 & 120 VDC. Outputs: 5V, ±12V & ±15V. Model: **TDC-200**

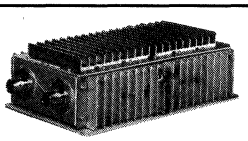


DC-DC with 24V, 36V, 48V or 120 VDC Inputs, up to 4 Outputs. Slim LIne 5.5″ × 9.5″ × 2.2″. Up to 150 Watt. Standard Outputs: 5V, +12V, −12V & 24V. Powerful yet very compact unit. Model: **TDC-150**



MIL APPROVED AND MILITARIZED POWER SUPPLIES

Full MIL and Militarized power supplies
single and multiple outputs
up to 800 watts
High reliability full output to +70°C



CUSTOM DESIGNS—COMMERCIAL & MILITARY. YOUR SPECIAL IS OUR SPECIALTY. HIGH VOLUME, LOW COST UNITS PRODUCED IN OUR FACTORY IN KOREA.

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HIGH RELIABILITY STANDARD & CUSTOM POWER SYSTEMS

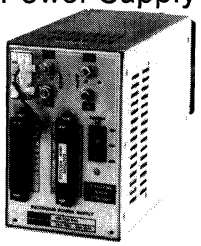
CUSTOM DESIGNS: COMMERCIAL & MILITARY

PROTOTYPES IN 10 WEEKS

Shown below are samples of our custom design capability. All standard units can be modified to suit unique customer requirements. New custom designs are accomplished at a record speed of 10 weeks. NRE charges are nominal, and for large quantity orders no NRE is charged. Call or send your specification to get our quick and responsive quotation.

COMMERCIAL PRODUCTS

800W Single Output Uninterruptable Power Supply



Input: 115/230 VAC 50/60 Hz and +12 VDC battery

Output: 13.5 VDC @ 55A

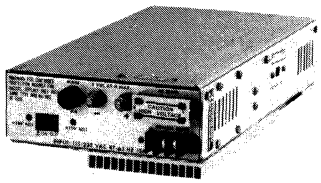
Regulation: ±1.0% line and load combined for a 20-100% load change

Features:
1) Battery charging circuit
2) Very low switching noise
3) OV and OL protection
4) Input RFI filter

Dimensions: 11.5″ x 8.0″ x 5.0″

Outputs Available: 24V, 48V, 56V

400W Slim Line Multiple Output



Input: 115/230 VAC 50/60 Hz

Output: +5 VDC @ 65A
±15 VDC @ 1.5A

Line Regulation: ±0.5%

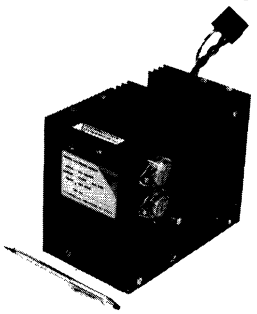
Load Regulation: ±1.0% for 10-100% load change

Features:
1) Designed to meet U.L. 544
2) Overvoltage protection
3) Overload protection
4) Remote sensing of +5V output
5) Input RFI filter

Dimensions: 13.5″ x 6.75″ x 3.0″

Other output voltages may be provided upon request.

300W High Power Converters and Battery Chargers



Input: 105-160 VDC (or 55-80 VDC) (AC input option available)

Output: 15 VDC @ 20A

Line Regulation: ±1% max.

Load Regulation: ±1% from 15%-full load

Ripple and Noise: Less than 1% pp

Dimensions: 4 13/16″ x 5 1/4″ x 6 5/16″

Note: Other output voltages available upon request.

Military to Mil-E-5400
(AIRBORNE)

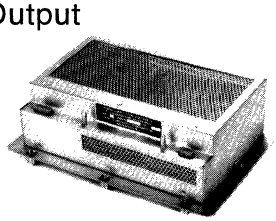
150W Full Mil, Multiple Output

Input: 108-118 VAC 50-425 Hz

Outputs: +15 VDC @ 6.0A ±2%
−15 VDC @ 1.7A ±2%
±10 VDC @ 0.2A ±5%
+24 VDC @ 1.1A ±3%
−5.3 VDC @ 0.15A ±5%
+5.3 VDC @ 2.2A ±5%

Dimensions: 12.15″ x 7.875″ x 3.38″
Wt.: 8.6 lbs.

Built in accordance with Mil-E-5400



150W Full-Mil DC/DC Converter

Input: 28 VDC nominal per Mil-Std-704C

Outputs: +5 VDC @ 14A
−5 VDC % 0.75A
±12 VDC @ 1.5A

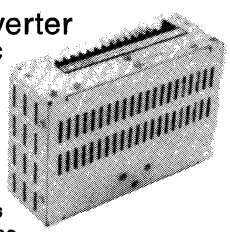
Line Regulation: ±0.5%, all outputs

Load Regulation: ±1.0% for +5V, ±5.0% all others

Ripple and Noise: 100 mVpp, all outputs

Dimensions: 3.0″ x 6.0″ x 8.75″. Wt.: 4 lbs.

Built in accordance with Mil-E-5400



Militarized Units

800W Multiple Output, Enclosed
(AIRBORNE)

Input: 104-132 VAC 47-440 Hz

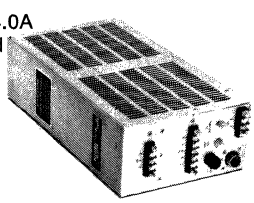
Outputs: +5 VDC @ 140A/±15 VDC @ 4.0A

Regulation: ±1% line and load combined

Ripple and Noise: ±1% peak-to-peak

Features:
- Militarized for high reliability
- Remote sensing of 5V output
- O.V. protection on all outputs
- Overload protection on all outputs

Dimensions: 14″ x 7.5″ x 4.0″



800W Multiple Output, Open-Frame
(SHIPBOARD)

Input: 704-132 VAC 47-440 Hz

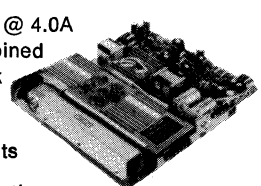
Outputs: +5 VDC @ 140A/±15 VDC @ 4.0A

Regulation: ±1% line and load combined

Ripple and Noise: ±1% peak to peak

Dimensions: 15.0″ x 13.5″ x 2.0″

Features:
1) OV and OL protection on all outputs
2) Remote sensing of 5V output
3) Militarized for high reliability-operating temp to 70°C with no derating



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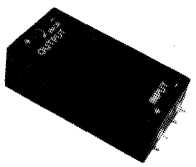
HIGH RELIABILITY STANDARD & CUSTOM POWER SYSTEMS

TDC/SERIES DC-DC CONVERTERS

COMMERICAL • MILITARIZED • FULL MIL
CUSTOM & STANDARD UNITS 3W TO 1000W

MODEL TDC3-X — 2.5 WATT Single Regulated Output

Encapsulated, small size unit for local conversion. Regulated output. Short circuit protected. Available for −30°C to +60°C operation.



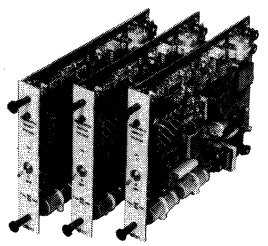
SIZE: 3″ x 1.5″ x 1″

MODEL	INPUT	OUTPUT	REG	RIPPLE
TDC3-1	24V	5V	±1%	50mVpp
TDC3-2	24V	12V	±1%	75mVpp
TDC3-3	48V	5V	±1%	50mVpp
TDC3-4	48V	12V	±1%	75mVpp

Input-Output Isolation: 500VDC

MODEL TDC50-X — 50 WATT Four Outputs

Plug-in card with a panel. Intended for utility control and monitoring systems. 0°C to +60°C operation.



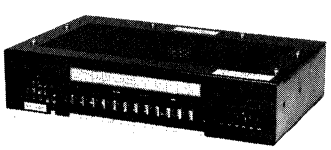
SIZE: 8″ x 6.25″ x .8″

MODEL	INPUT	OUTPUTS	
TDC50-1	48V	1. +12V 1A	4. +24V .2A
TDC50-2	110V	2. −12V 1A	1, 2, 3 are common
TDC50-3	220V	3. +24V 1A	4, isolated

Input/Output Isolation: 3500VAC
100KHz conversion frequency

MODEL TDC150-X — 75-150 WATT 1-5 Outputs

Slim line very compact and powerful unit intended primarily for data processing equip. All outputs are highly regulated and overload protected. The main output is O.V. protected. Operation range 0-50°C.

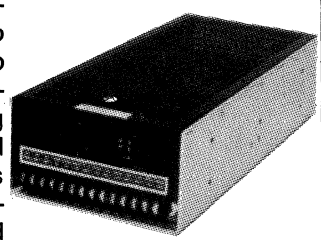


SIZE: 9.5″ x 5.5″ x 2.2″

MODEL	INPUT	OUTPUTS
TDC150-1	−48V	5V 10A, ±12V 2.5A, ±15V 1A
TDC150-2	−48V	5V 10A, ±12V 2A, ±18V 1A
TDC150-3	+24V	5V 10A, ±12V 2.5A, ±15V 1A
TDC150-4	+24V	5V 10A, ±12V 2A, ±18V 1A

MODEL TDC200-X — 100-200 WATT 1-5 Outputs

Designed as a universal DC-DC converter capable of providing up to 5 outputs and up to 200W. Specifically capable of withstanding high transients and noise at the input as present in utility stations. The unit is sold with a cover.



SIZE: 10.8″ x 5.5″ x 2.75″

MODEL	INPUT	OUTPUTS	
TDC200-1	12V	12V 8A	
TDC200-2	24V	5V 6A	12V 10A
TDC200-3	24V	5V 20A	
TDC200-4	24V	5V 3A, ±12V 1A, ±15V 1A	
TDC200-5	120V	5V 10A	12V 12A

CUSTOM DESIGNS Single & multi output commercial and military ground support or vehicular applications. Battery or generator input. Designs to MIL-STD-704. Plug in units Switching frequency 25KHz or 100KHz.

PROTOTYPES IN 10 WEEKS!

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HIGH RELIABILITY STANDARD & CUSTOM POWER SYSTEMS

MULTIPLE OUTPUT HIGH POWER SWITCHER

NTDM Series

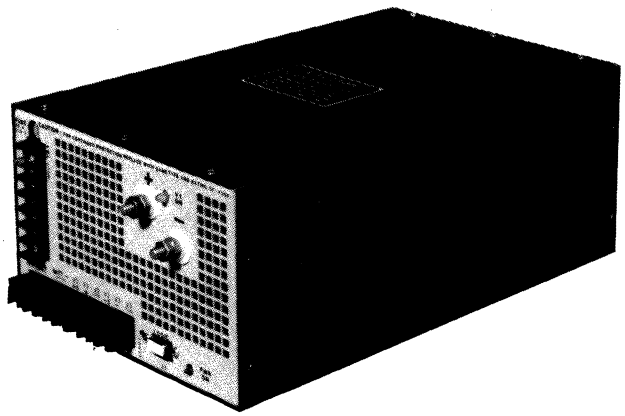
(with optional features)

Battery Backup, Power Factor Corrector, Universal Input, 3 Phase Input and (N + 1) Configuration

500W-2000W

APPLICATIONS: This universal power supply is suitable for uses in data processing, communications, telecom, instrumentation, automation equipment and robotics.

- Rugged construction for high shock and vibration
- Up to 4 powerful outputs
- MTBF exceeding 100,000 hours
- Full overload, overvoltage and overtemperature protection
- Can be supplied with battery backup feature
- Can be supplied with "power factor correction" feature
- Universal input option
- Can be supplied on 19" rack with (N + 1) configuration
- Available in militarized version



SINGLE OUTPUT

STANDARD MODEL NUMBERS

Other Voltages and Currents Available. Consult Factory.

500 W

MODEL	OUTPUT VOLTAGE	MAX. CURRENT
NTDM-5-100	5V	100A
NTDM-12-45	12V	45A
NTDM-15-33	15V	33A
NTDM-24-20	24V	20A
NTDM-28-18	28V	18A
NTDM-48-12	48V	12A
NTDM-110-4.5	110V	4.5A

1000 W

MODEL	OUTPUT VOLTAGE	MAX CURRENT
NTDM-5-200	5V	200A
NTDM-12-90	12V	90A
NTDM-15-66	15V	66A
NTDM-24-41	24V	41A
NTDM-28-35	28V	35A
NTDM-48-20	48V	20A
NTDM-110-9	110V	9A

1500 W

MODEL	OUTPUT VOLTAGE	MAX. CURRENT
NTDM-12-125	12V	125A
NTDM-15-100	15V	100A
NTDM-24-62	24V	62A
NTDM-28-55	28V	55A
NTDM-48-31	48V	31A
NTDM-110-13	100V	13A

2000 W

MODEL	OUTPUT VOLTAGE	MAX. CURRENT
NTDM-28-71	28V	71A
NTDM-36-55	36V	55A
NTDM-48-42	48V	42A
NTDM-60-33	60V	33A
NTDM-110-18	110V	18A

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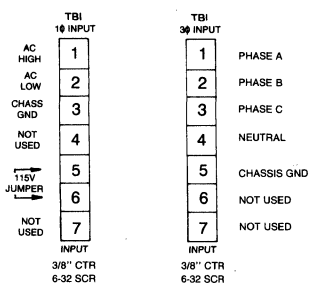
HIGH RELIABILITY STANDARD & CUSTOM POWER SYSTEMS

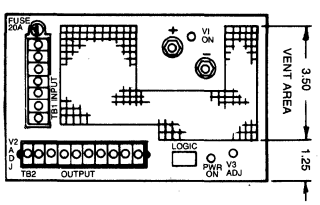
NTDM Series

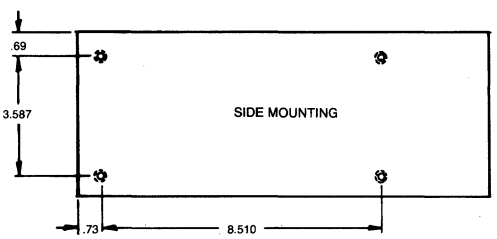
Electrical Specifications

Input Volt. Range	90-132/180-264VAC user selected
Input Frequency	47-63Hz. 400 Hz optional
Efficiency	75-85% typical at full load depending on specific model
Line Regulation	±.2% thru entire range
Load Regulation	±.5% from min. load to max. load. ±1% N.L. to F.L.
Min. Load	10% of full load current on each output
Temp. Coeff.	.02% per °C
Output Ripple	1% of output or 200mvpp, whichever is smaller
Hold-Up Time	20ms from nominal line and full load
Dynamic Responses	400 microseconds for 25% load step applied from 50% load
Voltage Adj. Range	±10% for outputs up to 24V, +5/-20% for higher outputs
Op. Temp. Range	0-55°C ambient for full output power
Output Power @ 70°C	Commercial units 50%. Militarized units 100%
Warranty	1 year standard. 2-5 years optional
Overload	Shorted ouput & O.L. protection. Foldback w/auto recovery
Overvoltage	Adjustable O.V. shut-down on main output
Overtemperature	O.T. shut-down standard feature on all units
Safety Regulatory	All units are designed to meet UL 1012 & CSA 22.2 standards. VDE compliance to 0871 or TUV equivalent.
EMI/RFI	Designed to meet FCC Part 15 EMI spec. Meets VDE 0871B for radiated noise. Meets VDE 0871B conducted with external filter.

Mechanical Outline





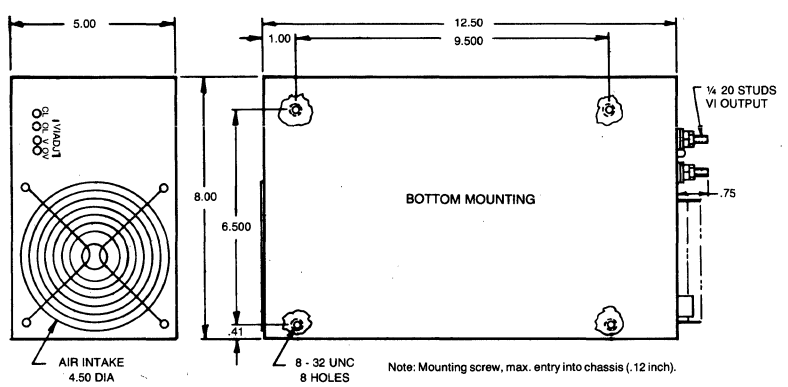


J1 LOGIC CONNECTOR
Connector P/N
AMP 74394-2

1	LOGIC GROUND
2	NEG SENSE OF MAIN OUTPUT
3	BATTERY LOW PENDING SHUTDOWN
4	POS SENSE OF MAIN OUTPUT
5	AC FAIL
6	INHIBIT
7	AUX +150 VDC
8	2nd OUTPUT MONITOR
9	3rd OUTPUT MONITOR

TB2 (3/8" CTR, 6-32 SCREWS)

BATTERY INPUT				SECOND OUTPUT				THIRD OUTPUT	
10	9	8	7	6	5	4	3	2	1
POS		NEG		+5	+	COM V2	−5	−	COM V3



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NTDM Series

Available Options

3-PHASE INPUT	INPUT 208 or 240V 3 or 4 Wire 47 to 400 Hz	All units in one to three outputs are available in Single or 3-Phase Input. For 3-phase add 3-Phase Suffix to Model Number. Example: NTDM-28-55-3 Phase.

	SECOND INPUT			THIRD OUTPUT		
	VOLT	Io	SUFFIX	VOLT	Io	SUFFIX
MULTIPLE OUTPUTS	-5 -12 -15 -24	5A 3A 3A 2A None	A1 A2 A3 A4 —	+5 +12 +15 +24 None	10A 10A 6A 4A None	B1 B2 B3 B4 — None
	Example: NTDM-12-45-A1 For +12 @ 45A & -5V @ 5A			Example: NTDM-28-18-A2-B2 For 28V @ 18A, -12V @ 3A & +12V @ 10A		

Second and Third Outputs Are Regulated to ±2% And Overload Protected

Applicable only to units with total output power of 1000W or less.				
HIGH POWER FOURTH OUTPUT	5V	50A	C1	The fourth output is insulated and hence it may be use as a positive or negative output.
	12V or 15V	20A	C2	
	24V	10A	C3	
Note: The Fourth Output option may be implemented only if the option for power factor corrector or uninterruptible (battery backup) are not exercised.				

UPS BATTERY BACKUP 48VDC	Applicable to all units: 1-3 outputs, up to 1000W and having no power factor correction option.
	Once placed in the unit, the battery backup module makes this switcher an uninterruptible system. Transfer to battery occur automatically and "glitchlessly." Accepts 48VDC input, and can support up to 1000W of total output. Charges the battery when AC is present.
	For battery backup option, add UPS as a suffix to the part number. Example: NTDM28-18A2B2-UPS.

POWER FACTOR CORRECTION (Accepts input of 90-264V)	Applicable to all units: 1-3 outputs, up to 1000W and having 4th output or UPS options.
	The power factor correction module reshapes the input current to a nearly perfect sinusoidal waveshape which has a power factor of .95-.98.
	For this feature add PF as a suffix to the part number. Example: NTDM5-100A28B2-PF.

REDUNDANCY	Applicable to all units. Consult factory.
(N+1) CONFIGURATION HOT PLUGGABLE	The NTDM units may be optionally equipped with "ORing" diodes on the outputs, thus enabling these units to be connected in parallel for (N + 1) applications. A standard 19" rack mount is available to accomodate up to 3 units in one tray.The units may be removed or plugged into location without power removal.

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HIGH RELIABILITY STANDARD & CUSTOM POWER SYSTEMS

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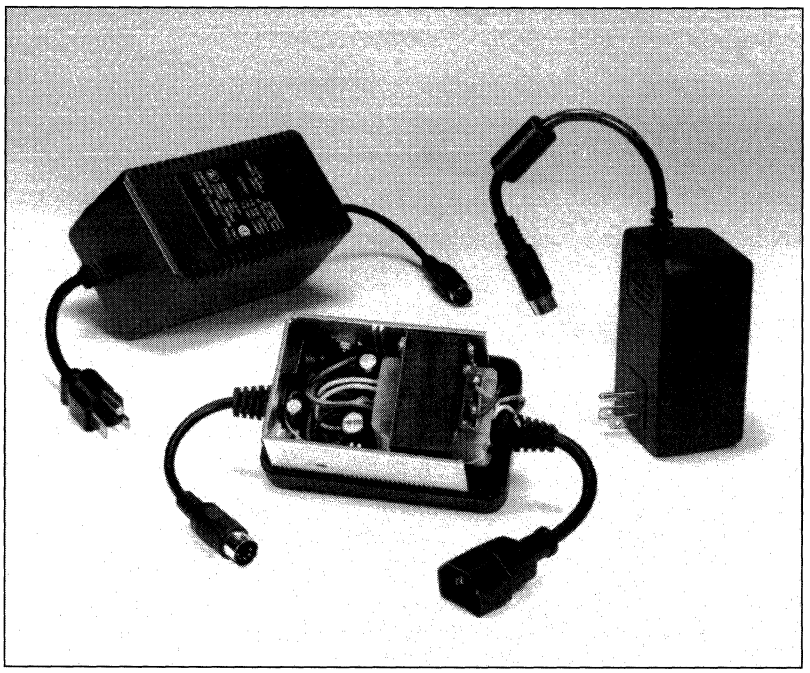
REGULATED LINEAR EXTERNAL POWER SUPPLIES

Our products are manufactured in the **FAR EAST** and are competitively priced. We can cross reference to standard designs or our engineers will help you select the features which will best fit your application.



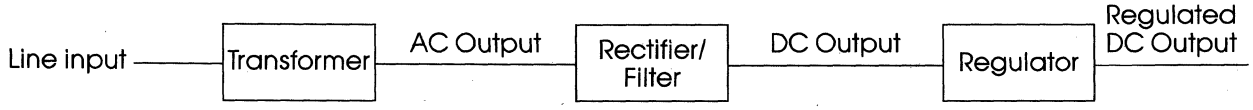
Specifications and Available Options:

- Typical Input Voltage Range: 105 To 132 VAC @ 60 Hz
- NEMA 5-15 P Plug with Ground Pin Available
- Single and Multiple Outputs
- Any Combination of Voltages and Currents
- Ripple and Noise: 10 mV P-P Typical
- Output Accuracy: ±5%
- Overvoltage Crowbar Protection Circuits Optional
- RFI/EMI and Transient Protection
- Switchable Input Available
- European IEC/VDE and U.K. BABT Equivalent Designs Available for Certification
- Typical Operating Temperature Range: 0°C—40°C
- Custom Colors: Plastics and Cables
- Custom Tooling and Molding of Enclosures
- All APX Enclosures Are Made of High Impact Plastics Meeting UL 1310/1012 and CSA 22.2-223
- Custom Tooling and Molding of Cables and Connectors
- Typical Breakdown Voltage: 1500 VAC
- Warranty: 1 Year

Class II Regulated Output Designs: Typical Model Selection Guide

APX Model No.	Output 1	Output 2	Output 3
APX 5R750	+5 @ 750		
APX 12R1200	+12 @ 1200		
APX 512R-01	+5 @ 500	+12 @ 1000	
APX 512R-02	+5 @ 600	+12 @ 1000	
APX 512R-03	+5 @ 700	+12 @ 700	
APX 515R-01	+5 @ 1000	+15 @ 1000	
APX 51212R-01	+5 @ 450	+12 @ 100	−12 @ 100
APX 51212R-02	+5 @ 750	+12 @ 700	−12 @ 100
APX 51212R-03	+5 @ 1000	+12 @ 1000	−12 @ 100
APX 51212R-04	+5 @ 1000	+12 @ 500	−12 @ 500
APX 51212R-05	+5 @ 1100	+12 @ 900	−12 @ 100
APX 51212R-06	+5 @ 1500	+12 @ 1100	−12 @ 100
APX 51212R-07	+5 @ 1500	+12 @ 600	−12 @ 600
APX 81212R-01	+8 @ 800	+12 @ 150	−12 @ 150
APX 81212R-02	+8 @ 850	+12 @ 200	−12 @ 100

See our Transformer Pages in Volume A Section 5600



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apx ARSTAN PRODUCTS

AC AND DC EXTERNAL POWER SUPPLIES–ADAPTERS

Our products are **engineered** domestically in the **U.S.** and manufactured in the **FAR EAST.** Selection available from a variety of designs which are **UL/CSA** listed or have our engineers help you select a custom design for your special application.

Class II
AC Output: Typical Model Selection Guide

APX Model No.	Typical Output Rating	Size Ref.
APX 6A500	6.0 VAC @ 500 mA	35
APX 8A1500	8.0 VAC @ 1500 mA	48
APX 8.5A1350	8.5 VAC @ 1350 mA	48
APX 9A400	9.0 VAC @ 400 mA	35
APX 9A700	9.0 VAC @ 700 mA	41
APX 9A1000	9.0 VAC @ 1000 mA	48
APX 9A1250	9.0 VAC @ 1250 mA	48
APX 9A1500	9.0 VAC @ 1500 mA	48
APX 12A300	12.0 VAC @ 300 mA	35
APX 12A1200	12.0 VAC @ 1200 mA	48
APX 14A2800	14.0 VAC @ 2800 mA	57
APX 16A1250	16.0 VAC @ 1250 mA	57
APX 18A200	18.0 VAC @ 200 mA	35
APX 18A350	18.0 VAC @ 350 mA	41
APX 19.6A850	19.6 VAC @ 850 mA	57
APX 20A500	20.0 VAC @ 500 mA	48
APX 20A700	20.0 VAC @ 700 mA	48
APX 20A800	20.0 VAC @ 800 mA	57
APX 21A500	21.0 VAC @ 500 mA	48
APX 21A600	21.0 VAC @ 600 mA	48
APX 24A150	24.0 VAC @ 150 mA	35
APX 24A600	24.0 VAC @ 600 mA	57
APX 26A2250	26.0 VAC @ 2250 mA	66

- Models available in wall plug in or desk top configuration depending on output power.

Class II
DC Output: Typical Model Selection Guide

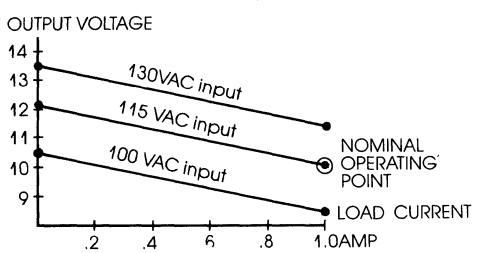
APX Model No.	Typical Output Rating	Size Ref.
APX 6D300	6.0 VDC @ 300 mA	35
APX 9D300	9.0 VDC @ 300 mA	35
APX 9D500	9.0 VDC @ 500 mA	41
APX 9D1000	9.0 VDC @ 1000 mA	48
APX 14D800	14.0 VDC @ 800 mA	48
APX 18D150	18.0 VDC @ 150 mA	35
APX 18D800	18.0 VDC @ 800 mA	57
APX 20D150	20.0 VDC @ 150 mA	41
APX 25D400	25.0 VDC @ 400 mA	48
APX 26D1500	26.0 VDC @ 1500 mA	66
APX 28D400	28.0 VDC @ 400 mA	48

MOST DESIGNS AGENCY APPROVED OR LISTED AS REQUIRED.

Specifications and Available Options:

- Typical Nominal Input: 120 VAC @ 60 Hz
- NEMA 5-15 P Plug with Ground Pin Available
- Switchable Input Voltages Available
- Typical Output Tolerance ±5%
- Typical DC Filtered Models with 1000 mfd Capacitor
- Models with Lower Ripple Available with Larger Value Capacitors
- Center Tap Designs Available on AC Models
- Standard and Custom Output Connectors
- Typical Operating Temperature Range: 0°C—40°C
- RFI/EMI and Transient Protection
- European IEC/VDE and U.K. BABT Equivalents Available
- Special Designs to Medical/Dental UL 544 Standards
- Custom Tooling and Molding Available for Plastics and Connectors
- All APX Enclosures are made of High Impact Plastics Meeting UL 1310/1012 and CSA C22.2 Number 223
- Typical Breakdown Voltage: 1500 VAC

TYPICAL OUTPUT LOAD CURVES for AC adapter nominal 10VAC @ 1 Amp



See our Transformer Pages in Volume A Section 5600

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EUROPEAN AND INTERNATIONAL DESIGNS

We are transformer specialists! You get technical assistance from our engineers here and top performance at low prices from our factories in the FAR EAST. We provide approval samples on quantity orders prior to production. TECHNICAL EXPERTISE, PERFORMANCE, PRICE...It's all here!

IEC BABT

AC Output: Typical Model Selection Guide

APX Model No.	Typical Output Rating
APX 10A600E	10 VAC @ 600 mA
APX 12A200E	12 VAC @ 200 mA
APX 16A850E	16 VAC @ 850 mA
APX 18A1300E	18 VAC @ 1300 mA
APX 19.5A850E	19.5 VAC @ 850 mA
APX 26A2250E	26 VAC @ 2200 mA

DC Output: Typical Model Selection Guide

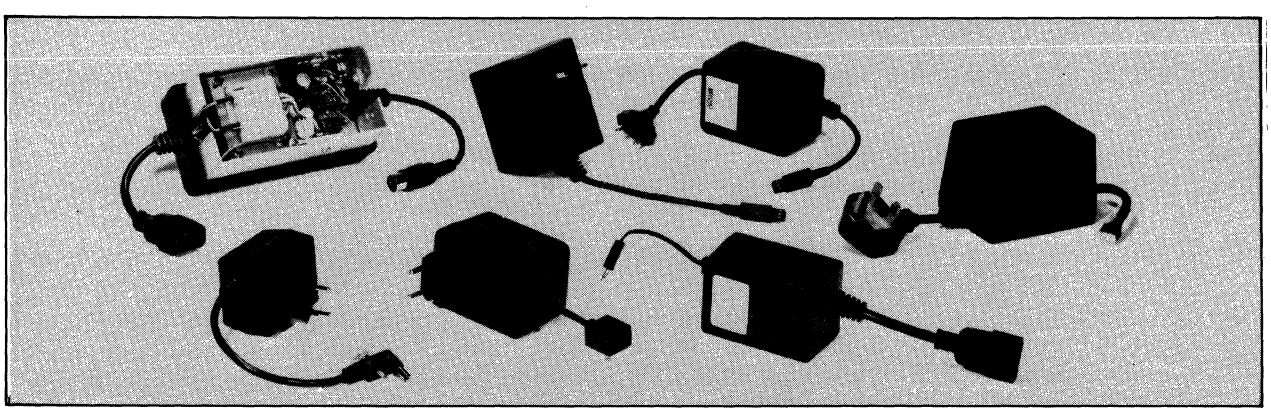
APX Model No.	Typical Output Rating
APX 5D500E	5 VDC @ 500 mA
APX 9D600E	9 VDC @ 600 mA
APX 9D1000E	9 VDC @ 1000 mA
APX 12D250E	12 VDC @ 250 mA
APX 12D800E	12 VDC @ 800 mA

Specifications and Available Options:

- Typical Input Voltage: 220-230 and 240 VAC @ 50 Hz
- Switchable Input Availability
- Grounded and Non-grounded Models Available
- Center Tap Designs Available on AC Models
- Any Combination of Output Voltages and Currents
- Overload and Shorted Output Protection
- Overvoltage Crowbar Protection Circuits Available on Regulated Units
- Thermal Protection
- Designed to Comply With IEC, VDE, BSI, BABT, SAA Standards
- Compliant to EN 60950/BS 7002 for EEC 92 STDS Quality Control STD BS 5750
- Typical Breakdown Voltage: 3750 VAC
- Warranty: 1 year

Typical Regulated Output Designs

APX Model No.	Output 1	Output 2	Output 3
APX 5R750E	+5 VDC @ 750 mA		
APX 512R-04E	+5 VDC @ 500 mA	+12 VDC @ 100 mA	
APX 512R-03E	+5 VDC @ 750 mA	+12 VDC @ 700 mA	
APX 51212R-01E	+5 VDC @ 450 mA	+12 VDC @ 100 mA	−12 VDC @ 100 mA
APX 51212R-04E	+5 VDC @ 1.0A	+12 VDC @ 500 mA	−12 VDC @ 500 mA
APX 51212R-03E	+5 VDC @ 1.0A	+12 VDC @ 1.0A	−12 VDC @ 100 mA



SOME MODELS CERTIFIED AS MEETING EEC 1992 STANDARDS.

See our Transformer Pages in Volume A Section 5600

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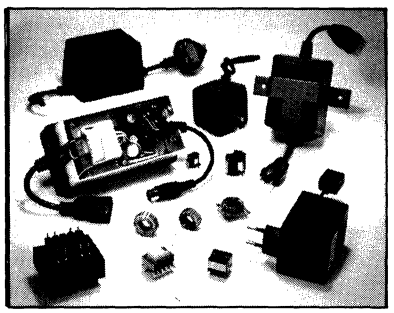
We are a manufacturer of **POWER SUPPLIES** and **MAGNETIC PRODUCTS** with engineering/sales offices in the **U.S.** and manufacturing in the **Far East.**

Our Products Include:

- AC and DC External Power Supplies
- Regulated Linear Power Supplies
- Custom Made Specialized Power Supplies
- Battery Chargers
- Power, Pulse and Telecommunication Transformers
- Inductors and Specialized Magnetic Products



Typical Applications:

- Computers
- Telecommunications
- Modems
- Medical Equipment
- Computer Peripherals
- Bar Scanning Equipment
- Microprocessor Control Systems
- ATE and Security Systems

QUALITY— RELIABILITY— SERVICE — RESPONSE — WARRANTY and COMPETITIVE PRICING

Established in 1978 we have successfully worked with engineers, buyers and program managers supporting products and programs with 12 years of:

- **Product Analysis**
- **Design Engineering Support**
- **Custom Tooling and Packaging**
- **Custom Molding**
- **Domestic and International Agency Certifications**
- **BABT Approved Manufacturing Facility**

Battery Chargers:

- Standard and Custom Designs for Nickel Cadmium and Lead Acid Batteries
- Single and Dual Stage Charging Systems
- Standard and Regulated Outputs
- Designs are available to UL/CSA as well as European IEC/VDE Standards
- Designs to Medical/Dental UL544 Standards
- Wall Mount Plug- in and Desk Top Configurations Available
- Custom Enclosures

See our Transformer Pages in Volume A Section 5600

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DC-DC CONVERTERS

APEX MICROTECHNOLOGY CORPORATION • TUCSON, ARIZONA • APPLICATIONS HOTLINE (800) 421-1865

APEX DB2800 SERIES

The DB2800 Series marks the debut of APEX Microtechnology into power conversion, and capitalizes on our expertise in power hybrids.

Reliable operation over the full military temperature range is assured via our use of power dip technology, a technology proven for its inherent low temperature gradients, wave solderability and ruggedness.

Ideally suited to low voltage, high power applications, the DB2800 Series is hermetic with no derating over the full military temperature range. Indeed, if power at temperature is important, the DB2800 Series is the only choice, offering 33% more power than the nearest competition at 125°C case temperature.

APPLICATIONS

In addition to 28 volt 704D designs, some applications the DB2800 Series can be used in are: digital circuit power supplies, high current, low voltage analog circuits, parallel redundant operations and isolated instrumentation.

OTHER PRODUCTS

In addition to DC/DC converters, APEX is recognized as a world leader in high voltage, high current and high speed operational amplifiers designed to drive resistive, inductive and capacitive loads.

TOLL-FREE TECHNICAL ASSISTANCE

The APEX Applications Hotline is the quickest way to get answers about your specific circuit needs. We can assist you in product selection, design suggestions, schematic review and circuit debugging. In the United States & Canada call 1-800-421-1865, Monday through Thursday, 7 a.m. to 5 p.m. MST, Fridays 7 a.m. to 1 p.m. MST.

APEX MICROTECHNOLOGY CORPORATION

5980 N. Shannon Road, Tucson, Arizona, USA
(602) 742-8600 For Orders Call (602) 742-8601

Model	Output Voltage Nom	Output Current Max	Output Power Max	Input Voltage I_O = Max	Output Ripple I_O = Max	Temp Range Min/Max	η Efficiency I_O = Max	Isolation 500Vdc
DB2805SA	5	4.00	20	16-50	50mV	-55/125	74	Yes
DB2812SA	12	1.875	22.5	14-50	60mV	-55/125	76	Yes
DB2815SA	15	1.500	22.5	14-50	70mV	-55/125	77	Yes

20 WATT DC-DC CONVERTER
DB2805S • DB2805SA

APEX MICROTECHNOLOGY CORPORATION • TUCSON, ARIZONA • APPLICATIONS HOTLINE (800) 421-1865

HI-REL DESIGN

- WELDED HERMETIC PACKAGE
- LOW INTERNAL TEMPERATURE GRADIENTS
- LOW COMPONENT COUNT
- ALL CERAMIC CAPACITORS
- WAVE SOLDERABLE PACKAGE

PATENT PENDING

OTHER FEATURES

- NO DERATING – -55 to +85°C and -55 to +125°C
- WIDE SUPPLY RANGE – 15 to 50V
- HIGH POWER DENSITY – 20W/IN³
- HIGH ISOLATION – 500V

DESCRIPTION

The DB2805S(A) has been created to provide a reliable DC/DC Converter specified over the military temperature range. This has been achieved using a new package, rather than pushing the envelope on existing DC/DC Converter packages. A 12 pin Power Dip™, pioneered by Apex for Power Amplifiers up to 500W, provides very low thermal gradients, rugged hermeticity and high voltage isolation.

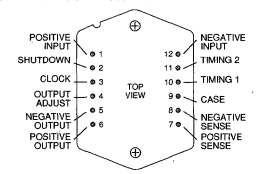
To further enhance reliability, the internal component count has been kept low. What is more, no tantalum or electrolytic capacitors are used in this design, a major cause of low MTBF in DC/DC Converters.

The sophisticated DB 2805S(A) features remote shutdown, kelvin sense, slaveability, and indefinite short circuit protection. It uses a push-pull topology operated in the feed forward, current mode. The typical switching frequency is 500 KHz. A π type input filter is included in order to reduce the peak to peak input ripple current.

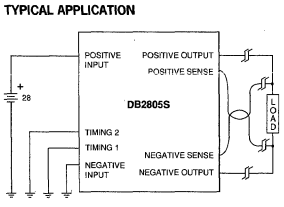
This hybrid converter utilizes thick film (cermet) resistors, ceramic capacitors, miniature magnetics and semiconductor chips to maximize reliability, minimize size and give top performance. Ultrasonically bonded aluminum wires provide reliable interconnections at all operating temperatures.

The PD12/60H 12-pin Power Dip™ package (see Package Outlines) is hermetically sealed and isolated from the internal circuits. Do not use thermally conductive electrically insulators between package and heatsink.

EXTERNAL CONNECTIONS

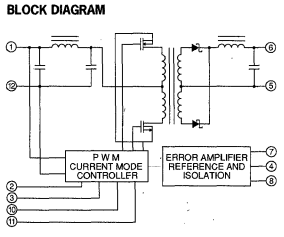


TYPICAL APPLICATION



The above diagram shows the remote sense feature which reduces V_O errors due to resistive drops in long power supply lines. This diagram also shows the connection for non-synchronized operation.

BLOCK DIAGRAM



DB2805S/DB2805SA

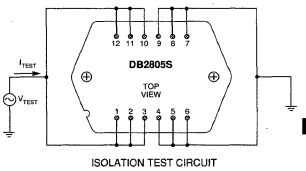
ABSOLUTE MAXIMUM RATINGS SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

INPUT VOLTAGE RANGE	0 - 50V
OUTPUT CURRENT	4A
POWER DISSIPATION	15W
TEMPERATURE, Storage	-65°C, 150°C
TEMPERATURE, Pin Soldering 10s	300°C

SPECIFICATIONS

PARAMETER	TEST CONDITIONS[2]	DB2805S MIN	DB2805S TYP	DB2805S MAX	DB2805SA MIN	DB2805SA TYP	DB2805SA MAX	UNITS
STEADY STATE CHARACTERISTICS								
OUTPUT VOLTAGE	V_{IN}: 16 - 40 Vdc	5.00	5.05	5.10	*	*	*	Vdc
OUTPUT CURRENT		0.40		4	*		*	Amps
EFFICIENCY	V_{IN}: 17-40, I_{OUT} = 4 Amps	64	72	76	66	72	76	%
RIPPLE VOLTAGE	Bandwidth DC → 1MHz	20	60	70	20	50	60	mV
OUTPUT POWER			20	20.8		*	*	Watts
LINE REGULATION	V_{IN}: 16 to 40 Volts		±0.2	±1.0		±0.1	±0.5	%
LOAD REGULATION	I_{OUT}: 400mA to 4 Amps		±2.0	±3.0		±1.0	±2.0	%
INPUT VOLTAGE RANGE	I_{OUT} = 4 Amps	17	28	40	16	28	40	Vdc
INPUT CURRENT	V_{IN}: 16 to 40 Volts	1.78	0.95	0.75	*	*	*	Amps
INPUT RIPPLE CURRENT	V_{IN}: 16 to 40 Volts	20	60	70	*	*	*	mA p-p
JUNCTION TEMPERATURE RISE			10	22		*	*	°C
TEMPERATURE RANGE, case	I_{OUT} = 4.0 Amps	-55	25	85	-55	25	125	°C
QUIESCENT CURRENT	V_{IN}: 16 to 40 Volts; V_{PIN2}: 5V		60	100		*	*	mA
ISOLATION CHARACTERISTICS								
LEAKAGE RESISTANCE	(See Figure 1 DC)	100			*			MΩ
LEAKAGE CAPACITANCE	(See Figure 1, f = 10KHz	20	35		*	*		pF
DYNAMIC CHARACTERISTICS								
LINE STEP RESPONSE	V_{IN} Slew Rate = .1V/µs							
OUTPUT VOLTAGE	V_{IN}: 17 → 40 Volts		+700			*		mVpk
RECOVERY TIME	V_{IN}: 17 → 40 Volts		700			*		µsec
OUTPUT VOLTAGE	V_{IN}: 40 → 7 Volts		-800			*		mVpk
RECOVERY TIME	V_{IN}: 40 → 17 Volts		700			*		µsec
LOAD STEP RESPONSE	I_{OUT} Slew Rate = 1.5A/µs							
OUTPUT VOLTAGE	I_O: 2 → 4 Amps		-700			*		mVpk
RECOVERY TIME	I_O: 2 → 4 Amps		200			*		µsec
OUTPUT VOLTAGE	I_O: 4 → 2 Amps		+800			*		mVpk
RECOVERY TIME	I_O: 4 → 2 Amps		200			*		µsec
START-UP OVERSHOOT	V_{IN} : 0 → 28V		0.25			*		Vdc
SHUTDOWN DELAY	V_{PIN2} ; 0 → 5 Volts		40			*		µsec
SHUTDOWN RECOVERY	V_{PIN2} ; 5 → 0 Volts		10			*		msec



ISOLATION TEST CIRCUIT

NOTES:
* The specification of DB2805SA is identical to the specification for DB2805S in applicable column to the left.
1. Long term operation at the maximum junction temperature will result in reduced product life. Derate internal power dissipation to achieve high MTBF. For guidance, refer to the heatsink data sheet.
2. Unless otherwise stated T_C = 25°, $V_{IN} = V_{PIN12} - V_{PIN1}$ = 28V, I_{OUT} = 4 Amps.

CAUTION The internal substrate contains beryllia (BeO). Do not break the seal. If broken, do not crush, machine, or subject to temperatures in excess of 850°C to avoid generating toxic fumes.

AC-DC/DC-DC MODULAR MINIATURIZED
SWITCHING POWER SUPPLIES

ARNOLD MAGNETICS

INTRODUCING
EXPANDED CAPABILITY

CONFIGURE-YOUR-OWN

MIL SPEC • HIGH RELIABILITY

POWER SUPPLIES

A HIGHER LEVEL OF PERFORMANCE

EL 2000 SERIES

Complete AC to DC and DC to DC multi output systems.

- Rugged high density packaging to 8 watts/in.^{3}
- Efficiencies to 80% +.
- **NOW** 115/230 VAC strappable 1∅ input.
- **NOW** 120/208 VAC 3∅/4 wire Wye input.
- **NOW** 270 VDC input.
- **NOW** To 110 amps, 300 VDC and 580 watts total output.
- **NOW** Low noise options available.
- **NOW** Hermetically sealed parts options available for extended MTBF.
- Mil-Std 704A-D, 1399 and 1275 input surge and spike protection.
- Meets many provisions of Mil-Std-810D, Mil-E-5400T, Mil-E-16400, Mil-T-27, Mil-E-4158E (USAF) and Mil-Std-454J.

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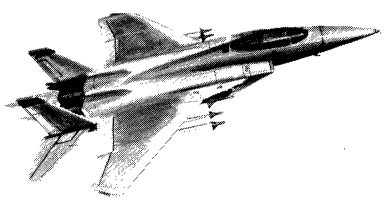
SWITCHING POWER SUPPLIES

WHY CHOOSE ARNOLD MAGNETICS?

SAVE SPACE... MINIATURIZED PACKAGES

Arnold's complete AC-DC and DC-DC Multi Output Systems are 50% to 75% smaller than previous generation power

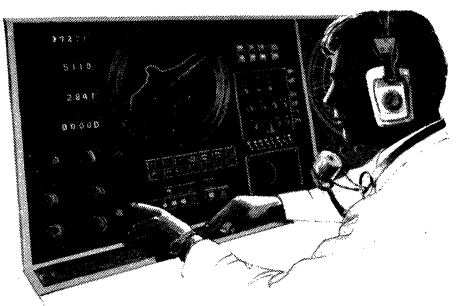


supplies, achieving densities of 5 to 8 watts per cubic inch. Our miniaturized packages, with their unique narrow footprints, provide more power in less space.

SAVE TIME... QUICK DELIVERIES

Arnold's unique design concept allows you to choose inputs and outputs from predesigned standard modules.

You configure your own "custom" multi-output power supply system and get delivery in weeks...even with non-standard voltage combinations.

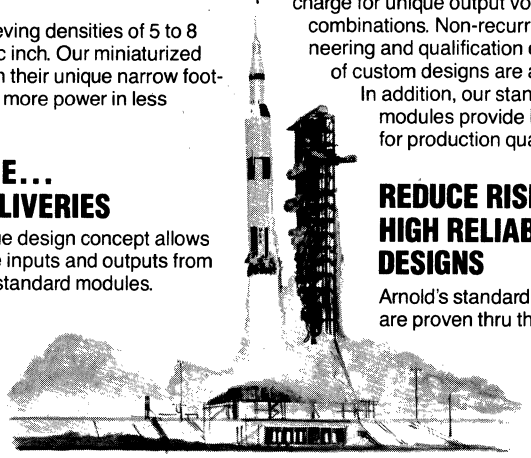


SAVE MONEY... LOWER PROGRAM COSTS

With Arnold, there is no additional charge for unique output voltage combinations. Non-recurring engineering and qualification expenses of custom designs are avoided. In addition, our standard modules provide lower cost for production quantities.

REDUCE RISK... HIGH RELIABILITY DESIGNS

Arnold's standard modules are proven thru thousands of hours of failure-free qualification before ever being shipped to our customers. NAVMAT derating and testing methods, along with standardized modular designs, ensure reliability and reduce the risk of failure inherent in new custom circuits or thermal and mechanical package designs.



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SWITCHING POWER SUPPLIES

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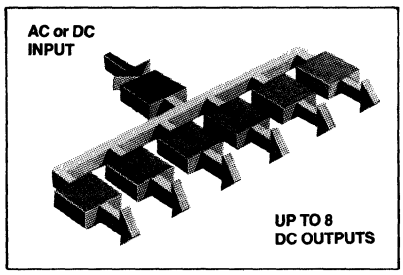
CONFIGURE-YOUR-OWN POWER SUPPLY SYSTEM

FROM STANDARD MODULES!

EL 2000 SERIES



1 OUTPUT SELECTION

Every standard output module may be specified to the exact nominal voltage and maximum current you require. The table of output regulators describes the range of voltages and currents available as standards. Please select the nominal voltage required for each output. All outputs are adjustable ±5% from nominal by means of an externally accessible potentiometer. Outputs are isolated and may be connected for positive or negative polarity. Ensure your required load is within the maximum current specified. You may have up to eight outputs per power supply.

OUTPUT REGULATORS

NOMINAL VDC OUTPUT (V)	MAXIMUM CURRENT OUTPUT (A)	EL-2000 MODEL	REGULATOR LENGTH (INCHES)	TYPICAL EFFICIENCY (%)	LINE/LOAD REGULATION (% Eo)[3]	V RMS RIPPLE/NOISE (% Eo)
From 4 to 6	2	ERA-6	0.6	80	0.10	0.15
	5	ERC-6	0.6	80	0.20	0.5
	10	ERF-6	0.6	85	0.20	0.5
	20	ERM-6	1.2	85	0.30	0.5
	45	ERP-6M[1]	2.7	80	0.50	0.5
	65	ERY-6M[1]	2.7DW[2]	80	0.50	0.5
	110	ERZ-6M[7]	3.6DW[2]	85	0.50	0.5
From 6.1 to 18	1	ERA-18	0.6	85	0.05	0.15
	3	ERC-18	0.6	90	0.10	0.3
	5	ERF-18	0.6	90	0.10	0.3
	10	ERM-18	1.2	90	0.15	0.3
	15	ERP-18M[1]	2.7	80	0.25	0.4
	20	ERY-18M[1]	2.4DW[2]	80	0.25	0.4
From 18.1 to 30	0.5	ERA-30	0.6	90	0.05	0.15
	1.5	ERC-30	0.6	95	0.10	0.15
	2.5	ERF-30	0.6	95	0.10	0.15
	5	ERM-30	1.2	95	0.10	0.15
	10	ERP-30M[1]	2.7	85	0.25	0.3
	12	ERY-30M[1]	2.4DW[2]	85	0.25	0.3
From 30.1 to 130	0.5	ERB-130	0.6	90	0.1	0.1
	1	ERK-130	1.2	90	0.1	0.1
From 130.1 to 200	0.35	ERB-200	0.6	95	0.1	0.1
	0.70	ERK-200	1.2	95	0.1	0.1
From 200.1 to 300	0.15	ERB-300	0.6	95	0.1	0.1
	0.30	ERK-300	1.2	95	0.1	0.1

OPERATING SPECIFICATIONS

- **TEMPERATURE COEFFICIENT:** 0.01%/°C. −55°C to +85°C.
- **OPERATING TEMPERATURE** (Baseplate): −40°C to +85°C (optional −55°C to +85°C)
- **STORAGE TEMPERATURE:** −65°C to +100°C.
- **SHORT CIRCUIT PROTECTION:** All outputs are short circuit protected and feature foldback current limiting. (ERP, ERY straight current limiting).
- **OUTPUT ADJUSTMENT RANGE:** All outputs are adjustable over a plus or minus 5% range.
- **SEMICONDUCTOR JUNCTION TEMPERATURE:** Maximum of 100°C at operating baseplate temperature of +85°C (derating per Navmat P4855-1 and Mil-Std-454J).
- **ISOLATION:** The inputs, case and outputs are isolated (floating) from each other. Output to case isolation test voltage is the greater of 50VDC or 1.3 x E out. Input to case 500VDC on 115VAC units, 50VDC on DC input units (to 30V). Input to output 250VDC on all units.

NOTES

1. M—Denotes Master Channel (max. of one per power supply); —10% minimum load (to 5 amps max.) required.
2. DW—Denotes Double Width design only.
3. Line/Load Regulation Band consists of high line to low line and 1/2 load to full load change.
4. Consult Factory.
5. No additional space required for Inrush/Transient Protection.
6. No additional space required for E & T options.
7. Use with EDC, EDD or EDM Input Sections only.
8. @ −55°C; 8.7 DW.
   For 187-265 V operation only; 7.7DW

2 INPUT SELECTION

Select the input section, AC or DC, with sufficient power to drive the output modules. This is determined from your worksheet calculations. We have provided conservative data for your analysis. The efficiencies shown in the Output Regulators table may vary with options such as wide input or extended temperature. Our factory applications engineers will be happy to assist you in evaluating various alternative configurations.

AC INPUT SECTION

INPUT VOLTAGE RANGE	EL-2000 MODEL	OUTPUT POWER RATING (WATTS)	MAXIMUM INPUT SECTION LENGTH (INCHES)
103-127 V 47-500 Hz 1⌀	EDAA	100	Note 4
	EDAB	200	6.9
	EDAC	300	6.9
	EDAD	400	7.2
	EDAE	500	7.2
103-127 V 340-500 Hz 1⌀	EDBA	100	Note 4
	EDBB	200	6.6
	EDBC	300	6.6
	EDBD	400	6.9
	EDBE	500	6.9
103-127V or 187-265V 1⌀ Strapable 47-500 Hz	EDCA	100	Note 4
	EDCB	200	Note 4
	EDCC	300	8.2DW[8]
	EDCD	400	8.2DW[8]
	EDCF	580	8.2DW[8]
120/208 3⌀/4W Wye 47-500 Hz	EDDA	100	Note 4
	EDDB	200	Note 4
	EDDC	300	6.9DW[2]
	EDDD	400	6.9DW[2]
	EDDF	580	6.9DW[2]
103-127 V 47-500 Hz 3⌀ DELTA	EDEA	100	Note 4
	EDEB	200	8.1
	EDEC	300	8.1
	EDED	400	8.4
	EDEE	500	8.4

DC INPUT SECTION

INPUT VOLTAGE RANGE	EL-2000 MODEL	OUTPUT POWER RATING (WATTS)	MAXIMUM INPUT SECTION LENGTH (INCHES)
24-30 VDC	EDHA	100	Note 4
	EDHB	200	6.9[6]
	EDHC	300	6.9[6]
	EDHD	400	8.4[6]
	EDHE	500	8.4[6]
105-125 VDC	EDKA	100	Note 4
	EDKB	200	5.4[5]
	EDKC	300	5.4[5]
	EDKD	400	5.7[5]
150-170 VDC	EDLA	100	Note 4
	EDLB	200	5.4[5]
	EDLC	300	5.4[5]
	EDLD	400	5.7[5]
	EDLE	500	5.7[5]
250-280 VDC	EDMA	100	Note 4
	EDMB	200	Note 4
	EDMC	300	6.9DW[2 & 6]
	EDMD	400	6.9DW[2 & 6]
	EDMF	580	6.9DW[2 & 6]

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AC-DC/DC-DC MODULAR MINIATURIZED SWITCHING POWER SUPPLIES

3 CASE SELECTION

You have a variety of choices when selecting the package that best fits your space. Just add up your modules (Input Section, Regulators and Options) and pick the case that best fits your system needs.

Case Size	Total of Module Lengths (inches)	Base-plate Area	Maximum Case Dimensions (inches) Length (L)	Width (W)	Height (H)	Mounting Holes (inches) M	N	Quan.	Final Unit Weight (oz.)	Figure No.
ECAA	3.2	4.8 in^2	3.5	1.63	3.63	1.125	2.750	4	25	1
ECBA	4.7	7.1 in^2	5.0	1.63	3.63	1.125	4.250	4	35	1
ECCA	6.7	10.1 in^2	7.0	1.63	3.63	1.125	2.750	6	45	1
ECFA	8.2	12.4 in^2	8.5	1.63	3.63	1.125	3.500	6	60	1
ECDA	10.2	15.4 in^2	10.5	1.63	3.63	1.125	4.500	6	70	1
"DOUBLE WIDE" Packages below allow modules to be mounted side by side.										
ECAB	2 x 3.2	9.7 in^2	3.5	3.13	3.63	2.625	2.750	4	45	2
ECBB	2 x 4.7	14.2 in^2	5.0	3.13	3.63	2.625	4.250	4	66	2
ECCB	2 x 6.7	20.2 in^2	7.0	3.13	3.63	2.625	2.750	6	82	2
ECFB	2 x 8.2	24.8 in^2	8.5	3.13	3.63	2.625	3.500	6	110	2
ECDB	2 x 10.2	30.8 in^2	10.5	3.13	3.63	2.625	4.500	6	130	2
"TRIPLE WIDE" Packages below allow modules to be mounted three across.										
ECAC	3 x 3.2	14.4 in^2	3.5	4.62	3.63	4.126	2.750	4	63	2
ECBC	3 x 4.7	21.3 in^2	5.0	4.62	3.63	4.126	4.250	4	90	2
ECCC	3 x 6.7	30.3 in^2	7.0	4.62	3.63	4.126	2.750	6	123	2
ECFC	3 x 8.2	37.2 in^2	8.5	4.62	3.63	4.126	3.500	6	150	2
ECDC	3 x 10.2	46.2 in^2	10.5	4.62	3.63	4.126	4.500	6	186	2

NOTE: All cases are gold anodized aluminum with turret-style solder terminals and Teflon insulation, 7/16 maximum height, except for ERP and ERY which has 1/4-28 threaded studs with a maximum height of 7/16 standard or 11/16 optional, (select).

Optional Threaded Terminals have maximum height of 1/2 or 5/8, (select).

FIGURE 1

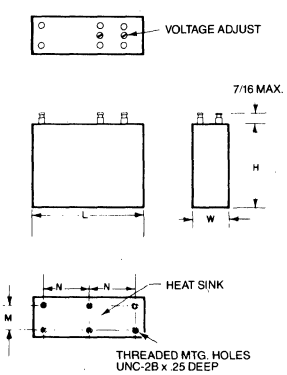
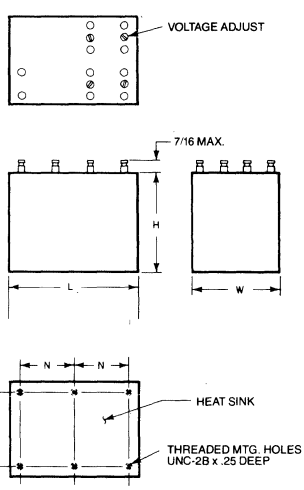
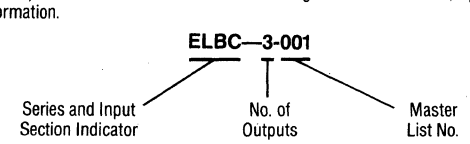


FIGURE 2



4 Contact Factory for assignment of final model number.

(For example ELBC-3001). This Model Number includes all voltage and current levels, options and package size information.



OPTIONS

OPTION LETTER	DESCRIPTION
EA-V	**Output Over-Voltage Protection**—SCR type to 20A. All ERP and ERY use electronic control. 120% ±10% of nominal Eo, available on all Regulators except ERB and ERK. No additional length required for ERP and ERY. For others, please add 0.6" to length of Regulator.
EA-T	**Extended Temperature Operation**—−55°C to +85°C. Contact Factory for other requirements. Temp. range may affect Case Size and maximum output current.
EA-E	**Extended Input Voltage**—92-138 VAC and 18-36 VDC. For other ranges please contact Factory with your requirements. Input range may affect unit efficiency, case size and maximum output current.
EA-TP	**Input Transient Protection**—Conforms to the transient provision of MIL-STD 704A-D as well as MIL-STD 1275 and MIL-STD 1399. For undershoot and dropout contact Factory with specific requirements. Add 0.6" to Input Section length.
EA-R	**Remote Sense**—Maintains specified output voltage at remote load. Compensates for a voltage drop of .25V maximum. Available above 10A. Standard on master channels. Add 0.6" to Regulators, except ERP and ERY.
EA-A	**Remote Voltage Adjustment**—Terminals are provided for external potentiometer. Add 0.6" to Regulators.
EA-TS	**Over-Temperature Shutdown**—Unit will shut off during over-temp and automatically reset within specified range. Add 1.2" to Input Section length.
EA-ST	**Stud-Terminals**—8-32 threaded studs are provided for input and output terminations (maximum height of 5/8"). ERP and ERY regulators come standard with 1/4-28 stud terminals. Maximum torque of retaining nut: 15 inch-pound for 8-32 stud; 25 inch-pound for 1/4-28 stud.
EA-H	**Helicoil Mounting Inserts**—Locking or free running helicoil inserts are provided. Specify 6-32 or 8-32.
EA-LC	**TTL On/Off Control**—Logic signal will turn unit On or Off. Add 0.6" to Input Section length.
EA-D	**Power-Down Signal**—TTL signal warns of input power loss prior to outputs falling out of regulation. Add 0.6" to Input Section length.
EA-I	**Inrush Soft Start**—Unit inrush limited to 2 times steady state current at turn-on (AC only). Add 0.6" to Input Section length.

ENVIRONMENTAL SPECIFICATIONS

- **Temperature Range:** Operating Temperature: −40°C to +85°C Baseplate Temperature. Optional −55°C to +85°C range. Non-Operating Storage Temperature: −65°C to +100°C.
- **High Temperature:** Per MIL-STD-810, Method 501, Procedure II.
- **Low Temperature:** Per MIL-STD-810, Method 502, Procedure I.
- **Temperature-Altitude:** Per MIL-STD-810, Method 504, Procedure I; the following details apply: −40°C to +85°C (and −55°C to +85°C) at Altitude: Sea level to 70,000 ft.
- **Humidity:** Per MIL-STD-810, Method 507, Procedure I.
- **Acceleration:** Per MIL-STD-810, Method 513, Procedure I and II, at a test level of 14 G.
- **Vibration:** Per MIL-STD-810, Method 514, Procedure I, at a test level of 15 G.
- **Shock:** Per MIL-STD-810, Method 516, Procedures I, II, III, V, and VI at a test level of 40 G.

THERMAL INTERFACE

Arnold Magnetics Power Supplies are cooled by conduction. Always use thermal compound during installation. To assure reliability the thermal interface must be designed to maintain specified Baseplate Temperature under worst-case conditions. Heat transfer via forced air or natural convection will be minimal.

Please consult the Factory to discuss heat-sinking considerations.

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AC-DC/DC-DC MODULAR MINIATURIZED SWITCHING POWER SUPPLIES

ARNOLD MAGNETICS

CONFIGURE-YOUR-OWN POWER SUPPLY WORKSHEET*

*For 7 or more output voltages use separate sheet.

	REGULATOR MODEL	VOLTS (Nominal)	AMPS (Maximum)	OUTPUT POWER	REGULATOR EFFICIENCY	REGULATOR POWER FROM INPUT SECTION	REGULATOR LENGTH (Include Options)	PRICE (Include Options)
1.	_____	_____VDC ×	_____A =	_____Watts ÷	_____% =	_____Watts	_____Inches	$_____
2.	_____	_____VDC ×	_____A =	_____Watts ÷	_____% =	_____Watts	_____Inches	$_____
3.	_____	_____VDC ×	_____A =	_____Watts ÷	_____% =	_____Watts	_____Inches	$_____
4.	_____	_____VDC ×	_____A =	_____Watts ÷	_____% =	_____Watts	_____Inches	$_____
5.	_____	_____VDC ×	_____A =	_____Watts ÷	_____% =	_____Watts	_____Inches	$_____
6.	_____	_____VDC ×	_____A =	_____Watts ÷	_____% =	_____Watts	_____Inches	$_____
	TOTAL OUTPUT POWER			_____Watts		_____Watts	_____Inches TOTAL REGULATORS (Include options)	$_____ TOTAL REGULATOR
	POWER REQUIRED FROM INPUT SECTION						+ _____Inches INPUT SECTION LENGTH (Include Options)	$_____ INPUT SECTION PRICE
	TOTAL MODULE LENGTH =						_____Inches Input Section & Regulators	$_____ TOTAL PRICE

INPUT SECTION	MODEL	RATED OUTPUT POWER
	_____	_____Watts

→ MUST BE 10% GREATER THAN** → POWER REQUIRED FROM INPUT SECTION

**Due to system configuration.

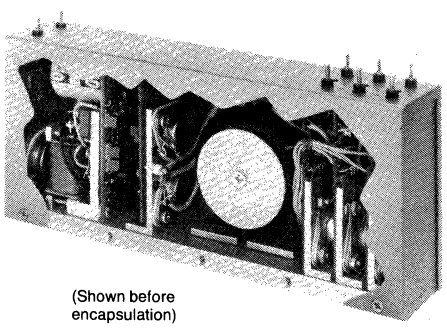
Select a case size that will accommodate the sum of all Regulators, Options and Input Section.

TOTAL MODULE LENGTH _____INCHES ≤ CASE_____CONTAINING_____TOTAL MODULE INCHES

RELIABILITY...FROM THE INSIDE OUT!

Modular Concept Provides Repeatability

Extra Protection Circuitry adds to True Reliability



(Shown before encapsulation)

Tantalum Capacitors for High Density

Conduction Cooled Additional Airflow is Rarely Required

Thermal Management Maintains Safe Operating Temperatures

MOSFET Designs for Minimum Switching Losses and Higher Efficiencies

Established Reliability Components for Higher MTBF

Fully Isolated Output Voltages

Heavy Brackets Resist Shock/Vibration

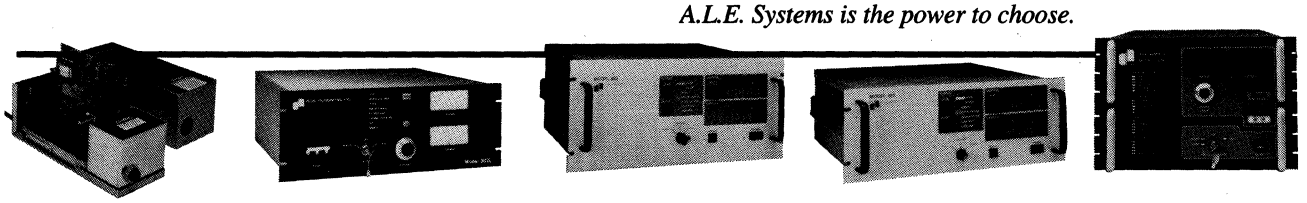
ARNOLD MAGNETICS CORPORATION

4000 Via Pescador, Camarillo, California 93012 • Phone: (805) 484-4221 • TWX: 910-343-6468 • FAX: (805) 484-4113

HIGH VOLTAGE POWER SUPPLIES

a.l.e. systems, inc.
150 Homer Ave., Ashland, MA 01721
Telephone: 508-881-5252 Fax: 617-235-6588

Since its incorporation, A.L.E. Systems has been a leader in advanced switchmode power conversion systems for laser and other high power, high voltage applications. Our broad experience solving complex high voltage applications assures successful integration of our power supplies to your specific requirements. With thousands of units operating world wide in both OEM and laboratory applications, A.L.E. Systems is the power to choose.



Model	Average Power J/sec	Peak Charge Rate J/sec	Size	Input Voltage
500	500	650	6 x 5.5 x 14	110-220
102	1000	1200	6 x 5.5 x 14	110-220
152	1500	2000	*7 x 17 x 17	190-260
202	2000	2500	*7 x 17 x 17	190-260
302	3000	4000	*7 x 17 x 17	190-260
402	4000	5000	*7 x 17 x 17	190-260 380-415
802	8000	9000	*8.75 x 17 x 17	190-260 380-415
153	15000	20000	*12.25 x 17 x 22	190-260 380-530

All units are available with full scale output voltages of 1, 2, 4, 5, 10, 20, 30, 40, 50kV. Other voltages are available on request.

* Rack Mount

Capacitor Charging Power Supplies

500 J/S to 15KJ/S

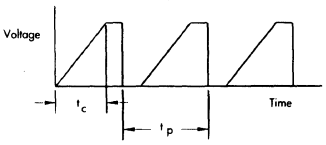
Advanced high voltage current sources specifically designed to charge capacitors in discharge driven applications.

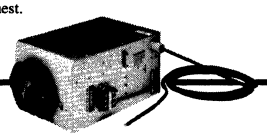
Capacitor charging supplies are rated in Joules per second. To determine the required supply capacity, multiply the energy storage ($CV^2/2$) by the pulse repetition frequency. For example a 90nF capacitor operating at 40kV and a 50Hz rate would require a 3600J/sec. supply.

All A.L.E. capacitor charging supplies are rated in both average and peak charge rate. The peak rating assures that the full average power of the unit is available when the requirement for transfer switch recovery time is taken into account.

$$\text{Peak charge rate} = \frac{1/2\,CV^2}{t_c}$$

$$\text{Average charge rate} = \frac{1/2\,CV^2}{t_p}$$



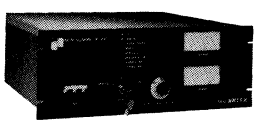


CW Arc Lamp Supplies

4kW to 10kW

Rack mount and OEM versions

Active power factor correction available to 6kW level.

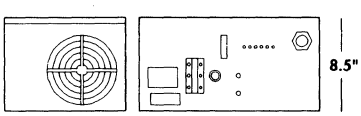


The YAG Drive Series of switching power supplies are designed for Nd: YAG and other solid-state laser systems. Advanced semi-conductor technology combined with high quality construction yield an exceptionally small and reliable power supply. With integral igniter and boost circuitry, the YAG Drive provides a complete power system for krypton arc lamps used in laboratory and OEM applications

Output Power
YD-4 30A, 200V, 4kW max.
YD-6 40A, 200V, 6kW max.
YD-8 45A, 200V, 8kW max.
YD-10 50A, 200V, 10kW max.

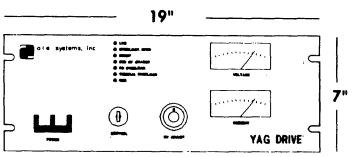
Regulation
0.1% max. over full line and load range.
Ripple
0.1% rms max.

YD-4-SC, YD-6-SC
Small chassis, remote operation only. Used in low cost, high volume OEM applications.



Small Chassis Configuration

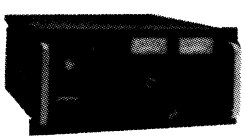
YD-6, YD-8 , YD-10
19" standard rack mount with full front panel instrumentation for use in laboratory, prototype or OEM applications. Includes voltage and current meters, current adjust and AC contactor.



Rack Mount Configuration

Precision High Power HVDC

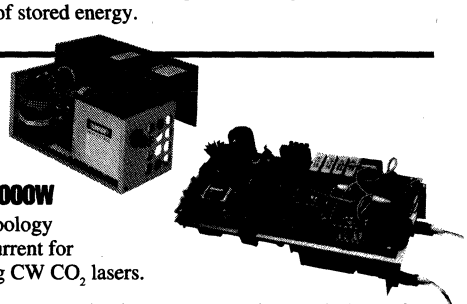
Custom supplies from 2kW to 30kW



Highly regulated supplies for ion implantation, X-ray and other demanding high power applications. Basic voltage transformation to 40kV allows for a minimal number of multiplication stages and hence extremely low levels of stored energy.

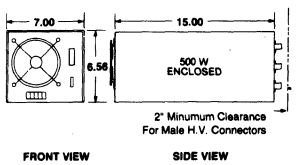
CO_2

Ballastless CO2 Supplies 250W to 1000W



Patented converter topology provides controlled current for striking and sustaining CW CO_2 lasers.

The CO2 Series high voltage switching power supplies are designed for medical and industrial CO2 laser systems. The advanced "ballastless" design can increase laser system efficiency by 20%. Configured as either open-frame or enclosed chassis, the CO2 power supply is compact enough to be designed right into the laser head. Designed for continuous use, these air-cooled power supplies provide an average power of 250 Watts or 500 Watts, and status monitoring are easily accomplished with thestandard remote interface.



Ascent
POWER TECHNOLOGY INC.

Power Supplies

Ascent Power Technology is a new name in power electronics with over 18 years of experience as a producer of high quality, custom power supply products. Ascent Power Technology is currently a supplier to many major *commercial, industrial, medical,* and *military* power supply users. Our organizational strengths are characterized as follows:

■ ENGINEERING

We offer a full range of engineering design capabilities, including SPICE simulation and analysis of all circuits, **C**omputer **A**ided **D**esign, and extensive qualification to a wide range of commercial and military requirements.

■ MANUFACTURING

We are capable of both leaded component and SMD assembly, high voltage encapsulation, in-house magnetic production, and both high voltage and low voltage automated testing. Our facility can manufacture to military and commercial requirements.

■ QUALITY

At the development level we specialize in detailed worst case analysis, stringent component derating and extensive life testing. Our experienced manufacturing staff participates in yearly training courses and our processes are monitored through **S**tatistical **P**rocess **C**ontrol. Our order control and factory scheduling is done on one of the most advanced computer scheduling systems available to enable us to meet your **J**ust **I**n **T**ime delivery requirements.

■ CUSTOM POWER SUPPLIES

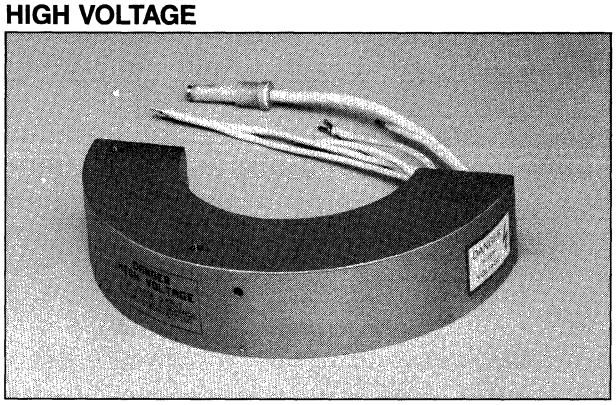
Low Voltage

AC/DC – 250W to 2kW, power factor correction optional
DC/DC – 50W to 200W industry standard package
– 100W to 2kW custom package

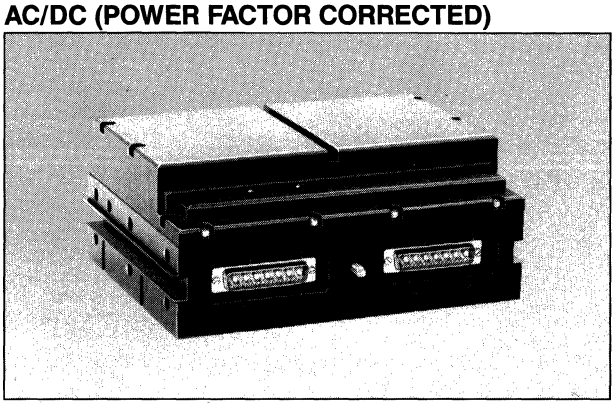
High Voltage

Up to 100kV Applications • CRT • Medical
• Laser Printer • Military (ground and airborne)

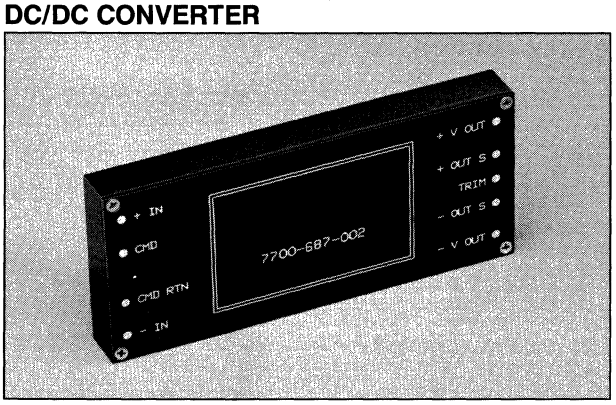
HIGH VOLTAGE



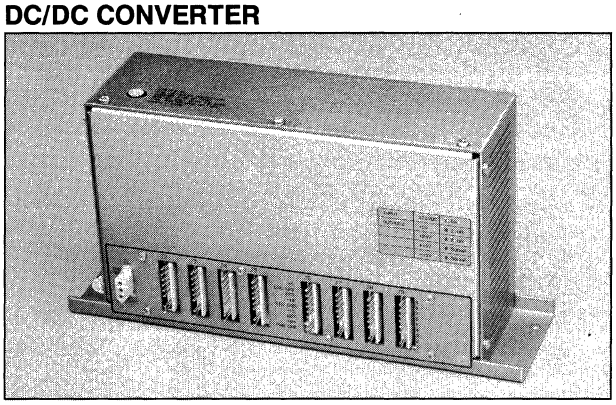
AC/DC (POWER FACTOR CORRECTED)



DC/DC CONVERTER



DC/DC CONVERTER



Ascent
POWER TECHNOLOGY INC.
146 Adesso Drive, Concord, Ontario, Canada L4K 3C3
Phone **(416) 660-9819** FAX **(416) 660-9567**

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401 Jones Road
Oceanside, CA 92054-1216
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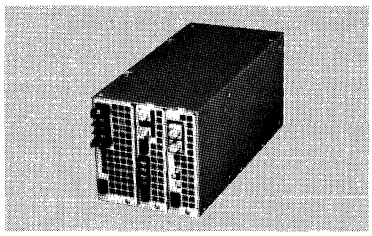
HIGH POWER

SPECTRUM SERIES
500 to 2000 WATTS MULTIPLE OUTPUTS

NEW

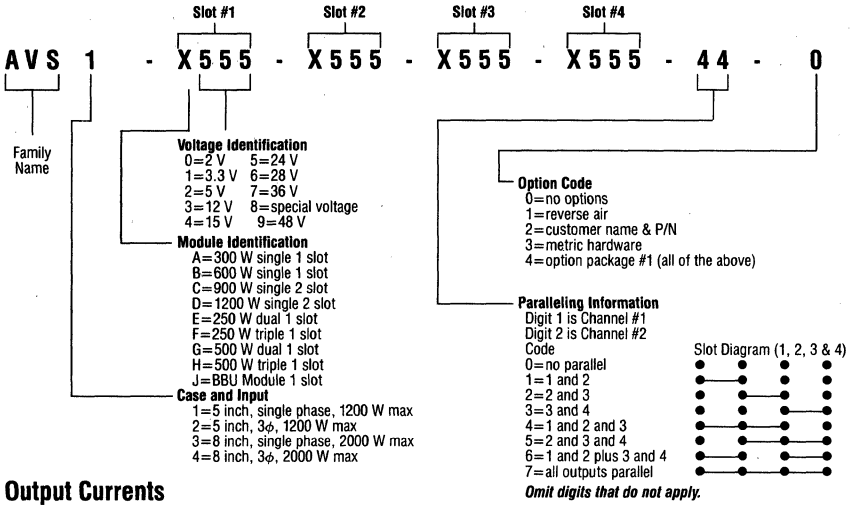


Spectrum is the first full-featured high power product with a built-in PFC front end. It is available in both single and multiple output versions and offers a very compact footprint. The 1200 watt package, measuring 5″×5″×11″, and the 2000 watt package, measuring 5″×8″×11″, achieve more value per watt of power than any other high power design.

FEATURES

- IEC 555-2 compliant
- Power factor correction (standard)
- Current share on all outputs (standard)
- Remote sense on all outputs
- Overload protect on all outputs
- Voltage adjustment all outs ±10%
- Margining on all outputs ±5%
- Power fail signal
- Global DC output good
- Power Good signal and status indicator LED on all outputs
- Inhibit (enable) signal (outputs > 10 amps)
- Level A EMI filtering (standard)
- Full output ratings to −10° to 50°C ambient

Model Selection



Omit digits that do not apply.

Output Currents

Voltage Identification	Module Identification					
Main Channel (=Channel 1)	**A (1 Slot) 300 W Single**	**B (1 Slot) 600 W Single**	**C (2 Slots) 900 W Single**	**D (2 Slots) 1200 W Single**	**E,F, (1 Slot) 250 W Triple Main Output**	**G,H (1 Slot) 500 W Triple Main Output**
2	60	120	180	240	25	50
3.3	60	120	180	240	25	50
5	60	120	180	240	25	50
12	25	50	75	100	10.5	21
15	20	40	60	80	8.3	16.6
24	12.5	25	37.5	50	5.3	10.5
28	10.7	21.4	32.1	42.8	N/A	N/A
36	8.3	16.6	24.9	33.2	N/A	N/A
48	6.3	12.5	18.75	25	N/A	N/A
Auxiliary Channel (=Channel 2 & 3)	**E,F 250 W Triple Aux. Output**	**G,H 500 W Triple Aux. Output**				
4.2-15.8 volts	5 amp	10 amp				
20-26 volts	2-5 amps	5 amp				

SINGLES Pre Configured Model Numbers

Total Power	Volts/Amps	Size	Model No.
600	5/120	5×5×11	AVS1-B2-00-0
900	5/180	5×5×11	AVS1-C2-00-0
1200	5/240	5×5×11	AVS1-D2-00-0
1500	5/300	5×8×11	AVS3-D2-A2-10-0
1800	5/360	5×8×11	AVS3-D2-B2-10-0
2000	5/400	5×8×11	AVS3-D2-D2-10-0

OTHER VOLTAGES AVAILABLE:

Voltage Identification Code

2V	0	24V	5
3.3V	1	28V	6
12V	3	36V	7
15V	4	48V	9

For models with voltage other than 5, replace "2" in model number with voltage identification code.

MULTIPLE OUTPUT Pre Configured Model Numbers

Total Power	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Size	Model No.
500W	5/50	12/10	12/10				5×5×11	AVS1-H233-00-0
750W	5/50	12/10	12/10	15.8.3	15/5	5/5	5×5×11	AVS1-H233-F442-00-0
800W	5/60	12/21	12/10	5/10			5×5×11	AVS1-A2-H233-00-0
800W	5/60	12/21	12/10	24/5			5×5×11	AVS1-A2-H335-00-0
800W	5/60	15/16.6	15/10	5/10			5×5×11	AVS1-A2-H442-00-0
800W	5/60	15/16.6	15/10	24/5			5×5×11	AVS1-A2-H445-00-0
1000W	5/50	12/10	12/10	15/16.6	15/10	24/5	5×5×11	AVS1-H233-H445-00-0
1000W	5/50	12/10	12/10	15/16.6	5/10	24/5	5×5×11	AVS1-H233-H425-00-0
1100W	5/120	12/21	12/20				5×5×11	AVS-B2-633-00-0
1100W	5/120	12/21	12/10	5/10			5×5×11	AVS1-B2-H332-00-0
1100W	5/170	12/10	12/10				5×5×11	AVS1-B2-H233-10-0
1100W	5/120	15/16.6	15/10	5/10			5×5×11	AVS1-B2-H442-00-0
1100W	5/120	15/16.6	15/10	24/5			5×5×11	AVS1-B2-H445-00-0
1400W	5/180	12/21	12/20				5×8×11	AVS3-C2-633-00-0
1400W	5/180	12/21	12/10	5/10			5×8×11	AVS3-C2-H332-00-0
1600W	5/170	12/20	12/21	5/20			5×8×11	AVS3-B2-623-10-0
1700W	5/240	12/21	12/20				5×8×11	AVS3-D2-633-00-0
1700W	5/240	2/21	12/10	5/10			5×8×11	AVS3-D2-H332-00-0
1900W	5/180	12/21	12/20	5/60	15/10	24/5	5×8×11	AVS3-C2-633-H245-00-0
2000W	5/240	12/21	12/20	5/60	15/10	24/5	5×8×11	AVS3-D2-633-H245-00-0

ASTEC STANDARD POWER
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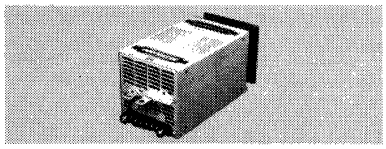
401 Jones Road
Oceanside, CA 92054-1216
Telephone: 619-757-1880
Facsimile: 619-439-4243

HIGH POWER

POWERTEC 600 TO 1000 WATTS
Single output
2 to 48 VDC
switch mode power supplies
9 A/B/C

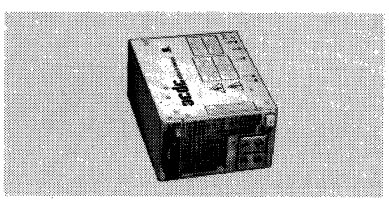


FEATURES
- Ultra compact 5″×5″×10″
- Field Selectable Inputs
- Single wire parallel
- Automatic current sharing of paralleled units
- Fault Tolerant (N+1) redundancy adaptable
- Soft start
- Input power fail signal
- Logic Inhibit
- Overvoltage protection
- Automatic thermal shutdown protection

SPECIFICATIONS

	Total Power (Watts)	Volts Amps	Model Number		Total Power (Watts)	Volts Amps	Model Number
2 Volts	400	2 V / 200 A	9A2-200-371	24 Volts	600	24 V / 25 A	9A24-25-371
	600	2 V / 300 A	9C2-300-371		800	24 V / 33 A	9B24-33-371
5 Volts	600	5 V / 120 A	9A5-120-371		1000	24 V / 42 A	9C24-42-371
	800	5 V / 160 A	9B5-160-371	28 Volts	600	28 V / 21 A	9A28-21-371
	1000	5 V / 200 A	9C5-200-371		800	28 V / 29 A	9B28-29-371
12 Volts	600	12 V / 50 A	9A12-50-371		1000	28 V / 36 A	9C28-36-371
	800	12 V / 67 A	9B12-67-371	48 Volts	600	48 V / 13 A	9A48-13-371
	1000	12 V / 83 A	9C12-83-371		800	48 V / 17 A	9B48-17-371
15 Volts	600	15 V / 40 A	9A15-40-371		1000	48 V / 21 A	9C48-21-371
	800	15 V / 53 A	9B15-53-371				
	1000	15 V / 67 A	9C15-67-371				

ACDC 2000 WATTS
Single output
2 to 48 VDC
Switchmode power supplies
JF201

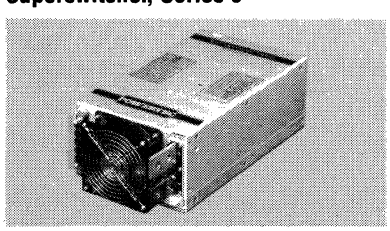


FEATURES
- Smallest 2000 Watt switcher on market
- Three phase power factor correction to .9
- Three input models: three phase, single phase, DC
- Single wire paralleling
- Current monitor
- Internal EMI filter available: FCC and VDE "A"
- Phase loss protection
- Superior DC output connection
- UL/CSA/VDE

SPECIFICATIONS

Volts/Amps	Size	Model #
2V/400A	5″ × 8″ × 10″	JF201A-1000
5V/400A	5″ × 8″ × 10″	JF201A-2000
12V/167A	5″ × 8″ × 10″	JF201A-3000
15V/134A	5″ × 8″ × 10″	JF201A-4000
24V/84A	5″ × 8″ × 10″	JF201A-5000
28V/72A	5″ × 8″ × 10″	JF201A-6000
48V/42A	5″ × 8″ × 10″	JF201A-9000

POWERTEC 3000 WATTS
Single output 2V to 48VDC
Switchmode power supplies
Superswitcher, Series 9



FEATURES
- Smallest 3000 Watt switcher
- Field selectable inputs
- EMI filter, FCC and FDE "A"
- IL/CSA/VDE
- Margining +/– 10%
- Soft start
- Full power outputs at 50°C

SPECIFICATIONS

Volts/Amps	Size	Model #
2V/700A	5″ × 8″ × 15″	9R2-700-381-N
5V/600A	5″ × 8″ × 15″	9R5-600-381-N
12V/250A	5″ × 8″ × 15″	9R12-250-381
15V/200A	5″ × 8″ × 15″	9R15-200-381
24V/130A	5″ × 8″ × 15″	9R24-130-381
28V/105A	5″ × 8″ × 15″	9R28-105-381
48V/65A	5″ × 8″ × 15″	9R48-65-381

ASTEC STANDARD POWER
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Oceanside, CA 92054-1216
Telephone: 619-757-1880
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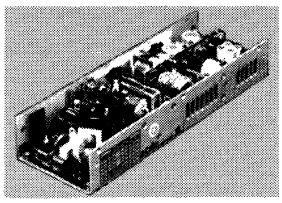
LOW/MEDIUM POWER

ACDC 100 TO 400 WATTS
RH/RMV/RMC/RMF Series



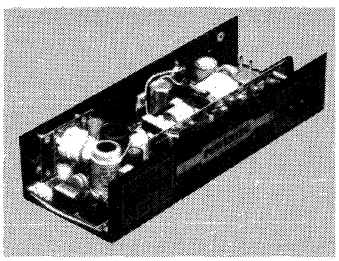
FEATURES
- Optional universal input some models
- Electronic soft start
- AC input nominal 115/230 VAC field selectable
- EMI filter (except RH) • Remote sense
- Overload/short circuit protection • Overvoltage/overtemperature protection
- Reverse voltage protection • UL, CSA IEC 380/VDE 0806 Certification
- No minimum load required on main output for full output on auxiliaries
- Remote inhibit (main output)

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Output #5	Case H × W × L (ins)	Model Number
100W	5V/20A					2.2 × 4 × 8	RH101B-2000-0008
100W	12V/8.5A					2.2 × 4 × 8	RH101B-3000-0008
100W	15V/7A					2.2 × 4 × 8	RH101B-4000-0008
100W	24V/4.5A					2.2 × 4 × 8	RH101B-5000-0008
220W	5V/25A	12V/4A	12V/3A			2.5 × 4.8 × 14.0	RMV223B-2330
220W	5V/25A	12V/4A	12V/3A	5V/1.5A		2.5 × 4.8 × 14.0	RMV224B-2332
220W	5V/25A	12V/4A	12V/3A	12V/2A		2.5 × 4.8 × 14.0	RMV224B-2333
220W	5V/25A	12V/4A	12V/3A	24V/2A		2.5 × 4.8 × 14.0	RMV224B-2339
220W	5V/25A	15V/3A	15V/2A	5V/1.5A		2.5 × 4.8 × 14.0	RMV224B-2442
220W	5V/25A	15V/3A	15V/2A	24V/2A		2.5 × 4.8 × 14.0	RMV224B-2449
300W	5V/60A					2.5 × 5 × 12.0	RMC301B-2000-0000
300W	12V/25A					2.5 × 5 × 12.0	RMC301B-3000-0000
300W	15V/20A					2.5 × 5 × 12.0	RMC301B-4000-0000
300W	24V/12.5A					2.5 × 5 × 12.0	RMC301B-5000-0000
300W	5V/40A	12V/5A	12V/5A			2.5 × 4.8 × 14.0	RM(F or C) 303B-2330
300W	5V/40A	12V/5A	12V/5A	5V/2A		2.5 × 4.8 × 14.0	RM(F or C) 304B-2332
300W	5V/40A	12V/5A	12V/5A	12V/2A		2.5 × 4.8 × 14.0	RM(F or C) 304B-2333
300W	5V/40A	12V/5A	12V/5A	24V/3A		2.5 × 4.8 × 14.0	RM(F or C) 304B-2339
300W	5V/40A	15V/4A	15V/4A	5V/2A		2.5 × 4.8 × 14.0	RM(F or C) 304B-2442
300W	5V/40A	15V/4A	15V/4A	24V/3A		2.5 × 4.8 × 14.0	RM(F or C) 304B-2449
300W	5V/45A	12V/6A	12V/6A			2.6 × 7.0 × 14.0	RMV303B-2330
300W	5V/45A	12V/6A	12V/6A	5V/3A		2.6 × 7.0 × 14.0	RMV304B-2332
300W	5V/45A	12V/6A	12V/6A	12V/3A		2.6 × 7.0 × 14.0	RMV304B-2333
300W	5V/45A	12V/6A	12V/6A	24V/3A		2.6 × 7.0 × 14.0	RMV304B-2339
300W	5V/45A	15V/5A	15V/5A	5V/3A		2.6 × 7.0 × 14.0	RMV304B-2442
300W	5V/45A	15V/5A	15V/5A	24V/3A		2.6 × 7.0 × 14.0	RMV304B-2449
400W	5V/50A	12V/7A	12V/7A			2.6 × 7.0 × 14.0	RM(F or C) 403B-2330
400W	5V/50A	12V/7A	12V/7A	5V/5A		2.6 × 7.0 × 14.0	RM(F or C) 404B-2332
400W	5V/50A	12V/7A	12V/7A	12V/3A		2.6 × 7.0 × 14.0	RM(F or C) 404B-2333
400W	5V/50A	12V/7A	12V/7A	24V/4A		2.6 × 7.0 × 14.0	RM(F or C) 404B-2339
400W	5V/50A	15V/6A	15V/6A	5V/5A		2.6 × 7.0 × 14.0	RM(F or C) 404B-2442
400W	5V/50A	15V/6A	15V/6A	24V/4A		2.6 × 7.0 × 14.0	RM(F or C) 404B-2449

Output #1 is main output

POWERTEC 200 TO 300 WATTS
Series 29D



FEATURES
Series 29D
- 5 to 24 VDC outputs
- VDE, IEC, CSA, UL Safety Specs
- Isolated and Floating Outputs
- Automatic Current-Sharing*
- Internal Isolation Diodes* (option)
- Field Switchable 115/230 VAC
- Over Voltage Protection*
- Remote Sense*
- Five D.C. Outputs
- Automatic Thermal Shut-Down
- Remote Inhibit* – Logic High or Low
- Alarm Circuitry for "Input Power Fail" and "Output Good" Signals
- N+1 Redundancy
- Automatic Pre-Load (option)
- 100% Dynamic Burn-in: AC Cycled On and Off, Full Load to No Load to Short Circuit Cycling

*Provided on fully regulated outputs #1-#4

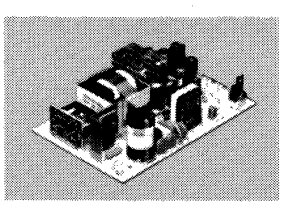
PowerSystems Enclosures
- Hot Plug-In/Replacement
- Holds up to Six 29D supplies
- Up to 1800 Watts
- User Configurable Backplane

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Output #5	Case H×W×L (ins)	Model Number
300W	5V/40A	12V/5A	12V/3A	5V/3A	24V/4A	5×2.8×13.8	29D5-A2A-371-3
300W	5V/40A	12V/5A	12V/3A	5V/3A	24V/4A	5×2.8×13.8	29D5-A2A-371-FK-3
300W	5V/40A	12V/5A	12V/3A	12V/3A	12V/6A	5×2.8×13.8	29D5-C2A-371-3
300W	5V/40A	12V/5A	12V/3A	12V/3A	12V/6A	5×2.8×13.8	29D5-C2A-371-FK-3
300W	5V/40A	12V/5A	12V/3A	12V/3A	24V/4A	5×2.8×13.8	29D5-D2A-371-3
300W	5V/40A	12V/5A	12V/3A	12V/3A	24V/4A	5×2.8×13.8	29D5-D2A-371-FK-3
300W	5V/40A	15V/5A	15V/3A	15V/3A	24V/4A	5×2.8×13.8	29D5-J2A-371-FK-3
300W	5V/40A	12V/5A	12V/3A	5V/3A	24V/4A	2.9×5×13.8	29D5-A2A-371-FT-3
300W	5V/40A	12V/5A	12V/3A	12V/3A	24V/4A	2.9×5×13.8	29D5-A2A-371-FT-3

Output #1 is main output.

ACDC 15 TO 220 WATTS
RB Series



FEATURES
- 0° to 50°C full power operation (convection cooled)
- 1 year warranty
- 100% computer final tested. Test data sheet furnished with each unit
- Installation and specification data included with each unit
- AC input nominal 115/230VAC field selectable
- EMI filter
- Remote sense
- Short circuit protection
- Overvoltage protection
- UL, CSA, IEC 380/VDE 0806 certification
- Some models Universal input

SPECIFICATIONS

Output #1 is main output

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Output #5	Case H×W×L (ins)	Model Number
40W	5V/6A					1.1×3×5	RBS42*
40W	12V/3A					1.1×3×5	RBS43*
40W	15V/2.5A					1.1×3×5	RBS44*
40W	24V/1.5A					1.1×3×5	RBS45*
50W	+5V/5A	+12V/2A	−12/.5A			1.5×4×6.4	RBT52
50W	+5V/5A	+15V/2A	−15/.5A			1.5×4×6.4	RBT53*
50W	+5V/5A	+12V/2A	−5/.5A			1.5×4×6.4	RBT54*
60W	+5V/5A	+12V/2.5A	−12V/0.5A			1.7×3.9×6.30	RBT61
135W	+5V/15A	+12V/4A	−12V/0.7A	−5V/0.7A		2.5×5×10.5	RBQ131
135W	+5V/15A	+15V/3.2A	−15V/0.7A	−5V/0.7A		2.5×5×10.5	RBQ132
135W	+5V/15A	+12V/3A	−12V/0.7A	+24V/1.5A		2.5×5×10.5	RBQ133
135W	+5V/15A	+15V/2.4A	−15V/0.7A	+24V/1.5A		2.5×5×10.5	RBQ134

*Universal input models.

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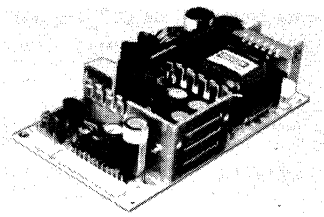
LOW/MEDIUM POWER

ASTEC 30 TO 130 WATTS
Multiple output
Switch mode power supplies
SA Series



FEATURES

SAXX-1XXX-open PCB
SAXX-2XXX-L-bracket
SAXX-3XXX-fully cased

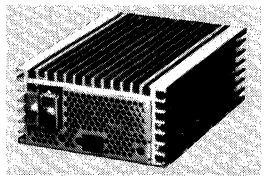
- High efficiency
- Built-in EMI filter
- Dual Input voltage – 115/230VAC, Field Selectable
- Universal Input on some models
- Adjustable 5V output on some models
- Overvoltage protection
- Overload protection (Power limit)
- Short circuit protection
- 100% factory burn-in
- Low ripple and noise
- PCB and bracket, fully enclosed units available
- UL, CSA, VE safety specifications
- MTBF minimum 50,000 hours

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Output #5	Case H×W×L (ins)	Model Number
30W	+5V/2A	+12V/2A	−12V/0.3A			1.7×3.5×5.51	SA30-1305
30W	+5V/2A	+15V/1.8A	−15V/0.3A			1.7×3.5×5.51	SA30-1306
40W	+5V/3A	+12V/2A	−12V/.35A			1.25×3×5	SA40-1313*
40W	+5V/2.5A	+12V/2A	−12V/0.1A			2.0×3.9×6.30	AC8151-02
50W	+5V/6A	+12V/2.5A	±12V/0.5A	±5V/0.5A		2.0×4.3×7.76	SA50-1400
50W	+5V/6A	+12V/2.5A	±12V/0.5A	±5V/0.5A		2.4×4.4×7.99	SA50-2400
50W	+5V/6A	+12V/2.5A	±12V/0.5A	±5V/0.5A		2.4×4.6×7.99	SA50-3400
50W	+5V/6A	+12V/2A	−12V/1A	−5V/0.5A		2.0×4.3×7.76	SA50-1405
70W	+5V/8A	+12V/3.5A	−12V/1A	−5V/0.7A		2.0×4.3×7.76	SA70-1400
70W	+5V/8A	+12V/2A	−12V/1A	−5V/1.5A		2.0×4.3×7.76	SA70-1401
70W	+5V/8A	+12V/2A	−12V/1A	+24V/2A		2.0×4.3×7.76	SA70-1402
70W	+5V/8A	+15V/2A	−5V/0.5A	−5V/0.5A		2.0×4.3×7.76	SA70-1403
70W	+5V/8A	+12V/3.5A	−12V/1A			2.0×4.3×7.76	SA70-1304
100W	+5V/10A	+12V/3.5A	−12V/0.7A	+5V/0.7A		2.0×4.3×7.76	SA100-1400
100W	+5V/10A	+12V/3.5A	−12V/0.7A	−5V/0.7A		2.0×4.4×7.99	SA100-2400
100W	+5V/10A	+12V/3.5A	−12V/0.7A	−5V/0.7A		2.0×4.4×7.99	SA100-3400
100W	+5V/10A	+12V/1.5A	+12V/3.5A	−12V/0.7A		2.0×4.3×7.76	SA100-1401
100W	+5V/10A	+12V/1.5A	+12V/3.5A	−12V/0.7A		2.0×4.4×7.99	SA100-2401
100W	+5V/10A	+12V/1.5A	+12V/3.5A	−12V/0.7A		2.0×4.4×7.99	SA100-3401
100W	+5V/10A	+12V/1.5A	+24V/2A	−12V/0.7A		2.0×4.3×7.76	SA100-1402
100W	+5V/10A	+12V/1.5A	+24V/2A	−12V/0.7A		2.0×4.4×7.99	SA100-2402
100W	+5V/10A	+12V/1.5A	+24V/2A	−12V/0.7A		2.0×4.4×7.99	SA100-3402
130W	+5V/15A	+12V/5A	−12V/0.7A	−5V/0.7A		2.5×5×8.50	SA130-2400
130W	+5V/15A	+12V/5A	−12V/0.7A	−5V/0.7A		2.5×5×8.50	SA130-3400
130W	+12V/2A	+12V/5A	−12V/1A	+5V/15A		2.5×5×8.50	SA130-2401
130W	+12V/2A	+12V/5A	−12V/1A	+5V/15A		2.5×5×8.50	SA130-3401
130W	+24V/3A	+12V/4A	−12V/1A	+5V/15A		2.5×5×8.50	SA130-2402
130W	+24V/3A	+12V/1A	−12V/1A	+5V/15A		2.5×5×8.50	SA130-3402

Output #1 is main output ***Universal input model**

NEW ASTEC 300-350 WATTS
Single/multiple output
Switch mode power supplies
"Lightning" ALS Series



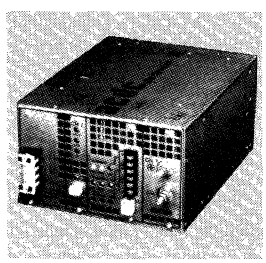
FEATURES

- Universal input
- >75% efficiency
- 3.3 Watts per inch³
- 200% self-protecting peak loading on two aux channels
- 20 ms full load holdover storage
- All outputs fully floating
- Overvoltage protection
- Overload protection
- Remote sensing
- Inhibit function
- Power fail signal
- Margining on main output
- Automatic thermal overload protection
- Soft start circuitry

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Case (H"×W"×L")	Model Number
300W	5V/60A				2.5×5×6.5	ALS301C-2000
300W	12V/25A				2.5×5×6.5	ALS301C-3000
300W	24V/12A				2.5×5×6.5	ALS301C-5000
325W	5V/40A	12V/5A	12V/5A	5V/5A	2.5×5×6.5	ALS304B-2332
325W	5V/40A	12V/5A	12V/5A	24V/2A	2.5×5×8.5	ALS304B-2339
325W	5V/40A	15V/4A	15V/4A	5V/5A	2.5×5×8.5	ALS304B-2442
325W	5V/40A	15V/4A	15V/4A	24V/2A	2.5×5×8.5	ALS304B-2449

ACDC 500 WATTS
Single/Multiple Output
Switch mode power supplies
RSF Series



FEATURES

- Power design
- Two-year warranty
- 100% computer tested

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Output #5	Case H"×W"×L" (ins)	Model Number
500W	2V/100A					5×7.1×10.2	RSF501B-1000
500W	5V/100A					5×7.1×10.2	RSF501B-2000
500W	12V/42A					5×7.1×10.2	RSF501B-3000
500W	15V/35A					5×7.1×10.2	RSF501B-4000
500W	24V/21A					5×7.1×10.2	RSF501B-5000
500W	28V/18A					5×7.1×10.2	RSF501B-6000
500W	5V/80A	2V/80A				5×8.0×10.2	RSF102B-2100
500W	5V/80A	5V/80A				5×8.0×10.2	RSF102B-2200
500W	5V/80A	12V/33A				5×8.0×10.2	RSF102B-2300
500W	12V/33A	12V/33A				5×8.0×10.2	RSF102B-3300
500W	5V/80A	2V/16A				5×8.0×10.2	RSF502B-2100
500W	5V/80A	12V/16A				5×8.0×10.2	RSF502B-2300
500W	12V/33A	12V/16A				5×8.0×10.2	RSF502B-3300
500W	5V/80A	5V/8A	12V/8A			5×8.0×10.2	RSF503B-2230
500W	5V/80A	12V/8A	12V/8A			5×8.0×10.2	RSF503B-2330
500W	5V/80A	15V/7A	15V/7A			5×8.0×10.2	RSF503B-2440
500W	5V/80A	2V/8A	12V/8A	12V/2A		5×8.0×10.2	RSF504B-2133
500W	5V/80A	5V/8A	12V/8A	12V/2A		5×8.0×10.2	RSF504B-2233
500W	5V/80A	12V/8A	12V/8A	5V/5A		5×8.0×10.2	RSF504B-2332
500W	5V/80A	12V/8A	12V/8A	24V/1A		5×8.0×10.2	RSF504B-2335
500W	5V/80A	12V/8A	12V/8A	24V/4A*		5×8.0×10.2	RSF504B-2339
500W	5V/80A	15V/7A	15V/7A	5V/5A		5×8.0×10.2	RSF504B-2442
500W	5V/80A	15V/7A	15V/7A	24V/1A		5×8.0×10.2	RSF504B-2445

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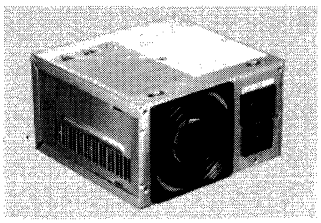
PC SUPPLIES/RACKS/LOADS

ASTEC PC SERIES 85 TO 300 WATTS
MULTIPLE OUTPUT SWITCH MODE POWER SUPPLIES



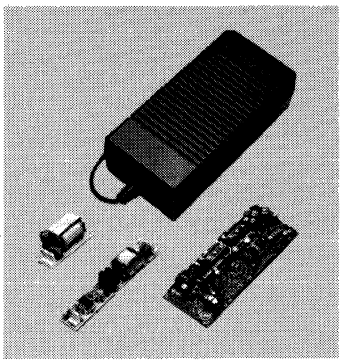
FEATURES
- High efficiency
- Built-in EMI filter
- UL, CSA, VDE approvals
- 100% burn-in
- Vacuum impregnated transformers
- Overvoltage protection
- Short circuit protection
- Dual input voltage (115/230 VAC)
- Compatible with PC applications
- Built-in fan, power switch, voltage select switch, cable harness or edge connector, AC receptacle, and convenience outlet
- Universal input on some models

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Case H×W×L (ins)	Model Number
85W	+5V/10A	+12V/2.5A	−12V/0.3A	−5V/0.3A	3.4×5.5×5.9	SA85-3408
130W	5V/5A	12V/12A	−12V/12A	−5V/5A	4.7×5.6×8.3	AA14102
200W	+5V/19.8A	+12V/7.3A	−12V/.3A	−5V/.3A	5.9×5.9×8.3	AA14500
230W	+5/20A	+12V/8A	−12V/.3A	−5V/.3A	5.9×5.9×8.3	AA14620
145W	+5V/18A	+12V/4.2A	−12V/0.3A	−5V/0.3A	3.4×5.5×5.9	SA145-3408
200W	+5V/20A	+12V/6A	−12V/.5A	−5V/.5A	3.4×5.5×5.9	SA201-3438*
300W	+5V/32A	+12V/10A	−12V/1A	−5V/1A	5.85×5.9×8.35	SA300-3400

Output #1 is main output
***Universal input model**

LAPTOP SERIES
MULTIPLE OUTPUT SWITCH MODE POWER SUPPLIES



FEATURES
- High efficiency
- Class B EMI filter (SA-55)
- UL, CSA, VDE approvals
- 4 battery status signals
- Battery temperature sense
- Fully protected
- Wide range AC input
- EL & CCFT backlight modules

SPECIFICATIONS—Laptop Supplies

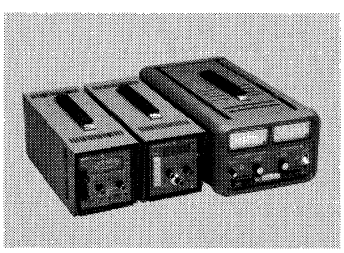
Total Power	Volts/Amps Output #1	Output #2	Output #3	Output #4	Output #5	Case H×W×L (mm)	Model Number
43W	+5V/3.5A	+12V/1.1A	−5V/0.4A	−12V/0.04A	−26V/0.04A	120×45×20	AA9030 (DC/DC)
55W	+18V/3.1A					6.5″×3.2″×2.0″	SA55-3100 (AC Adapter)
2.8W	100VRMS					60×24×17	AA9072 (EL Inverter)
3.5W	350V@5mA	350V@5mA				100×20×8.5	AA9042 (CCFT Inverter)

Output #1 is main output

SPECIFICATIONS—Notebook Supplies

35W	11V@6A					5.9″×2.6″×1.8″	SA35-3100 AC Adapter
28W	5V@3.75A	12.6V@.1A	350V@5mA	−26V@40mA	350V@5mA	90×40×20	AA9090 (DC/DC Converter)

LOADS
EL Series



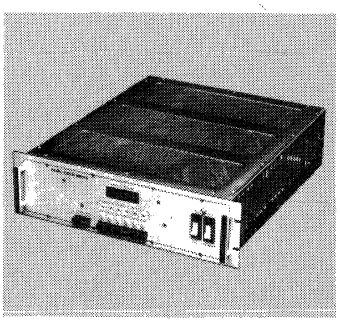
FEATURES
- Static or dynamic loading
- Single & multi channel
- RETMA rack or bench top configuration
- Parallel operation for increased capability

SPECIFICATIONS

Model	Watts	Application	Capabilities
EL300N	300	Single	4.5 to 60 VDC/60A
EL300N & 301	300	Single	1.8 to 60 VDC/60A
EL311	600	Dual or 2 Singles	1.8 to 60 VDC/60 A/channel
EL750B	750	Single	1.8 to 55 VDC/150A
EL310	900	Triple or Single	1.8 to 60 VDC/60 A/channel 1.8 to 60 VDC/180 A (paralleled)
EL312	1200	Quad or Single	4.5 to 60 VDC/60 A/channel 4.5 to 60 VDC/240 A (paralleled)
EL750BR-2	1500	Dual or Single	1.8 to 55 VDC/150 A/channel 1.8 to 55 VDC/300 A (paralleled)

OPTIONS
Bench top case
Four-position rack
Blank dress panels
Ribbon cable
12″ line cord
Slides
Power strip
Load cables

RACKS
RPS SERIES



The RPS (Rack Power System) Series offers a broad line of 19″ wide power systems.

Three standard RETMA configurations available:
5¼″ × 19″ × 21″
5¼″ × 19″ × 14″
7″ × 19″ × 21″

Each RPS can provide up to twelve individual outputs from Astec's broad line of linear and switching power supplies. Your specific connectors and termination can be incorporated into a custom rack design.

Basic Rack Assembly...
RPS1-P3-115-XXX (1) 5¼″ × 19″ × 14″ Rack
(1) Front panel with a lighted circuit breaker and handles

Note: The suffix "XXX" denotes the power supplies in the RPS

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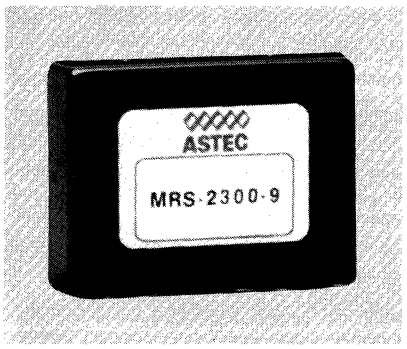
DC–DC CONVERTERS

ASTEC 1.5 TO 4.5 WATTS
SINGLE/DUAL OUTPUT
DC/DC POWER CONVERTERS



FEATURES

MV Series—1.5 to 2.4 Watt Single/Dual output
- Regulated outputs • LC input filter

MB/MH Series—2.4 Watt Single/Dual output
- Unregulated outputs • LC input filter
- COntinuous short circuit protection
- MOSFET design
- Efficiency to 80% • MTBF 1,000,000 hours

MQ Series—3 Watts single/dual outputs
- Ultra low noise Pi input filter
- Continuous short circuit
- Regulated output

MX Series—3.0 to 3.6 Watt Single/Dual output
- Unregulated outputs
- LC input filter
- Efficiency to 80%
- Continuous short circuit protection
- MOSFET design
- MTBF >1,000,000 hours
- 500 VDC I/O isolation

MK/MW Series—3.5 to 12 Watt Single/Dual output
- Unregulated outputs
- Pi input filter
- Efficiency to 80%
- Continuous short circuit protection
- MOSFET design
- 500VDC I/O isolation
- MTBF 1,000,000 hours
- Alternative pin configuration

MA Series—4.5 Watt Single/Dual output
- Regulated outputs
- SMT-surface mount technology
- Continuous short circuit protection
- MOSFET design
- 4:1 Ultra-wide input range

SPECIFICATIONS

Model Number	Input Voltage Range VDC	Output Voltage	Output Current	Case H×W×L (ins)
MV Series				
MVS2030-2	4.75-5.25	5VDC	300mA	0.4×1.25×0.8
MVS7020-2	4.75-5.25	9VDC	200mA	0.4×1.25×0.8
MVS3020-2	4.75-5.25	12VDC	200mA	0.4×1.25×0.8
MVS4016-2	4.75-5.25	15VDC	160mA	0.4×1.25×0.8
MVD2020-2	4.75-5.25	±5VDC	±100mA	0.4×1.25×0.8
MVD3017-2	4.75-5.25	±12VDC	±85mA	0.4×1.25×0.8
MVD4014-2	4.75-5.25	±15VDC	±70mA	0.4×1.25×0.8
MB/MH Series				
MBS2018-2	4.5-5.5	5VDC	180mA	0.5×1.1×1.1
MBS2045-2	4.5-5.5	5VDC	450mA	0.5×1.1×1.1
MBS3007-2	4.5-5.5	12VDC	750mA	0.5×1.1×1.1
MBS3020-2	4.5-5.5	12VDC	200mA	0.5×1.1×1.1
MHD3008-2	4.5-5.5	±12VDC	±38mA	0.5×1.1×1.1
MHD3020-2	4.5-5.5	±12VDC	±100mA	0.5×1.1×1.1
MHD4006-2	4.5-5.5	±15VDC	±30mA	0.5×1.1×1.1
MHD4016-2	4.5-5.5	±15VDC	±80mA	0.5×1.1×1.1
MQ Series				
MQS2060-2	4.5-5.5	5VDC	600mA	.4×2.0×2.0
MQS2060-3	10.8-15.0V	5VDC	600mA	.4×2.0×2.0
MQS2060-5	21.6-30.0V	5VDC	600mA	.4×2.0×2.0
MQS2060-9	42.0-56.0V	5VDC	600mA	.4×2.0×2.0
MQD3007-2	4.5-5.5V	±12VDC	±35mA	.4×1.5×2.0
MQD3007-3	10.8-15.0V	±12VDC	±35mA	.4×1.5×2.0
MQD3007-5	21.6-30.0V	±12VDC	±35mA	.4×1.5×2.0
MQD3007-9	42.0-56.0V	±12VDC	±35mA	.4×1.5×2.0
MQD3025-2	4.5-5.5V	±12VDC	±125mA	.4×2.0×2.0
MQD3025-3	10.8-15.0V	±12VDC	±125mA	.4×2.0×2.0
MQD3025-5	21.6-30.0V	±12VDC	±125mA	.4×2.0×2.0
MQD3025-9	42.0-56.0	±12VDC	±125mA	.4×2.0×2.0
MQD4006-2	4.5-5.5V	±15VDC	±30mA	.4×1.5×20
MQD4006-3	10.8-15.0V	±15VDC	±30mA	.4×1.5×20
MQD4006-5	21.6-30.0V	±15VDC	±30mA	.4×1.5×20
MQD4006-9	42.0-56.0V	±15VDC	±30mA	.4×1.5×20
MQD4020-2	4.5-5.5V	±15VDC	±100mA	.4×20×2.0
MQD4020-3	10.8-15.0V	±15VDC	±100mA	.4×20×2.0
MQD4020-5	21.6-30.0V	±15VDC	±100mA	.4×20×2.0
MQD4020-9	42.0-56.0V	±15VDC	±100mA	.4×20×2.0

Model Number	Input Voltage Range VDC	Output Voltage	Output Current	Case H×W×L (ins)
MX Series				
MXS2060-2	4.0-6.0	5V	600mA	1.25×0.8×0.375
MXS7033-2	4.0-6.0	9V	330mA	1.25×0.8×0.375
MXS3030-2	4.0-6.0	12V	300mA	1.25×0.8×0.375
MXS4024-2	4.0-6.0	15V	240mA	1.25×0.8×0.375
MXD3030-2	4.0-6.0	±12V	150mA	1.25×0.8×0.375
MXD4024-2	4.0-6.0	±15V	120mA	1.25×0.8×0.375
MK/MW Series (MW Series Case Size .4×2.0×2.0)				
MKS2075-2	4.5-5.5	5VDC	750mA	0.375×2.0×2.0
MKS3060-2	4.5-5.5	12VDC	600mA	0.375×2.0×2.0
MKS3080-2	4.5-5.5	12VDC	800mA	0.375×2.0×2.0
MKD3060-2	4.5-5.5	±12VDC	±300mA	0.375×2.0×2.0
MKD3080-2	4.5-5.5	±12VDC	±400mA	0.375×2.0×2.0
MKD4060-2	4.5-5.5	±15VDC	±300mA	0.375×2.0×2.0
MKD4080-2	4.5-5.5	±15VDC	±400mA	0.375×2.0×2.0
MA Series				
MAS2075-2	4.75-5.25	5VDC	750mA	0.375×1.0×2.0
MAS3037-2	4.75-5.25	12VDC	375mA	0.375×1.0×2.0
MAS4030-2	4.75-5.25	15VDC	300mA	0.375×1.0×2.0
MAS2075-8	9-36	5VDC	750mA	0.375×1.0×2.0
MAS3037-8	9-36	12VDC	375mA	0.375×1.0×2.0
MAS4030-8	9-36	15VDC	300mA	0.375×1.0×2.0
MAS2075-9	20-72	5VDC	750mA	0.375×1.0×2.0
MAS3037-9	20-72	12VDC	375mA	0.375×1.0×2.0
MAS4030-9	20-72	15VDC	300mA	0.375×1.0×2.0
MAD3037-2	4.75-5.25	±12VDC	±185mA	0.375×1.0×2.0
MAD4030-2	4.75-5.25	±15VDC	±150mA	0.375×1.0×2.0
MAD3037-8	9-36	±12VDC	±185mA	0.375×1.0×2.0
MAD4030-8	9-36	±15VDC	±150mA	0.375×1.0×2.0
MAD3037-9	20-72	±12VDC	±185mA	0.375×1.0×2.0
MAD4030-9	20-72	±15VDC	±150mA	0.375×1.0×2.0

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DC–DC CONVERTERS

ASTEC 5 TO 40 WATTS
SINGLE/MULTIPLE OUTPUT DC/DC CONVERTERS

FEATURES

MP/MF Series—5 to 7.5 Watt Single/Dual output
- Regulated outputs • Pi input filter
- Continuous short circuit protection
- MOSFET Design • 500 VDC I/O isolation
- SMT—surface mount technology
- 4:1 Ultra-wide input range

ML Series—6 Watts Single/Dual outputs
- MOSFET Design
- Surface Mount Technology
- 4:1 Ultra-wide Input Range
- Continuous Foldback Short Circuit Protection
- Regulated Outputs
- 500 Vdc I/O Isolation
- Efficiency 80% (typ)

MR Series—15 Watts Single/Dual outputs
- MOSFET Design
- Surface Mount Technology
- 4:1 Wide Input Range
- Continuous Foldback Short Circuit Protection
- Regulated Outputs • 500 V Isolation
- Six-sided Shielding

MC Series—15 to 25 Watt single output
- Regulated outputs
- Six sided shielding
- Low profile package
- Efficiency to 85% • Non isolated

MD Series—15-40 Watts Single/Dual outputs
- MOSFET Design • Surface Mount Technology
- 4:1 Wide Input Range
- Continuous Foldback Short Circuit Protection
- Regulated Outputs • Six-sided Shielding

MG/MI Series—18 Watt Single output
- Regulated outputs
- Remote shutdown
- Continuous short circuit protection
- 200kHz switching frequency

MJ Series—18 Watt Single/Dual/Triple output
- Regulated outputs
- Six-sided shielding
- Continuous short circuit protection
- Remote shutdown

AA Series—25-40 Watt Single/Multi output
- Low profile
- 400 KHz switching frequency
- High efficiency
- Parallelable • Adjustable output

SPECIFICATIONS

Model Number	Input Voltage Range VDC	Output Voltage	Output Current	Case H×W×L (ins)
MP/MF Series				
MPS2100-2	4.5-5.5	5VDC	1000mA	0.4×2.0×2.0
MPS2100-8	9-36	5VDC	1000mA	0.4×2.0×2.0
MPS2100-9	20-72	5VDC	1000mA	0.4×2.0×2.0
MPS7066-2	4.5-5.5	9VDC	660mA	0.4×2.0×2.0
MPS7066-8	9-36	9VDC	660mA	0.4×2.0×2.0
MPS7066-9	20-72	9VDC	660mA	0.4×2.0×2.0
MPS3060-2	4.5-5.5	12VDC	600mA	0.4×2.0×2.0
MPS3060-8	9-36	12VDC	600mA	0.4×2.0×2.0
MPS3060-9	20-72	12VDC	600mA	0.4×2.0×2.0
MPS4050-2	4.5-5.5	15VDC	500mA	0.4×2.0×2.0
MPS4050-8	9-36	15VDC	500mA	0.4×2.0×2.0
MPS4050-9	20-72	15VDC	500mA	0.4×2.0×2.0
MPD3060-2	4.5-5.5	±12VDC	±300mA	0.4×2.0×2.0
MPD3060-8	9-36	±12VDC	±300mA	0.4×2.0×2.0
MPD3060-9	20-72	±12VDC	±300mA	0.4×2.0×2.0
MPD4050-2	4.5-5.5	±15VDC	±250mA	0.4×2.0×2.0
MPD4050-8	9-36	±15VDC	±250mA	0.4×2.0×2.0
MPD4050-9	20-72	±15VDC	±250mA	0.4×2.0×2.0
ML Series				
MLS2100-2	4.5-5.5VDC	5VDC	1000mA	.4×2.0×1.0
MLS7060-2	4.5-5.5VDC	9VDC	600mA	.4×2.0×1.0
MLS3050-2	4.5-5.5VDC	12VDC	500mA	.4×2.0×1.0
MLS4040-2	4.5-5.5VDC	15VDC	400mA	.4×2.0×1.0
MLS2100-8	9-36VDC	5VDC	1000mA	.4×2.0×1.0
MLS3050-8	9-36VDC	12VDC	500mA	.4×2.0×1.0
MLS4040-8	9-36VDC	15VDC	400mA	.4×2.0×1.0
MLS2100-9	20-72VDC	5VDC	1000mA	.4×2.0×1.0
MLS3050-9	20-72VDC	12VDC	500mA	.4×2.0×1.0
MLS4040-9	20-72VDC	15VDC	400mA	.4×2.0×1.0
MLD3050-2	4.5-5.5VDC	±12VDC	±250mA	.4×2.0×1.0
MLD4040-2	4.5-5.5VDC	±15VDC	±200mA	.4×2.0×1.0
MLD3050-8	9-36VDC	±12VDC	±250mA	.4×2.0×1.0
MLD4040-8	9-36VDC	±15VDC	±200mA	.4×2.0×1.0
MLD3050-9	20-72VDC	±12VDC	±250mA	.4×2.0×1.0
MLD4040-9	20-72VDC	±15VDC	±200mA	.4×2.0×1.0
MR Series				
MRS2300-9	20-72V	5VDC	3000mA	.4×2×1.6
MRS3125-9	20-72V	12VDC	1250mA	.4×2×1.6
MRS4100-9	20-72V	15VDC	1000mA	.4×2×1.6
MRD3062-9	20-72V	±12VDC	±625mA	.4×2×1.6
MRD4050-9	20-72V	±15VDC	±500mA	.4×2×1.6
MC Series				
MCS2300-8	9-36	5VDC	3.0A	0.4×2.5×3.0
MCS2500-8	9-36	5VDC	5.0A	0.83×2.5×3.0
MCS3200-8	16-36	12VDC	2.0A	0.4×2.5×3.0
MCS4150-8	18-36	15VDC	1.5A	0.4×2.5×3.0

Model Number	Input Voltage Range VDC	Output Voltage	Output Current	Case H×W×L (ins)
MD Series				
MDS2300-8	7-40V	5VDC	3000mA	.4×2.0×2.0
MDS3125-8	15-36V	12VDC	1250mA	.4×2.0×2.0
MDS4100-8	18-36V	15VDC	1000mA	.4×2.0×2.0
MDS2800-8	9-36V	5VDC	8000mA	.83×2.5×3.5
MDS3330-8	14-36V	12VDC	3300mA	.83×2.5×3.5
MDS4266-8	18-36V	15VDC	2660mA	.83×2.5×3.5
MDS2800-8X	9-36V	5VDC	8000mA	.83×2.5×3.5
MDS3330-8X	14-36V	12VDC	3300mA	.83×2.5×3.5
MDS4266-8X	18-36V	15VDC	2660mA	.83×2.5×3.5
MG/MI Series				
MGS2350-8	9-36	5VDC	3.5A	1.25×2.5×3.0
MIS2350-8	9-36	5VDC	3.5A	1.25×2.5×3.5
MGS2350-9	20-72	5VDC	3.5A	1.25×2.5×3.0
MIS2350-9	20-72	5VDC	3.5A	1.25×2.5×3.5
MJS3150-8	9-36	12VDC	1.5A	0.83×2.5×3.0
MGS3150-8	9-36	12VDC	1.5A	1.25×2.5×3.0
MIS3150-8	9-36	12VDC	1.5A	1.25×2.5×3.5
MGS3150-9	20-72	12VDC	1.5A	1.25×2.5×3.0
MIS3150-9	20-72	12VDC	1.5A	1.25×25.×3.5
MGS4120-8	9-36	15VDC	1.2A	1.25×2.5×3.0
MIS4120-8	9-36	15VDC	1.2A	1.25×2.5×3.5
MGS4120-9	20-72	15VDC	1.2A	1.25×2.5×3.0
MIS4120-9	20-72	15VDC	1.2A	1.25×2.5×3.5
MJ Series				
MJS2350-8	9-36	5VDC	3.5A	0.83×2.5×3.0
MJS2350-9	20-72	5VDC	3.5A	0.83×2.5×3.0
MJS3150-9	20-72	12VDC	1.5A	0.83×2.5×3.0
MJS4120-8	9-36	15VDC	1.2A	0.83×2.5×3.0
MJS4120-9	20-72	15VDC	1.2A	0.83×2.5×3.0
MJD3150-8	9-36	±12VDC	±750mA	0.83×2.5×3.0
MJD3150-9	20-72	±12VDC	±750mA	0.83×2.5×3.0
MJD4120-8	9-36	±15VDC	±600mA	0.83×2.5×3.0
MJD4120-9	20-72	±15VDC	±600mA	0.83×2.5×3.0
MJT23260-8	9-36	±5/±12VDC	2.0A±310mA	0.83×2.5×3.0
MJT23260-9	20-72	±5/±12VDC	2.0A±310mA	0.83×2.5×3.0
MJT24250-8	9-36	±5/±15VDC	2.0A±260mA	0.83×2.5×3.0
MJT24250-9	20-72	±5/±15VDC	2.0A±260mA	0.83×2.5×3.0

Model Number	Total Power	Input Voltage	Volts/Amps Output #1	Output #2	Output #3	Case H×W×L (ins)
AA7811A	25W	−35V to −63V	+5.1V/5A	+12V/1A	−12V/1A	.43×3.0×2.99
AA7941A	25W	19V to 35V	+5.1V/5A	+12V/1A	−12V/1A	.43×3.0×2.99
AA7814A	30W	−35V to −63V	+12V/2.5A	−12V/2A		.43×3.0×2.99
AA7944A	30W	19V to 35V	+12V/2.5A	−12V/2A		.43×3.0×2.99
AA7812A	40W	−35V to −63V	+5.1V/8A			.43×3.0×2.99
AA7942A	40W	19V to 35V	+5.1V/8A			.43×3.0×2.99

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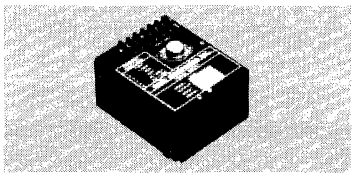
LINEARS

ACDC OEM SERIES 15 TO 260 WATTS

INDUSTRIAL GRADE
LINEAR POWER
SUPPLIES
SINGLES/DUALS



FEATURES

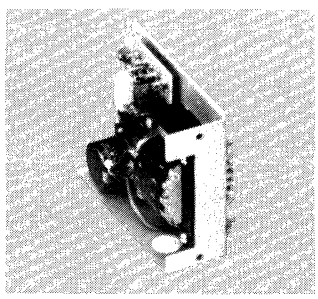
- Fully enclosed
- All I/O terminations via barrier strip
- MIL-T-27 Grade 6, Class R transformers
- 5 year warranty

MODEL SELECTION CHART & ORDERING DATA DIMENSIONS

Nominal Output Voltage	Adj. Range ±V	Max Current 40°C	Case Size	Model
Single Output				
5	0.25	3.0	2.7×4×4.8	OEM5N3-1-2
		5.7	4.9×3.2×6.2	OEM5N5.7-1-2
		10.0	4.9×3.2×10	OEM5N10-1-2
		17.0	4.9×4.9×10	OEM5N17-1-2
		25.0	6.6×4.9×12	OEM5N25-1-2
		35.0	7.2×4.9×16	OEM5N35-1-2
12	0.5	1.7	2.7×4×4.8	OEM12N1.7-1-2
		3.2	4.9×3.2×6.2	OEM12N3.2*
		5.8	4.9×3.2×10	OEM12N5.8-1-2
		9.5	4.9×4.9×10	OEM12N9.5*
		13.0	6.6×4.9×12	OEM12N13-1-2
		18.5	7.2×4.9×16	OEM12N18.5-1-2
15	0.5	1.5	2.7×4×4.8	OEM15N1.5*
		2.7	4.9×3.2×6.2	OEM15N2.7*
		5.0	4.9×3.2×10	OEM15N5-1-2
		8.2	4.9×4.9×10	OEM15N8.2-1-2
		11.2	6.6×4.9×12	OEM15N11.2*
		15.8	7.2×4.9×16	OEM15N15.8-1-2
Single Output (con't.)				
24	1	1.0	2.7×4×4.8	OEM24N1*
		1.8	4.9×3.2×6.2	OEM24N1.8-1-2
		3.3	4.9×3.2×10	OEM24N3.3*
		5.4	4.9×4.9×10	OEM24N5.4-1-2
		7.5	6.6×4.9×12	OEM24N7.5*
		10.6	7.2×4.9×16	OEM24N10.6*
Dual Output				
±12	0.5	1.5	4.9×3.2×6.2	OEM12D1.5*
		2.7	4.9×3.2×10	OEM12D2.7*
±15	0.5	1.3	4.9×3.2×6.2	OEM15D1.3-1.2
		2.4	4.9×3.2×10	OEM15D2.4-1-2

* Special build

ACDC 15 TO 150 WATTS SINGLE/MULTIPLE OUTPUT LINEAR POWER SUPPLIES ECV/ETV SERIES



FEATURES

- 100% Vacuum varnish impregnated transformers.
- Cross references with all manufacturers.
- Installation instructions/specifiction sheet with each unit.
- World wide voltage taps. AC input nominal, 100/117/220/230/240VAC field selectable.
- Remote sense.
- Overload protection.
- Overvoltage protection.
- 0° to 50°C operating temperature.
- Cooling—natural convection.
- UL, CSA certification.

SPECIFICATIONS

Total Power	Volts/Amps Output #1	Output #2	Output #3	Case H×W×L (ins)	Model Number
15W	5V/3A			2.0×4.0×4.84	ECV5N3-1
20.4W	12V/1.7A			2.0×4.0×4.84	ECV12N1.7
22.5W	15V/1.5A			2.0×4.0×4.84	ECV15N1.5
28.8W	24V/1.2A			2.0×4.0×4.84	ECV24N1.2
30W	5V/6A			2.9×4.8×5.59	ECV5N6-1
40.8W	12V/3.4A			2.9×4.8×5.59	ECV12N3.4
45W	5V/9A			3.3×4.8×6.97	ECVN9-1
45W	15V/3A			2.9×4.8×5.59	ECV15N3
57.6W	24V/2.4A			2.9×4.8×5.59	ECV24N2.4
60W	5V/12A			3.3×4.8×8.98	ECV5N12-1
60W	12V/5A			3.3×4.8×6.97	ECV12N5
67.5W	15V/4.5A			3.3×4.8×6.97	ECV15N4.5
81.6W	12V/6.8A			3.3×4.8×8.98	ECV12N6.8
85W	5V/17A			3.2×4.9×14	EC 5N17
86.4W	24V/3.6A			3.3×4.8×6.97	ECV24N3.6
90W	15V/6A			3.3×4.8×8.98	ECV15N6
115.2W	24V/4.8A			3.3×4.8×8.98	ECV24N4.8
125W	5V/25A			4.9×4.9×16.8	EC 5N25
180W	24V/7.5A			3.2×4.9×14	EC 24N7.5
240W	24V/10A			4.9×4.9×16.8	EC 24N10
14W	+12V/1A	−5V/0.4A		2.0×4.0×6.50	ECV12D1
14W	+15V/0.8A	−5V/0.4A		2.0×4.0×6.50	ECV12D1
23.9W	+12V/1.7A	−5V/0.7A		2.9×4.8×6.97	ECV12D1.7
24W	+12V/1A	−12V/1A		2.0×4.0×6.50	ECV12D1
24W	+15V/0.8A	−15V/0.8A		2.0×4.0×6.50	ECV12D1
26W	+15V/1.5A	−5V/0.7A		2.9×4.8×6.97	ECV12D1.7
40.8W	+12V/1.7A	−12V/1.7A		2.9×4.8×6.97	ECV12D1.7
45W	+15V/1.5A	−15V/1.5A		2.9×4.8×6.97	ECV12D1.7
58W	+12V/4A	+5V/2A		3.3×4.8×6.97	ECV151
81.6W	+12V/3.4A	−12V/3.4A		3.3×4.8×9.37	ECV12D3.4
90W	+15V/3A	−15V/3A		3.3×4.8×9.37	ECV12D3.4
120W	+12V/5A	−12V/5A		3.2×4.9×14	EC12D5
22W	5V/2A	12 to 15V/0.4A	−12 to −15V/0.4A	2.0×4.0×6.50	ETV251
22W	5V/2A	12 to 15V/0.4A	−5V/0.2A	2.0×4.0×6.50	ETV251
39W	5V/3A	12 to 15V/0.8A	−12 to −15V/0.8A	2.9×4.0×10.2	ETV351
39W	5V/3A	12 to 15V/0.8A	−5V/0.4A	2.9×4.0×10.2	ETV351
60W	5V/6A	12 to 15V/1A	−12 to −15V/1A	3.3×4.8×9.02	ETV401
60W	5V/6A	12 to 15V/1A	−5V/0.4A	3.3×4.8×9.02	ETV401
75W	5V/6A	12 to 15V/1.5A	−12 to −15V/1.5A	3.3×4.8×11.0	ETV451
75W	5V/6A	12 to 15V/1.5A	−5V/0.7A	3.3×4.8×11.0	ETV451
85W	5V/8A	12 to 15V/1.5A	−12 to −15V/1.5A	3.3×4.8×11.0	ETV551
85W	5V/8A	12 to 15V/1.5A	−5V/0.7A	3.3×4.8×11.0	ETV551
105W	5V/12A	12 to 15V/1.5A	−12 to −15V/1.5A	3.3×4.8×14.2	ETV651
105W	5V/12A	12 to 15V/1.5A	−5V/0.7A	3.3×4.8×14.2	ETV651
105W	5V/12A	+15V/3A	−15V/3A	4.9×4.9×16.8	ETV602

Output #1 is main output

SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Österreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

AT&T Microelectronics

POWER SUPPLIES dc

Board-Mounted Power Modules

AT&T's FE Series Board-Mounted Power Modules are a new and fast-growing family of dc-dc converters manufactured at AT&T's one million-square-foot facility in Dallas, Texas.

AT&T Power Range 0.5 W to 150 W

AT&T board-mounted power modules offer low-profile, high-power-density, off-the-shelf, dc-dc power conversion in module sizes of 0.5 W to 150 W. Known for reliability, AT&T board-mounted power modules feature a variety of design options with typical power efficiencies in excess of 80%.

Distributed Power Architecture for the '90s

Developed by AT&T Bell Laboratories to reduce the high first-cost of providing power and ensuring system reliability, distributed power architecture allows you to partition your system load into separate and distinct service groups, each with its own power conversion unit. Power modules are placed precisely where power conversion is needed. Distributed power architecture eliminates the need for both a large, multi-output power supply and power supply redundancy to gain system reliability. AT&T board-mounted power modules allow your computer and telecommunications applications to keep pace with power conversion trends throughout the '90s.

Features

- Electronic on/off
- Remote sensing
- Overcurrent protection
- Overvoltage protection
- Isolated and non-isolated models
- Input/output filtering
- External synchronization
- Well-regulated output voltage
- Wide operating temperature ranges
- Three-year warranty

Applications

- Telecommunications
- Data processing systems
- Industrial electronics
- Test and measurement systems
- Uninterruptible power systems
- Aeronautics
- Robotics

Data Sheets Fast!

Full technical details on all products are available in data sheet and catalog form via mail or fax.

For additional information, contact your AT&T Account Manager or the following:
☐ AT&T Microelectronics, Dept. 52AL040420, 555 Union Blvd., Allentown, PA 18103 **1-800-372-2447** (In Canada, **1-800-553-2448**)

AT&T Microelectronics

POWER SUPPLIES dc

Board-Mounted Power Modules

Low Power Product Matrix (0.5 W to 50 W)

Part Number	Nominal Input (Vdc)	Input Range (Vdc)	Output Voltage (Vdc)*	Output Current (IA)	Power, Watts (W)	Height (in.)	Length (in.)	Width (in.)	Ambient Temp. (°C)
112A2	5	4.5—5.5	12	0.041	0.5	0.440	0.96	0.70	−40 to +85
112C2	5	4.5—5.5	15	0.100	1.5	0.440	0.96	0.70	−40 to +85
112D2	5	4.5—5.5	25	0.030	0.75	0.440	0.96	0.70	−40 to +85
112E2	5	4.5—5.5	12	0.125	1.5	0.440	0.96	0.70	−40 to +85
113A2	5	4.5—5.5	−5	0.100	0.5	0.440	0.96	0.70	−40 to +85
113B2	5	4.5—5.5	−12	0.063	0.75	0.440	0.96	0.70	−40 to +85
113C2	5	4.5—5.5	−15	0.050	0.75	0.440	0.96	0.70	−40 to +85
113E2	5	4.5—5.5	−130	0.0005	0.065	0.440	0.96	0.70	−40 to +85
113F2	5	4.5—5.5	−5	0.300	1.5	0.440	0.96	0.70	−40 to +85
113G2	5	4.5—5.5	−12	0.125	1.5	0.440	0.96	0.70	−40 to +85
MC005A	28	18—36	5	1.0	5	0.460	2.000	1.100	−40 to +85
MC005B	28	18—36	12	0.42	5	0.460	2.000	1.100	−40 to +85
MC005C	28	18—36	15	0.33	5	0.460	2.000	1.100	−40 to +85
MC005BK	28	18—36	±12	0.21	5	0.460	2.000	1.100	−40 to +85
MC005CL	28	18—36	±15	0.17	5	0.460	2.000	1.100	−40 to +85
ME005A	48	39.5—60	5	1.0	5	0.460	2.000	1.100	−40 to +85
ME005B	48	39.5—60	12	0.42	5	0.460	2.000	1.100	−40 to +85
ME005BK	48	39.5—60	±12	0.21	5	0.460	2.000	1.100	−40 to +85
ME005C	48	39.5—60	15	0.33	5	0.460	2.000	1.100	−40 to +85
ME005CL	48	39.5—60	±15	0.17	5	0.460	2.000	1.100	−40 to +85
MW005A	48	36—72	5	1.0	5	0.460	2.000	1.100	−40 to +85
MW005B	48	36—72	12	0.42	5	0.460	2.000	1.100	−40 to +85
MW005BK	48	36—72	±12	0.21	5	0.460	2.000	1.100	−40 to +85
MW005C	48	36—72	15	0.33	5	0.460	2.000	1.100	−40 to +85
MW005CL	48	36—72	+15	0.17	5	0.460	2.000	1.100	−40 to +85
MC010A	48	36—72	5	2.0	10	0.500	2.000	1.600	−40 to +85
MC010B	48	36—72	12	0.83	10	0.500	2.000	1.600	−40 to +85
MC010BK	48	36—72	±12	0.43	10	0.500	2.000	1.600	−40 to +85
MC010C	48	36—72	15	0.67	10	0.500	2.000	1.600	−40 to +85
MC010CL	48	36—72	±15	0.33	10	0.500	2.000	1.600	−40 to +85
MW010A	48	36—72	5	2.0	10	0.500	2.000	1.600	−40 to +85
MW010B	48	36—72	12	0.83	10	0.500	2.000	1.600	−40 to +85
MW010BK	48	36—72	±12	0.43	10	0.500	2.000	1.600	−40 to +85
MW010C	48	36—72	15	0.67	10	0.500	2.000	1.600	−40 to +85
MW010CL	48	36—72	±15	0.33	10	0.500	2.000	1.600	−40 to +85
ME010A	48	40—60	5	2.0	10	0.500	2.000	1.600	−40 to +85
ME010B	48	40—60	12	0.83	10	0.500	2.000	1.600	−40 to +85
ME010BK	48	40—60	±12	0.43	10	0.500	2.000	1.600	−40 to +85
ME010C	48	40—60	15	0.67	10	0.500	2.000	1.600	−40 to +85
ME010CL	48	40—60	±15	0.33	10	0.500	2.000	1.600	−40 to +85
912A	48	40—60	12	1.0	12	0.610	3.000	2.200	0 to 70
915AW	48	40—60	5	3.0	15	0.500	2.700	2.100	−40 to +85
FC020A	28	18—36	5	4.0	20	0.500	3.620	1.900	−40 to +85
FC020B	28	18—36	12	1.67	20	0.500	3.620	1.900	−40 to +85
FC020C	28	18—36	15	1.33	20	0.500	3.620	1.900	−40 to +85
FE008AJ	48	39.5—60	5	1.2	8	0.500	2.000	2.000	−40 to +85
FE020A	48	40—60	5	4.0	20	0.500	3.620	1.900	−40 to +85
FE020B	48	40—60	12	1.67	20	0.500	3.620	1.900	−40 to +85
FE020C	48	40—60	15	1.33	20	0.500	3.620	1.900	−40 to +85
ME025ABK	48	40—60	5, ±12	4.0, 0.2	25	0.500	4.290	2.610	0 to 60
984A	48	40—60	5	6.0	30	0.750	3.630	2.030	−40 to +70
984D	48	40—60	12	2.5	30	0.750	3.630	2.030	−40 to +70
984B	48	40—60	5.2	6.0	31	0.750	3.630	2.030	−40 to +70

* Other voltages available.

For additional information, contact your AT&T Account Manager or the following:
☐ AT&T Microelectronics, Dept. 52AL040420, 555 Union Blvd., Allentown, PA 18103 **1-800-372-2447** (In Canada, **1-800-553-2448**)

AT&T Microelectronics

POWER SUPPLIES dc

Board-Mounted Power Modules

High Power Product Matrix (50 W to 150 W)

Features

- UL recognized (some models in submittal stage)
- Meets FCC Class A
- Operating case temperature up to 90 °C
- Calculated MTBF of over 1 million hours
- Parallel for load sharing or true N+1 redundancy
- Hot insertion/extraction
- 25 watts per cubic inch
- Remote sense
- Remote ON/OFF
- Current limit, overvoltage protection

Part Number	Nominal Input (Vdc)	Input Range (Vdc)	Output Voltage (Vdc)*	Output Current (I_A)	Power, Watts (W)	Height (in.)	Length (in.)	Width (in.)	Case Temp. (°C)
FC050F	28	18—36	3.3	10.0	33	0.500	4.800	2.500	0 to 90
FC050A	28	18—36	5	10.0	50	0.500	4.800	2.500	0 to 90
FC050B	28	18—36	12	4.2	50	0.500	4.800	2.500	0 to 90
FC100A	28	18—36	5	20.0	100	0.500	4.800	2.500	0 to 90
FC100B	28	18—36	12	8.3	100	0.500	4.800	2.500	0 to 90
FC150A	28	18—36	5	30.0	150	0.500	4.800	2.500	0 to 90
FC150B	28	18—36	12	12.5	150	0.500	4.800	2.500	0 to 90
FC150D	28	18—36	2	30.0	60	0.500	4.800	2.500	0 to 90
FC150F	28	18—36	3.3	30.0	100	0.500	4.800	2.500	0 to 90
FC100F	28	18—36	3.3	20.0	66	0.500	4.800	2.500	0 to 90
FE050F	48	40—60	3.3	10.0	33	0.500	4.800	2.500	0 to 90
FE050A	48	40—60	5	10.0	50	0.500	4.800	2.500	0 to 90
FE050B	48	40—60	12	4.2	50	0.500	4.800	2.500	0 to 90
FE100A	48	40—60	5	20.0	100	0.500	4.800	2.500	0 to 90
FE100B	48	40—60	12	8.3	100	0.500	4.800	2.500	0 to 90
FE150A	48	40—60	5	30.0	150	0.500	4.800	2.500	0 to 90
FE150B	48	40—60	12	12.5	150	0.500	4.800	2.500	0 to 90
FE150D	48	40—60	2	30.0	60	0.500	4.800	2.500	0 to 90
FE150F	48	40—60	3.3	30.0	100	0.500	4.800	2.500	0 to 90
FE100F	48	40—60	3.3	20.0	66	0.500	4.800	2.500	0 to 90
FE150H	48	40—60	24	6.25	150	0.500	4.800	2.500	0 to 90

* Other voltages available.

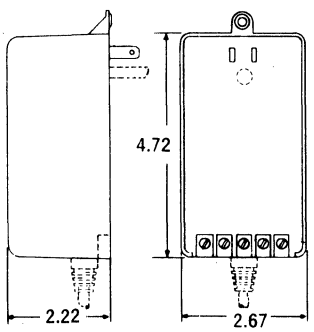
AT&T Built-in Quality

AT&T has built a reputation for technical excellence and a commitment to quality and reliability. We back our board-mounted power modules with our three-year warranty and quality commitment, a commitment for reliability and on-time delivery of the finished product.

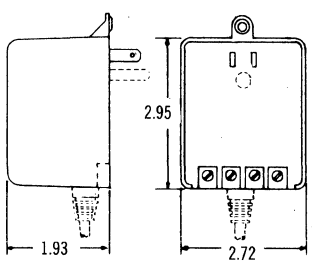
For additional information, contact your AT&T Account Manager or the following:
☐ AT&T Microelectronics, Dept. 52AL040420, 555 Union Blvd., Allentown, PA 18103 **1-800-372-2447** (In Canada, **1-800-553-2448**)

AULT INCORPORATED
EXTERNAL POWER SPECIALIST

SWITCHER CASE SIZE LP8
5.87" ×3.40" ×2.00



CASE SIZE "7"



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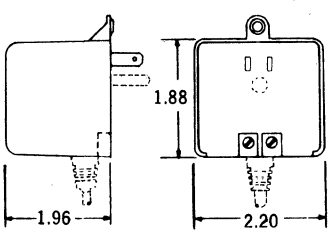

CASE SIZE "3"

WE POWER INNOVATION

EXTERNAL SWITCHER SPECIFICATIONS

SINGLE OUTPUT UNITS

MODEL	INPUT VOLTS	OUTPUT VOLT.	OUTPUT CURRENT	REGULATION %	RIPPLE MV P-P
9305-000-4XX	120	+ 5.0	5.0	4	50 MV P-P
9312-000-4XX	120	+12.0	2.0	2	50 MV P-P
9348-000-4XX	120	+48	0.5	2	50 MV P-P < 20 dBm
S60A SERIES	120	+48	1.25	2	50 MV P-P <30 dBm
SW106	90-264	+ 5	5.0	1	50 MV P-P
SW101	90-264	+12	3.5	1	100 MV P-P
SW103	90-264	+16	2.8	1	100 MV P-P
SW105	90-264	+24	2.0	1	100 MV P-P

MULTIPLE OUTPUT UNITS

MODEL	INPUT VOLTS	OUTPUT VOLT.	OUTPUT CURRENT	REGULATION %	RIPPLE MV P-P
9712-000-4XX	120	+12.0 −12.0	1.0 MAX 1.0 MAX	10 10	100 MV P-P 100 MV P-P
SA300 SERIES	120	+5.0 +12.0 −12.0	4.0 MAX 1.0 MAX 0.6 MAX	1 -5 6	50 MV P-P 100 MV P-P 100 MV P-P
		25 WATTS TOTAL MAXIMUM			
SW305 SERIES	90-264	+5.0 +12.0 −12.0	2.0 MAX 0.8 MAX 0.5 MAX	4 -5,-10 6	50 MV P-P 100 MV P-P 100 MV P-P
		17 WATTS TOTAL MAXIMUM			
SW300 SERIES	90-264	+5.0 +12.0 −12.0	4.0 MAX 1.0 MAX 0.6 MAX	1 5 6	50 MV P-P 100 MV P-P 100 MV P-P
		25 WATTS TOTAL MAXIMUM			
SW308 SERIES	90-264	+5.0 +12.0 −12.0	5.0 MAX 2.0 MAX 0.6 MAX	1 2 6	50 MV P-P 100 MV P-P 100 MV P-P
		50 WATTS TOTAL MAXIMUM			

Input: 90-130 VAC/47 to 63 Hz or 90-264 VAC/47 to 63 Hz
Operating Temperature: 0° to +50°C
Transient Response: 500 microseconds for 50% load change typical.
Protection: Overcurrent and short circuit protected, 5V overvoltage crowbar, automatic resetting from overcurrent.
EMI: Meets FCC Docket 20780 Class B and VDE 0871 Class B.
Enclosure: High impact resistant molded lexan plastic.
Weight: 13–20 oz.
Hold-up Time: 20–120 MS
Storage Temperature: −30 to +85°C
Safety Agencies: UL, CSA, TUV, B.S.I., IEC950
Warranty: 1 or 2 years
Short Circuit Protection: Indefinite at 50°C
Relative Humidity: 5% to 80% non-condensing

External transformers, battery chargers, linear and switching power supplies provide several advantages over conventional built in power sources as listed below:

FEATURES

- Wall plug-in and desktop styles
- Single and multiple output models available
- UL Listed safety agency approved
- Impact resistant Lexan thermoplastic enclosure
- AC blades zinc plated solid brass with tapered tip
- Available with input and/or output cord(s) and connector
- One or two year Warranty
- Sealed construction
- Private label hot stamping available
- Some available with 230V/50 Hz input for European use

BENEFITS

- Eliminate UL considerations because hazardous voltages are kept out of your product
- Increase space for other components in your product
- Increase aesthetic appearance and portability by reducing the size and weight of your product
- Keep power source heat out of your product for increased life
- Tamperproof power source
- Reduce design time for your product
- International uniformity of your product

BATTERY CHARGERS

Battery chargers for Gel-Cel and Sealed Lead Acid batteries are available in 6, 12 and 24 volt charge models for fixed voltage (float) and automatic fast charge applications. NiCd chargers also available.

FLOAT STYLE

BATTERY VOLTAGE	MAXIMUM FAST CHARGE	VOLTAGE AT END OF CHARGE	RATED CURRENTS AVAILABLE		CASE SIZE** (SAME ORDER)
			UL 1310	UL 544	
6	None	6.9	.4, .6	.4, .5	3, 5, 3, 5
12	None	13.8	.3, .5	.3, .375	3, 5, 3, 5
24	None	27.6	.2	.2	3, 3

AUTOMATIC FAST CHARGE

	TYPE 1*	TYPE 2*				
6	7.2	7.45	6.9	.4, .6, 1.5, 3.0	.4, .5	3, 5, 7, 7, 3, 5
12	14.4	14.9	13.8	.3, .5, 1.25, 2.75	.3, 3.75	3, 5, 7, 7, 3, 5
24	28.8	29.8	27.6	.25, .5, 1.5	.2	3, 7, 7, 3

* Type 1: For Gel Cell Batteries. Type II: For Sealed Lead Acid Batteries.
** Case sizes are listed in the same order as the rated currents.

AULT INCORPORATED
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STANDARDS MODIFIED CUSTOMS

AULT INCORPORATED
EXTERNAL POWER SPECIALIST

CONSIDER THE ADVANTAGES OF EXTERNAL POWER

LINEAR DC POWER SUPPLIES

UL Listed, Input Voltage: 105-129 VAC, 60 Hz

Operating Temperature: 0° to +40°C
All UL Listed

SINGLE OUTPUT MODELS
10 MV RMS Ripple, ±5% Overall Reg.

MODEL	OUTPUT VDC	AMPS	CASE SIZE
3305-000-400	+5	.3	3
5305-000-400	+5	.5	5
7305-000-400	+5	1.25	7
H405-000-400	+5	3.0	7
7306-000-400	+6	1.2	7
3312-000-400	+12	.12	3
5312-000-400	+12	.4	5
7312-000-400	+12	.8	7
5324-000-400	+24	.25	5
7324-000-400	+24	.5	7
5348-000-400	+48	.1	5
7000-348-400	+48	.25	7

MULTIPLE OUTPUT MODELS-LINEAR
10 MV RMS RIPPLE, ±5% Overall Reg.

MODEL	OUTPUT VDC	AMPS	CASE SIZE
5712-000-400	±12	.2 ea.	5
5000-712-400	±12	.30 ea.	5
7712-000-400	±12	.4 ea.	7
5715-000-400	±15	.15 ea.	5
5324-110-400	24 10 VAC	.2 .1	5
5712-305-401	+5 ±12	.5 .130 ea.	5
7712-305-401	+5 ±12	.6 .2 ea.	7
7612-305-401	+5 ±12	1.0 .25 ea.	7
H712-305-401	+5 ±12	2.0 .20 ea.	7

OPTIONS: Input cord, output cord, output connector, ground pin, hot stamping, 220 VAC/50 Hz.

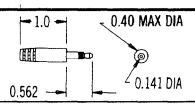
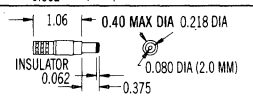
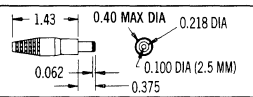
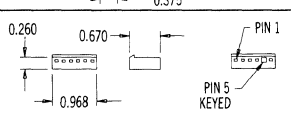
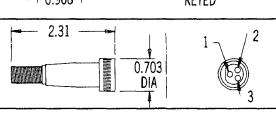
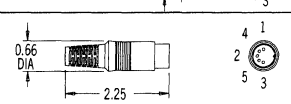
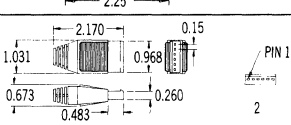
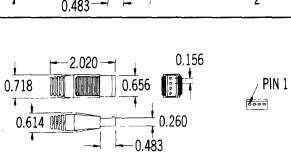
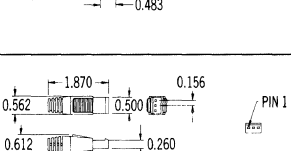
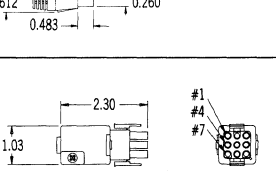
SINGLE OUTPUT MODELS
Unregulated-Filtered/3.2 V.P.P. RIPPLE

MODEL	OUTPUT VDC	AMPS	CASE SIZE
3312-000-000	12	.35	3
5312-000-000	12	1.2	5
5323-000-000	23	.5	5
5316-000-000	16	.8	5
7323-000-000	23	1.0	7

AC TRANSFORMERS—U.S. AND EUROPEAN WALL PLUG-IN OR DUAL CORD STYLES
The following are all available with optional input cord, output cord, connectors, earth ground, center tap and custom hot stamped with your company logo. Standard models have output screw terminals. All versions are UL 1310 listed, some are CSA Approved.

VA	VOLTAGES AVAILABLE	CASE SIZE
7.5	24	3
9.6	24	3
10	6, 7, 10, 12, 14, 16, 18, 20, 22, 24	3
11.3	22.5	3
12	18.5	3
16	10, 12, 14, 16, 18, 20, 22, 24	3
20	12, 14, 16, 18, 22, 24	3
40	10, 12, 14, 16, 18, 20, 24, 26	5

OUTPUT CONNECTORS

MODEL NO.	PROFILE & DIMENSIONS	PINOUT CODE	DESCRIPTION	MATING CONNECTOR
1		Tip: positive. Sleeve: negative	Switchcraft 750 plug	Switchcraft #41 jack
2		Center contact: positive	Switchcraft S760 plug	Switchcraft #722A or National Teltronics 6-205P-1 right angle P.C. mount
3		Center contact: positive	Switchcraft 760 plug	Switchcraft #712A jack
4		(1) Gnd (2) Com (3) +5V (4) −12V (5) Key (6) +12V	6-pin Molex connector (Housing 26-03-4061; Terminals 08-50-0187)	0.045 square pin on 0.156 centers. (Ref: Molex Series 2420, 2630)
6		(1) Gnd (2) Pos (3) Neg	3-pin female Slim-Line Series	Switchcraft SL Series
12		(1) Com (2) Gnd (3) +5V (4) −12V (5) +12V	5-pin DIN 180° male connector	Various styles of straight or right angle panel or p.c. mounted DIN connectors
17		(1) Gnd (2) Com (3) +5V (4) −12V (5) Key (6) +12V	6-pin overmolded Molex connector (Housing 26-03-4061; Terminals 08-50-0187)	0.045 square pin on 0.156 centers. (Ref: Molex Series 2420, 2630)
20		TRANSFORMER: (1) Gnd (2) AC (3) AC (4) CT POWER SUPPLY: (1) DC (2) Com (3) DC (4) Gnd	4-pin overmolded Molex connector (Housing 26-03-4041; Terminals 08-50-0187)	0.045 square pin on 0.156 centers. (Ref: Molex Series 2420, 2630)
21		TRANSFORMER: (1) AC (2) Gnd (3) AC POWER SUPPLY: (1) DC (2) Com (3) Gnd	3-pin overmolded Molex connector (Housing 26-03-4030; Terminals 08-50-0187)	0.045 square pin on 0.156 centers. (Ref: Molex Series 2420, 2630)
26		(1) +5V (2) +5V (3) −12V (4) (5) (6) Gnd (7) Com (8) Com (9) −12V	9-pin Amp Mate-N-Lok Connector	Amp 641971-1 pin header assembly

▲ Contact Factory for Exact Wire Size, Length & Insulation Color For Your Specific Application

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AUTEC POWER SYSTEMS

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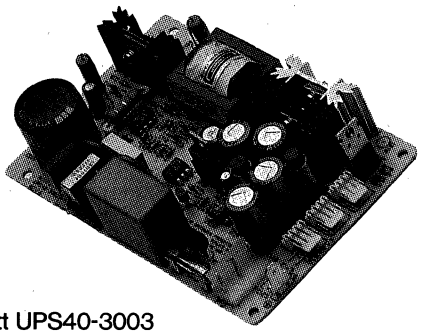
Fax: (818) 341-5726

WE OFFER ...

- High Volume, Low Cost Manufacturing.
- 90-260 VAC (continuous) Universal Input.
- Consistent On-Time Delivery.
- Adherence to Industry Standards.
- Extensive Engineering Capabilities.
- Rapid Turn-Around on Custom Products.

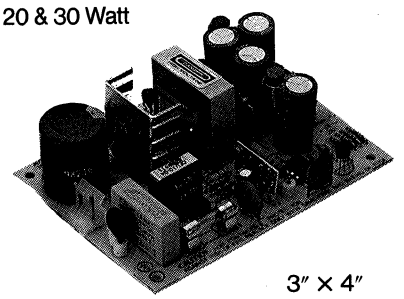


40 Watt UPS40-3003

SINGLE OUTPUT MODELS

MODEL NUMBER	PWR	OUTPUT 1	DIMENSIONS (INCHES)	MOUNTING HOLES
UPS40-2051	40	5V @ 8.0A	3.00 x 5.00 x 1.25	4.55" x 2.55"
UPS40-2091	40	9V @ 4.4A	3.00 x 5.00 x 1.25	4.55" x 2.55"
UPS40-2121	40	12V @ 3.5A	3.00 x 5.00 x 1.25	4.55" x 2.55"
UPS40-2151	40	15V @ 2.5A	3.00 x 5.00 x 1.25	4.55" x 2.55"
UPS40-2241	40	24V @ 1.5A	3.00 x 5.00 x 1.25	4.55" x 2.55"
UPS65-1051	65	5V @ 13.0	3.50 x 6.00 x 1.54	4.80" x 3.15"
UPS65-1121	65	12V @ 5.5A	3.50 x 6.00 x 1.54	4.80" x 3.15"
UPS65-1151	65	15V @ 4.5A	3.50 x 6.00 x 1.54	4.80" x 3.15"
UPS65-1241	65	24V @ 2.8A	3.50 x 6.00 x 1.54	4.80" x 3.15"

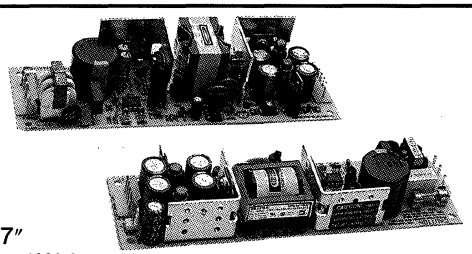
20 & 30 Watt



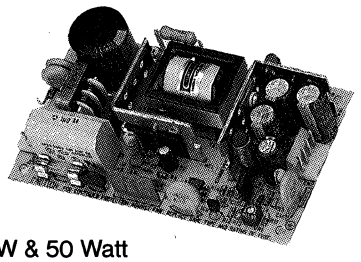
3" x 4"

20 WATT THRU 50 WATT DUAL & TRIPLE OUTPUT MODELS

MODEL NUMBER	PWR	OUTPUT 1	OUTPUT 2 (Peak)	OUTPUT 3	DIMENSIONS (INCHES)	MOUNTING HOLES
UPS20-2002	20	5V @ 1.0A	12V @ 1.5A (3.0A)		3.00 x 5.00 x 1.20	4.55" x 2.55"
UPS20-5002	20	5V @ 1.6A	12V @ 1.0A (2.0A)		3.00 x 4.00 x 1.20	3.56" x 2.62"
UPS25-1002	25	5V @ 1.0A	12V @ 1.5A (3.0A)		2.00 x 8.00 x 1.00	6.60" x 1.60"
UPS30-4003	30	5V @ 1.5A	12V @ 1.5A (3.0A)	-12V @ 0.3A	5.12 x 2.76 x 1.30	4.72" x 2.36"
UPS30-5002	30	5V @ 1.7A	12V @ 1.8A (3.0A)		3.00 x 4.00 x 1.50	3.56" x 2.62"
UPS40-1002	40	5V @ 3.0A	12V @ 2.0A (4.5A)		2.00 x 7.00 x 1.20	6.60" x 1.60"
UPS40-2002	40	5V @ 3.0A	12V @ 2.0A (4.5A)		3.00 x 5.00 x 1.20	4.55" x 2.55"
UPS40-2003	40	5V @ 3.0A	12V @ 2.0A (4.5A)	-12V @ 0.3A	3.00 x 5.00 x 1.20	4.55" x 2.55"
UPS40-3003	40	5V @ 3.0A	12V @ 2.0A (4.5A)	-12V @ 0.3A	5.40 x 3.55 x 1.24	4.82" x 3.15"
UPS50-1002	50	5V @ 3.0A	12V @ 3.0A (5.0A)		2.00 x 7.00 x 1.57	6.60" x 1.60"
UPS51-2002	50	5V @ 4.0A	12V @ 3.0A (5.0A)		3.00 x 5.00 x 1.20	4.55" x 2.55"



2" x 7"
30W, 40W & 50 Watt



3" x 5"
20W, 40W & 50 Watt

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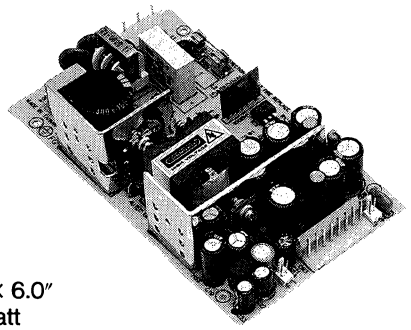
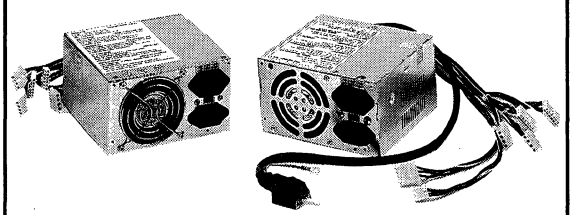


3.5″ × 6.0″
65 Watt



PC SERIES

E133148
UL1950

LR89164
1402C
LEVEL 3

TÜV Rheinland R98290
IEC950

VDE EN60950
APPROVAL ON
65 WATT MODELS

65 WATT MULTIPLE OUTPUT MODELS

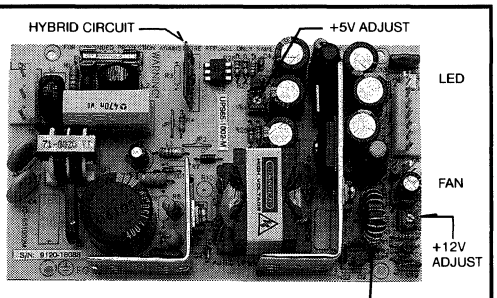
DIMENSIONS: 6.0″ × 3.5″ × 1.54″
MOUNTING: 4.80″ × 3.15″

MODEL NUMBER	OUTPUT 1	OUTPUT 2 (Peak)	OUTPUT 3	OUTPUT 4
UPS65-1002	5V @ 3.50A	12V @ 4.0A (7.0A)		
UPS65-1002-M	5V @ 3.50A	12V @ 4.0A (7.0A)		
UPS65-1004	5V @ 5.5A	12V @ 2.5A (6.0A)	−12V @ 0.5A	−5V @ 0.5A
UPS65-1004-1	5V @ 5.5A	15V @ 2.0A (4.0A)	−15V @ 1.0A	−5V @ 1.0A
UPS65-1004-2	5V @ 5.5A	12V @ 2.5A (6.0A)	−12V @ 1.0A	−5V @ 1.0A
UPS65-1004-C	5V @ 5.5A	15V @ 1.2A (2.0A)	−12V @ 1.0A	24V @ 0.51A (0.75A)

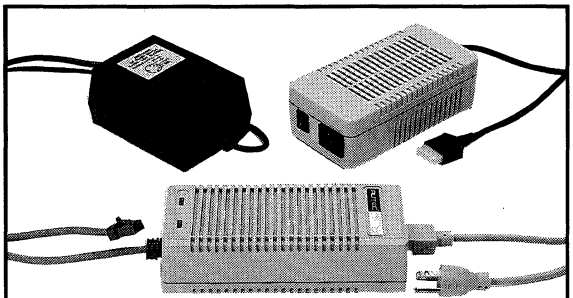
PC POWER SUPPLIES

DIMENSIONS: BABY AT – 5.90″ × 5.51″ × 3.385″
STANDARD AT AND TOWER CASE SIZES ALSO AVAILABLE

MODEL NUMBER		OUTPUT 1	OUTPUT 2 (Peak)	OUTPUT 3	OUTPUT 4
PC150-B111	150	5V @ 15A	12V @ 6A (9A)	−12V @ 0.5A	−5V @ 0.5A
PC200-B111	200	5V @ 20A	12V @ 8A (11A)	−12V @ 0.5A	−5V @ 0.5A
A3200BAK08	200	5V @ 20A	12V @ 8A (11A)	−12V @ 0.5A	−5V @ 0.5A
PC250-B111	250	5V @ 26A	12V @ 9A (12A)	−12V @ 0.5A	−5V @ 0.5A



65 Watt MAG-AMP
UPS65-1002-M



PLASTIC ADAPTER POWER SUPPLIES

AUTEC POWER SYSTEMS

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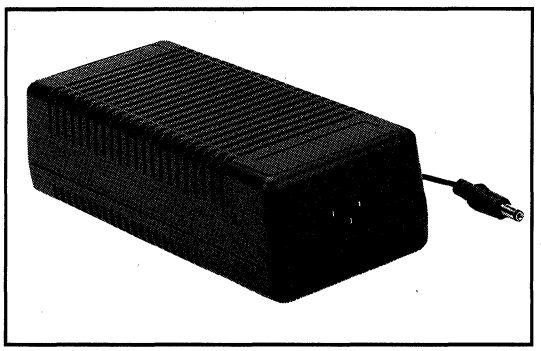
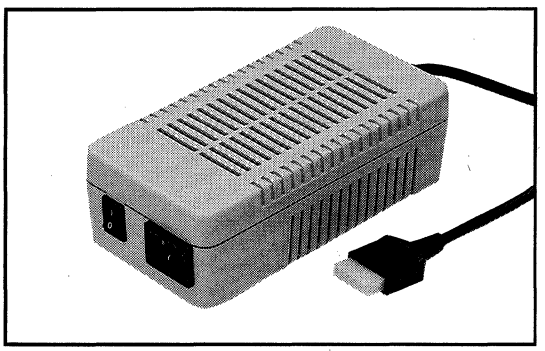
PLASTIC ADAPTER POWER SUPPLIES

- 90 - 260 VAC (Continuous) UNIVERSAL INPUT
- DPDT ON/OFF SWITCH (VDE approved)
- UL LISTED, CSA CERTIFIED, TUV LICENSED
- CHOICE OF AC & DC CABLE (AC optional)





OUTPUT TABLE

PWR	MODEL	V1 (PEAK)	V2 (PEAK)	V3
17	LIN20-5120	+5V @ 1.0A	+12V @ 1.0A	
30	UPS30-V20P	+5V @ 2.0A	+12V @ 1.5A	
30	UPS30-230P	+5V @ 1.5A	+12V @ 1.5A	−12V @ 0.3A
30	UPS30-205P	+5V @ 6.0A (8.0A)		
30	UPS30-209P	9V @ 3.3A (4.5A)		
30	UPS30-212P	12V @ 2.5A (3.5A)		
30	UPS30-215P	15V @ 2.0A (2.7A)		
30	UPS30-224P	24V @ 1.3A (1.7A)		
54	UPS54-2009	9V @ 6.0A		
54	UPS54-2012	12V @ 4.5A		
54	UPS54-2015	15V @ 3.6A		
54	UPS54-2018	18V @ 3.0A		
54	UPS54-2018A	13.5V @ 4.0A		

DC CABLE TYPES

5 PIN DIN

3 PIN HOSIDEN

BARREL JACK

5 PIN MOLEX

OVERALL DIMENSIONS:

17W = 3.6″ × 5.2″ × 3.7″
30W = 3.6″ × 7.0″ × 2.3″
54W = 3.4″ × 7.8″ × 2.2″

NORTH AMERICAN

CONTINENTAL EUROPE

BRITISH

SWISS

ITALIAN

OPTIONAL AC CABLES

CUSTOM CABLE AND ENCLOSURE CAPABILITIES. CONSULT THE FACTORY FOR DETAILS.

AUTEC POWER SYSTEMS

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SAFETY AGENCY APPROVALS

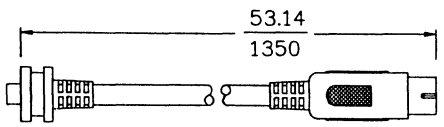
All models except LIN20-5120 have the following agency approvals:

UL 1950
LISTED 5J67
E126072

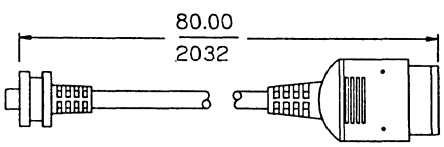
CSA 1402C
LEVEL 3
LR89164-2

IEC 950
E98416

CABLE DRAWINGS:

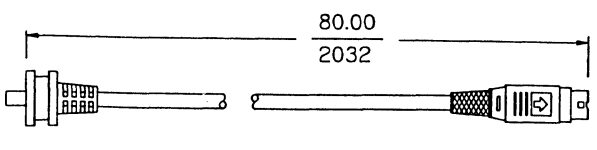


PIN	NUMBER OF OUTPUTS DUAL	TRIPLE	SINGLE	COLOR
3	+5V	+5V	+VOLT	RED
5	+12V	+12V	+VOLT	BROWN
2	GND	GND	GND	BLACK
4	GND	-12V	GND	WHITE
1	SHLD	SHLD	SHLD	SHIELD

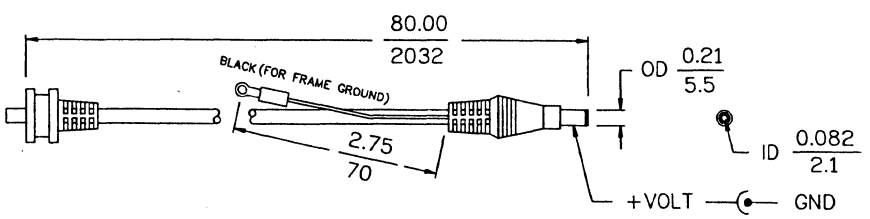


MOLEX 09-50-3051 OR EQUIVALENT

PIN	NUMBER OF OUTPUTS DUAL	TRIPLE	SINGLE	COLOR
6	+12V	+12V	+VOLT	BROWN
4	GND	-12V	GND	WHITE
3	+5V	+5V	+VOLT	RED
2	GND	GND	GND	BLACK
1	SHLD	SHLD	SHLD	SHIELD



HOSIDEN TCP 8927-63-1100 OR EQUIVALENT



ORDERING INFORMATION:

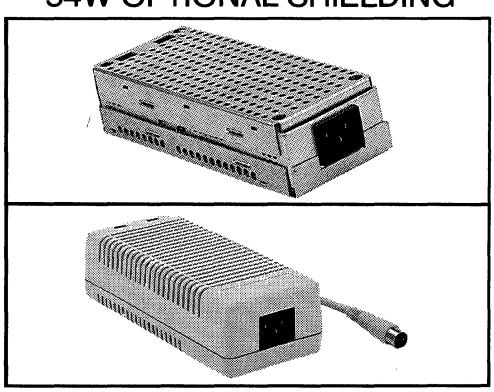
UPS30-V20P - [ ] - [ ]

DC CABLE ↑ ↑ AC CABLE

D - DIN
H - HOSIDEN
J - JACK
M - MOLEX

A - NORTH AMERICAN
B - BRITISH
C - CONTINENTAL EUROPE
D - DANISH
I - ITALIAN
J - ISRAEL
N - AUSTRALIA / NEW ZEALAND
S - SWISS

54W OPTIONAL SHIELDING

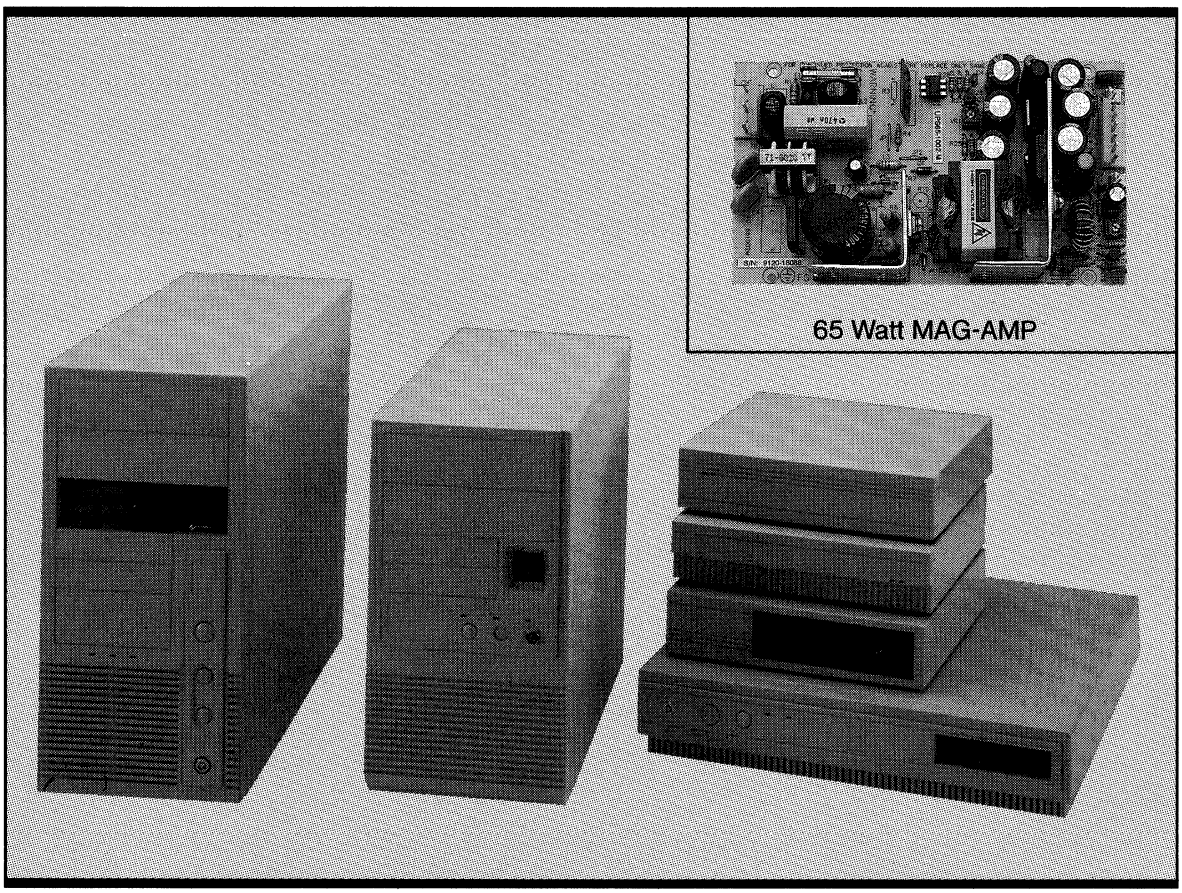


AUTEC POWER SYSTEMS

Tel: (818) 341-6123
Fax: (818) 341-5726

AUTEC'S ENCLOSURE PRODUCTS

- ZERO FOOT-PRINT EXTERNAL MAC DRIVES
- SCSI EXTERNAL DRIVE ENCLOSURES PC & MAC
- PC ENCLOSURES
- TOWER ENCLOSURES



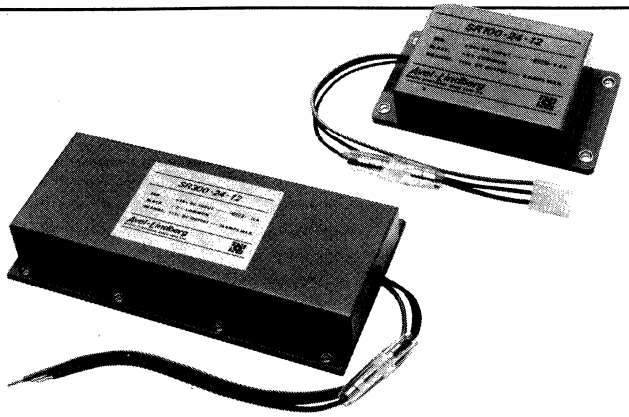
65 Watt MAG-AMP

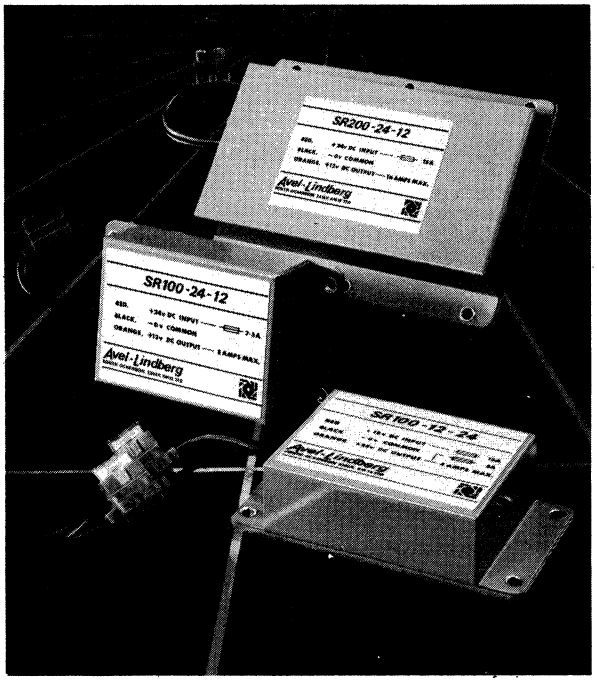
AUTEC manufactures a wide assortment of external drive enclosures and microcomputer cases. Our popular external drive enclosures come complete with all internal cabling (*AC, DC, SCSI cables*), On/Off switch, SCSI ID switch universal input power supply, LED'S and mounting hardware.

In addition, AUTEC is able to provide numerous optional external SCSI cables (*25:50, 50:50, 25:25 & SCSI II*). Power supply options range from 25 watts for a CD-ROM or DAT tape drive to a 65 watt Mag-Amp regulated power supply for high performance full height disk drives and erasable optical drives. Both open Bezel (*for tape drives*) and closed Bezel enclosures are available. The PC and Tower Enclosures can be ordered with either a 150W, 200W or 250W power supply installed.

Custom Metal and Plastic Drive Enclosures, Bezels and Cables are available, consult an Applications Engineer for details.

DC to DC Switching Regulators...Ask AVEL





Voltages: The Avel range of switching regulators offers the following combination of input to output voltage 12/12, 12/24, 24/12. From unstable input source varying as much as ± 25% an output voltage regulated to better than ± 1% is obtained no load to full load.

Protection: Output over-voltage and current limiting circuits fully protect the load on 24 to 12 volt types which are additionally protected by an input fuse. Types with 12 to 12 or 12 to 24 volt configuration are protected by an output line fuse.

Package: To ensure high reliability in hostile environments the SR series switching regulator is resin encapsulated in an all steel case. This form of construction gives complete protection from water, oil and other deleterious substances. Large easy to locate fixing holes allow fitting to vehicle chassis or body members and in marine application on bulkheads or panels. Connection is made easy via non-reversible plug.

Application: Where equipment designed for 12V d.c. operation is fitted to 24V d.c. systems on buses, trucks, marine craft. The equipment can be cellular telephones, TV monitors, video players, electronic ticket machines, route information systems.

TYPE	SR100/12/12	SR100/12/24	SR100/24/12	SR200/24/12	SR300/24/12
NOM INPUT VOLTS	12V DC	12V DC	24V DC	24V DC	24V DC
INPUT VOLTAGE RANGE	8-18V DC	10-18V DC	18-30V DC	18-30V DC	18-30V DC
OUTPUT VOLTAGE	12.5V DC For Inputs up to 13V. Otherwise 0.5V Below Input	24.5V DC	12V or 13.8V DC Other Voltages to Order	12V or 13.8V DC Other Voltages to Order	12V or 13.8V DC Other Voltages to Order
OUTPUT CURRENT (CONTINUOUS)	8A Max.	4A Max. 12A Peak	8A Max.	16A Max.	25A Max.
OUTPUT POWER	100W	100W	100W	200W	300W
OUTPUT REGULATION (LINE+LOAD)	Less than 1% up to 13V Input	<1%	<1%	<1%	<1%
EFFICIENCY	80-90%	85-90%	80-90%	80-90%	80-90%
SWITCHING FREQUENCY	100KHz	100KHz	100KHz	100KHz	100KHz
INPUT RIPPLE r.m.s.	<250mV	<250mV	<50mV	<100mV	<100mV
OUTPUT RIPPLE r.m.s.	<200mV	<200mV	<25mV	<50mV	<50mV
NO LOAD DRAIN	1W	1W	2W	2W	2W
PROTECTION—OUTPUT	FUSE	FUSE	Over-Voltage (Typ. 15V) Current Limit (Typ. 120%)	Over-Voltage (Typ. 15V) Current Limit (Typ. 120%)	Over-Voltage (Typ. 15V) Current Limit (Typ. 120%)
INPUT	FUSE	FUSE	FUSE	FUSE	FUSE
FUSE (IN LINE) INPUT	20A	20A	7.5A	10A	15A
OUTPUT	7.5A	5A	—	—	—
WEIGHT	1.54lb	1.54lb	1.54lb	3.31lb	4.4lb
SIZE	5.5″×3″×1.3″	5.5″×3″×1.3″	5.5″×3″×1.3″	7.25″×5.5″×1.3″	10″×5.5″×1.3″
OPERATING TEMPERATURE (WITHOUT ADDITIONAL HEATSINK)	−10 to +40°C At Continuous Full Power		−10 to +55°C At Continuous 70% of Full Power (or Typical Radio/Telephone Transmission Duty Cycles)		

Or, for special needs, let us quote on a custom design with competitive pricing!

Avel-Lindberg Inc.
203-355-4711 5 Old Town Park Road Unit 47
Fax: 203-354-8597 New Milford, Connecticut 06776

BK PRECISION / **AC/DC POWER SUPPLIES**
MAXTEC INTERNATIONAL CORP.
6470 W. Cortland St. • Chicago, IL 60635 • 312-889-9295 • TELEX #210017 • FAX 312-794-9740

GENERAL PURPOSE DC POWER SUPPLIES

Model 1630 $315.00
Model 1611 $295.00
Model 1610 $215.00

Model 1635 $380.00

Designed to run continuously at maximum output

Durable, lab quality supplies are fully protected
- Reverse Polarity Protection
- Overload Protection
- Thermal Protection
- Short Circuit Protection
- Current Limiting

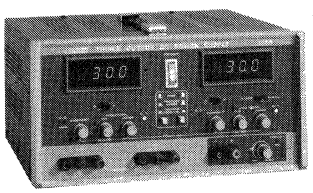
Excellent specifications
- Tight regulation
- Low ripple
- Conservatively rated for continuous operation at maximum power output without overheating

Very versatile
- Connect two supplies in parallel to double the current output
- Connect two in series to double the voltage output
- Constant current or constant voltage operation

MODEL	VOLTAGE	CURRENT
1610	0-30VDC	1A MAX.
1611	0-50	2A
1630/1635*	0-30	3A

*Model 1635 has digital LED display

TRIPLE OUTPUT DC POWER SUPPLIES



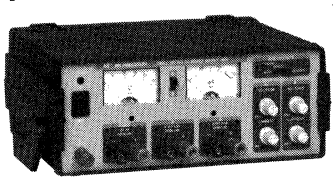
Model 1660 $629.00

- Two 0-30 VDC, 2 A sections capable of independent or tracking operation (Master & Slave)
- One 4-6.5 VDC, 5 A section
- Switchable series/parallel operation—30 V sections
- Adjustable current limit controls—30 V sections
- Two 3½ digit LED displays—one reads volts or amps of "slave" supply—one reads volts or amps of "master" supply or 4V-6.5 V supply.
- Constant current and constant voltage indicators—30 V sections

SPECIFICATIONS

Output Voltage Rage: 0V (+0/–30mV) to 30V + (3% to 7%) (Master & Slave)
Output Current Limit Range: 0A (+0/–30mA) to 2A + (3% to 7%) (Master & Slave)
Ripple: RMS (c.v.) ≤1mV (Master & Slave)
Load Regulation: (Constant Current) ≤0.2% + 3mA (Master & Slave)
Power Requirements: 110/120/220/240 VAC ≤10%, 50/60 Hz
Power Consumptin: Fully loaded approx. 320W
Protection: Reverse polarity and current limiting
Dimensions: (H x W x D): 12.4 x 15 x 6.5" (315 x 381 x 165 mm)
Weight: 22 lbs (10 kg)

NEW



Model 1651 $395.00

- Two 0 to 24 VDC outputs (0.5A)
- One fixed 5V output (4A)
- Independent or tracking operation
- Adjustable current limiting
- Designed to operate continuously at rated output
- Short circuit protection, overload protection, reverse polarity protection
- Connect outputs in series for higher voltage output or in parallel for higher current output (switch selectable)

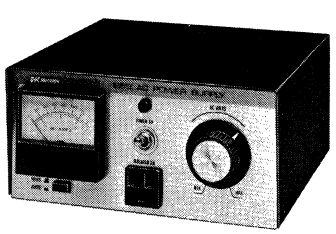
SPECIFICATIONS

MAIN SUPPLIES (TWO)
Output Voltagea: 0 to 24 VDC (both supplies continuously variable)
Output Current: 0 to 500mA (variable)
Line Regulation: 0.01% + 3mV for line voltage variation of ± 10%
Load Regulation: 0.01% + 3mV
Ripple: 2mV rms

FIXED SUPPLY (ONE)
Output Voltage: 5 VDC ± 100mV
Output Current: 4 ADC Maximum
Line Regulatin: 0.1% ± 5mV for line voltage variation of ± 10%
Load Regulation: 0.1% ± 5mV
Ripple: 2mV rms

GENERAL
Power Source: 100/120/220/240 VAC ± 10%, 50/60 Hz
Dimensions: 10 x 24 x 19 cm (3.9 x 9.4 x 7/5")
Weight: 10.5 lb (4.8 kg)

ISOLATED-VARIABLE AC POWER SUPPLIES



Model 1653 $260.00

SPECIFICATIONS

Voltage Adjustment Range: 0-150 VAC, with input at 120 VAC.
Output Isolation: leakage less than 0.1 mA (25°C, 50% relative humidity).
Current Range: 0-2A
Maximum Current (Isolated): 2 A continuous
Voltage/Current Sensing: Sine wave average, calibrated in RMS.
Meter: 3½" overrange protected.
Meter Accuracy: ± 5% of full scale.
Power Requirement: 120 VAC ± 10%, 60 Hz 300 VA.
Dimensions: 21.6 x 9.5 x 20.3 cm (8.5" x 3.75" x 8")
Weight: 5.5 kg (12 lbs)

Model 1655 $459.00

SPECIFICATIONS

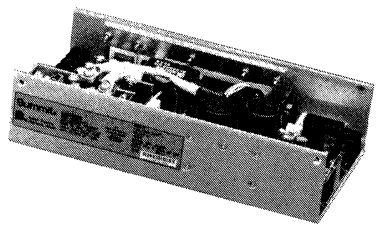
Voltage Adjustment Range: 0-150 VAC, with input at 120 VAC. **Output Isolation:** leakage less than 0.1 mA (25°C, 50% relative humidity). **Current Ranges:** 0-2 A, 0-4 A. **Maximum Current (Isolated):** 3 A continuous, 4 A intermittent (0-130 V). **Peak Current (Inrush):** 30 A max. (inrush limited to one cycle at 30 A). **Voltage Current Sensing:** Sine wave average, calibrated in RMS. **Volt-Amp Ranges:** 0-240 VA, 0-480 VA (voltage set at 120) **Leakage Range:** 0 to 5,000 microamps (expanded in 100-500 microamp portion, compressed to 5 mA full scale). **Meter:** 4½" multicolor scales, overrange protected. **Meter Accuracy:** ± 5% full scale (volts and current) ± 5% at 500 microamps (leakage) **Solder Iron Temperature Control:** 70%-99% of power line (100 W max.) **Power Requirements:** 120 VAC ± 10%, 60 Hz, 600 VA at maximum output. **Dimensions: (H x W x D):** 30.5 x 15.2 x 28.0 cm (12" x 6" x 11") **Weight:** 10 kg (22 lbs)

Summit SWITCHING POWER SUPPLIES

FROM Basler Electric

NEW 400 WATT POWER SUPPLY

- UNIVERSAL INPUT
- REMOTE INHIBIT
- RUGGEDIZED CONSTRUCTION
- FCC/VDE CLASS B FILTER



400 WATTS

Summit power supplies offer the maximum customizing capability and eliminate the need for stocking many different custom units with similar output voltage requirements—250, 300, 400, 500, and 750 watts and custom packaging.

FEATURES

- High package density
- UL/CSA/IEC/VDE/TUV Approvals
- Three to five outputs
- Adjustable auxiliary outputs
- Parallel operation
- FCC/VDE/EMI Filters

BELOW IS INFORMATION ON OUR FULL RANGE OF SWITCHING POWER SUPPLIES

MULTIPLE OUTPUT UNITS

MODELS	+5V	−5V	+12V	−12V	+15V	−15V	+24V	+12V	TOTAL POWER	L W H
LX250-U3A	40A		10A	3A*					250 Watts	10.5″ × 5″ × 2.5″
LX250-U3D	40A				3A	3A*				
LX250-U4A	40A	3A*	10A	3A*						
LX250-U4B	40A			3A*			5A	3A*		
LX250-U4C	40A		10A	3A*				3A*		
LX250-U4D	40A	3A*			3A	3A*				
LX250-U4E	40A				3A*	3A*	5A			
HX300-U3A	50A		12A	3.6A*					300 Watts	10.5″ × 5″ × 2.5″
HX300-U3D	50A				3.6A	3.6A*				
HX300-U4A	50A	3.6A*	12A	3.6A*						
HX300-U4B	50A			3.6A*			6A	3.6A*		
HX300-U4C	50A		12A	3.6A*				3.6A*		
HX300-U4D	50A	3.6A*			3.6A	3.6A*				
HX300-U4E	50A				3.6A*	3.6A*	6A			
JX400-U3A	70A		10A	5A*					400 Watts	10″ × 5″ × 2.5″
JX400-U3B	70A				8A	5A*				
JX400-U4C	70A	3A*	10A	5A*						
JX400-U4D	70A		10A	5A*			2A*			
JX400-U4E	70A		10A	5A*				3A*		
JX400-U4F	70A	3A*			8A	5A*				
JX400-U4G	70A				8A	5A*	2A*			

*May be connected as either positive or negative

GX500-5001	75A	3A	15A	15A			6A		500 Watts	Unfinned 10.00″ × 5.00″ × 2.75″ Finned 10.00″ × 5.50″ × 2.75″
GX500-5002	75A	3A	15A	15A				6A		
GX500-5003	75A	3A			15A	15A	6A			
GX500-5004	75A	3A			15A	15A		6A		
GX500-6024	75A		15A	15A						
GX500-5011	75A	8A	15A	15A			6A			Unfinned 10.00″ × 5.15″ × 2.75″ Finned 10.00″ × 5.65″ × 2.75″
GX500-5012	75A	8A	15A	15A				6A		
GX500-5013	75A	8A			15A	15A	6A			
GX500-5014	75A	8A			15A	15A		6A		
GX750-5011	120A	8A	20A	20A			15A		750 Watts	Unfinned 15.50″ × 5.15″ × 3.00″ Finned 15.50″ × 6.15″ × 3.00″
GX750-5012	120A	8A	20A	20A				15A		
GX750-5013	120A	8A			20A	20A	15A			
GX750-5014	120A	8A			20A	20A		15A		

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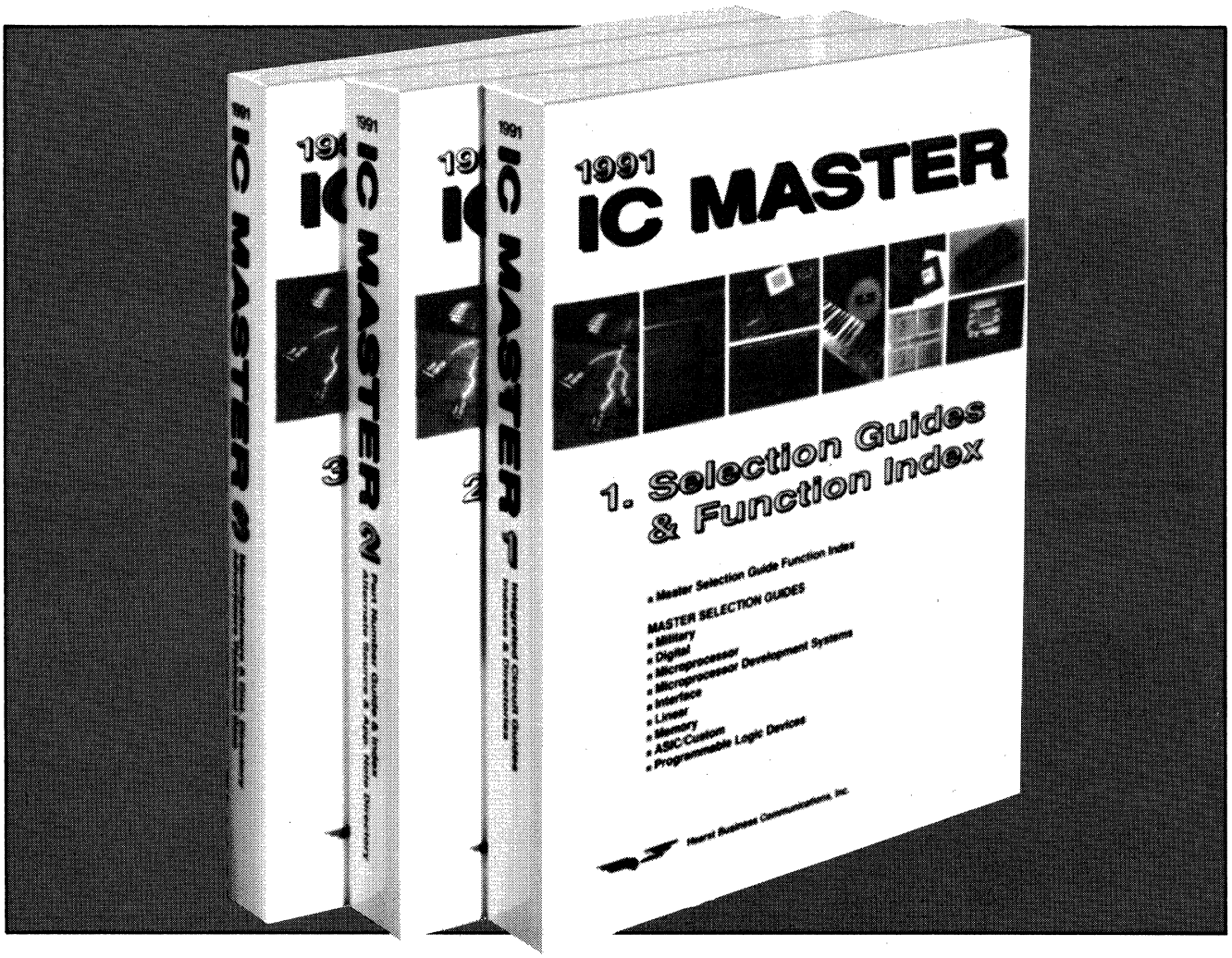

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The Master lists every single IC you can buy. Better yet, the Master lists ICs by function. You know what you want to do. The Master tells you who makes what for what you want to do.

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IC MASTER

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DC/DC CONVERTERS 0710-DIP 0730-SIP

TECHNICAL INFORMATION

GENERAL SPECIFICATIONS

Isolation Voltage	500 VDC min.
Operating Temperature Range	– 25 to 80°C
Storage Temperature Range	– 55 to 110°C
Efficiency at Full Load, 12 and 15 Volt Output Types	75% min.
Efficiency at Full Load, 5 Volt Output Types	70% min.
Isolation Resistance	10^9 Ohm min.

INPUT SPECIFICATIONS

Input Voltage Range	± 10%
Input Filter	Capacitor Type

OUTPUT SPECIFICATIONS

Voltage Accuracy	± 5%
Load Voltage Regulation (1 mA min. load)	± 10%
Line Voltage Regulation	1%/1% of Vin
Ripple and Noise, 20 MHz BW	50 mV p-p max.
Temperature Coefficient	0.03%/°C max.
Short Circuit Protection	1.0 second
Total Output Power (May be drawn from one pin)	750 mW

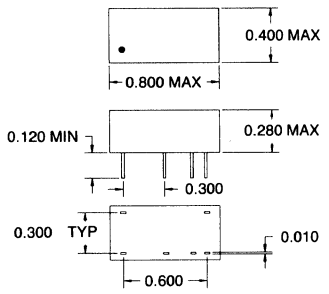

Fig. 1

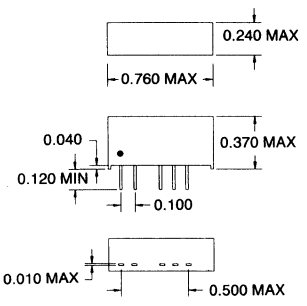

Fig. 2

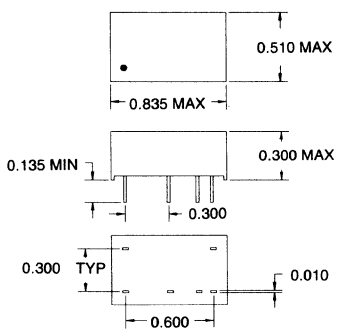

Fig. 3

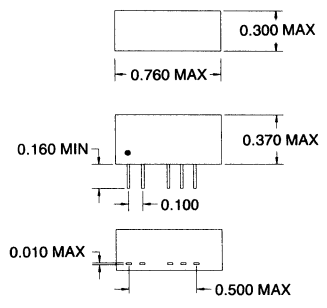

Fig. 4

Part Number	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (Each Output) (mA)	Package Type
0710-0505-00	5	± 5	75	DIP (Fig. 1)
0710-0512-00	5	±12	30	DIP (Fig. 1)
0710-0515-00	5	±15	25	DIP (Fig. 1)
0730-0505-00	5	± 5	75	SIP (Fig. 2)
0730-0512-00	5	±12	30	SIP (Fig. 2)
0730-0515-00	5	±15	25	SIP (Fig. 2)
0710-1205-00	12	± 5	75	DIP (Fig. 1)
0710-1212-00	12	±12	30	DIP (Fig. 1)
0710-1215-00	12	±15	25	DIP (Fig. 1)
0730-1205-00	12	± 5	75	SIP (Fig. 2)
0730-1212-00	12	±12	30	SIP (Fig. 2)
0730-1215-00	12	±15	25	SIP (Fig. 2)
0710-2405-00	24	± 5	75	DIP (Fig. 1)
0710-2412-00	24	±12	30	DIP (Fig. 1)
0710-2415-00	24	±15	25	DIP (Fig. 1)
0730-2405-00	24	± 5	75	SIP (Fig. 2)
0730-2412-00	24	±12	30	SIP (Fig. 2)
0730-2415-00	24	±15	25	SIP (Fig. 2)
0710-4805-01	48	± 5	75	DIP (Fig. 3)
0710-4812-01	48	±12	30	DIP (Fig. 3)
0710-4815-01	48	±15	25	DIP (Fig. 3)
0730-4805-01	48	± 5	75	SIP (Fig. 4)
0730-4812-01	48	±12	30	SIP (Fig. 4)
0730-4815-01	48	±15	25	SIP (Fig. 4)

Specifications Subject to Change Without Notice

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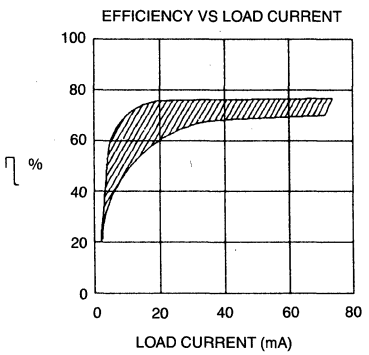
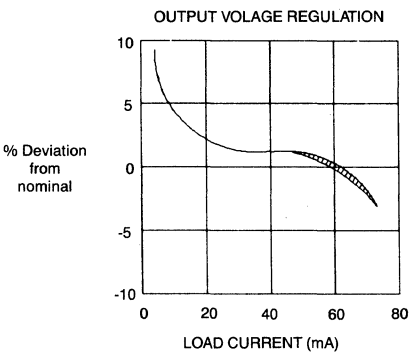
DC/DC CONVERTERS 0710-DIP 0730-SIP

±5 VOLT OUTPUT CONVERTERS





PART NUMBER

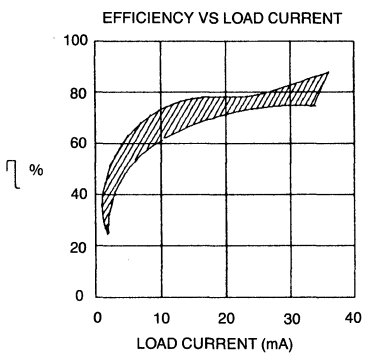
0710 - 05 15 - 00

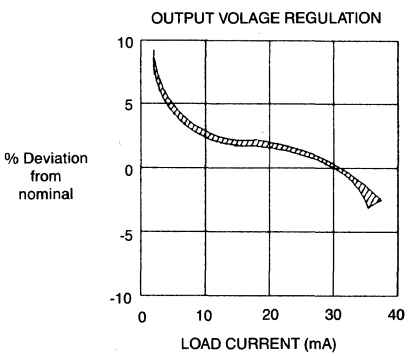
0710 = DIP
0730 = SIP
Input Voltage
Output Voltage
Package Size

Example: DC/DC converter with 5 Volt input, ± 15 Volt output in a DIP package.

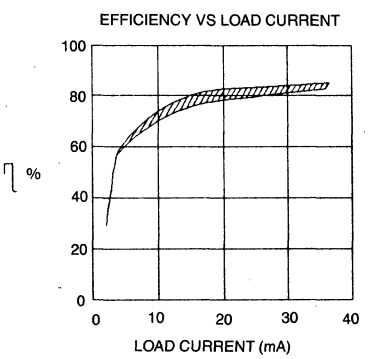
0710-0515-00

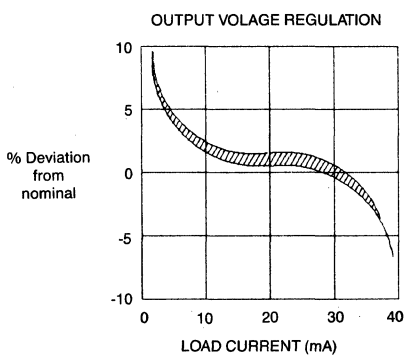
±12 VOLT OUTPUT CONVERTERS





±15 VOLT OUTPUT CONVERTERS





Specifications Subject to Change Without Notice

BERTAN HIGH VOLTAGE POWER SUPPLY SOLUTIONS

BERTAN SELECTION GUIDE

MODULES

Model Series	OUTPUT VOLTAGE (V) / CURRENT (mA)																FEATURES											
	500	1000	1500	2000	2500	3000	5000	7500	10K	15K	20K	30K	50K	60K	75K	100K	REV	CV/CL	CV/CC	VPROG	VMON	IPROG	IMON	METER	CBNY	IEEE	Input AC	Input DC
830		300		150		100	60		30		15	10	6	5	4				•	•	•	•	•	D		O	•	
810		100		50		33	20		10		5	3.3	2.2	1.6	1.3				•	•	•	•	•	D		O	•	
603C		30	20			10	5		2	1.5	1	0.4						•		•	•		•				•	
606C			20			10	5		2	1.5	1	0.4						•		•	•		•					•
602C		15	10			5	2		1	0.6	0.4							•		•	•		•				•	
605C			6			3	1.5		0.75	0.4								•		•	•		•					•
720A									1.2			0.3						•		•	•							•
730A												0.5						•		•	•		•					•
740A												2	1					•		•	•		•					•
612A											1	0.5	0.3					•		•	•		•				•	
PMT	8	4	1	2	0.5		0.5	0.25										•		•	•							•

INSTRUMENTS

Model Series	OUTPUT VOLTAGE (V) / CURRENT (mA)																FEATURES											
	500	1000	1500	2000	2500	3000	5000	7500	10K	15K	20K	30K	50K	60K	75K	100K	REV	CV/CL	CV/CC	VPROG	VMON	IPROG	IMON	METER	CBNY	IEEE	Input AC	Input DC
105		1000				333	200		100		50	33	20				•		•	•	•	•	•	D		O	•	
135		300		150		100	60		30		15	10	6	5	4		•		•	•	•	•	•	D		O	•	
210		225		100		75	40		15		7	4.5	2.5		2	1	•	•		•	•		•	A	O	O	•	
115		100		50		33	20		10		5	3.3	2.2	1.6	1.3		•		•	•	•	•	•	D		O	•	
205B		30				10	5		2.5		1	0.5	0.3				•	•		•	•		•	D		•	•	
225		30				10	5		2.5		1	0.5	0.3				•	•		•	•		•	D		•	•	
230		15				5	3		1.5		0.6	0.4					•	•			O		O	D			•	
CRT30		1							1			2						•		•	•		•	D		O	•	
CRT50		1							1			2						•		•	•		•	D		O	•	
EB/ IB-30A		0.05										0.05						•		•	•		•	D		O	•	
EB/ IB-50A				0.05								0.25						•		•	•		•	D		O	•	
EB/ IB-100A				0.05												0.1		•		•	•		•	D		O		

CV/CL: Constant Voltage Current Limit
CV/CC: Constant Voltage Constant Current

• Standard
A - Analog
D - Digital

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BERTAN HIGH VOLTAGE POWER SUPPLY SOLUTIONS

NUCLEAR MODULES

SERIES NIM

MODEL	VOLTAGE	CURRENT	RIPPLE	SIZE	NOTES	REV	CV/CL	VPROG	VMON	METER	INPUT AC	INPUT DC	DUAL OUTPUT
301	0 to ±1,000V	0 to 3mA	1mV	D	—	●	●	●				●	
342A	0 to ±2,000V	0 to 1mA	2mV	S	3	●	●	●		A		●	
362	0 to ±2,000V	0 to 1mA	2mV	S	—	●	●	●		A		●	●
303	0 to ±3,000V	0 to 1mA	3mV	D	—	●	●	●				●	
353	0 to ±3,000V	0 to 2mA	5mV	S	—	—	●	●			●		
313B	0 to ±3,000V	0 to 10mA	10mV	D	—	●	●	●		A	●		
323B	0 to ±3,000V	0 to 10mA	10mV	D	—	●	●	●		D	●		
345A	0 to ±5,000V	0 to 300μA	5mV	S	3	●	●	●		A		●	
305	0 to ±5,000V	0 to 500μA	5mV	D	—	●	●	●				●	
355	0 to ±5,000V	0 to 1mA	10mV	S	—	—	●	●			●		
365	0 to ±5,000V	0 to 1mA	5mV	S	—	●	●	●		A		●	●
362/5	0 to ±5,000V	0 to 1mA	2/5mV	S	1	●	●	●		A		●	●
315B	0 to ±5,000V	0 to 5mA	25mV	D	—	●	●	●		A	●		
325B	0 to ±5,000V	0 to 5mA	25mV	D	—	●	●	●		D	●		
375P,N,X	0 to 5,000V	0 to 500μA	50mV	D	2	—	●	●	●	A		●	●
377P,N,X	0 to 7,500V	0 to 500μA	50mV	D	2	—	●	●	●	A		●	●
380P,N,X	0 to 10,000V	0 to 300μA	50mV	D	2	—	●	●	●	A		●	●
310P,N	0 to 10,000V	0 to 250μA	20mV	D	—	—	●					●	
320P,N	0 to 10,000V	0 to 2mA	100mV	D	—	—	●	●			●		

NOTES:
1. Model 362/5 is a dual output unit having one 0 to ±2,000V output and one 0 to ±5,000V output.
2. Output polarity: P=both positive, N=both negative, X=one positive, one negative.
3. 342A, 345A: Double output current is available with increased input.

Size: D: Double width:
2.7"W×8.7"H×9.7"D (69×221×246mm)
S: Single width:
1.35"W×8.7"H×9.7"D (34×221×246mm)

CV/CL: Constant Voltage Current Limit
CV/CC: Constant Voltage Constant Current

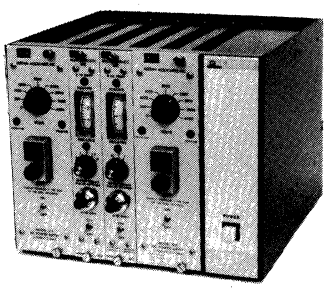
• Standard
A - Analog
D - Digital

SPECIFICATIONS ALL MODELS	
Regulation	0.001% line, 0.002% load
Stability	0.01%/hr., 0.02%/8 hrs.
Temp. Coeff	50ppm/°C, 0 to +50°C

- Models for all Detector Types
- Single and Dual Output Units
- Reversible Polarity
- High Stability
- ac Line Powered & dc Bin Powered

Bertan offers a complete line of high voltage power supplies in NIM configuration. Modules are available in single or dual width, single or dual output, and with ac or dc input. All models have reversible polarity (except 10 kV units), remote programming, arc and short circuit protection.

The Series MWPC supplies are designed specifically for multiwire proportional counter



applications and include sensitive monitors, precision voltage control, fast and slow overcurrent detection.

Bertan also provides NIM mini-bin enclosures for convenient benchtop mounting of single or dual width NIM modules requiring ac or dc power.

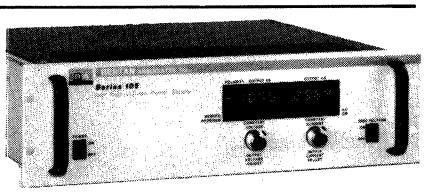
PRECISION SWITCHING LABORATORY POWER SUPPLIES

SERIES 115, 135, 105; 100W, 300W, 1KW

115, 135, 105		MAXIMUM OUTPUT CURRENT		
MODEL SUFFIX	OUTPUT VOLTAGE	100 Watt Series 115	300 Watt Series 135	1 kW Series 105
-01R	0 to 1kV	0 to 100mA	0 to 300mA	0 to 1A
-02R	0 to 2kV	0 to 50mA	0 to 150mA	0 to 500mA
-03R	0 to 3kV	0 to 33mA	0 to 100mA	0 to 333mA
-05R	0 to 5kV	0 to 20mA	0 to 60mA	0 to 200mA
-10R	0 to 10kV	0 to 10mA	0 to 30mA	0 to 100mA
-20R	0 to 20kV	0 to 5mA	0 to 15mA	0 to 50mA
-30R	0 to 30kV	0 to 3.3mA	0 to 10mA	0 to 33mA
-50P,N	0 to 50kV	0 to 2mA	0 to 6mA	0 to 20mA
-60P,N	0 to 60kV	0 to 1.6mA	0 to 5mA	—
-75P,N	0 to 75kV	0 to 1.3mA	0 to 4mA	—

- **Constant Voltage/Constant Current**
- **Auto Crossover**
- **Reversible Polarity**
- **IEEE-488 Interface**

These precision switch mode power supplies with output voltages ranging from 1 to 75 kv. They feature constant voltage and constant current with automatic crossover. For safety and reliability, all models include remote interlock, slow start and power interrupt as well as arc, short and open circuit protection. Remote programming of the power supply



output voltage and output current can be accomplished with a remote analog voltage, remote resistance or with an optional IEEE-488 interface (Model 100-C488).

For dedicated remote applications, units are available without front panel controls, digital metering and operating mode indicator lights.

Input: 115/230 Vac, 50-60, Hz • **Voltage Regulation:** ±0.02% for ±10% line change, ±0.04% for NL/FL or FL/NL • **Ripple:** 0.1% of setting +0.1% of max. peak to peak • **Current Regulation:** ±0.1% for ±10% line change, ±0.2% for NL/FL or FL/NL • **Temperature Coefficient:** ±100 ppm for constant voltage, ±200 ppm for constant current • **Size:** 19" x 5.2" x 17" (483 x 133 x 432mm) • **Weight:** 45.1 lbs. (20kg)

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BERTAN HIGH VOLTAGE POWER SUPPLY SOLUTIONS

PRECISION LINEAR LABORATORY POWER SUPPLIES

SERIES 210; 100 to 200 W

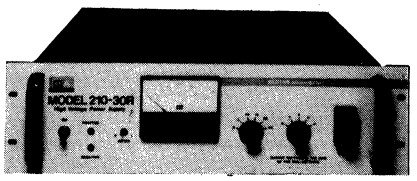
Model	OUTPUT		
	Voltage	Current	Ripple*
210-01R	0 to ±1kV	0 to 225mA	50mV
210-02R	0 to ±2kV	0 to 100mA	100mV
210-03R	0 to ±3kV	0 to 75mA	100mV
210-05R	0 to ±5kV	0 to 40mA	200mV
210-10R	0 to ±10kV	0 to 15mA	500mV
210-20R	0 to ±20kV	0 to 7mA	1V
210-30R	0 to ±30kV	0 to 4.5mA	1.5V
210-50P,N,R	0 to 50kV	0 to 2.5	5V
210-75P,N	0 to 75kV	0 to 2	5V
210-100P,N	0 to 100kV	0 to 1	10V

**Measured peak to peak at maximum output.*

- **Reversible Polarity**
- **Voltage and Current Metering**
- **Remote Programming and Monitoring**
- **IEEE-488 Interface Available**

The Series 210 is a family of fully enclosed, precision regulated, linear power supplies. They feature an analog meter for current and voltage, remote analog programming and monitoring, reversible polarity (up to 50kV), and direct reading calibrated front panel voltage control.

All models provide arc and short circuit protection for safe, reliable operation. Any model may be ordered with an optional 16 bit binary remote programming. An IEEE-488 interface is also available (Model 200-C488).



Input: 115/230 Vac, 50-60 Hz, **Line Regulation:** ±0.001% for ±10% line change • **Load Regulation:** ±0.005 for NL/FL or FL/NL • **Temperature Coefficient:** 50ppm per °C • **Remote Programming and Monitoring:** 0 to +5V • **Size:** up to 5kV - 19″ x 5.2″ x 11″ (483 x 133 x 279mm); 10kV-100kV - 19″ x 5.2″ x 16″ (483 x 133 x 406mm)

SERIES 205B/225; 15 to 30W

Model 205B/225	OUTPUT		
	Voltage	Current	Ripple*
-01R	0 to ±1kV	0 to 30mA	10mV
-03R	0 to ±3kV	0 to 10mA	30mV
-05R	0 to ±5kV	0 to 5mA	50mV
-10R	0 to ±10kV	0 to 2.5mA	100mV
-20R	0 to ±20kV	0 to 1mA	300mV
-30R	0 to ±30kV	0 to 0.5mA	400mV
-50R	0 to ±50kV	0 to 0.3mA	2V

**Measured peak to peak at maximum output.*

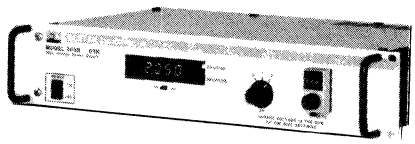
- **Reversible Polarity**
- **Digital Voltage and Current Metering**
- **Remote Programming and Monitoring**
- **IEEE-488 Interface***

The Series 205B/225 are a family of fully enclosed, precision regulated, linear power supplies. They feature a digital LED meter for current and voltage, remote analog programming and monitoring, reversible polarity, and direct reading calibrated front panel voltage control.

The Series 206B/226 offers identical performance specifications but omits the front panel controls and meter of the Series 205B/225.

All models provide arc and short circuit protection for safe, reliable operation. *An IEEE-488 interface is standard on the 225/226 (Model 200-C488).

Input: 115/230 Vac, 50-60 Hz • **Line Regulation:** ±0.001% for ±10% line change • **Load Regulation:** ±0.005% for NL/FL or FL/NL • **Temperature Coefficient:** 50ppm per °C



•**Remote Programming and Monitoring:** 0 to +5 V • **Size:** up to 20 kV - 19″ x 3.5″ x 9.6″ (483 x 89 x 244mm) • **Weight:** 20.1 lbs (9.1kg); 30 kV, 50 kV 19″ x 5.25″ x 16″ (483 x 133 x 406mm)

SERIES 230; 15W

Model	OUTPUT		
	Voltage	Current	Ripple*
230-01R	0 to ±1kV	0 to 15mA	10mV
230-03R	0 to ±3kV	0 to 5mA	30mV
230-05R	0 to ±5kV	0 to 3mA	50mV
230-10R	0 to ±10kV	0 to 1.5mA	500mV
230-20R	0 to ±20kV	0 to 600μA	2V
230-30R	0 to ±30kV	0 to 400μA	5V

**Measured peak to peak at maximum output*

- **Reversible Polarity**
- **Digital Voltage and Current Meter**
- **Compact, Benchtop**
- **Low Ripple and Noise**

The Series 230 is a family of regulated, compact, precision high voltage power supplies, available with outputs up to 30 kV. Output polarity of all models is reversible. A 3½ digit LCD meter displays voltage or current (switch selectable). Automatic current limiting and arc protection assure safe, reliable operation.

REM option provides remote output voltage and current monitoring, remote interlock, and increased current limit sensitivity (25% of maximum rated output).

Input: 115/230 Vac, 50-60 Hz • **Line Regulation:** ±0.002% for ±10% line change • **Load Regulation:** ±0.01% for NL/FL or FL/NL • **Temperature Coefficient:** 100ppm per °C. • **Size:** 7.6″ x 7.5″ x 5.2″ (194 x 191 x 128mm) • **Weight:** 10.1 lbs. (4.5kg)

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BERTAN HIGH VOLTAGE POWER SUPPLY SOLUTIONS

HIGH VOLTAGE SWITCHING MODULES

SERIES 800; 100W & 300W

NEW

810, 830 MODEL SUFFIX	OUTPUT VOLTAGE	MAXIMUM OUTPUT CURRENT SERIES 810 (100W)	MAXIMUM OUTPUT CURRENT SERIES 830 (300W)
-02P,N	0 to 2kV	0 to 50mA	0 to 150mA
-03P,N	0 to 3kV	0 to 33mA	0 to 100mA
-05P,N	0 to 5kV	0 to 20mA	0 to 60mA
-10P,N	0 to 10kV	0 to 10mA	0 to 30mA
-20P,N	0 to 20kV	0 to 5mA	0 to 15mA
-30P,N	0 to 30kV	0 to 3.3mA	0 to 10mA
-50P,N	0 to 50kV	0 to 2mA	0 to 6mA
-60P,N	0 to 60kV	0 to 1.6mA	0 to 5mA
-75P,N	0 to 75kV	0 to 1.3mA	0 to 4mA

- **Compact high performance models up to 75 kV**
- **Constant voltage/constant current-auto crossover**
- **High efficiency switch-mode technology**
- **Remote programming and monitoring**
- **Custom designs available**

The Series 810 and Series 830 are two families of regulated, fixed output polarity, modular, switch mode, high voltage power supplies. Output voltages from 1 to 75 kV are available at up to 100 Watts for the Series 810 and up to 300 Watts for the Series 830.

The user may configure the power supply for internal control or remote operation. Remote features include voltage and current programming, voltage and current monitoring, enable/trip control and operating mode indicator.

All models require 115/230 Vac, 50-60 Hz line power input. Appropriate mating connectors for line power, remote control, remote monitor and the high voltage output are provided.

Line Regulation: 0.02% • **Temperature Coefficient:** less than 100ppm/deg C. • **Ripple:** 0.05% pk-pk for the Series 810 and 0.2% pk-pk for the Series 835. • **Size:** 5 x 5½ x 11″ (127 x 140 x 280mm) for the Series 810 and 5 x 17 x 15″ (127 x 432 x 381mm) for the Series 830.

PHOTOMULTIPLIER MODULES

SERIES PMT

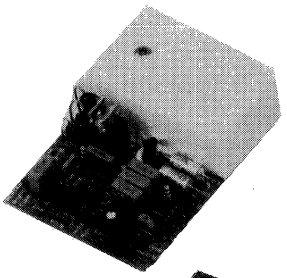
Model	OUTPUT Voltage	OUTPUT Current	Ripple	Input
PMT-05C-P,N	0 to 500V	0 to 8mA	5mV	+24 Vdc or ± 12 Vdc
PMT-10C-P,N	0 to 1kV	0 to 4mA	4mV	
PMT-20C-P,N	0 to 2kV	0 to 2mA	2mV	
PMT-50A-P,N	0 to 5kV	0 to 500μA	10mV	
PMT-75A-P,N	0 to 7.5kV	0 to 250μA	100mV	
PMT-1500N	0 to −1500V	0 to 1mA	25mV	+15 Vdc
PMT-1500P	0 to +1500V	0 to 1mA	25mV	
PMT-2500N	0 to −2500V	0 to 0.5mA	25mV	
PMT-2500P	0 to +2500V	0 to 0.5mA	25mV	

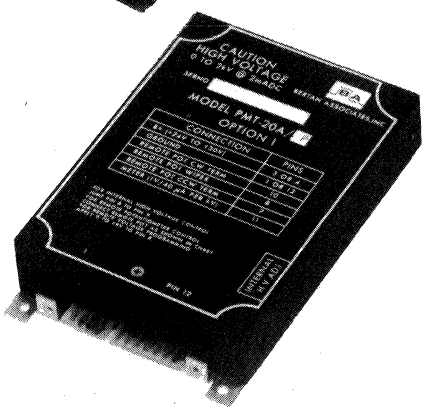
Specify output polarity (P or N) and input option: #1 (+24V to +30V) or #3 (± 12V to ± 18V)

- Internal Voltage Control
- Remote Voltage Programming
- Remote Voltage Monitoring
- Low Ripple and Noise
- Economical Small Size Unit
- Direct PC Board Mounting

The PMT Series is a family of high performance regulated dc to dc modular power supplies suitable for OEM or laboratory applications. They feature exceptionally low ripple and noise, local or remote voltage control, remote voltage monitoring (except for PMT-1500/2500), arc and short circuit protection.

SPECIFICATIONS ALL MODELS	PMT-05, 10, 20, 50, 75	PMT-1500, 2500
Input	1: +24Vdc to +30Vdc 3: ± 12Vdc to ± 18Vdc	+15Vdc
Line Regulation	± 0.001% for ± 1% line change	100mV
Load Regulation	± 0.001% for NL-FL or FL-NL	100mV
Stability	0.005%/hr. 0.2%/8 hrs	same
Voltage Programming	0 to +9V or 5k ohm pot	0 to +10V
Voltage Monitor	1% or 0.1% of output voltage	N/A
Size	3.88″ x 6.3″ x 1.25″ (99 x 160 x 32mm)	2.63″ x 3.6″ x 1″ (67 x 91 x 25mm)





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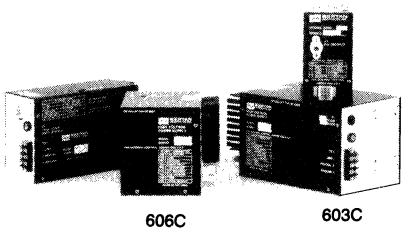
BERTAN HIGH VOLTAGE POWER SUPPLY SOLUTIONS

HIGH VOLTAGE LINEAR POWER SUPPLY MODULES

SERIES 600; 9 to 30 W

602C, 603C, 605C, 606C			MAXIMUM OUTPUT CURRENT			
			ac POWERED UNITS		dc POWERED UNITS	
MODEL SUFFIX	OUTPUT VOLTAGE	RIPPLE*	SERIES 602C	SERIES 603C	SERIES 605C	SERIES 606C
-15P,N	0 to 1.5kV	15mV	10mA	20mA	6mA	20mA
-30P,N	0 to 3kV	30mV	5mA	10mA	3mA	10mA
-50P,N	0 to 5kV	50mV	2mA	5mA	1.5mA	5mA
-100P,N	0 to 10kV	200mV	1mA	2mA	.75mA	2mA
-150P,N	0 to 15kV	450mV	0.6mA	1.5mA	.4mA	1.5mA
-200P,N	0 to 20kV	800mV	0.4mA	1mA	N.A.	1mA
-300P,N	0 to 30kV	3.0V	N.A.	.4mA	N.A.	.4mA

Measured peak to peak at maximum output.



- Low Ripple and Noise
- ac or dc Powered
- Internal Control/Remote Programming
- Voltage and Current Monitoring

The Series 602C, 603C, 605C and 606C are four families of regulated, fixed output polarity modular high voltage power supplies.

The Series 602C and 603C require a standard line input of 115/230Vac (switch selectable), 50-60Hz. The Series 605C and 606C require a +24Vdc input (+28Vdc optionally-available). The units are fully enclosed and designed to satisfy system or bench top operation.

The output voltage is controlled internally by a multi-turn potentiometer. Remote analog voltage or resistance programming is included in all models. Analog monitor outputs are also included for remote monitoring of both the high voltage output and the output current. Remote control capability includes a remote ON/OFF logic input.

Line Regulation: ±0.001% for ±10% input line change. • **Load Regulation:** ±0.002% for 0 to maximum rated output current change. • **Temperature Coefficient (0 to 50°C):** 50ppm of maximum per °C. • **Stability (after ½ hr warm-up):** 0.01% per hour; 0.02% per 8 hours. • **Local Control:** Internal multi-turn potentiometer for 0 to maximum output voltage (±0.2%). • **Remote Programming:** 0 to +5 Volt dc analog input signal. • **Voltage Monitor:** 0 to +5 Volts proportional to 0 maximum output high voltage. • **Current Monitor:** 0 to +5 Volts proportional to 0 to maximum output current. • **Current Limit:** Short circuit current limiting to less than 110% of the maximum rated output current. • **Protection:** Arc and short circuit protected, self-restoring. The input ac line is fused.

MODEL	SIZE	WEIGHTS
602C	5″ x 3.1″ x 8.7″ (127 x 79 x 221mm)	6.75 lbs (3.1kg)
603C	5″ x 5.5″ x 8.5″ (127 x 140 x 216mm)	8.0 lbs (3.64kg)
605C	5″ x 2.75″ x 4.75″ (127 x 70 x 121mm)	3.2 lbs (1.45kg)
606C	5″ x 5.2″ x 4.5″ (127 x 140 x 114mm)	3.5 lbs (1.6kg)

PRECISION HIGH VOLTAGE POWER SUPPLY MODULES

SERIES 612; 20W

Model	OUTPUT		
	Voltage	Current	Ripple*
612A-200P,N	0 to 20kV	0 to 1mA	200mV
612A-300P,N	0 to 30kV	0 to 0.5mA	300mV
612A-500P,N	0 to 50kV	0 to 0.3mA	800mV

Measured peak to peak at maximum output.

- **High Stability**
- **Low Ripple and Noise**
- **Internal and Remote Control**
- **Voltage and Current Monitoring**

The Series 612A is a family of regulated, fixed output polarity, modular high voltage power supplies. They provide exceptional performance and are ideally suited to many specialized requirements such as CRTs, imaging, ion beam and electron beam applications.

The Series 612A require a standard line voltage of 115/230 Vac (internally selectable), 50-60Hz. The units are fully enclosed and designed for system or bench top operation. Models are available from 20kV up to 50kV.

The output voltage is controlled locally by an internal multi-turn potentiometer. Provision for remote analog voltage or resistance programming is included in all models. Analog monitor outputs are also included for remote monitoring of both the high voltage and current outputs. All units are short circuit current limited and arc protected.

Input: 115 Vac ±10% @ 1A, 50-60 Hz., 230 Vac ±10% @ 0.5A, 50-60 Hz. • **Line Regulation:** ±0.001% of max. for ±10% line change • **Load Regulation:** ±0.002% of max. for 0 to max. rated output current change • **Temperature Coefficient:** 50 ppm of max. per °C • **Stability:** 0.01% per hour; 0.02% per 8 hours • **Local Control:** Internal multi-turn potentiometer for 0 to 102% of max. output voltage • **Remote Programming:** 0 to -5 Vdc

analog input signal proportional to 0 to 102% of max. rated output. The programming input impedance is greater than 10 megohms • **Size:** 4.88″ x 8.38″ x 9.75″ (124 x 213 x 248mm) • **Weight:** 9 lbs. (4.1kg)

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BERTAN HIGH VOLTAGE POWER SUPPLY SOLUTIONS

E-BEAM, I-BEAM, X-RAY, CRT AND OEM/CUSTOM POWER SUPPLIES

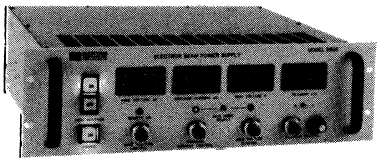
SERIES EB/IB

Model	Beam Power Supply		*Bias Power Supply	
	Voltage	Current	Voltage	Current
EB-30A	0 to −30kV	0 to 500μA	0 to −1000V	0 to 50μA
EB-50A	0 to −50kV	0 to 250μA	0 to −2000V	0 to 50μA
EB-100A	0 to −100kV	0 to 100μA	0 to −2000V	0 to 50μA
IB-30A	0 to +30kV	0 to 500μA	0 to +2000V	0 to 50μA
IB-50A	0 to +50kV	0 to 250μA	0 to +2000V	0 to 50μA
IB-100A	0 to +100kV	0 to 100μA	0 to +2000V	0 to 50μA

Series EB and Series IB are triple output high voltage power supply systems specifically developed for precision electron beam and ion beam applications. Each model contains three independently adjustable power supplies for beam acceleration, bias, and filament. The isolated bias and filament power outputs "float" on the high voltage acceleration output.

In addition to the standard models, custom designed units are available to meet specific requirements.

An IEEE-488 interface is available to provide full control and monitoring capability.



GENERAL SPECIFICATIONS	
*Filament	Voltage: 0 to 5Vdc Current: 0 to 5Adc
Input	115/230V ± 10%, 2A, 50-60Hz
Size	19″ x 5.25″ x 17″ (483 x 133 x 432mm)
Weight	55 lbs. (25kg)

Bias and Filament "float" at Beam high voltage.

SERIES XR

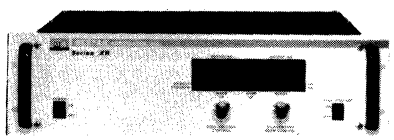
Model	TARGET	
	Voltage	Current
XR-20B	0 to 20kV	0 to 15mA
XR-30B	0 to 30kV	0 to 10mA
XR-50B	0 to 50kV	0 to 6 mA
XR-75B	0 to 75kV	0 to 4 mA

Specify target output voltage polarity when ordering.

- **Target Voltage/Current Control**
- **Front Panel/Remote Control**
- **IEEE-488 Interface Available**

The BERTAN Series XR is designed for the operation and control of filamentary X-RAY sources. All units include a regulated high voltage target power supply, an appropriately isolated filament power supply and the intelligent control circuitry to provide adjustable constant target current operation.

Custom designed units can be provided to meet specialized system, test or laboratory applications.



Input: 115/230V ± 10%, 8/4A, 50/60Hz • **Filament:** 0 to 3V @ 0 to 3A • **Size:** 19″ x 5.25″ x 18″ (483 x 133 x 457mm) • **Weight:** 48 lbs (22kg)

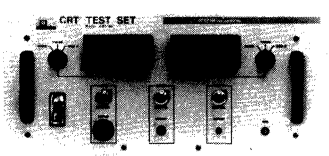
SERIES CRT 30/50

Model	OUTPUT		
	Voltage	Current	Ripple* pk-pk
Anode CRT-30 CRT-50	 0 to +30kV 0 to +50kV	 0 to 2mA 0 to 1.5mA	 3V 5V
Focus	0 to +10kV	0 to 1mA	1V
G2	0 to +1kV	0 to 1mA	100mV

Measured peak to peak at maximum output.

- **CRT Test System**
- **IEEE-488 Interface Available**

The BERTAN CRT-30 and CRT-50 are three output high voltage power supply systems configured for versatile laboratory, CRT test, or system applications. Calibrated controls and digital displays provide independent control and monitoring of the anode, focus, and G2 voltages and currents. A wide range of options are available, including auxiliary outputs, dynamic focus, digital programming, and a comprehensive IEEE-488 Talker/Listener interface. Custom units can be provided to meet individualized system applications.



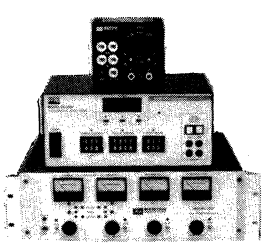
GENERAL SPECIFICATIONS	
Input	115/230V ± 10% 50-60 Hz
Regulation	.01% line, .01% load
Temp. Coeff.	100ppm/ºC, 0 to +50ºC
Accuracy	.25% +.2% of maximum
Size:	19″ x 8.75″ x 15″ (483 x 222 x 381mm)

SERIES OEM

- **Outputs up to 100kV, 1kW**
- **ac to dc, dc to dc**
- **Single or Multiple Output**
- **Microprocessor Control**
- **Analog and Digital Programming including IEEE-488**
- **Custom Interfacing**
- **UL/CSA/VDE APPROVALS**

BERTAN specializes in designing and producing custom and OEM systems with unique electrical and mechanical features. Our experienced engineering staff, equipped with the most advanced design and analytical tools, including CAD/CAM, enables us to provide cost effective, timely solutions to your particular power supply problems. Our modern 40,000 sq. ft. manufacturing facility is staffed and organized to satisfy both large and small quantity production requirements.

Complete in-house quality control accompanies each custom product. From the determination of specifications and configurations through full production and delivery, the utmost attention is given to optimizing quality and reliability while minimizing cost. Each power supply is fully burned in and tested to ensure that it meets or exceeds all performance requirements.



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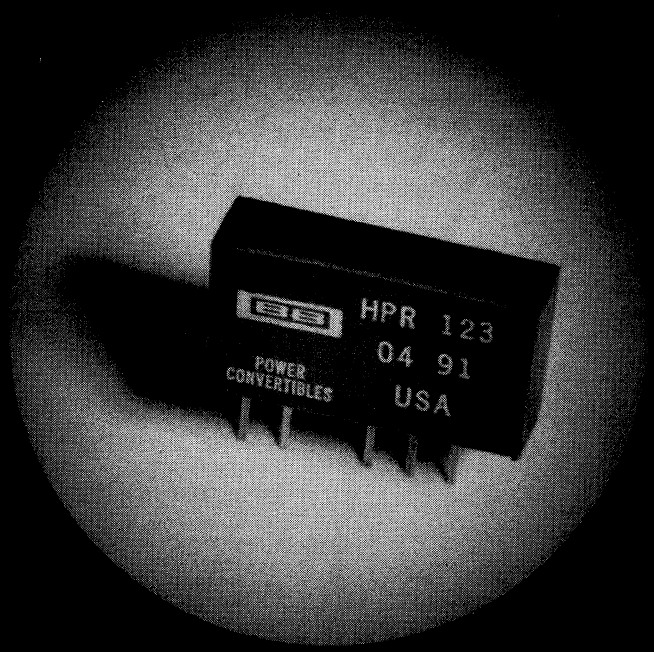
Announcing the *New* Ultimate in Driving



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The premiere vehicle in power conversion. These DC/DC Converters allow you to maintain a unique balance between price and performance.

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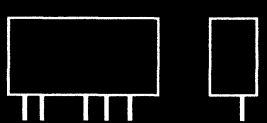

actual size

Precision performance comes with the HPR1XX's 750mW of output power. This Power Convertible has exceptional roadhandling with a high efficiency rating of 80%. You can "rev" up your designs with our isolation voltage of 750VDC.

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- Output wattages from .45 to 15W
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Power Convertibles
DC/DC Converter Product Portfolio

SERIES	POWER (Watts)	INPUT VOLTAGE						OUTPUT VOLTAGE							# OF CHANNELS	REGULATION	ISOLATION VOLTAGE	SHORT CIRCUIT PROTECTION	PACKAGE INFORMATION			NOTES	Price (1000s)	
								+	+	+	+	±	±	±					LENGTH	WIDTH	HEIGHT		SINGLE	DUALS
PWR1XX	0.45	5	12	15	24	28	48	5		12	15	5	12	15	1	U	1000	Continuous	1.12	1.12	0.41		36.50	38.75
PWR70	0.45			15										15	1	U	2000	Momentary	1.12	1.12	0.41		NA	26.46
HPR1XX	0.75	5	12	15	24			5		12	15		12	15	1	U	750	Momentary	0.78	0.25	0.41	SIP	4.60	6.85
PWR59XX	1.00	5	12	15	24			5	9	12	15		12	15	1	R	750	Continuous	1.25	0.8	0.41	DIP	17.35	18.60
PWR11XX	1.50	5	12	15	24			5	9	12	15		12	15	1	U	500	Momentary	1.25	0.8	0.41	DIP	14.80	15.75
PWR13XX	1.50	5	12	15				5		12	15		12	15	1	U	4000	5 Seconds	1.25	0.8	0.41	DIP or 2x1" Pkg.	19.80	21.00
PWR1726	1.50			15										15	1	U	5000	Continuous	1.62	1.12	0.48	Synch, Rem. On/Off	NA	25.00
PWR2XX	1.50	5	12	15	24	28	48	5		12	15		12	15	1	U	1000	Continuous	1.12	1.12	0.41		36.50	38.75
PWR74	1.50			15										15	2	U	1500	45 Seconds	1.12	1.12	0.41		NA	33.00
PWR60XX	1.80	5	12	15	24			5					12	15	1	R	500	Continuous	2	1	0.41		28.25	28.25
PWR3XX	2.00	5	12	15	24	28	48	5		12	15		12	15	2	U	1000	Continuous	1.12	1.12	0.41		26.00	29.00
PWR6XX	2.00	5	12	15	24	28	48	5		12	15		12	15	1	R	500	Continuous	2	1	0.41	Optional 2x2" Pkg.	52.00	70.00
PWR1017	3.00			15										15	4	U	1000	Momentary	2	2	0.41	Sync	NA	48.50
PWR12XX	3.00	5	12	15	24			5	9	12	15		12	15	1	U	500	Momentary	1.25	0.8	0.41	DIP	16.35	17.35
PWR4XX	3.00	5	12	15	24	28	48	5		12	15		12	15	1	U	1000	Continuous	1.12	1.12	0.41		36.50	38.75
PWR71	3.00			15										15	4	U	1000	Continuous	2	2	0.41		NA	35.70
PWR72	3.00			15										15	1	U	1000	Momentary	1.12	1.12	0.41		NA	31.60
PWR73XX	3.00	5	12	15	24			5					12	15	1	R	500	Continuous	2	2	0.41		24.75	29.50
PWR40XX	4.00	5	12	15	24			5		12			12	15	1	U	1000	Momentary	1.12	1.12	0.41		17.00	18.00
PWR5XX	4.00	5	12	15	24	28	48	5		12	15		12	15	4	U	750	Momentary	1.62	1.12	0.41		39.25	47.75
PWR1546A	5.00													15	1	R	750	Continuous	2	2	0.41	Ultra Low Noise	NA	51.50
PWR70XX	5.00	5	12	15	24		48	5					12	15	1	R	500	Continuous	2	2	0.41		27.00	32.00
PWR7XX	5.00	5	12	15	24	28	48	5		12	15		12	15	1	R	1000	5 Seconds	2	2	0.41		47.50	51.50
PWR8XX	5.00	5	12	15	24	28	48	5					12	15	2	U	1000	Momentary	1.62	1.12	0.41		52.00	52.00
PWR62XX	5.20	5	12	15	24	28	48								1	R	500	15 Minutes	2	2	0.41		49.50	NA
PWR16XX	6.00	5	12	15	24			5		12			12	15	1	U	500	Momentary	2	1	0.41		22.25	23.25
PWR510X	9.00	5											12	15	1	R	750	15 Seconds	2	2	0.41		NA	34.25
PWR53XX	15.00							5		12	15		12	15	1	R	500	Continuous	2.8	2.4	0.72	Remote On/Off	69.75	71.85

For Immediate Order Information **Call 1-800-548-6132**

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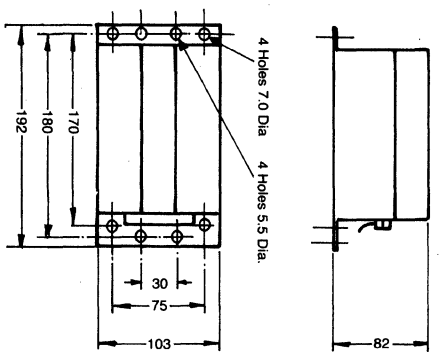
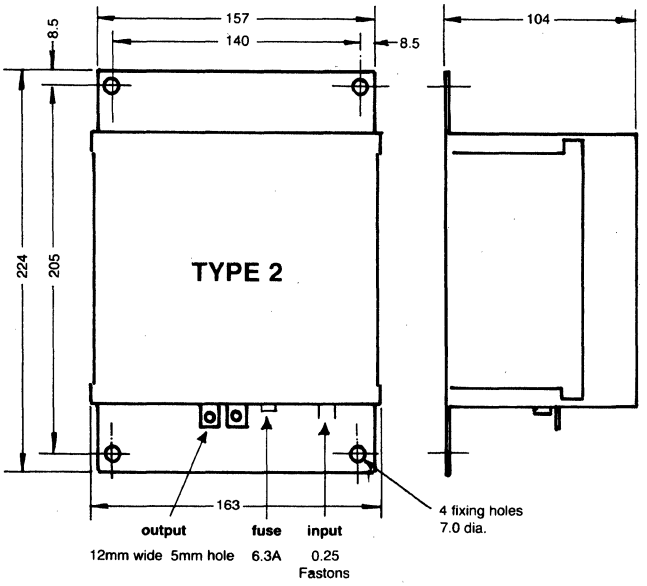
DC/DC CONVERTERS

All dimmensions in millimeters

TYPE 1





Features

- Regulated output voltage
- Fully isolated output
- Output current limit
- Short circuit protection
- High efficiency
- Start up on full load
- Supply reversal protection
- Range of output voltages
- Range of supply voltages
- Rugged construction
- Easy installation
- Competitive unit cost

Regulated Output Voltage
The range of DC/DC converters provide a means of obtaining a stable, high current low voltage supply from a range of higher DC voltage sources.

Fully Isolated Output
The converters are arranged to give complete isolation between input and output providing complete versatility of circuitry arrangements.

Output Current Limit
Output current is continuously monitored protecting the converter and output load circuitry.

Short Circuit Protection
Provision is made to provide complete protection against output short circuit conditions. Under these conditions the output current is limited to a maximum set limit within the rating of the converter.

High Efficiency
Careful design gives the converter high efficiency providing the user with a very low loss unit to be included in his total system.

Start up on Full Load
This standard feature enables the user to incorporate the converter into his system with minimum complication.

Supply Reversal Protection
To protect against inadvertent misconnection of the input supply, the converter is designed to rupture the input fuse link in the event of reverse polarity connection, thus protecting the converter and installation.

Output Voltage Range
Converters are available in either 12 Volt or 24 Volt (nominal) output. Other output voltages available to special order.

Input Voltage Range
A family of converters have been designed to cover a wide range of input voltages.

Rugged Construction
Each type of converter is self contained, enclosed in a rugged steel enclosure with its own cooling heatsink. The small physical size allows ease of installation using the fixing facilitites provided.

TECHNICAL SPECIFICATION

Output		**Nominal Output Voltage**	
		12	**24**
*Voltage (Volts)		12.25	24.5
Variation over load range (Volts)		±0.2	±0.25
Ripple at Full Load (constant input) (Volts)		±0.2	±0.2
Continuous current	Type 1	15	10
Tamb =20°C (amps)	Type 2	30	20
Intermittant Current	Type 1	20	12
limit (amps)	Type 2	35	25
Short circuit current	Type 1	22	14
(amps)	Type 2	40	30

Input

*Voltage Range	Type 1 24,36,48,60,72-80,96
(Volts) ±20%	Type 2 48,60,72-80,96,120
Operating temp (°C)	−25+40
Storage temp (°C)	−40+50
Overall efficiency (%)	Better than 85

*Other ratings are available on request.

Notes
1 Maximum ratings only achieved with converter when heatsink fins are vertically oriented in free air.
2 Order writing data as follows:—Type/input voltage/output voltage/continuous current eg. T1/72-80/12/15 or T2/60/24/20.
3 Input Supply to be connected as close as possible to source.

DC/DC CONVERTERS

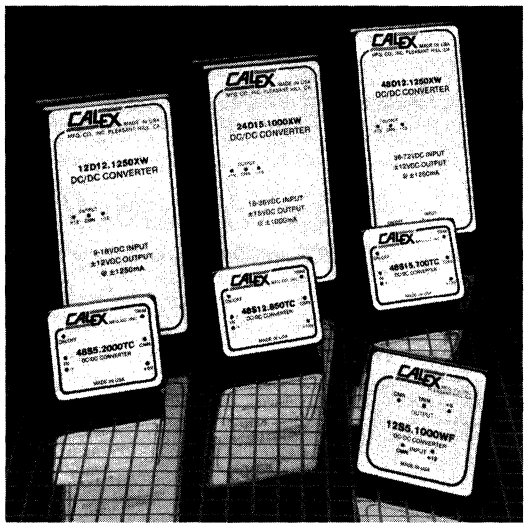
Specializing in DC/DC Converters

CALEX DC/DC converters are designed for use in telecommunications applications, medical instruments field portable and battery operated equipment. They are also used in a variety of industrial applications, instrumentation and computer systems.

CALEX manufactures 114 DC/DC converters with input voltages from 5 Volts to 72 Volts that range from 1.8 Watts to 57 Watts output power. We specialize in low noise, high efficiency and high reliability power conversion modules.

Most CALEX converters are encapsulated and are housed in six-sided, shielded copper cases. They are 100% tested and burned-in during manufacture to ensure the highest quality. All CALEX DC/DC converters are covered by a 5 year limited warranty.

Call **800-542-3355** or **415-932-3911** for individual assistance on price and delivery or to request a copy of our 120 page Design Guide and Catalog. After September 2, 1991 call 510-932-3911 or FAX us at 510-932-6017.

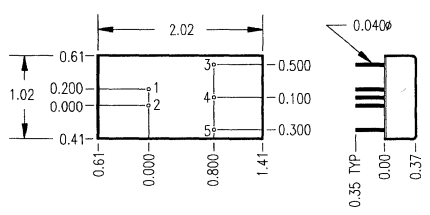


1.8 WATT DUAL OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
4.60/5.50	±12	±75	5D12.075	$63.00
	±15	±60	5D15.060	$63.00
10.80/13.80	±12	±75	12D12.075	$63.00
	±15	±60	12D15.060	$63.00

Line regulation typical: 0.10%
Load regulation typical: 0.10%
Noise typical: 15mV p-p
Isolation: 500 VDC
Case operating temperature: -25°C to +80°C

1.8 Watt Dual Case



PIN	FUNCTION 1.8 WATT DUALS
1	+INPUT
2	-INPUT
3	+OUTPUT
4	CMN
5	-OUTPUT

4.5 WATT DUAL OUTPUTS

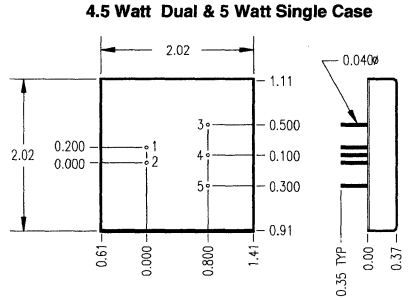
INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
4.50/5.50	±12	±125	5D12.125	$103.00
	±15	±100	5D15.100	$103.00
4.75/5.25	±12	±185	5D12.185	$105.00
	±15	±150	5D15.150	$105.00

5.0 WATT SINGLE OUTPUT

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
4.75/5.25	5	1000	5S5.1000	$108.00
	12	450	5S12.450	$108.00
	15	350	5S15.350	$108.00
7.00/32.00	5	1000	12S5.1000WF	$62.00

Line regulation typical: 0.05%
Load regulation typical: 0.05%
Noise typical: 10mV p-p
Isolation: 500 VDC (12S5.1000WF not Isolated)
Case operating temperature: -25°C to +80°C

4.5 Watt Dual & 5 Watt Single Case



PIN	FUNCTION 4.5 WATT DUALS	5.0 WATT SINGLES	5.0 WATT SINGLE WF
1	+INPUT	+INPUT	+INPUT
2	-INPUT	-INPUT	-INPUT
3	+OUTPUT	+OUTPUT	+OUTPUT
4	CMN	N/P (No Pin)	TRIM
5	-OUTPUT	CMN	OUTPUT CMN

Quality Products Since 1962
3355 Vincent Road, Pleasant Hill, CA 94523-4389 800-542-3355 (415)932-3911 FAX: (415)932-6017

DC/DC CONVERTERS

CALEX 3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone (415)932-3911 FAX: (415)932-6017

CALEX 3 & 6 Watt Single and Dual DC/DC Converters are ideal for use in industrial applications and systems that require direct PCB mounting.

These units are designed with low profile six-sided shielded copper cases to significantly reduce radiated noise.

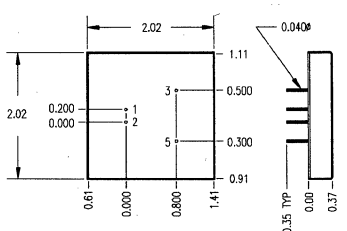
Also available is your choice of two convenient mounting kits for the 3 & 6 Watt units: the model MS15 and the model MS6.

3.0 & 6.0 WATT SINGLE OUTPUT

INPUT VOLTAGE RANGLE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
4.75/5.25	5	600	5S5.600	$98.00
	12	250	5S12.250	$98.00
	15	200	5S15.200	$98.00
10.56/15.60	5	600	12S5.600*	$98.00
	12	250	12S12.250*	$98.00
	15	200	12S15.200*	$98.00
11.16/13.20	5	1000	12S5.1000*	$108.00
	12	500	12S12.500*	$108.00
	15	400	12S15.400*	$108.00
21.12/31.20	5	600	24S5.600*	$98.00
	12	250	24S12.250*	$98.00
	15	200	24S15.200*	$98.00
22.32/26.40	5	1000	24S5.1000*	$108.00
	12	500	24S12.500*	$108.00
	15	400	24S15.400*	$108.00
24.64/36.40	5	600	28S5.600*	$98.00
	12	250	28S12.250*	$98.00
	15	200	28S15.200*	$98.00
26.04/30.80	5	1000	28S5.1000*	$108.00
	12	500	28S12.500*	$108.00
	15	400	28S15.400*	$108.00
42.24/62.40	5	600	48S5.600*	$98.00
	12	250	48S12.250*	$98.00
	15	200	48S15.200*	$98.00
44.64/52.80	5	1000	48S5.1000*	$108.00
	12	500	48S12.500*	$108.00
	15	400	48S15.400*	$108.00

*These units are Recognized to UL 1012 and 1459-2.

3 Watt, 6 Watt & 7.5 Watt Single Case



PIN	FUNCTION		
	3.0 WATT SINGLES	6.0 WATT SINGLES	7.5 WATT SINGLES
1	+INPUT	+INPUT	+INPUT
2	-INPUT	-INPUT	-INPUT
3	+OUTPUT	+OUTPUT	+OUTPUT
5	CMN	CMN	OUTPUT CMN

7.5 WATT SINGLE OUTPUT

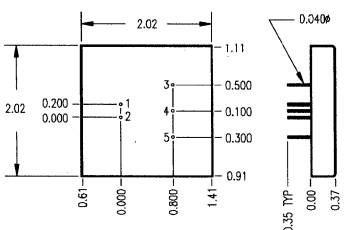
INPUT VOLTAGE RANGLE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
36.0/72.0	5	1500	48S5.1500FW	$85.00
	12	625	48S12.625FW	$85.00
	15	500	48S15.500FW	$85.00

3.0 & 6.0 WATT DUAL OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
10.56/15.60	±12	±125	12D12.125	$103.00
	±15	±100	12D15.100	$103.00
11.16/13.20	±12	±250	12D12.250	$112.00
	±15	±200	12D15.200	$112.00
21.12/31.20	±12	±125	24D12.125	$103.00
	±15	±100	24D15.100	$103.00
22.32/26.40	±12	±250	24D12.250	$112.00
	±15	±200	24D15.200	$112.00
24.64/36.40	±12	±125	28D12.125	$103.00
	±15	±100	28D15.100	$103.00
26.04/30.80	±12	±250	28D12.250	$112.00
	±15	±200	28D15.200	$112.00
42.24/62.40	±12	±125	48D12.125	$103.00
	±15	±100	48D15.100	$103.00
44.64/52.80	±12	±250	48D12.250	$112.00
	±15	±200	48D15.200	$112.00

Specifications for 3 Watt & 6 Watt Singles & Duals
Line regulation typical: 0.02%
Load regulation typical: 0.02%
Noise typical: 10mV p-p
Isolation: 500 VDC
Case operating temperature: -25°C to +80°C

3 Watt & 6 Watt Dual Case



PIN	FUNCTION	
	3.0 WATT DUALS	6.0 WATT DUALS
1	+INPUT	+INPUT
2	-INPUT	-INPUT
3	+OUTPUT	+OUTPUT
4	CMN	CMN
5	-OUTPUT	-OUTPUT

DC/DC CONVERTERS

3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone: (415)932-3911 FAX: (415)932-6017

- Low Noise, Highly Regulated Triple Outputs
- Efficiency 75% for All Line Conditions
- Six-Sided Shielded Low Thermal Gradient Copper Case
- 500 VDC Minimum Input to Output Isolation
- Covered Under the CALEX 5 Year Warranty

The CALEX 8.5 Watt Triple Output DC/DC Converters are designed with a high accuracy feedback control circuit and are ideal for wide (4:1) input ranges. Under specified ranges, these triple output units achieve outstanding line and load regulation.

The converters have both a logic shutdown pin and thermal overload protection circuitry. The three outputs are protected from overvoltage transients by transient voltage suppressor diodes.

For more information or to place an order call our toll free number **800-542-3355.**

Originally designed for the telecommunications industry, the CALEX 10 Watt DC/DC Converters are also used in industrial and instrument applications with wide input and low noise requirements.

The series operates from 48 Volt input power. Total power consumption is minimized with a logic shut down pin controlled by open collector TTL/CMOS circuits.

8.5 WATT TRIPLE OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
9.0/36.0	5,±12	800,±185	12T5.12UW	$135.00
	5,±15	800,±150	12T5.15UW	$135.00
18.0/72.0	5,±12	800,±185	48T5.12UW	$135.00
	5,±15	800,±150	48T5.15UW	$135.00

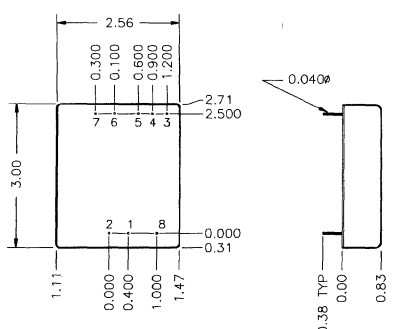
Line regulation typical: 0.50%
Load regulation typical: 2.00%
Noise typical: 20mV p-p
Isolation: 500 VDC
Case operating temperature: -25°C to +80°C

10 WATT SINGLE & DUAL OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
20.0/60.0	5	2000	48S5.2000TC	$105.00
	12	850	48S12.850TC	$105.00
	15	700	48S15.700TC	$105.00
20.0/60.0	±12	400	48D12.400TC	$110.00
	±15	350	48D15.350TC	$110.00

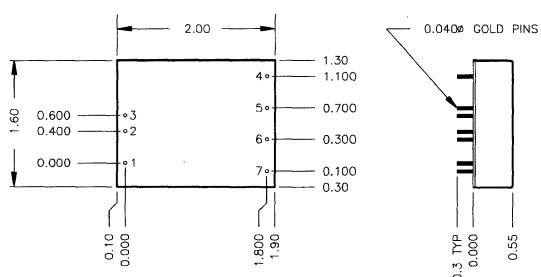
Line regulation typical: 0.01% single outputs
0.10% dual outputs
Load regulation typical: 0.10% single outputs
1.00% dual outputs
Noise typical: 20mV p-p
Isolation: 500 VDC
Case operating temperature: -25°C to +80°C

8.5 Watt Triple Case



PIN	FUNCTION 8.5 WATT TRIPLES		
1	+INPUT	5	-12/-15 OUTPUT
2	-INPUT	6	+5 OUTPUT
3	+12/+15 OUTPUT	7	+5 CMN
4	± OUTPUT CMN	8	ON/OFF

10 Watt Single & Dual Case



PIN	FUNCTION	
	10 WATT SINGLES	10 WATT DUALS
1	ON/OFF	ON/OFF
2	-INPUT	-INPUT
3	+INPUT	+INPUT
4	N/P (No Pin)	+OUTPUT
5	+OUTPUT	OUTPUT CMN
6	CMN	-OUTPUT
7	TRIM	TRIM

DC/DC CONVERTERS

CALEX 3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone (415)932-3911 FAX: (415)932-6017

- High Efficiency Operation
- Six-Sided Shielded Steel Case
- LC Type Input Filter
- Wide Input Voltage Ranges

The CALEX 10 & 12 Watt Single and Dual DC/DC Converters are used in a variety of industrial and instrument applications. The extra wide input range (3:1) is ideal for battery or unregulated input applications.

These units feature state of the art MOSFET technology, an isolation transformer and a high regulation linear post regulator.

Call toll free **800-542-3355** for additional information.

10 & 12 WATT SINGLE & DUAL OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
9.0/27.0	5	2000	12S5.2000*	$124.00
	12	1000	12S12.1000*	$124.00
	15	800	12S15.800*	$124.00
	±12	±500	12D12.500	$130.00
	±15	±400	12D15.400	$130.00
12.0/36.0	5	2000	24S5.2000*	$124.00
	12	1000	24S12.1000*	$124.00
	15	800	24S15.800*	$124.00
	±12	±500	24D12.500	$130.00
	±15	±400	24D15.400	$130.00
18.0/54.0	±5	±1000	28D5.1000	$130.00
24.0/72.0	5	2000	48S5.2000*	$124.00
	12	1000	48S12.1000*	$124.00
	15	800	48S15.800*	$124.00
	±12	±500	48D12.500	$130.00
	±15	±400	48D15.400	$130.00

* Recognized to UL 1012 and UL 1459-2
Line regulation typical: 0.02%
Load regulation typical: 0.02%
Noise typical: 10mV p-p
Isolation: 500 VDC
Case operating temperature: -25°C to +80°C

The 15 Watt Triple Series offers high efficiency, regulated outputs and is ideal for use with wide input ranges.

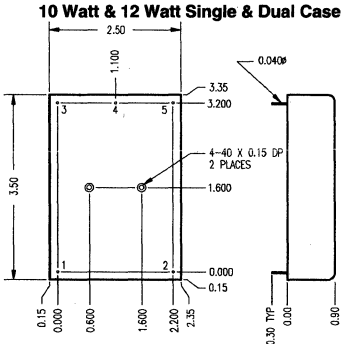
They are designed with a high accuracy feedback control circuit and coupled inductor magnetics for optimum performance.

15 WATT TRIPLE OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
9.0/18.0	5,±12	1500,±310	12T5.12SW	$130.00
	5,±15	1500,±250	12T5.15SW	$130.00
18.0/36.0	5,±12	1500,±310	24T5.12SW	$130.00
	5,±15	1500,±250	24T5.15SW	$130.00
36.0/72.0	5,±12	1500,±310	48T5.12SW	$130.00
	5,±15	1500,±250	48T5.15SW	$130.00

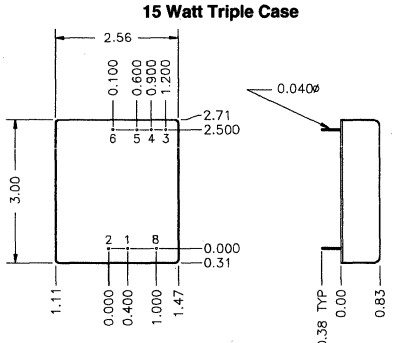
Line regulation typical: 0.10%
Load regulation typical: 2.0% 5 Volt, 1.5% all others
Noise typical: 20mV p-p
Isolation: 500 VDC
Case operating temperature: -25°C to +80°C

10 Watt & 12 Watt Single & Dual Case



PIN	FUNCTION	
	10 & 12 WATT SINGLES	10 & 12 WATT DUALS
1	+INPUT	+INPUT
2	-INPUT	-INPUT
3	+OUTPUT	+OUTPUT
4	N/C (Not Connected)	OUTPUT CMN
5	CMN	-OUTPUT

15 Watt Triple Case



PIN	FUNCTION 15 WATT TRIPLES		
1	+INPUT	5	-12/-15 OUTPUT
2	-INPUT	6	+5 OUTPUT
3	+12/+15 OUTPUT	8	ON/OFF
4	OUTPUT CMN		

DC/DC CONVERTERS

3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone: (415)932-3911 FAX: (415)932-6017

- Wide Input Voltage Range
- Overvoltage Protected Output
- No Derating to 80°C Case Temperature
- Shielded, Low Thermal Gradient Copper Case
- Covered Under the CALEX 5 Year Warranty

15 WATT SINGLE OUTPUT

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
9.0/27.0	5	3000	12S5.3000XC	$120.00
	12	1250	12S12.1250XC	$120.00
	15	1000	12S15.1000XC	$120.00
24.0/72.0	5	3000	48S5.3000XC	$120.00
	12	1250	48S12.1250XC	$120.00
	15	1000	48S15.1000XC	$120.00

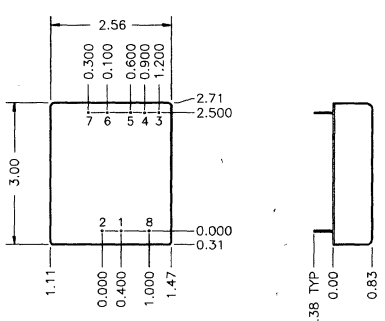
Line regulation typical: 0.05%
Load regulation typical: 0.10%
Noise typical: 20mV p-p
Isolation: 500 VDC input to output, 250 VDC leads to case
Case operating temperature: -25°C to +80°C
Output voltage trim range: ±10%

25-45 WATT SINGLE OUTPUT

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
7.0/40.0	5	5000	12S5.5000UW	$135.00
14.0/40.0	12	2500	24S12.2500UW	$135.00
	12	3500	24S12.3500UW	$135.00
17.0/40.0	15	3000	24S15.3000UW	$135.00

Line regulation typical: 0.02%
Load regulation typical: 0.02%
Noise typical: 20mV p-p
Isolation: not isolated input to output
Case operating temperature: -25°C to +80°C
Output voltage trim range: ±17%

15 Watt Single & 25-45 Watt Single Case



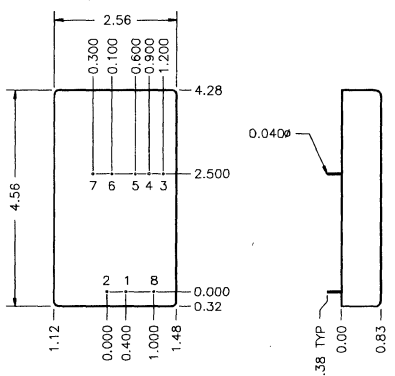
PIN	FUNCTION	
	15 WATT SINGLES	25-45 WATT SINGLES
1	+INPUT	+INPUT
2	-INPUT	-INPUT
3	N/P (No Pin)	+SENSE
4	TRIM	TRIM
5	N/P (No Pin)	-SENSE
6	+OUTPUT	+OUTPUT
7	OUTPUT CMN	-OUTPUT
8	ON/OFF	ON/OFF

25-30 WATT SINGLE & DUAL OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
9.0/18.0	±12	±1250	12D12.1250XW	$165.00
	±15	±1000	12D15.1000XW	$165.00
9.0/36.0	5	5000	24S5.5000XW	$160.00
	12	2500	24S12.2500XW	$160.00
	15	2000	24S15.2000XW	$160.00
18.0/36.0	±12	±1250	24D12.1250XW	$165.00
	±15	±1000	24D15.1000XW	$165.00
20.0/72.0	5	5000	48S5.5000XW	$160.00
	12	2500	48S12.2500XW	$160.00
	15	2000	48S15.2000XW	$160.00
36.0/72.0	±12	±1250	48D12.1250XW	$165.00
	±15	±1000	48D15.1000XW	$165.00

Line regulation typical: 0.05% single outputs
0.02% dual outputs
Load regulation typical: 0.05% single outputs
0.80% dual outputs
Noise typical: 20mV p-p
Isolation: 500 VDC input to output, 250 VDC leads to case
Case operating temperature: -25°C to +80°C
Output voltage trim range: ±10% single outputs only

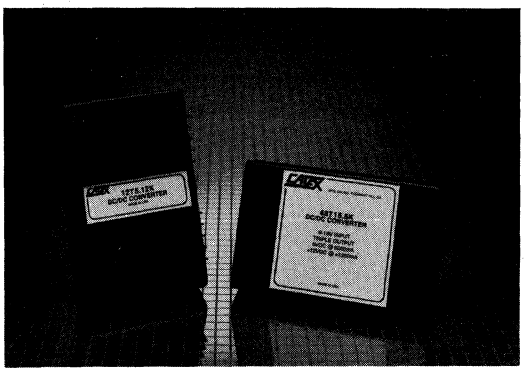
25-30 Watt Single & Dual Case



PIN	FUNCTION	
	25-30 WATT SINGLES	25-30 WATT DUALS
1	+INPUT	+INPUT
2	-INPUT	-INPUT
3	+SENSE	+OUTPUT
4	OUTPUT TRIM	OUTPUT CMN
5	-SENSE	-OUTPUT
6	+OUTPUT	N/P (No Pin)
7	-OUTPUT	N/P (No Pin)
8	ON/OFF	ON/OFF

DC/DC CONVERTERS

CALEX 3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone (415)932-3911 FAX: (415)932-6017



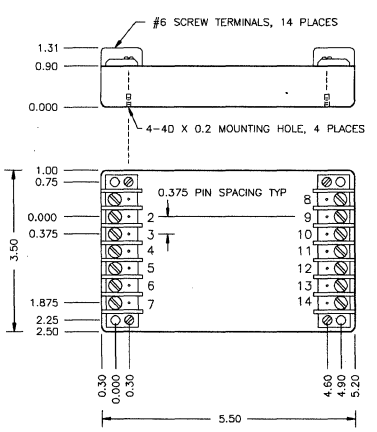
- PCB Mounting With Optional Heat Sink Or Chassis Mount Versions
- 2:1 Wide Input Voltage Range (9-18, 18-36, 36-72)
- Efficiencies to 90%
- Common and Differential Mode Input Filtering
- Remote Sense On +5 Volt Output
- Single and Dual Outputs Are Isolated From Each Other
- No Derating To 80°C Case Temperature

The K Triple Output Series is designed with separate power sections for the single and dual outputs. Each power section operates in anti-phase to the other, thereby reducing the ripple current stress on the input components and the reflected input ripple. An order of magnitude regulation improvement is achieved over competitive designs. There is no cross regulation between the +5 output and the dual outputs.

Excellent noise performance is achieved by the use of a 0.040 inch thick aluminum case, pot core and toroidal magnetics, double shielded transformers and both normal mode and common mode filtering.

The input and outputs are protected from overvoltage by transient voltage suppressor diodes. The outputs are protected from faults with pulse by pulse digital current limiting.

CHASSIS MOUNT OPTION (-3 SUFFIX)



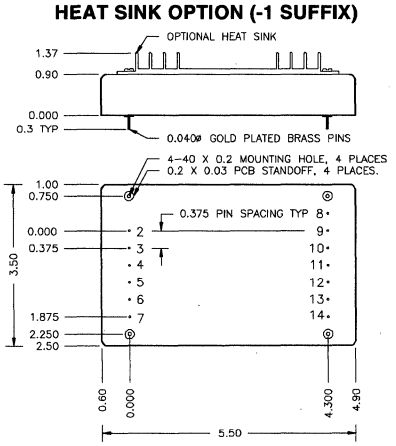
55 WATT TRIPLE OUTPUTS

INPUT VOLTAGE RANGE VDC MIN/MAX	OUTPUT VOLATGE VDC	OUTPUT CURRENT mA	MODEL NUMBER	PRICE (1-9)
9.0-18.0	5, ±12	5000, ±1250	12T5.12K	$215.00
	5, ±15	5000, ±1000	12T5.15K	$215.00
18.0-36.0	5, ±12	5000, ±1250	24T5.12K	$215.00
	5, ±15	5000, ±1000	24T5.15K	$215.00
36.0-72.0	5, ±12	5000, ±1250	48T5.12K	$215.00
	5, ±15	5000, ±1000	48T5.15K	$215.00

Line Regulation typical: 0.02%
Load Regulation typical: 0.02% 5V output
0.80% dual outputs
Noise: 50mVp-p max (0-20MHz bandwidth)
Isolation (input/output and output/output): 500VDC minimum
Case Operating Range: -25°C to 80°C

55 Watt Triple Case

HEAT SINK OPTION (-1 SUFFIX)



PIN	FUNCTION 55 WATT TRIPLES		
1	N/C	8	+5V CMN SENSE
2	-INPUT	9	+5V CMN
3	-INPUT	10	+5V OUTPUT
4	+INPUT	11	+5V SENSE
5	+INPUT	12	-DUAL OUTPUT
6	ON/OFF	13	DUAL CMN
7	CASE	14	+DUAL OUTPUT

For more information, pricing, availability , a copy of our full line Power Conversion Design Guide and Catalog, or to place an order call our toll free Hot Line at:

800-542-3355

or our factory direct line at:

415-932-3911

After September 2, 1991 call 510-932-3911

Prices are subject to change without notice, for qunatity discounts and OEM contract details consult the Factory at the above number.

AC/DC Linear Power Supplies

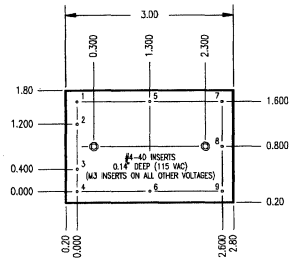
3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone: (415)932-3911 FAX: (415)932-6017

CALEX

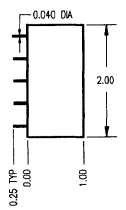
PRINTED CIRCUIT BOARD MOUNTING CASES

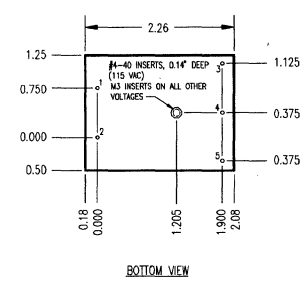
OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	LINE & LOAD REGULATION	NOISE & RIPPLE mV RMS	CASE SIZE	MODEL NUMBER	PRICE (1-9)
SINGLE OUTPUTS						
5	300	±0.2%	2	C	21-30	$64.00
5	500	±0.1%	1	B1	1.5.500	$78.00
5	1000	±0.1%	1	B2	1.5.1000	$100.00
**5	1000	±0.1%	1	B2	1.5.1000-DV	$110.00
*5	1000	±0.1%	1	B2	7009	$130.00
5	2000	±0.2%	2	B3	1.5.2000	$125.00
9	1000	±0.1%	2	B3	1.9.1000	$120.00
12	120	±0.2%	2	C	21-12	$64.00
12	480	±0.04%	2	B2	1.12.480	$115.00
**12	480	±0.04%	2	B2	1.12.480-DV	$120.00
12	750	±0.04%	2	B3	1.12.750	$125.00
15	400	±0.04%	2	B2	1.15.400	$100.00
15	600	±0.04%	2	B3	1.15.600	$125.00
18	500	±0.04%	2	B3	1.18.500	$120.00
24	375	±0.04%	2	B3	1.24.375	$125.00
DUAL OUTPUTS						
±5	±750	±0.1%	1	B3	2.5.750	$125.00
±12	±120	±0.04%	1	B1	2.12.120	$78.00
±12	±120	±0.04%	2	A	22-120	$87.00
±12	±240	±0.04%	1	B2	2.12.240	$100.00
**±12	±240	±0.04%	1	B2	2.12.240-DV	$110.00
±12	±360	±0.04%	2	B3	2.12.360	$125.00
±15	±50	±0.04%	1	B1	2.15.50	$70.00
±15	±50	±0.2%	2	C	22-40	$64.00
±15	±100	±0.04%	1	B1	2.15.100	$78.00
±15	±100	±0.04%	2	A	22-100	$87.00
±15	±200	±0.04%	1	B2	2.15.200	$100.00
**±15	±200	±0.04%	1	B2	2.15.200-DV	$110.00
*±15	±200	±0.04%	1	B2	7010	$145.00
±15	±350	±0.04%	2	B3	2.15.350	$125.00
TRIPLE OUTPUTS						
±12 & 5	±100 600	±0.1%♦	2	B2	3.12.5	$123.00
±15 & 5	±100 500	±0.1%	2	B2	3.15.5	$123.00
±12 & 5	±125 1000	±0.2%	2	B3	3.12.1000	$150.00
±15 & 5	±100 1000	±0.2%	2	B3	3.15.1000	$150.00

*Recognized to UL 544 Available in 115VAC only.
**Dual AC Input 115/230VAC
♦ The +5V output load regulation in the 3.12.5-100 and 3.12.5-115 models is ±0.2%
C Case Size Units Output Current is 1/2 @ 50Hz



A CASE SIZE





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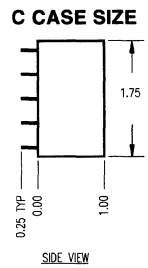


- Tightly Regulated
- Low Noise, Highly Stable
- Short Circuit Protected
- Covered Under CALEX Warranty

CALEX produces the highest quality power supplies available. Each power supply employs industry standard pin configurations that make the units ideal for use with operational amplifiers, function modules, and data conversion circuits.

COMMON SPECIFICATIONS

Input Voltage

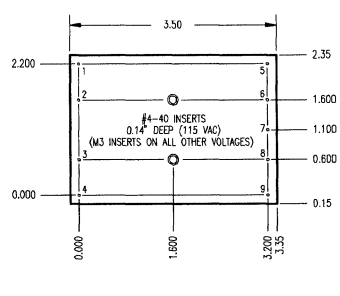
100 ±10VAC (add "-100" to model number)
115 ±10VAC (add "-115" to model number)
220 ±20VAC (add "-220" to model number)
230 ±20VAC (add "-230" to model number)
240 ±20VAC (add "-240" to model number)

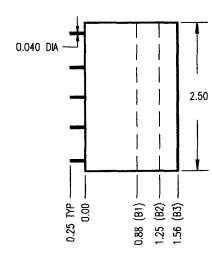
Input frequency range: 50 to 60 Hz
Input to Output Isolation: 1000-2500 VRMS, contact factory
Input to Output Resistance: 50 Megohms minimum
Capacitance: 50-250pF, contact factory
Over voltage protection: standard on all 5 Volt singles except 21-30 and 7009
Temperature coefficient: +0.01%/°C typical
Storage temperature: -25°C to +85°C
Case operating temperature range no derating: -25°C to +50°C
Short circuit protection: foldback current limiting on all except models 21-12, 21-30 and 22-40 which have constant current limiting

Mounting kits are available for the PC board mounting cases.
Call factory direct for large quantity pricing.
OEM pricing available.

800-542-3355

B CASE SIZES (Dimensions are in inches)





"A" MODELS HAVE 2" SPACING BETWEEN AC PINS.
(E.G. 2.15.200A)

AC/DC Linear Power Supplies

CALEX 3355 Vincent Road, Pleasant Hill,CA 94523-4389 800-542-3355 Telephone (415)932-3911 FAX: (415)932-6017

QUALITY PRODUCTS SINCE 1962

FEATURES

- 5 Year Warranty
- Convenient Barrier Strip Design
- Molded-in Threaded Inserts and Thru Hole Mounting
- Foldback Short Circuit Protection

The unique CM Series is a creatively engineered package. These units are ideally suited for use with small dedicated microprocessor systems, instrumentation and test equipment. Their clever design allows a clamp type terminal to secure the wire without twisting. A recessed barrier strip permits tight connections that protect the wire from physical damage. The case has four molded-in threaded inserts and four through holes. The CM Series also comes with foldback current limiting for continuous short circuit protection. All CALEX chassis mount power supplies come with our standard 5 Year Warranty.

CHASSIS MOUNTING CASES

OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	LINE & LOAD REGULATION	NOISE & RIPPLE mV RMS	CASE SIZE	MODEL NUMBER	PRICE (1-9)
SINGLE OUTPUTS						
5	500	±0.10%	1	CM	CM1.5.500	$88.00
5	1000	±0.10%	1	CM	CM1.5.1000	$115.00
10	400	±0.10%	1	CM	CM1.10.400	$115.00
12	500	±0.10%	1	CM	CM1.12.500	$115.00
15	400	±0.10%	1	CM	CM1.15.400	$115.00
250	30	±2.0%	5	CM	CM1.250.30	$115.00
DUAL OUTPUTS						
±12	±120	±0.04%	1	CM	CM2.12.120	$88.00
±12	±240	±0.04%	1	CM	CM2.12.240	$115.00
±15	±50	±0.04%	1	CM	CM2.15.50	$84.00
±15	±100	±0.04%	1	CM	CM2.15.100	$88.00
±15	±200	±0.04%	1	CM	CM2.15.200	$115.00
TRIPLE OUTPUTS						
±12 & 5	±100 600	±0.10%	2	CM	CM3.12.5	$134.00
±15 & 5	±100 500	±0.10%	2	CM	CM3.15.5	$134.00

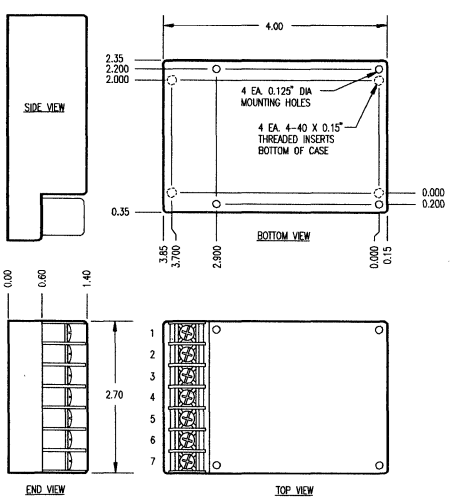
COMMON SPECIFICATIONS

Input Voltage

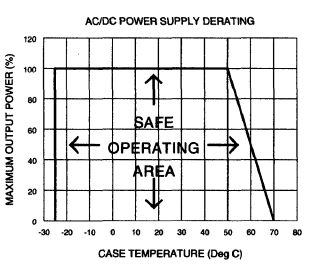
100 ±10VAC (add "-100" to model number)
115 ±10VAC (add "-115" to model number)
220 ±20VAC (add "-220" to model number)
230 ±20VAC (add "-230" to model number)
240 ±20VAC (add "-240" to model number)

Input frequency range: 50 to 60 Hz
Input to Output Isolation: 1200 - 1500 VRMS
Input to Output Resistance: 50 Megohms minimum
Capacitance: 50 - 250pF
Over voltage protection: standard on all 5 Volt singles
Temperature coefficient: +0.01%/°C typical
Storage temperature: -25°C to +85°C
Case operating range no derating: -25°C to +50°C
Short circuit protection: foldback current limiting on all CM units

CM CASE SIZE



SCREW TERMINAL	FUNCTION		
	SINGLE	DUAL	TRIPLE
1	-	-	AC INPUT
2	AC INPUT	AC INPUT	AC INPUT
3	AC INPUT	AC INPUT	5V CMN
4	-	-OUTPUT	+OUTPUT
5	CMN	CMN	-OUTPUT
6	+OUTPUT	+OUTPUT	CMN
7	-	-	+OUTPUT



For more information or a full line catalog on these quality products call:

800-542-3355

YOUR QUALITY SUPPLIERS FOR AC ADAPTORS

8529 N. Dixie Dr., Dayton, OH 45414 (513) 890-7881 FAX (513) 890-5136

STANDARD AC/DC ADAPTORS

DC 6 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-0603	6.0	30ma
AD-0610	6.0	100
AD-0620	6.0	200
AD-630M	6.0	300
AD-0640M	6.0	400
AD-0650M	6.0	500
AD-0630	6.0	300
AD-0640	6.0	400
AD-0650	6.0	500
AD-0660	6.0	600
AD-0670	6.0	700
AD-0680	6.0	800
AD-0690	6.0	900
AD-061A	6.0	1A
AD-062A	6.0	2A

DC 12 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-1205	12.0	50
AD-1210	12.0	100
AD-1215	12.0	150
AD-1220M	12.0	200
AD-1220	12.0	200
AD-1230	12.0	300
AD-1235	12.0	350
AD-1240	12.0	400
AD-1245	12.0	450
AD-1250	12.0	500
AD-1260	12.0	600
AD-1270	12.0	700
AD-1280	12.0	800
AD-1290	12.0	900
AD-121A	12.0	1A
AD-121A2	12.0	1.2A

DC 18 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-1815	18.0	150
AD-1820	18.0	200
AD-1825	18.0	250
AD-1830	18.0	300
AD-1835	18.0	350
AD-1840	18.0	400
AD-1845	18.0	450
AD-1850	18.0	500
AD-1860	18.0	600
AD-1870	18.0	700
AD-1880	18.0	800
AD-1890	18.0	900

DC 7.5 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-0710	7.5	100ma
AD-0720	7.5	200
AD-0730M	7.5	300
AD-0740M	7.5	400
AD-730	7.5	300
AD-740	7.5	400
AD-0750	7.5	500
AD-0760	7.5	600
AD-0770	7.5	700
AD-0780	7.5	800
AD-0790	7.5	900
AD-071A	7.5	1A

DC 15 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-1515	15.0	150
AD-1520	15.0	200
AD-1525	15.0	250
AD-1530	15.0	300
AD-1535	15.0	350
AD-1540	15.0	400
AD-1540L	15.0	400
AD-1550	15.0	500
AD-1560	15.0	600
AD-1570	15.0	700
AD-1580	15.0	800
AD-1590	15.0	900
AD151A	15.0	1A

DC 20 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-2010	20.0	100
AD-2015	20.0	150
AD-2020	20.0	200
AD-2025	20.0	250
AD-2030	20.0	300
AD-2030L	20.0	300
AD-2035	20.0	350
AD-2040	20.0	400
AD-2045	20.0	450
AD-2050	20.0	500
AD-2060	20.0	600
AD-2070	20.0	700

DC 9 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-0903	9.0	30
AD-0905	9.0	50
AD-0910	9.0	100
AD-0920M	9.0	200
AD-0930M	9.0	300
AD-0920	9.0	200
AD-0930	9.0	300
AD-0940	9.0	400
AD-0950	9.0	500
AD-0960	9.0	600
AD-0960L	9.0	600
AD-0970	9.0	700
AD-0980	9.0	800
AD-0990	9.0	900
AD-091A	9.0	1000
AD-09A5	9.0	1500

DC 16 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-1605	16.0	50
AD-1610	16.0	100
AD-1615	16.0	150
AD-1620	16.0	200
AD-1625	16.0	250
AD-1630	16.0	300
AD-1635	16.0	350
AD-1645	16.0	450
AD-1650	16.0	500
AD-1655	16.0	550
AD-1660	16.0	600
AD-1670	16.0	700
AD-1680	16.0	800
AD-161A	16.0	1A

DC 24 VOLTS

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)
AD-2410	24.0	100
AD-2415	24.0	150
AD-2420	24.0	200
AD-2425	24.0	250
AD-2425L	24.0	250
AD-2430	24.0	300
AD-2435	24.0	350
AD-2440	24.0	400
AD-2450	24.0	500
AD-2460	24.0	600

ALL ABOVE MODELS CAN BE CHANGED TO AC/AC OUTPUT

GENERAL SPECIFICATIONS:

- **Input:**

120VAC 60Hz	UL/CSA	North America
220VAC 50Hz	VDE/TUEV	Europe
100VAC 50Hz	JIS	Japan
240VAC 50Hz	BSI/SAA	UK, Australia, S. Africa

- **Output:** ±0.5VDC rated load.
- **Temperature:** 0°C to +40°C full load condition.
- **Dielectric Withstand Voltage:**

UL, CSA, JIS	1500VAC	1 Minute
VDE, BSI, TUEV, SAA	4000VAC	1 Minute

- **Enclosure:** Noryl SE 100J, Cyclolac ABS or Equivalent.
- **O/P Cord:** 6 feet Awg 24 or heavier.
- **Safety:** UL, CSA, JIS, VDE, TUEV, BSI, SAA.
- **MTBF:** 30000 Hours at 25°C full load.
- **QA:** MIL-STD-1Ø5D

LINEAR POWER SUPPLY

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)	REGULATION	UNIT SIZE	SAFETY
AD-51ARB	5V	1000	5%	D	TUV
AD-51A5RB	5V	1500	5%	M	TUV
AD-5129	+5V +12V –12V	1200 200 200	5% 5% 5%	M	UL, CSA, TUV
AD51274	+5V +12V	700 500	5% 5%	N	UL, TUV

REGULATED AC ADAPTOR

MODEL NO.	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (MA)	PC LOAD VOLTAGE (VDC)	REGULATION	UNIT SIZE	SAFETY
AD-095ORG	9	500	9.45	5%	B	CSA
AD-124ORG	12	400	12.6	5%	B	CSA
AD-0820RG	8 8	200 200	+8.4 –8.4	5% 5%	81x56x48 L W H inch	UL
AD-0530R	+5.2 +12	300 200	+5.3 +12.6	5% 5%	D	UL
A-01	+5V +12V –12V	850 125 125	+5.3 +12.6 -12.6	5% 5% 5%	N	UL

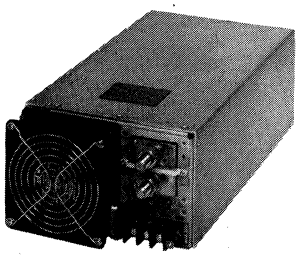
CEAG Switching Power Supplies

Industry Standard / Single Output Military Switching Power Supply / 4001 Series-1500 Watts

Voltage: 115/230 Vac. ±20%, 1 phase
Frequency: 57-63 Hz
Efficiency: 70% (min)
Power: 1500W
Voltage Adjustment: ±10%
Voltage Current: See chart below

Model	V	A	Model	V	A
4001-5	5	300	4001-18	18	85
4001-6	6	260	4001-24	24	65
4001-12	12	130	4001-28	28	60
4001-15	15	105	4001-48	48	35

Regulation: ±0.2% Weight: 26 lbs. max.
Operating Temperature: 0 to 71°C
Temperature Coefficient: 0.02%/°C max.
Protection: Over current, over-voltage and over temperature, built-in test and inhibit functions
MTBF: Greater than 50,000 hrs. @ 50°C in naval sheltered environment
Dimensions (ins): 5×8×15
Internal EMI Filter
Available Options: 3 phase input/ 47-440 Hz/Parallel (N+1) operation/Other outputs available

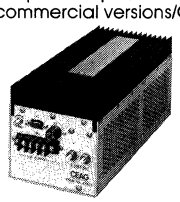


Single Output Military Switching Power Supply / 4032 Series-300 Watts

Voltage: 115/230 Vac. ±15%, 1 phase
Frequency: 47-440 Hz
Efficiency: 70% (min)
Power: 300W
Voltage Adjustment: ±10%
Voltage/Current: See chart below

Model	V	A	Model	V	A
4032-5	5	60	4032-18	18	17
4032-6	6	50	4032-24	24	13
4032-12	12	25	4032-28	28	11
4032-15	15	20	4032-48	48	6.5

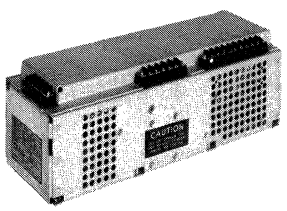
Regulation: ±0.25% Weight: 10 lbs. max.
Ripple and Noise: 100mVp-p
Operating Temperature: 0 to 71°C
Temperature Coefficient: 0.02%/°C max.
Protection: Over-current, over-voltage and over temperature, built-in test and inhibit functions
MTBF: Greater than 60,000 hrs. @ 40°C in naval sheltered environment
Holdup Time: 30mS
Cooling: Forced or free air
Dimensions (ins): 5×5×12
Internal EMI Filter
Available Options: 3 phase input/Industrial and ruggedized commercial versions/Other outputs available



Quad Output Shipboard Military Switching Power Supply / Model 4034-350 Watts ±15 Volts 6 Amps and ±28 Volts 3 Amps

Voltage: 115/220 Vac. ±10%, 1 phase
Frequency: 57-63 Hz
Efficiency: 70% (min)
Power: 350W
Voltage/Current: ±15V/6A ±28V/3A
Regulation: ±0.2%
Ripple and Noise: 200mVp-p max.
Operating Temperature: 0 to 65°C
Temperature Coefficient: 0.02%/°C

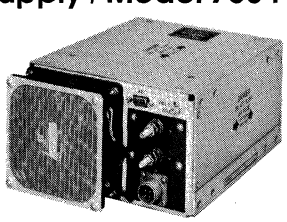
Protection: Over current, over-voltage and over temperature
MTBF: Greater than 50,000 hrs. @ 50°C in naval sheltered environment
Dimensions (ins): 4.75×4.75×13.75
Weight: 12 lbs. max.
Available Options: Other outputs and combinations available



Compact Fan-Cooled Single Output Military Switching Power Supply / Model 7604 1500 Watts / 28 Volts 54 Amps

Voltage: 115/230 Vac. ±20%, 1 phase
Frequency: 47-63 Hz
Efficiency: 80% (min)
Power: 1500W
Voltage/Current: 28V/54A
Regulation: ±0.5%
Ripple and Noise: 100mVp-p max.
Operating Temperature: 0 to 71°C
Temperature Coefficient: 0.02%/°C

Protection: Over current, over-voltage
MTBF: Greater than 120,000 hrs. @ 50°C in naval sheltered environment
Dimensions (ins): 5×8×11
Weight: 17 lbs. max. Internal EMI Filter
Available Options: AC input power fail/ Parallel (N+1) operation/Input frequency of 47-440 Hz available/3 phase input available/ Other output voltages available



DC-DC Six Output Military Switching Power Supply / Model 7654-130 Watts

5 Volts 20 Amps, −5 Volts .5 Amps, +15 Volts .5 Amps, −15 Volts .5 Amps, 21.5 Volts .2 Amps and −21.5 Volts .2 Amps

Voltage: 28Vdc, ±20%, per MIL-STD 1275A
Efficiency: 68%
Power: 130W
Voltage/Current: See chart below
Regulation: ±5V @ ±6%
±15V @ ±1.3%
±21.5V @ ±9.5%

5V/20A	−15V/.5A
−5V/.5A	21.5V/.2A
+15V/.5A	−21.5V/.2A

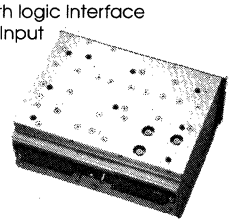
Ripple and Noise: 100mVp-p
Protection: Over-current and over-voltage
MTBF: Greater than 52,000 hrs. at 50°C, ground mobile environment
Temperature Coefficient: 0.02%/°C
Dimensions (ins): 1.8×7.6×8.4
Weight: 5.25 lbs. max.
Nuclear tolerant
Tempest:
Cooling wedgelock retainers
Available Options: Other outputs and combinations are available, EMI filter available

Nine Output Military Switching Power Supply / Model 7667

Voltage: 115/220 Vac ±10%, 1 phase
Frequency: 45-440 Hz Efficiency: 70%
Power: 320W, .95 power factor
Regulation: ±5%, Ripple: 100mVp-p
Voltage/Current: See chart below

5V/45A	-12V/1A	-5V/1.5A
5V/15A	15aV/0.5A	28V/0.05A
12V/1A	15bV/0.5A	15V/0.25A

Protection: Over-current, over-voltage, over-temperature ride through time during input power transitions
MTBF: Greater than 35,000 hrs at 50°C, ground mobile environment
Operating Temperature: —55 to 85°C
RAD hardened design for nuclear environment
Dimensions (ins): 8.38 x 3.875 x 6.38
Weight: 15 lbs max
Battery backup system with logic interface
Available Options: 28Vdc Input



CEC ELECTRONICS CORP.
1324 Motor Parkway, Hauppauge, New York, 11788 516/582-4422 FAX 516/582-4922

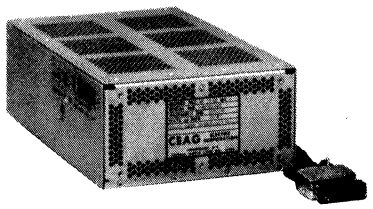
CEAG Switching Power Supplies

Quad Output Modular Military Switching Power Supply / Model 7860-250 Watts
5 Volts 21 Amps, −5.2 Volts 7.5 Amps, 12 Volts 7 Amps, −12 Volts 1.5 Amps

Voltage: 115VAC ±10%, 1 phase
Frequency: 60 Hz
Efficiency: 65%
Power: 250W
Voltage/Current: See chart below

5V/21A
−5.2V/7.5A
12V/7A
−12V/1.5A

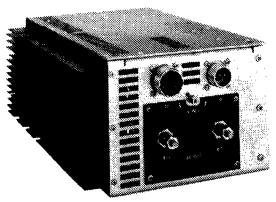
Regulation: ±1%
Output Ripple: 50mVp-p max
Protection: Over-current, over-voltage and over-temperature
MTBF: Greater than 40,000 hrs. at 40°C, ground mobile environment
Operating Temperature: −30 to 65°C
Dimensions (ins): 3.5×7×11
Weight: 12 lbs max



Triple Output Military Switching Power Supply / Model 7901-600 Watts
6 Volts 90 Amps, +15 Volts 1.5 Amps and −15 Volts 1.5 Amps

Voltage: 115 Vac, ±10%, 1 phase, per MIL-STD-1399
Frequency: 60 Hz
Efficiency: 65% min
Power: 600W
Voltage/Current: 6V/90A, 15V/1.5A, −15V/15A
Regulation: ±0.25%
Ripple and Noise: 100mVp-p
Protection: Overcurrent, overvoltage and overtemperature

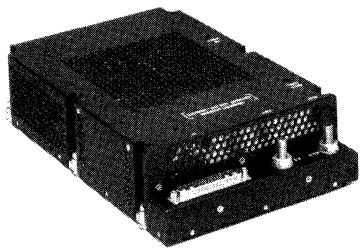
Internal EMI Filter
Remote Sense
Operating Temperature: 0 to 71°C
Temperature Coefficient: 0.02%/°C
Dimensions (ins): 5×6.75×12
Weight: 20 lbs max
Available Options: Other outputs and combinations available



Dual Output, Low Profile Military Switching Power Supply / Model 7911-710 Watts
5 Volts 100 Amps and 15 Volts 14 Amps

Voltage: 115 Vac, ±10%, 3 phase delta per MIL-STD-1399
Frequency: 47-440 Hz
Efficiency: 75%
Power: 710W
Voltage Adjustment: ±10%
Voltage/Current: 5V/100A and 15V/14A
Regulation: ±0.3%
Ripple and Noise: 75mVp-p
Protection: Overcurrent, overvoltage and overtemperature

MTBF: Greater than 100,000 hrs. @ 40°C in naval sheltered environment
Cooling Conduction
Operating Temperature: 0 to 65°C
Temperature Coefficient: 0.02%/°C
Dimensions (ins): 2.5×7×11
Weight: 10 lbs max
Available Options: Other outputs and combinations available

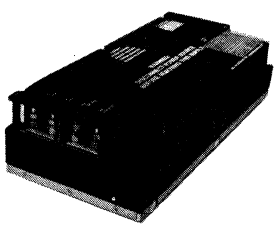


Triple Output, Low Profile Military Switching Power Supply / Model 7939-900 Watts
30 Volts 10 Amps

Voltage: 115 Vac, ±10%, 3 phase delta per MIL-STD-1399
Frequency: 47-440 Hz
Efficiency: 75%
Power: 900W
Voltage/Current: 30V/10A, 30V/10A, 30V/10A
Regulation: ±0.5%
Ripple and Noise: 100mVp-p
Protection: Overcurrent, overvoltage
MTBF: Greater than 100,000 hrs. @ 40°C in naval sheltered environment
Operating Temperature: 0 to 71°C
Dimensions (ins): 2.5×9.5×11.6
Weight: 12.5 lbs. max
Internal EMI Filter
Available Options: Other outputs and combinations are available

Single Output, Low Profile Military Switching Power Supply / Model 7970-785 Watts
5.25 Volts 150 Amps

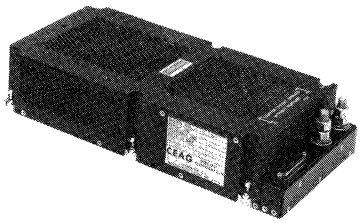
Voltage: 115 Vac, ±20% triple phase delta MIL-STD-1399
Frequency: 47-440 Hz
Efficiency: 70% min
Power: 785W
Voltage/Current: 5.25V/150A
Regulation (line, load, temperature life): ±0.3%
Ripple and Noise: 100mVp-p
Protection: Overcurrent, overvoltage and overtemperature
MTBF: Greater than 45,000 hrs. at 40°C, naval sheltered environment
Operating Temperature: 0 to 75°C
Temperature Coefficient: .02%/°C
Dimensions (ins): 3×6×14
Weight: 16 lbs max
Internal EMI conduction cooled
Available Options: Remote Sense available
MIL-STD-704 input available



Single Output Military Switching Power Supply / Model 7996-750 Watts
5 Volts 150 Amps

Voltage: 200 Vac, ±10%, 3 phase
Frequency: 47-440 Hz
Efficiency: 75%
Power: 750W
Voltage/Current: 5V/150A
Regulation: ±0.3%
Ripple and Noise: 70mVp-p
Protection: Overcurrent and overvoltage

Operating Temperature: −25 to 70°C
MTBF: Greater than 50,000 hrs. @ 50°C (baseplate) in Airborne Uninhabited fighter environment
Dimensions (ins): 2.5×6×13
Weight: 17 lbs max
Available Options: BIT signal and inhibit input



CEC ELECTRONICS CORP.
1324 Motor Parkway, Hauppauge, New York, 11788 516/582-4422 FAX 516/582-4922

C&C JETRONIC, INC.

SPECIFICATIONS

- Nominal voltage:
  - 1φ2W 100, 110, 120, 200, 220, 230, 240V
  - 1φ3W 110V / 220V
  - 3φ3W 220V
  - 3φ4W 120 / 208V or 220 / 380V
- Regulated range:
  - ± 15% of nominal voltage (nominal spec)
  - ± 22.5% of of nominal voltage (special spec)
- Recovery time:
  - ≤ 3 cycles for load vibration
  - ≤ 5 cycles for line vibration
- Output voltage≤ regulation:
  - ±2.5% (typical)
- Output wave form:
  - Same with input
- Efficiency:
  - ≥ 95%
- Power factor:
  - ±0.7~1 suitable for pure capacitive or inductive load
- Operating temp:
  - 0°C to 40°C
- Relative humidity:
  - 0~ 90%
- Automatic bypass when overload, short circuit or abnormal. Meanwhile, buzzer will alarm for 30 seconds and LED will lit. (3φ type only)
- 1φ 2W type is built by 220V type which connects with an isolation transformer box.
- 3φ Δ - Y type is built by Z type which connects with an isolation transformer box.
- Input voltage range: ±30% max. (option)
- Voltage recovery time: within 2 cycles (option)
- Over load capacity: 125% 1 hr, 150% 10 min, 200% 15 secs
- Over voltage & inrush current protection
- Widest power factor, suitable for pure capacitive or inductive load
- Microprocessor control circuit. Super micro size and silent operation
- Automatic electronic bypass switching when overload or abnormal
- Electronic select switches for indicating input/output voltage (1φ) and R/S/T phase voltage/current (3φ)

MODEL

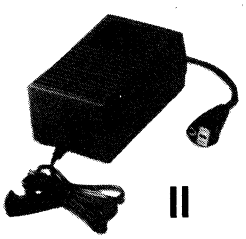
APS — XX K X

OUTPUT KVA

- A 1Ø2W110V
- B 1Ø2W220V
- C 1Ø3W110V/220V
- X 3Ø3W Δ - Δ
- Y 3Ø4W Δ -Y
- Z 3Ø4W Y -Y
- E ECONOMICAL TYPE

Digitalized AC Power Stabilizer

I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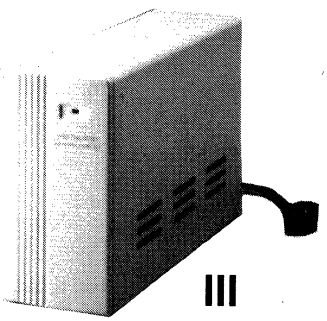
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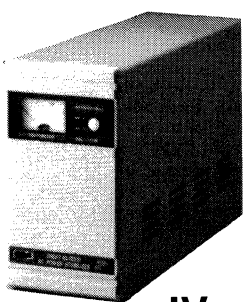
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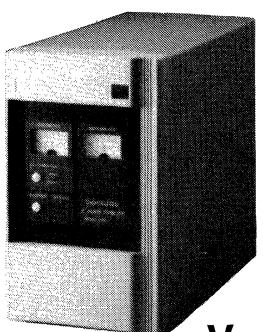
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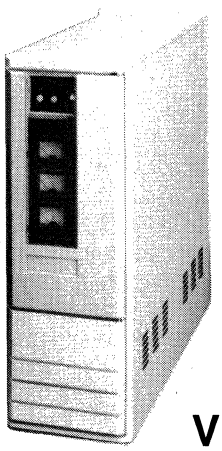

VI

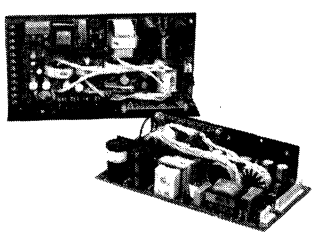
MODEL	OUTPUT KVA	DIMENSION (W X H X D)	WEIGHT (NET)	CASE TYPE
APS-500E	0.5	80x70x100	1.5kg	I
APS-IKE	1	95x70x130	2.5Kg	II
APS-500A/B	0.5	80x160x280	5kg	III
APS-1KA/B	1	80x160x280	6kg	III
APS-2KA/B	2	120x240x350	10kg	IV
APS-3KA/B	3	120x240x350	11kg	IV
APS-5KA/B	5	220x340x450	21kg	V
APS-5KC	5	300x600x450	21kg	V
APS-7KA/B	7.5	220x340x450	25kg	V
APS-7KC	7.5	300x600x450	25kg	V
APS-10KA/B	10	220x340x450	30kg	V
APS-10KC	10	300x600x550	30kg	V
APS-15KA/B	15	220x340x450	35kg	V
APS-15KC	15	300x600x450	35kg	V
APS-10KX/Y/Z	10	240x660x700	75kg	VI
APS-15KX/Y/Z	15	240x660x700	90kg	VI
APS-22KX/Y/Z	22.5	240x660x700	100kg	VI
APS-30KX/Y/Z	30	240x660x800	110kg	VI
APS-37KX/Y/Z	37.5	240x660x800	120kg	VI
APS-45X/Y/Z	45	240x660x800	130kg	VI

RESEARCH PARK 370 WALL ST., PRINCETON, N.J. 08540 • PHONE: 609-921-8540 • FAX: 609-921-7971

CHEROKEE INTERNATIONAL, INC.

SWITCHING POWER SUPPLIES

QFI-24



QT1-16

Standard Output Combination	Output 1 Volts	Output 1 Rated Amp	Output 1 Peak Amp	Output 2 Volts	Output 2 Rated Amp	Output 2 Peak Amp	Output 3 Volts	Output 3 Rated Amp	Output 3 Peak Amp	Output 4 Volts	Output 4 Rated Amp	Output 4 Peak Amp
QF7 35/43 Watts up to 3 Outputs (3.00×5.25×1.65) Notes: 2, 4/Options: F												
A	+5	5	6	+12	1	1.5	−12	.5	1			
B	+5	5	6	+15	1	1.5	−15	.5	1			
C	+5	5	6	+12	1	1.5	− 5	.5	1			
D	+5	5	6	+24	1	1.0	−12	.5	1			
E	+5	5	6	+24	1	1.0	− 5	.5	1			
QF1 50/60 Watts up to 3 Outputs (3.90×5.80×1.88) Notes: 1, 2, 3 5/Options: F/Weight: 14 oz.												
A	+5	4.0	5.0	+12	3.0	4.0	−12	0.5	1.0			
B	+5	4.0	5.0	+12	3.0	4.0	− 5	0.5	1.0			
C	+5	4.0	5.0	+24	2.0	2.5	−12	0.5	1.0			
D	+5	4.0	5.0	+24	2.0	2.5	− 5	0.5	1.0			
E	+5	4.0	5.0	+12	3.0	4.0	—	—	—			
F	+5	4.0	5.0	+24	2.0	2.5	—	—	—			
G	+5	4.0	5.0	+15	2.0	3.0	−15	0.5	1.0			
J	+5	6.0	8.0	—	—	—	—	—	—			
QF2, 50/60 Watts up to 4 Outputs (3.90×5.80×1.88) Notes: 1, 2, 3 5/Options: F/Weight: 14 oz.												
A	+5	4.0	5.0	+12	3.0	4.0	−12	0.5	1.0	−5	0.1	—
B	+5	4.0	5.0	+12	3.0	4.0	− 5	0.5	1.0	—	—	—
C	+5	4.0	5.0	+24	2.0	2.5	−12	0.5	1.0	−5	0.1	—
D	+5	4.0	5.0	+24	2.0	2.5	− 5	0.5	1.0	—	—	—
E	+5	4.0	5.0	+12	3.0	4.0	—	—	—	—	—	—
F	+5	4.0	5.0	+24	2.0	2.5	—	—	—	—	—	—
G	+5	4.0	5.0	+15	2.0	3.0	−15	0.5	1.0	−5	0.1	—
J	+5	6.0	8.0	—	—	—	—	—	—	—	—	—
K	+5	4.0	5.0	+15	2.0	3.0	−15	0.5	1.0	—	—	—
QF22 and 23, 50/70 Watts up to 4 Outputs (3.90×5.80×1.70) Weight: 11 oz.												QF22-FCC, VDE Level A QF23-FCC, VDE Level B
A	+5	10	12	+12	4	5	−12	1	—	5	1	—
B	+5	10	12	+24	2	2.5	−12	1	—	5	1	—
C	+5	10	12	+12	4	5	−12	1	—	12	1	—
D	+5	10	12	+15	4	5	−15	1	—	5	1	—
E	+5	10	12	—	—	—	−12	1	—	12	1	—
F	+5	10	12	+12	4	5	—	—	—	—	—	—
G	+5	14	16	—	—	—	—	—	—	—	—	—
H	+12	6	7	—	—	—	—	—	—	—	—	—
I	+5	4	—	+12	4	9	—	—	—	—	—	—
QF24 and 25, 65/85 Watts up to 4 Outputs (4.08×5.90×2.25) Weight: 1 lb. 5 oz.												QF24-FCC, VDE Level A QF25-FCC, VDE Level B
A	+5	10	12	+12	4	5	−12	1	—	5	1	—
B	+5	10	12	+24	2	2.5	−12	1	—	5	1	—
C	+5	10	12	+12	4	5	−12	1	—	12	1	—
D	+5	10	12	+15	4	5	−15	1	—	5	1	—
E	+5	10	12	—	—	—	−12	1	—	12	1	—
F	+5	10	12	+12	4	5	—	—	—	—	—	—
G	+5	14	16	—	—	—	—	—	—	—	—	—
H	+12	6	7	—	—	—	—	—	—	—	—	—
I	+5	4	—	+12	4	9	—	—	—	—	—	—
QF3 70/85 Watts up to 3 Outputs (4.08×5.90×2.25) Notes: 1, 2, 3/Options: F/Weight 1 lb., 5 oz.												
A	+5	7.5	9.0	+12	4.0	5.0	−12	0.5	1.0			
B	+5	7.5	9.0	+12	4.0	5.0	− 5	0.5	1.0			
C	+5	7.5	9.0	+24	2.5	3.0	−12	0.5	1.0			
D	+5	7.5	9.0	+24	2.5	3.0	− 5	0.5	1.0			
E	+5	7.5	9.0	+12	4.0	5.0	—	—	—			
F	+5	7.5	9.0	+24	2.5	3.0	—	—	—			
G	+5	7.5	9.0	+15	3.0	4.0	−15	0.5	1.0			
J	+5	10.0	12.0	—	—	—	—	—	—			
QF4, 70/85 Watts up to 4 Outputs (4.08×5.90×2.25) Notes: 1, 2, 3/Options: F/Weight: 1 lb. 5 oz.												
A	+5	8.0	9.0	+12	4.0	5.0	−12	0.5	1.0	−5	0.1	—
B	+5	8.0	9.0	+12	4.0	5.0	− 5	0.5	1.0	—	—	—
C	+5	8.0	9.0	+24	2.5	3.0	−12	0.5	1.0	−5	0.1	—
D	+5	8.0	9.0	+24	2.5	3.0	− 5	0.5	1.0	—	—	—
E	+5	8.0	9.0	+12	4.0	5.0	—	—	—	—	—	—
F	+5	8.0	9.0	+24	2.5	3.0	—	—	—	—	—	—
G	+5	8.0	9.0	+15	3.0	4.0	−15	0.5	1.0	−5	0.1	—
J	+5	10.0	12.0	—	—	—	—	—	—	—	—	—
K	+5	8.0	9.0	+15	3.0	4.0	−15	0.5	1.0	—	—	—
QF6 100/125 Watts Single Outputs (4.30×6.30×2.50) Notes: 2, 4/Options: F												
A	+2	25	25									
B	+5	25	25									
C	+5.2	25	25									
D	+12	10	10									
E	+15	9	9									
F	+24	4.5	4.5									
G	+28	4.5	4.5									
H	+48	2	2									
QT1 and 11 100/125 Watts up to 3 Outputs (4.56×8.25×1.92) Notes: 1, 2, 3, 5/Options: A, B, F/Weight: 1 lb., 4 oz.												QT1 =MTA CONNECTOR QT11=TERMINAL BLOCK
A	+5	15.0	20.0	+12	4.0	8.0	−12	1.0	1.5			
B	+5	15.0	20.0	+12	4.0	8.0	− 5	0.5	1.0			
C	+5	15.0	20.0	+15	4.0	8.0	−15	1.0	1.5			
D	+5	15.0	20.0	+24	4.0	5.0	−25	1.0	1.5			
E	+5	20.0	25.0	—	4.0	—	—	—	—			
F	+5	15.0	20.0	+12	4.0	8.0	—	—	—			
I	+5	10.0	15.0	+24	4.0	6.0	—	—	—			
QT2 and 12 125/150 Watts up to 3 Outputs (4.75×8.30×2.40) Notes: 1, 2, 3/Options: A, B, D, F/Weight: 2 lb., 8 oz.												QT2 =MTA CONNECTOR QT12=TERMINAL BLOCK
A	+5	20.0	25.0	+12	6.0	10.0	−12	1.0	1.5			
B	+5	20.0	25.0	+12	6.0	10.0	− 5	0.5	1.0			
C	+5	20.0	25.0	+15	6.0	10.0	−15	1.0	1.5			
D	+5	20.0	25.0	+24	4.0	5.0	−24	1.0	1.5			
E	+5	25.0	30.0	—	—	—	—	—	—			
F	+5	20.0	25.0	+12	6.0	10.0	—	—	—			
I	+5	10.0	15.0	+24	6.0	8.0	—	—	—			

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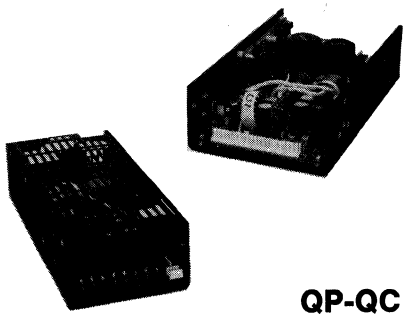
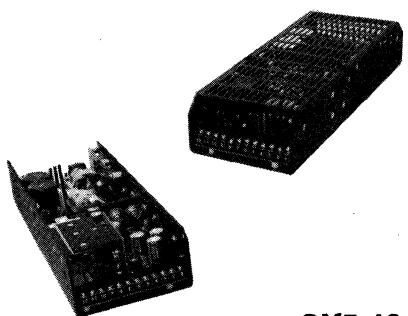
CHEROKEE INTERNATIONAL, INC.

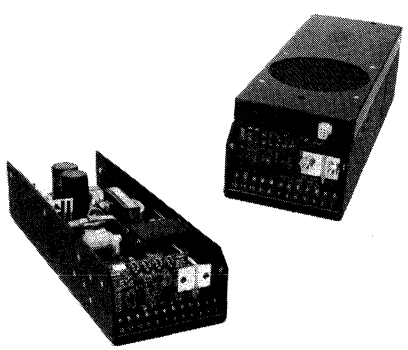
SWITCHING POWER SUPPLIES



QP-QC



QX5-10



QS3-4

QT3 and 13 100/125 Watts up to 4 Outputs

(4.56 x 8.25 x 1.92) Notes: 1, 2, 3, 5/Options: A, B, F/Weight: 1 lb., 14 oz.

QT3 = MTA CONNECTOR
QT13 = TERMINAL BLOCK

Standard Output Combination	Output 1 Volts	Output 1 Rated Amp	Output 1 Peak Amp	Output 2 Volts	Output 2 Rated Amp	Output 2 Peak Amp	Output 3 Volts	Output 3 Rated Amp	Output 3 Peak Amp	Output 4 Volts	Output 4 Rated Amp	Output 4 Peak Amp
A	+5	15.0	20.0	+12	4.0	8.0	−12	1.0	1.5	− 5	0.5	1.0
B	+5	15.0	20.0	+24	3.0	5.0	−24	1.0	1.5	−12	0.5	1.0
C	+5	15.0	20.0	+15	4.0	8.0	−15	1.0	1.5	−12	0.5	1.0

QT4 and 14 125/140 Watts up to 4 Outputs

(4.75 x 8.30 x 2.40) Notes: 1, 2, 3/Options: A, B, D, F/Weight: 2 lbs., 8 oz.

QT4 = MTA CONNECTOR
QT14 = TERMINAL BLOCK

A	+5	20.0	25.0	+12	4.0	8.0	−12	1.0	1.5	− 5	0.5	1.0
B	+5	20.0	25.0	+24	3.0	5.0	−24	1.0	1.5	−12	0.5	1.0
C	+5	20.0	25.0	+15	4.0	8.0	−15	1.0	1.5	−12	0.5	1.0

QT5 and 15 125/150 Watts up to 4 Outputs

(4.71 x 9.40 x 1.92) Notes: 1, 2, 3, 5/Options: A, B, E, F/Weight: 2 lbs., 8 oz.

QT5 = MTA CONNECTOR
QT15 = TERMINAL BLOCK

A	5	20.0	25.0	+12	2.0	3.0	−12	1.0	1.5	24	4.0	8.0
B	5	20.0	25.0	+12	2.0	3.0	−12	1.0	1.5	12	4.0	8.0
C	5	20.0	25.0	+12	2.0	3.0	−12	1.0	1.5	5	4.0	8.0
D	+5	10.0	25.0	−12	4.5	5.0	—	—	—	+24	4.0	8.0
E	5	20.0	25.0	—	—	—	—	—	—	12	4.0	8.0
F	5	25.0	30.0	—	—	—	—	—	—	—	—	—
G	5	20.0	25.0	+24	1.0	1.5	−12	0.5	1.0	12	4.0	8.0
H	5	20.0	25.0	15	2.0	3.0	—	—	—	15	4.0	8.0
I	5	20.0	25.0	+15	2.0	3.0	−15	1.0	1.5	24	4.0	8.0

QT6 and 16 150/175 Watts up to 4 Outputs

(4.90 x 9.50 x 2.40) Notes: 1, 2, 3/Options: A, B, D, E, F/Weight: 3 lbs.

QT6 = MTA CONNECTOR
QT16 = TERMINAL BLOCK

A	5	20.0	25.0	+12	2.0	3.0	−12	1.0	1.5	24	5.0	8.0
B	5	20.0	25.0	+12	2.0	3.0	−12	1.0	1.5	12	6.0	8.0
C	5	20.0	25.0	+12	2.0	3.0	−12	1.0	1.5	5	6.0	8.0
D	+5	10.0	20.0	−12	4.5	5.0	—	—	—	+24	5.0	8.0
E	5	20.0	25.0	—	—	—	—	—	—	12	6.0	8.0
F	5	25.0	30.0	—	—	—	—	—	—	—	—	—
G	5	20.0	25.0	+24	1.0	1.5	−12	0.5	1.0	12	6.0	8.0
H	5	20.0	25.0	15	2.0	3.0	—	—	—	15	5.0	8.0
I	5	20.0	25.0	+15	3.0	—	−15	1.0	1.5	24	5.0	8.0

QT9 and 19 125/150 Watts up to 3 Outputs

(4.75 x 8.30 x 2.40) Notes: 2, 4/Options: A, B, D, E, F

A	5	20	25	12	6	10	12	4.5	6			
B	5	20	25	12	6	10	5	4.5	6			
C	5	20	25	15	6	10	15	4.5	6			
D	5	20	25	24	4	5	12	3.0	4			

QC3 175/225 Watts up to 3 Outputs

(5.38 x 9.50 x 2.50) Notes: 1, 2, 3/Options: A, B, C, D, E, F, H, M, N/Weight: 3 lbs., 14 oz.

A	5	25	30	12	7.0	10.0	12	3.0	3.0			
B	5	25	30	12	7.0	10.0	5	3.0	3.0			
C	5	25	30	12	7.0	10.0	24	3.0	3.0			
D	5	25	30	24	6.0	8.0	12	3.0	3.0			
E	5	25	30	24	6.0	8.0	5	3.0	3.0			
F	5	25	30	5	7.0	10.0	12	3.0	3.0			
G	5	25	30	5	7.0	10.0	24	3.0	3.0			

QP1 175/200 Watts up to 3 Outputs

(4.25 x 10.00 x 2.50) Notes: 1, 2, 3/Options: A, C, D, F, G, R/Weight: 3 lbs., 3 oz.

A	5	20	25	12	2.5	3	12	6	10			
B	5	20	25	12	4.0	6	12	4	6			
C	5	10	15	12	2.5	3	12	6	10			
D	5	10	15	12	4.0	6	12	4	6			
E	5	20	25	5	2.5	3	12	6	10			
F	5	20	25	5	4.0	6	12	4	6			
G	5	10	15	24	2.5	3	12	6	10			
H	5	10	15	24	4.0	6	12	4	6			
I	5	10	15	12	2.5	3	24	6	10			
J	5	10	15	12	4.0	6	24	4	6			
K	5	20	25	12	4.0	6	5	6	10			
L	5	20	25	24	2.5	3	5	6	10			

QP2 225/250 Watts up to 3 Outputs

(4.25 x 10.00 x 2.50) Notes: 1, 2, 3/Options: A, C, D, F, G, R/Weight: 3 lbs., 4 oz.

A	5	40	45	12	2.5	3	12	6	10			
B	5	40	45	12	4.0	6	12	4	6			
C	5	40	45	5	2.5	3	12	6	10			
D	5	40	45	5	4.0	6	12	4	6			
E	5	40	45	24	2.5	3	12	6	10			
F	5	40	45	24	4.0	6	12	4	6			
G	5	40	45	12	2.5	3	24	6	10			
H	5	40	45	5	2.5	3	24	6	10			
I	5	40	45	5	4.0	6	24	4	6			
J	5	40	45	12	2.5	3	5	6	10			
K	5	40	45	24	2.5	3	5	6	10			

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CHEROKEE INTERNATIONAL, INC.

SWITCHING POWER SUPPLIES

FEATURES/BENEFITS

- All products are warranted to be free of defects in materials and workmanship for a period of one year
- Custom and standard products
- Many models are available off-the-shelf for immediate delivery
- Engineering and manufacturing capacity to support major OEM programs
- 0°-70° operating ambient
- 75% efficiency typical
- All outputs are rated for nominal and peak current
- All models are rated for convection and forced air cooling
- Accommodates high peak drive requirements
- AC input provisions
  - —Power Factor Correction
  - —90-132/180-264 VAC, 37-440 Hz
  - —Jumper relocation for VAC range selection
  - —Input surge current limited
  - —Brown out protected
  - —Autoranging
- DC output provisions
  - —Complete overload protection
  - —Overvoltage protected
  - —Reverse voltage protected
  - —Low noise outputs
  - —High hold-up time
  - —Current sharing

Total Power (Watts) Convection/ Forced Air		Single Output	Dual Output	Triple Output	Quad Output	Five Output
35	43		QF7	QF7		
50	60	QF2	QF2	QF1/ QF2	QF2	
70	85	QF6	QF3/ QF4	QF3/ QF4	QF4	
100	125	QF6	QT1/ QT11	QT1/ QT11	QT3/ 13	
125	150	QT2/ QT12	QT2/ QT12	QT2/ QT12 QT9 QT19	QT4/ 14 QT5/ 15	
150	175	QT6/ QT16	QT6/ QT16	QT6/ QT16	QT6/ QT16	
175	200 225	QP2	QP2	QP1 QC3	QP3	
225	250	QX5	QP2	QP2 QP4	QP3	QX6
250	300 325	QX5	QX5 QX9 QX10	QX5 QX9 QX10	QX5 QX10	QX6
275	325	QX6	QX6	QX6	QX5	QX6
300	350	QS5	QP5	QP5	QS3	QS3
300	400	QS5	QS3	QS3	QS3	QS3
400 (includes fan)		QD13	QX11 QD13	QX11 QD13	QD13	
500 (includes fan)		QS6 QD4	QS4 QD4	QS4 QD4	QS4 QD4	QS4
750		QD5	QD5	QD5	QD5	
1000		QD6 QD16	QD6 QD16	QD6 QD16	QD6 QD16	
1500		QD7	QD7	QD7	QD7	
2000		QD8	QD8	QD8	QD8	

QP3 225/250 Watts up to 4 Outputs

(4.25 x 10.00 x 2.50) Notes: 1, 2, 3/Options: A, C, D, E, F, G, N, R/Weight: 3 lbs., 4 oz.

Standard Output Combination	Output 1 Volts	Output 1 Rated Amp	Output 1 Peak Amp	Output 2 Volts	Output 2 Rated Amp	Output 2 Peak Amp	Output 3 Volts	Output 3 Rated Amp	Output 3 Peak Amp	Output 4 Volts	Output 4 Rated Amp	Output 4 Peak Amp	Output 5 Volts	Output 5 Rated Amp	Output 5 Peak Amp
A	5	40	45	+12	2.0	3.0	−12	1.0	1.5	+ 5	6	10			
B	5	40	45	+12	2.0	3.0	−12	1.0	1.5	+12	6	10			
C	5	40	45	+12	2.0	3.0	−12	1.0	1.5	+24	6	10			
D	5	40	45	+ 5	2.0	3.0	− 5	1.0	1.5	+12	6	10			
E	5	40	45	+ 5	2.0	3.0	− 5	1.0	1.5	+24	6	10			
F	5	40	45	+24	1.0	1.5	−12	.1	.25	+12	6	10			
G	5	40	45	+24	1.0	1.5	−24	1.0	1.5	+12	6	10			
H	5	40	45	+24	1.0	1.5	− 5	.1	.25	+12	6	10			
I	5	40	45	+12	2.0	3.0	− 5	.1	.25	+24	6	10			

QP4 225/250 Watts up to 3 Outputs DC to DC

(4.25 x 10.00 x 2.50) Notes: 1, 2, 3/Options: A, C, D/Weight: 3 lbs., 5 oz.

A	5	40	45	12	2.5	3	12	6	10						
B	5	40	45	12	4.0	6	12	4	6						
C	5	40	45	5	2.5	3	12	6	10						
D	5	40	45	5	4.0	6	12	4	6						
E	5	40	45	24	2.5	3	12	6	10						
F	5	40	45	24	4.0	6	12	4	6						
G	5	40	45	12	2.5	3	24	6	10						
H	5	40	45	5	2.5	3	24	6	10						
I	5	40	45	5	4.0	6	24	4	6						
J	5	40	45	12	2.5	3	5	6	10						
K	5	40	45	24	2.5	3	5	6	10						

QP5 300/350 Watts up to 3 Outputs DC to DC

(4.25 x 10.00 x 3.50) Notes: 2, 4/Options: A, C, F, G, R

A	5	50	55	12	2.5	3	12	6	10						
B	5	50	55	12	4.0	6	12	4	6						
C	5	50	55	5	2.5	3	12	6	10						
D	5	50	55	5	4.0	6	12	4	6						
E	5	50	55	24	2.5	3	12	6	10						
F	5	50	55	24	4.0	6	12	4	6						
G	5	50	55	12	2.5	3	24	6	10						

QP6 300/350 Watts up to 3 Outputs

(4.25 x 10.00 x 3.50) Notes: 2, 4/Options: A, C, F, G, R

A	5	50	55	12	2.5	3	12	6	10						
B	5	50	55	12	4.0	6	12	4	6						
C	5	50	55	5	2.5	3	12	6	10						
D	5	50	55	5	4.0	6	12	4	6						
E	5	50	55	24	2.5	3	12	6	10						
F	5	50	55	24	4.0	6	12	4	6						
G	5	50	55	12	2.5	3	24	6	10						

QX5 250/300 Watts up to 4 Outputs

(5.00 x 13.50 x 2.50) Notes: 1, 2, 3/Options: A, B, C, D, F, H, K, N/Weight: 4 lbs., 13 oz.

A	5	50	60	+12	5	—	−12	3	—	Aux Rtn	—	—			
B	5	50	60	+12	5	—	−12	3	—	− 5	1	—			
C	5	50	60	+15	5	—	−15	3	—	Aux Rtn	—	—			
D	5	50	60	+15	5	—	−15	3	—	− 5	1	—			
E	5	50	60	+12	5	—	− 5	3	—	Aux Rtn	—	—			
F	5	50	60	+12	5	—	− 5	3	—	−12	1	—			
G	5	30	40	+24	5	—	−12	1.5	—	Aux Rtn	—	—			
H	5	30	40	+24	5	—	−12	1.5	—	+12	2.5	3.0			
I	5	30	40	+24	5	—	−12	1.5	—	− 5	1	1.3			
J	5	30	40	+12	5	—	−12	3	—	+24	1.0	3.0			
K	5	50	60	+12	5	—	—	3	—	−12	1	1.3			
M	+5	30	40	+12	6	8	−12	3	—	Aux Rtn	—	—			

QX6 275/325 Watts up to 5 Outputs

(5.00 x 13.50 x 2.50) Notes: 1, 2, 3/Options: A, B, C, D, F, K, N/Weight: 4 lbs., 13 oz.

A	5	50	60	+12	5	—	−12	2.5	3.0	Aux Rtn	—	—	+12	6	8
B	5	50	60	+12	5	—	−12	2.5	3.0	− 5	1	—	+12	6	8
C	5	50	60	+12	5	—	− 5	2.5	3.0	Aux Rtn	—	—	+12	6	8
D	5	50	60	+12	5	—	− 5	2.5	3.0	−12	1	—	+12	6	8
E	5	30	40	+12	5	—	−12	2.5	3.0	Aux Rtn	—	—	+24	6	8
F	5	30	40	+12	5	—	−12	2.5	3.0	− 5	1	—	+24	6	8
G	5	30	40	+12	5	—	− 5	2.5	3.0	Aux Rtn	—	—	+24	6	8
H	5	30	40	+12	5	—	− 5	2.5	3.0	−12	1	—	+24	6	8
I	5	30	40	+12	5	—	−12	2.5	3.0	Aux Rtn	—	—	+12	10	12
J	5	30	40	+12	5	—	−12	2.5	3.0	− 5	1	—	+12	10	12
K	5	30	40	+12	5	—	− 5	2.5	3.0	Aux Rtn	—	—	+12	10	12
L	5	30	40	+12	5	—	− 5	2.5	3.0	−12	1	—	+12	10	12
M	+5	30	40	+24	6	8	−12	2.5	3.0	Aux Rtn	—	—	+24	6	8

QX9 250/325 Watts up to 3 Outputs

(5.00 x 13.50 x 2.50) Notes: 1, 2, 3/Options: A, C, D, F, M, N/Weight: 4 lbs., 13 oz.

A	5	40	45	12	5	—	12	10	15						
B	5	30	45	12	5	—	24	8	12						
C	5	40	45	5	5	—	12	10	15						
D	5	30	45	5	5	—	24	8	12						
E	5	30	45	24	5	—	12	10	15						
F	5	20	45	24	5	—	24	8	12						
G	5	25	30	12	7	12	12	10	15						
H	5	15	20	12	7	12	24	8	16						

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CHEROKEE INTERNATIONAL, INC.

SWITCHING POWER SUPPLIES

OPTIONS

- A) Remote On/Off
- B) Power Fail
- C) Thermal Shut Down
- D) EMI/Safety Cover
- E) Not Standard (Special per Series)*
- F) Wire for 230 VAC
- G) 115/230 VAC Remote Selection
- H) "L" Chassis Substitution for "U" Chassis
- J) AC Input in Same Side as DC Output
- K) ¼-20 Studs in lieu of Terminal Block on Output 1 (QX5 and QX6 only)
- L) ¼-20 Studs are not Applicable on Output 1 (QS3 and QS4 only)
- M) Internal VAC range Selection (QC3, QX9, QX10)
- N) Fan Output (QX5, QX6, QX9, QX10)
- P) Under Voltage Protection (QX9)
- R) Reverse Remote On/Off
- S) Reverse Power Fail
- T) Horizontal Output Studs (QS5-6)
- U) Fan at end, not top (QS6)

NOTES

1) UL Recognized, CSA Certified
2) TUV Approved
3) Fully compliant with FCC and VDE (Level A) standards for EMI
4) All EMI standards met with economical external filter
5) Increased output power can be obtained by appropriate heat sink mounting

ORDERING INFORMATION

OPTIONS*

QS 4 — A 1 A B C F J L

- Series
- Case/ Configuration
- Output Combinations (See AVAILABLE OUTPUTS)
- Version 1 = Standard)
- Eliminate Output 1 Studs
- AC Input at DC End (See Photo)
- Wire for 230 VAC
- Thermal Shutdown
- Power Fail (Good)
- Remote On/Off
- *List all OPTIONS selected

Standard Output Combination	Output 1			Output 2			Output 3			Output 4			Output 5		
	Volts	Rated Amp	Peak Amp	Volts	Rated Amp	Peak Amp	Volts	Rated Amp	Peak Amp	Volts	Rated Amp	Peak Amp	Volts	Rated Amp	Peak Amp
QX10 250/325 Watts up to 4 Outputs (5.00 x 13.50 x 2.50) Notes: 1, 2, 3/Options: A, C, D, F, M, N/Weight: 4 lbs., 13 oz.															
A	+ 5	20	25	− 5	20	25	12	5	—	12	10	15			
B	+ 5	15	20	− 5	15	20	12	5	—	24	8	12			
C	+ 5	15	20	− 5	15	25	24	5	—	12	10	15			
D	+ 5	15	25	− 5	15	25	24	5	—	24	8	12			
E	+ 5	15	25	− 5	15	25	12	7	10	12	10	15			
F	+12	10	15	−12	10	15	24	5	—	5	10	15			
G	+24	8	12	−24	8	12	12	5	—	5	10	15			
QX11 400 Watts up to 3 Outputs (5.00 x 13.50 x 3.40) Notes: 1, 2, 3/Options: A, C, D, F, M, N, R/Weight: 5 lbs., 6 oz.															
A	5	40	45	12	5	—	12	12	14						
B	5	30	45	12	5	—	24	10	14						
C	5	40	45	5	5	—	12	12	14						
D	5	30	45	5	5	—	24	10	14						
E	5	30	45	24	5	—	12	12	14						
F	5	20	30	24	5	—	24	12	20						
G	5	20	30	12	7*	10	12	12	20						
H	5	20	30	12	7*	10	24	12	20						
QS3 300/400 Watts up to 5 Outputs (5.00 x 14.95 x 3.12) Notes: 1, 2, 3/Options: A, B, C, D, E, F, L/Weight: 7 lbs., 11 oz.															
B	5	80	90	+12	6	7	−12	6	7	−5	6	7	24	10	14
C	5	80	90	+15	6	7	−15	6	7	—	—	—	—	—	—
D	5	80	90	+12	6	7	−12	6	7	−5	6	7	12	12	18
E	5	80	90	+12	6	7	−12	6	7	−5	6	7	—	—	—
G	5	80	90	+12	6	7	−12	6	7	—	—	—	24	10	14
I	5	80	90	+12	6	7	−12	6	7	—	—	—	12	12	18
J	5	80	90	+12	6	7	−12	6	7	—	—	—	—	—	—
L	5	80	90	+24	5	6	−12	6	7	−5	6	7	12	12	18
M	5	80	90	—	—	—	−12	6	7	−5	6	7	24	10	14
QS4 500 Watts up to 5 Outputs (5.00 x 14.95 x 4.13) Notes: 1, 2, 3/Options: A, B, C, D, F, J, L/Weight: 9 lbs., 2 oz.															
B	5	80	90	+12	6	7	−12	6	7	−5	6	7	24	10	14
C	5	80	90	+15	6	7	−15	6	7	—	—	—	—	—	—
D	5	80	90	+12	6	7	−12	6	7	−5	6	7	12	12	18
E	5	80	90	+12	6	7	−12	6	7	−5	6	7	—	—	—
G	5	80	90	+12	6	7	−12	6	7	—	—	—	24	10	14
I	5	80	90	+12	6	7	−12	6	7	—	—	—	12	12	18
J	5	80	90	+12	6	7	−12	6	7	—	—	—	—	—	—
L	5	80	90	+24	5	6	−12	6	7	−5	6	7	12	12	18
M	5	80	90	—	—	—	−12	6	7	−5	6	7	24	10	14
QS5 300/400 Watts Single Output (5.00 x 12.00 x 3.12) Notes: 1, 2, 3/Options: A, B, C, D, E, F, G, N, R, S, T/Weight: 6 lbs., 1 oz.															
A	2	80	100												
B	5	80	100												
C	5.2	80	100												
D	12	33	40												
E	15	27	33												
F	24	17	21												
G	28	14	18												
H	48	9	11												
QS6 500 Watts Single Output (5.00 x 12.00 x 4.12) Notes: 1, 2, 3/Options: A, B, C, E, F, G, J, R, S, T, U/Weight: 7 lbs., 2 oz.															
A	2	100	110												
B	5	100	110												
C	5.2	100	110												
D	12	42	46												
E	15	34	37												
F	24	21	23												
G	28	18	20												
H	48	11	12												

*2% Load Regulation

- Many other output combinations also available; consult factory.
- Quasi regulated outputs available in some models for increased output power; consult factory.

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CHEROKEE INTERNATIONAL, INC.

SWITCHING POWER SUPPLIES

INTRODUCING! THE QD FAMILY/ HIGH FREQUENCY SWITCHERS

- **Power Factor Corrected**
- **Proprietary "Cascode" Technology combines the advantages of MOSFET speed and BiPolar reliability.**
- **Mag Amp auxiliaries for efficient, well regulated, high current outputs**
- **All outputs can be paralleled for load sharing or N+1 redundancy.**
- **Autoranging (115-230 VAC Selection) is available on all models.**
- **UL, CSA and TUV approvals in place for most models. Other models are pending. Consult factory for status.**
- **Cherokee's most efficient products: 80% typical.**

NEW STAND ALONE POWER FACTOR CORRECTION UNITS

Power Output: 1000 Watts Continuous
1300 Watts 10 Seconds **"PF-1"**

1500 Watts Continuous
1700 Watts 10 Seconds **"PF-2"**

Input Line Voltage: 90-264 VRMS. Single Phase
Line Frequency: 47-63Hz
Power Factor:
20% to 50% Rated Load Greater Than or Equal To 0.92
50% to 100% Rated Load Greater Than or Equal To 0.96
Line Current Harmonics: Per IEC555-2 Limits
DC Output Voltage: 375 ±5% Vdc
Efficiency @ 50% To 100% Load:
Greater Than Or Equal To 90% at 115V Input
Greater Than or Equal To 94% @ 230V Input
Ambient Temperature: 0-50°C
Cooling: Internal Fan
Physical Dimensions: 5" × 11" × 3"
EMI: Conducted. FCC Class "A"
Radiated. FCC Class "A"

Protection:
Over Voltage:
- Over Voltage Circuitry Will Shut Down The Converter Between 400 and 420 VDC.

Over Temperature:
- Supply Will Shut Down If Over Temperature Is Reached; It Will Restart Automatically After Cool Down.

Connectors:
- AC Input Connector:
6-32 Screw Terminal Barrier Block.
- DC-Output Connector:
6-32 Screw Terminal Barrier Block.

Safety:
Designed To Meet UL1950; CSA 1402C, C22.2 and IEC 950.

QD13 400 Watts up to 4 Outputs Fan Cooled

(5"×4"×10.5") Notes: 1, 2, 3 Options: A, B, C, E, F, K, R, S Plus Autoranging (V) Weight: 4lbs. 1oz.

Standard Output Combination	Output 1 Volts	Output 1 Rated Amp	Output 1 Peak Amp	Output 2 Volts	Output 2 Rated Amp	Output 2 Peak Amp	Output 3 Volts	Output 3 Rated Amp	Output 3 Peak Amp	Output 4 Volts	Output 4 Rated Amp	Output 4 Peak Amp
A	5	50	60	12	6	10	12	5	6	24	5	8
B	5	50	60	12	6	10	12	5	6	5	5	8
C	5	50	60	24	5	8	12	5	6	5	5	8
D	5	50	60	15	5	8	15	5	6	5	5	8
E	5	50	60	12	6	10	5	3	5	12	5	8
F	5	75	-									
G	12	33	-									

QD4 500 Watts up to 4 Outputs Fan Cooled

(4.125"×4"×11") Notes: 1, 2, 3 Options: A, B, C, E, F, R, S Plus Autoranging (V) Panel mounted fuse (W) Weight: 4lbs. 9oz.

A	5	80	90	24	5	8	12	8	10	12	6	8
B	5	80	90	12	8	12	12	6	10	12	6	8
C	5	80	90	12	8	12	5	8	10	12	6	8
D	5	80	90	24	5	8	5	8	10	12	6	8
E	5	80	90	5	8	10	15	8	10	15	6	8
F	5	100	120									
G	12	42	50									
H	24	21	25									
I	28	20	23									

QD5 750 Watts up to 4 Outputs Fan Cooled

(4.75"×4.5"×11") Notes: 1, 2, 3 Options: A, B, C, E, F, R, S Plus Autoranging (V) Panel mounted fuse (W) Weight: 5lbs.

A	5	120	150	24	6	10	12	12	16	12	8	10
B	5	120	150	12	12	16	12	12	16	12	8	10
C	5	120	150	12	12	16	12	12	16	5	8	10
D	5	120	150	24	6	10	12	12	16	5	8	10
E	5	120	150	5	12	16	15	12	16	5	8	10
F	5	150	175									
G	12	62	71									
H	24	31	36									
I	28	30	34									

QD6 1000 Watts up to 4 Outputs

(5"×5"×11") Options: A, B, E, R, S Plus Autoranging (VAC) Weight: 10lbs.

A	5	150	175	12	12	16	12	12	16	24[1]	8	12
B	5	150	175	12	12	16	12	12	16	12	12	16
C	5	150	175	12	12	16	12	12	16	5	15	20
D	5	150	175	5	12	16	12	12	16	24[1]	8	12
E	5	150	175	15	12	16	15	12	16	5	15	20
F	5	200										
G	12	85										
H	24	42										
I	28	36										

Total (sum) of rated DC output power, maximum: 1000 Watts[2]

QD7 1500 Watts up to 4 Outputs

(5"×8"×12.25") Options: A, B, R, S Power Factor Corrected Weight: 13lbs.

A	5	200	250	12	20		12	20		24[1]	10	
B	5	200	250	12	20		12	20		12	20	
C	5	200	250	12	20		12	20		5	20	
D	5	200	250	5	20		12	20		24[1]	10	
E	5	200	250	15	20		15	20		5	20	
F	5	300										
G	12	125										
H	24	65										
I	28	55										

Total (sum) of rated DC output power, maximum: 1500 Watts

QD8 2000 Watts up to 4 Outputs

(5"×8"×12.25") Options: A, B, R, S Power Factor Corrected Weight: 15lbs.

A	5	300	350	12	20		12	20		24[1]	10	
B	5	300	350	12	20		12	20		12	20	
C	5	300	350	12	20		12	20		5	20	
D	5	300	350	5	20		12	20		24[1]	10	
E	5	300	350	15	20		15	20		5	20	
F	5	400										
G	12	168										
H	24	88										
I	28	72										
J	48	42										

Total (sum) of rated DC output power, maximum: 2000 Watts

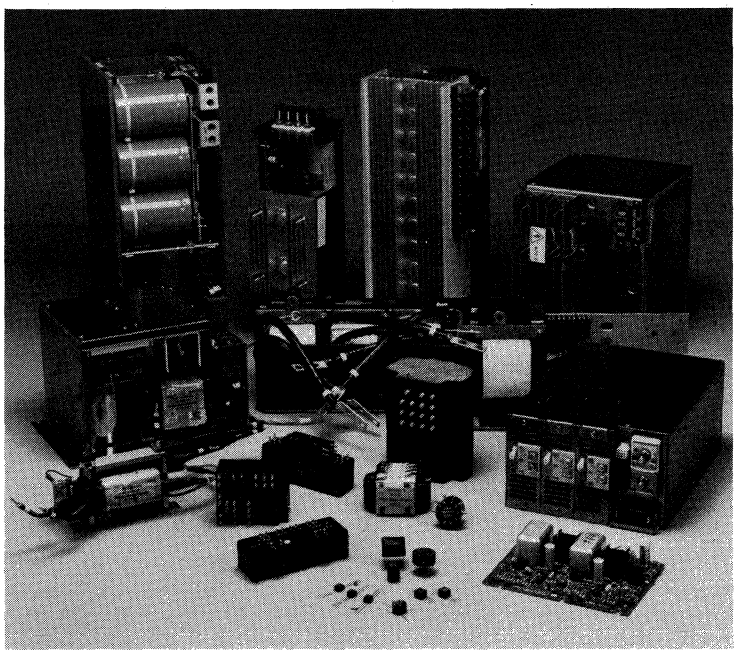
QD16 1000 Watts up to 4 Outputs

(5"×8"×11") Options: A, B, E, R, S Plus Autoranging Power Factor Corrected (VAC) Weight: 10lbs.

A	5	150	175	12	12	16	12	12	16	24	8	12
B	5	150	175	12	12	16	12	12	16	12	12	16
C	5	150	175	12	12	16	12	12	16	5	15	20
D	5	150	175	5	12	16	12	12	16	24	8	12
E	5	150	175	15	12	16	15	12	16	5	15	20
F	5	200										
G	12	85										
H	24	42										
I	28	36										

Total (sum) of rated DC output power, maximum: 1000 Watts

Cherokee International, Inc., 2841 Dow Ave., Tustin, CA 92680-7211 • (714) 544-6665 • FAX (714) 838-4742 • TWX 510-101-0493



Chloride-Electro Networks

- ***Commercial Power Supplies***
- ***Uninterruptible Power Supplies***
- ***Commercial Transformers***
- ***Military Transformers and Assemblies***

Chloride-Electro Networks: The Experience and Capabilities to Design and Build Power Supplies and Transformers for Custom Applications.

Our Markets

Whether it's military or a commercial application, Chloride Electro Networks has the design expertise and the manufacturing skill. For over 40 years, we have designed and built State-of-the-Art magnetic components and power supply assemblies for a wide variety of applications. Our design skill is utilized for the following applications.

- Main Frame Computers
- Minicomputers and Work Stations
- Copier and Office Products
- Computer Peripherals
- Process Automation and Control Systems
- Telecommunications
- Military Magnetics
  - Space Applications
  - Avionics Computers
  - Airborne and Ground Based Radar
  - Antisubmarine Warfare
  - C31, Navigation & Weapons Systems

Manufacturing Capabilities

Chloride Electro Networks has the resources to support your critical production needs. Our manufacturing operation performs to "Baldrige" level quality standards.
Our capabilities include:
• Facility: 140,000 square feet of efficient manufacturing space located just south of Rochester, NY.
• Quality: Statistical Process Control has been implemented on a plant wide basis. Chloride Electro Networks is producing power supplies in a 6 sigma environment. Our facility is benchmarked against ISO-9001 standards. Quality systems are controlled by Mil-Std-9858A and Mil-I-45208A.
• PC Board Assembly: Highly automated PC Board assembly is available for both small and large volume production runs.
• Test Capabilities: Fully Automated test equipment is utilized in power supply testing. Custom test equipment is developed for unique applications.
• Reliability Testing: Chloride has full capability for prototype design integrity testing as well as production stress testing for both Thermal Cycling, Shock & Vibration.
• Transformer Manufacturing: Chloride has the in house capability to manufacture all magnetics components for support of all internal power supply requirements.

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Chloride has the expertise to solve your design problems. The strength of the design community at Chloride is a combination of our skill in dealing with engineering intensive applications and our commitment to work together with our customer to achieve the design goals. As an illustration of the breadth of Choride's design capabilities, the following list indicates some of the product types we have have worked with:
• 50/60/400Hz Linear and Ferroresonant Transformers and Power Supplies.
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• Uninterruptible Power Supplies designed and manufactured in the 10KVA to 250KVA power range.
• Power transformers and assemblies in a wide array of power supply technologies including 1 MHz resonant applications.
• Controller assemblies for Electric Vehicle applications.
• Complex output inductor assemblies for single or multiple output power supply applications. Out capabilities include both high current and high voltage design expertise.
• Encapsulating technologies for application in the most demanding military/commercial transformer applications.
Chloride Electro Networks is your total source for high quality engineered power conversion equipment. Please contact us for further information on how we can fulfill your power needs.

CHLORIDE®

Chloride Electro Networks, a division of Chloride Power Electronics Incorporated
One Technology Place, Caledonia, New York 14423 716 538-4421 FAX 716 538-6345

High Voltage Power Supplies, Multipliers, Diode-Rectifier Assy.

ELECTRONIC HIGH VOLTAGE POWER SUPPLIES

Model	Input Voltage	Output Voltage Range	Current Range	Typical Power	Application
Unregulated					
CS2041 CS2132 CS2073	120/240 VAC	6-18 kV	1-5μA	60mW	Laser Triggers, Ionizers, ESD, Electrostatic Speakers
CS2109	9-24 VDC	3-6 kV	25-100μA	0.5-1W	ESD Applications
CS2091	120/240 VAC	6-30 kV	25-600μA	1-5W	Home Air Cleaners, Clean Room Applications, Copiers
CS2095	120/240 VAC	5-15 kV	0.8-1.5mA	5-10W	Home Air Cleaners
Regulated					
CS2096	120/240 VAC	5-15 kV	1.0-2.5mA	10-20W	Industrial Air Cleaners
CS2094	120/240 VAC	5-15 kV	2.0-5.0mA	15-70W	Industrial Air Cleaners
CS2097	120/240 VAC	5 kV	10-15mA	50-120W	Laser Supplies
CS2098	120/240 VAC	10-20 kV	30-40mA	200-600W	Heavy Industrial Air Cleaners, Laser Supplies
Pulsed					
CS2099	120/240 VAC	3 kV	1mA Pulsed	3-5W	Biomedical Research Equipment
AC Out Unregulated					
CS3000	120/240 VAC	7 kV AC	60mA	300-400W	Ozonators

Custom variations are available on request. LED displays, bleeders, voltage clamps and adjustable output voltage controls can be included.

HIGH VOLTAGE MULTIPLIERS

Custom-designed to meet your requirements: 5kV to 120kV DC output. Applications: CRT, copiers, electrostatic filters, ionizers, HV power supplies. Packaged to meet your requirements.

HIGH VOLTAGE DIODE/RECTIFIER ASSEMBLIES

Series Type	Repetitive Peak Reverse Voltage V_{RRM} (kV)	Average Forward Current I_O	Reverse Recovery Time t_{rr}	Package
CS450F	8-12	15mA	<100 nsec	Axial
CS451F	7-50	15mA	<100 nsec	Axial 1-3 IN.
CS454	2-15	275mA-1A	75nsec-2.5μs	Lead Mount
XRay	to 250	to 380mA	Std.	Board Mount
High Power	to 200	to 1.5A	75nsec-2.5μs	Board or Encapsulated
Bridges	All	to 3.0A	Any	Encapsulated Bolt Down

NEW. TRANSIENT SUPPRESSOR ASSEMBLIES

Custom-designed to provide replaceable modular protection. Available in single-phase, 3-phase, and other circuit configurations, with or without fusing and other optional features.

Standard and Custom Designs

Typical features are:

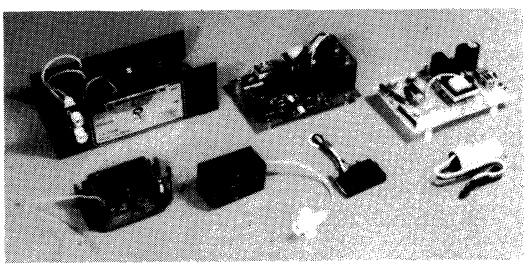
- 5kV to 35kV output voltage
- Output currents to 40mA
- Output power to 600 Watts
- Input: 110VAC; 220VAC; 12VDC

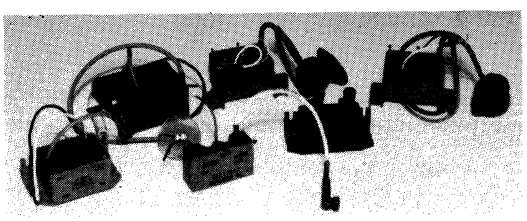
Ideal applications include:

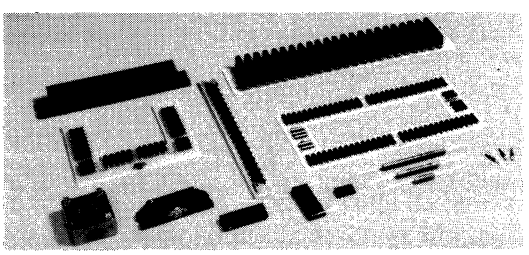
• Air Cleaners • Capacitor Charging • Arc Lamps • Laser Ignition • Laser Power • CRT HV Supply • Copier HV supply • Ionizers • Ozonators

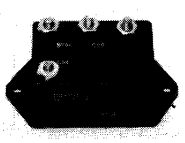
These all-solid-state power supplies from Collmer Semiconductor use advanced technology to produce superior solid-state power supplies at less cost and a fraction of the weight of supplies using traditional ferroresonant transformers. Many models are UL-recognized. These dependable power supplies are ideal for many types of appliances and computer peripheral equipment.

Collmer Semiconductor's high-volume production capacity assures on-time delivery for either standard types or those customized to meet your special requirements.









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eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

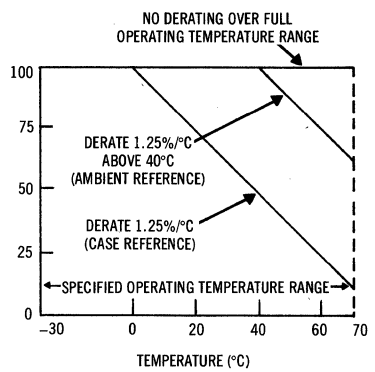


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

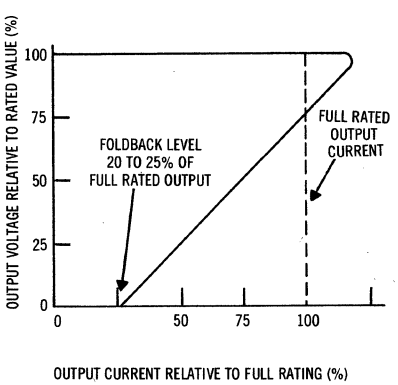


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

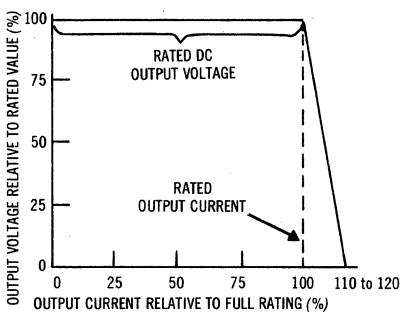


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

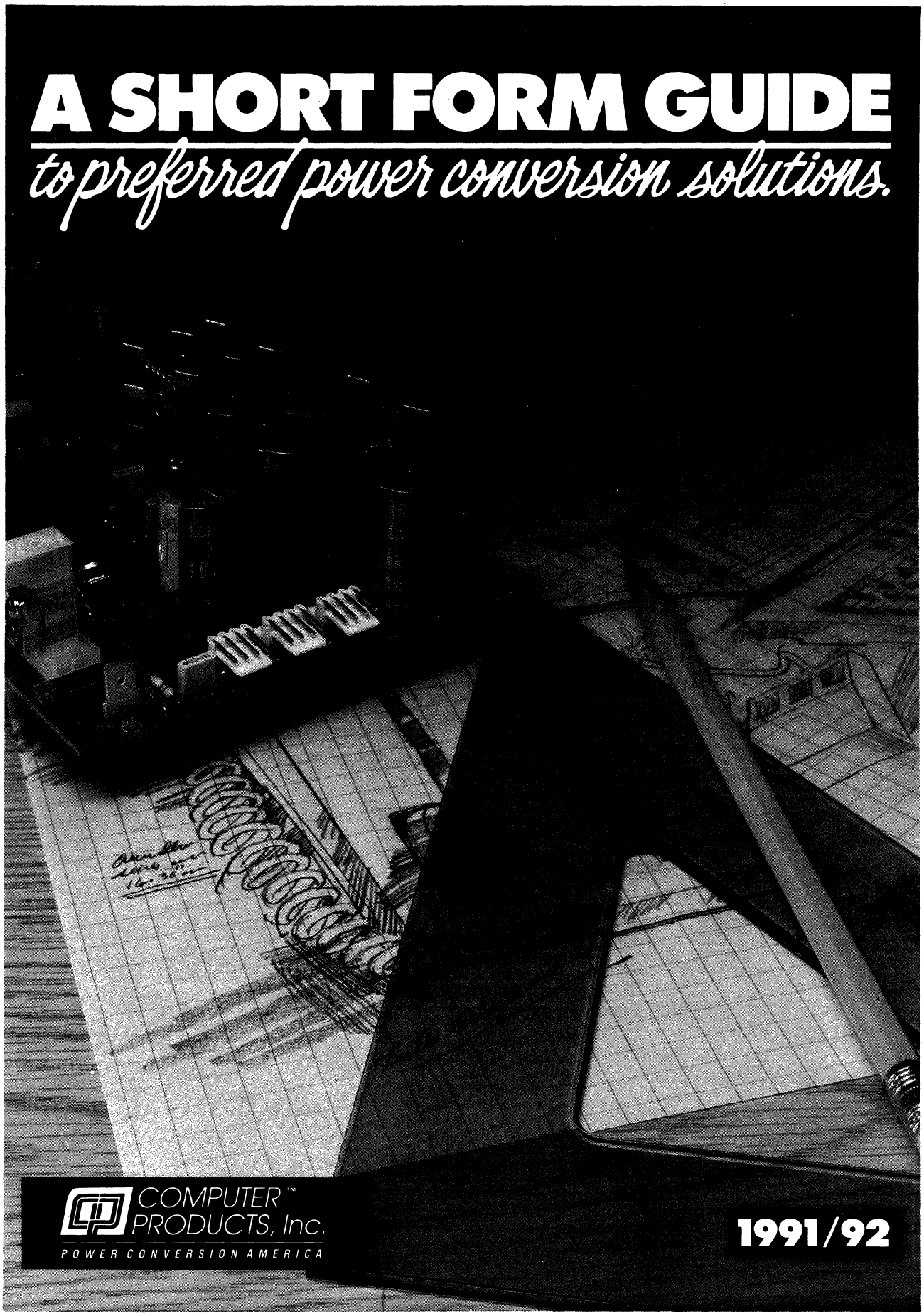
Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

A SHORT FORM GUIDE

to preferred power conversion solutions.



COMPUTER™ PRODUCTS, Inc.
POWER CONVERSION AMERICA

1991/92

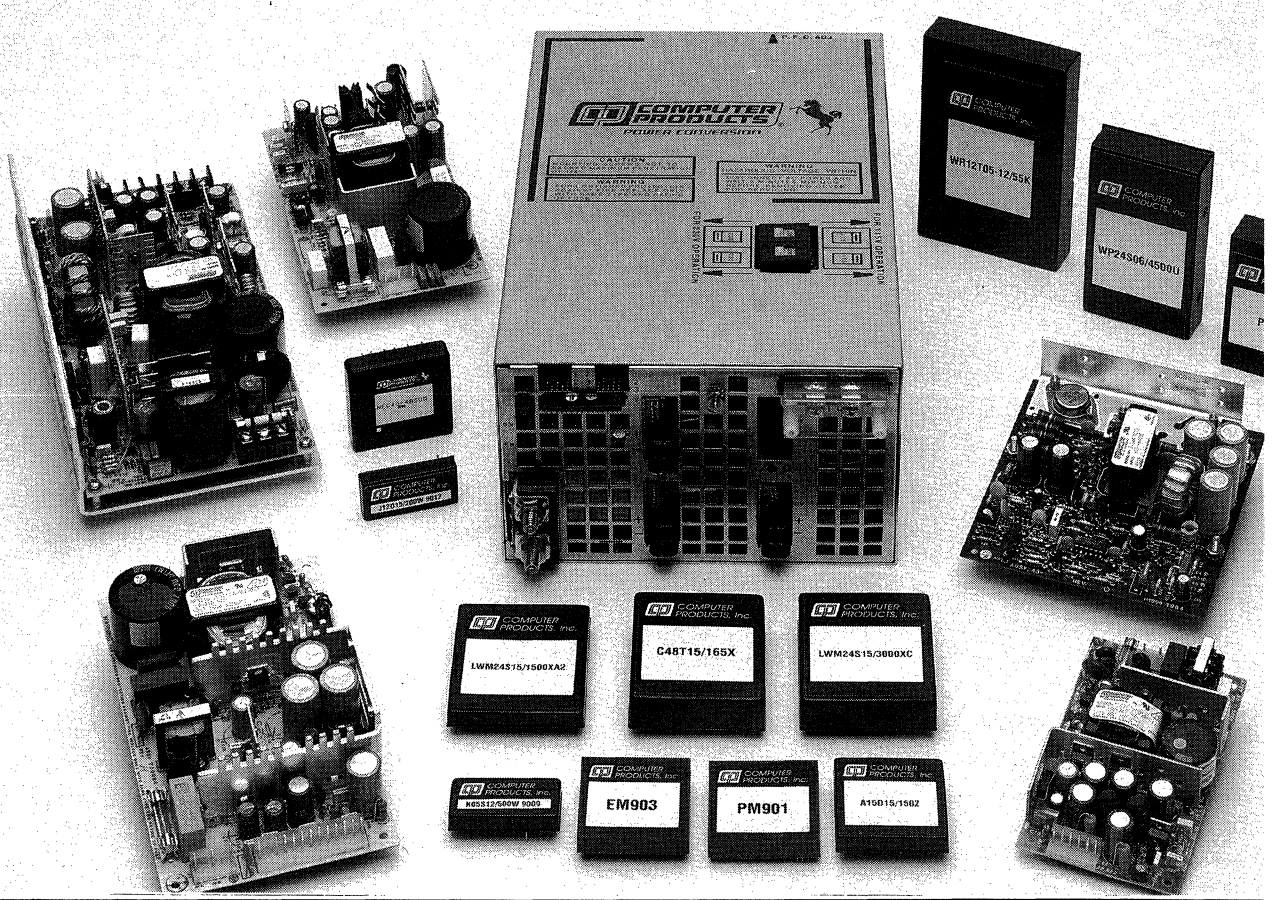
INTRODUCTION

Computer Products has long been in the forefront of power conversion technology. Since 1969, our commitment to quality, service and reliability has been the consistent goal in developing leading-edge products to power the systems of tomorrow. We strive to design our AC/DC switchers and DC/DC converters to be the finest available on the market. Bar none.

Additionally, Computer Products is totally dedicated to the concept of "manufacturability." For us, it isn't enough to just design a high-quality power converter. It must also be practical and cost-effective to produce. Our manufacturing engineers have very tough standards, and only after we've satisfied them does a new product get the go-ahead for production.

This year, we take great pride in introducing eight new stars to the Computer Products line. These innovative new products include many advanced features which were previously unavailable or only available in a custom order. Complete specifications on all products are available through any Computer Products sales representative or distributor.

Computer Products. Giving you the power to win. And the products to get you there.



PREFERRED POWER SOLUTIONS

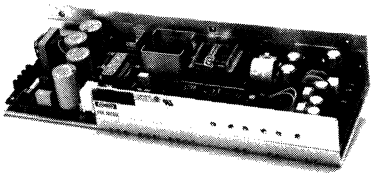
AC/DC POWER SUPPLY SELECTION TABLE

Output Power Watts	No. of Outputs 1 2 3 4 5	Description	Series	Page
25-350	X X X	Open frame switchers, universal input	NFS	4
60-450	X X X X X	Open frame switchers, general purpose	XL	4,5
1-10	X X X	Encapsulated linear modules	PM	5,6
25	X	Encapsulated switching modules	HE	7
15-1500	X X X X X	Enclosed switchers	PGR PHB XL HL	8

DC/DC CONVERTER SELECTION TABLE

Output Power (Watts)	No. of Outputs 1 2 3	Description	Series	Page
0.5-1.0	X X	Isolated	PM600	9
1.0-1.5	X X	0.5-12 Watts	EM600	9
1.0,1.5	X		H	9
1.8	X		EA	10
3.0	X X		DR	10
5.0	X X		AFC	10
5.0-6.0	X X		PM900/RM	11
5.0-6.0	X X		J/K	11
5.0-9.0	X X		EM900	12
7.5	X X		FW	12
10	X		C	12
10-12	X X		PM800	13
15	X X	Isolated	NFC15	13
15	X X	15-40 Watts	WR "XC"	13,14
15	X		ES	14
20	X X		NFC20	14
25	X		NFC25	14
25-30	X		WP	15
30	X X		WR "U"	15
40	X X		NFC40	15
50, 60	X X X	Isolated	WR "K"	15,16
100	X X X	50-100 Watts	WS	16
5.0	X	Non-Isolated	WF	10
15	X	5-25 Watts	LWM "XA"	14
25	X		LWM "XC"	14
150-360	X	Non-Isolated, 150-360 Watts	3T	16

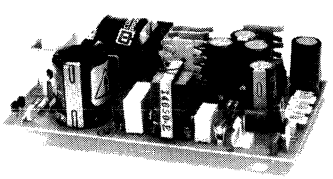
AC/DC POWER SUPPLIES



Universal Input Open Frame Switchers
Input Voltage 90 to 264 VAC

Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")			Model Number
25	+5.1V @ 2.0A	+12V @ 1.5A	−12V @ 0.2A		U C V	5.00	3.00	1.20	NFS25-7608
25	+5.1V @ 2.0A	+12V @ 0.2A	−12V @ 0.2A		U C V	5.00	3.00	1.20	NFS25-7628
25	+5.1V @ 2.0A	+12V @ 1.5.0A			U C V	5.00	3.00	1.20	NFS25-7629
40/50‡	+5.1V @ 8.0A				U C V	5.00	3.00	1.20	NFS40-7605
40/50‡	+5.1V @ 5.0A	+12V @ 2.0A	−5.0V @ 0.5A▼		U C V	5.00	3.00	1.20	NFS40-7607
40/50‡	+5.1V @ 5.0A	+12V @ 2.0A	−12V @ 0.5A▼		U C V	5.00	3.00	1.20	NFS40-7608
40/50‡	+5.1V @ 5.0A	+15V @ 2.0A	−15V @ 0.5A▼		U C V	5.00	3.00	1.20	NFS40-7610
40/50‡	12V @4.0A				U C V	5.00	3.00	1.20	NFS40-7612
40/50‡	15V @ 3.3A				U C V	5.00	3.00	1.20	NFS40-7615
40/50‡	24V @ 2.0A				U C V	5.00	3.00	1.20	NFS40-7624
40/50‡	+5.1V @ 5.0A	+12V @ 0.5A▼	−12V @ 0.5A▼		U C V	5.00	3.00	1.20	NFS40-7628
40	+5.0V @ 3.5A	+12V @ 2.5A	-12V @ 0.3A		U C V	6.30	3.94	1.50	NFS42-7608
40	+5.0V @ 3.5A	+15V @ 2.0A	-15V @ 0.3A		U C V	6.30	3.94	1.50	NFS42-7610
40	+5.0V @ 3.5A	+24V @ 1.2A	-12V @ 0.3A		U C V	6.30	3.94	1.50	NFS42-7627
50/60‡	+5.1V @ 7.0A	+12V @ 2.5A	-12V @ 0.7A▼		U C V	6.30	3.94	1.50	NFS50-7608
75	+5.1V @ 5.0A	+12V @ 3.0A	-12V @ 1.0A		U C V	6.50	4.00	1.80	NFS75-7608
80	+5V @ 12A	+24V @ 2.5A	+12V @ 3A	12V @ 3A	U C V	7.00	4.25	1.80	NFS80-7602
80	+5V @ 12A	+24V @ 2.5A	+15V @ 3A	15V @ 3A	U C V	7.00	4.25	1.80	NFS80-7606
80/110‡	+5.1V @ 10A	+12V @ 5.0A	−12V @1.0A ▼	−5.0V @ 1.0A▼	U C V	7.00	4.25	1.80	NFS110-7601
80/110‡	+5.1V @ 10A	+24V @ 4.5A	+12V @ 5.0A	−12V @ 1.0A▼	U C V	7.00	4.25	1.80	NFS110-7602
80/110‡	+5.1V @ 10A	+15V @ 5.0A	-15V @ 1.0A▼	−5.0V @ 1.0A▼	U C V	7.00	4.25	1.80	NFS110-7604
80/110‡	5.1V @ 20A				U C V	7.00	4.25	1.80	NFS110-7605
80/110‡	12V @ 9.0A				U C V	7.00	4.25	1.80	NFS110-7612
80/110‡	15V @ 7.3A				U C V	7.00	4.25	1.80	NFS110-7615
80/110‡	24V @ 4.5A				U C V	7.00	4.25	1.80	NFS110-7624
200	+5.1V @ 30A	+12.1V @ 10A	−12.1V @ 4.0A	−5.0V @ 6.0A	U C V	9.00	5.00	2.50	NFS200-7601
200	+5.1V @ 30A	+12.1V @ 8A	−12.1V @ 4.0A	24V @ 3A	U C V	9.00	5.00	2.50	NFS200-7602
200	+5.1V @ 30A	+12.1V @ 10A	−12.1V @ 4.0A	12.1V @ 4.0A	U C V	9.00	5.00	2.50	NFS200-7603
200	+5.1V @ 30A	+12.1V @ 8A	−12.1V @ 4.0A		U C V	9.00	5.00	2.50	NFS200-7608
350	+5.1V @ 50A	+12.1V @ 12.1A	−12.1V @ 5.0A		U C V	10.50	5.00	2.50	NFS350-7608
350	+5.1V @ 50A	+12.1V @ 12.1A	−12.1V @ 5.0A	(Note 1)	U C V	10.50	5.00	2.50	NFS350-7625
350	+5.1V @ 50A	+12.1V @ 12.1A	−12.1V @ 5.0A	(Note 2)	U C V	10.50	5.00	2.50	NFS350-7626

Additional models available.
Selected models are available for medical requirements.
Approvals include IEC601/VDE07S0, UL544 and C5A 22, 2-1-125.

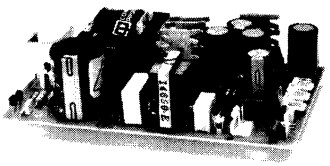


Open Frame Switchers
Input Voltage 115/220 VAC, user selectable

Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")			Model Number
60	+5.0V @ 6.0A	+12V @ 3.0A	−12V @ 0.7A▼	−5.0V @ 0.7A▼	U C V	7.75	4.25	2.00	XL50-3601
60	+5.0V @ 6.0A	+12V @ 0.7A▼	−12V @ 0.7A▼	+24V @ 2.0A	U C V	7.75	4.25	2.00	XL50-3602
60	+5.0V @ 6.0A	+12V @ 3.0A	−12V @ 0.7A▼	+12V @ 1.5A	U V	7.75	4.25	2.00	XL50-3603
60	+5.0V @ 6.0A	+15V @ 2.0A	−15V @ 0.7A▼	−5.0V @ 0.7A▼	U T	7.75	4.25	2.00	XL50-3604
100	+5.0V @ 10A	+12V @ 4.0A	−12V @ 0.7A▼	−5.0V @ 0.7A▼	U C V	10.30	4.75	2.00	XL100-3601
100	+5.0V @ 10A	+12V @ 4.0A	−12V @ 0.7A▼	+12V @ 1.5A	U C V	10.30	4.75	2.00	XL100-3602
100	+5.0V @ 10A	+12V @ 4.0A	−12V @ 0.7A▼	+12V @ 1.5A	U C V	10.30	4.75	2.00	XL100-3603
130	+5.1V @ 15A	+12V @ 5.0A	−12V @ 1.0A▼		U C V	8.45	4.68	2.40	XL120-3608

Note 1: Floating output can be adjusted from 4.5V to 15V @ 4.0A.
Note 2: Floating output can be adjusted from 15V to 30V @ 4.0A.
Absence of a "+" or "-" indicates a floating output which can be referenced as either polarity.
▼ Linear regulated output.
*Available Q3 1989

AC/DC POWER SUPPLIES



Open Frame Switchers
Input Voltage 115/220 VAC user selectable

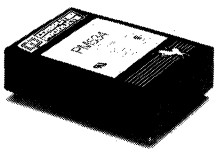
Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")	Model Number
130	+5.0V @ 15A	–5.0V @ 0.7A▼	+12V @ 5.0A	–12V @ 0.7A ▼	U C V	10.50 5.00 2.50	XL125-3601
130	+5.0V @ 15A	+12V @ 4.0A	–12V @ 0.7A ▼	+24V @ 4.0A	U C V	10.50 5.00 2.50	XL125-3602
130	+5.0V @ 15A	+12V @ 4.0A	–12V @ 0.7A ▼	+12V @ 1.5A	U C V	10.50 5.00 2.50	XL125-3603
160/185‡	+5.0V @ 22A‡	-5.0V @ 1.0A▼	+12V @ 5.0A‡	–12V @ 2.5A ‡	U C V T	10.50 5.00 2.50	XL160-3401
160/185‡	+5.0V @ 22A‡	+12V @ 5.0A‡	–12V @ 2.5A ‡	+24V @ 2.5A ‡	U C V T	10.50 5.00 2.50	XL160-3402
160/185‡	+5.0V @ 22A‡	+12V @ 5.0A‡	–12V @ 2.5A ‡	+12V @ 2.5A ‡	U C V T	10.50 5.00 2.50	XL160-3403
160/185‡	+5.0V @ 22A‡	+15V @ 4.0A‡	–15V @ 2.5A ‡	+24V @ 2.5A	U C V	10.50 5.00 2.50	XL160-3405
180/210‡	+5.0V @ 30A‡	+12V @ 6.0A‡	–12V @ 3.0A ‡	5.0V @ 4.0A ‡	U C V	14.00 5.00 2.50	XL200-3601
180/210‡	+5.0V @ 30A‡	+12V @ 6.0A‡	–12V @ 3.0A ‡	24 @ 5.0A	U C V	14.00 5.00 2.50	XL200-3602
180/210‡	+5.0V @ 30A‡	+12V @ 6.0A‡	–12V @ 3.0A ‡	12V @ 3.0A ‡	U C V	14.00 5.00 2.50	XL200-3603
225‡	+5.0V @ 30A	+12V @ 5.0A	12V @ 1.5A	5.0V @ 6.0A	U C V	10.50 5.00 2.50	XL220-3601
225‡	+5.0V @ 30A	+24V @ 4.0A	12V @ 1.5A	12V @ 5.0A	U C V	10.50 5.00 2.50	XL220-3602
225‡	+5.0V @ 30A	+12V @ 5.0A	12V @ 1.5A	12V @ 5.0A	U C V	10.50 5.00 2.50	XL220-3603
225‡	+5.0V @ 30A	+24V @ 4.0A	15V @ 1.5A	15V @ 4.0A	U C V	10.50 5.00 2.50	XL220-3605
250‡	+5.0V @ 30A	+12V @ 7.0A	–12V @ 3.5A	5.0V @ 4.0A	U C V	14.00 5.00 2.50	XL250-3601
250‡	+5.0V @ 30A	+12V @ 7.0A	–12V @ 3.5A	24V @ 7.0A	U C V	14.00 5.00 2.50	XL250-3602
250‡	+5.0V @ 30A	+12V @ 7.0A	–12V @ 3.5A	12V @ 6.0A	U C V	14.00 5.00 2.50	XL250-3603
325‡	+5.0V @ 45A	12V @ 10A	12V @ 10A		U C V	14.00 5.50 2.50	XL325-3608
450‡	+5.0V @ 60A	–5.0V @ 4.0A	+12V @ 15A	–12V @ 10A	U C V	16.75 5.20 2.50	XL450-3406
				Output #5 +24V @ 12A			
450‡	+5.0V @ 60A	+12V @ 15A	–12V @ 10A	+24V @ 12A	U C V	16.75 5.20 2.50	XL450-3407
				Output #5 –24V @ 4.0A			
450‡	+5.0V @ 60A	–5.0V @ 4.0A	+15V @ 12A	–15V @ 8.0A	U C V	16.75 5.20 2.50	XL450-3415
				Output #5 +24V @ 12A			

Encapsulated Linear Modules, PCB Mount
Input Voltage 115 VAC(100, 220, or 240 VAC-Consult Factory)

Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")	Model Number
1.3	5.0V @ 250mA				UC	3.50 2.25 0.88	PM533
2.5	5.0V @ 500mA				UC	3.50 2.25 0.88	PM534
5.0	5.0V @ 1.0A				UC	3.50 2.25 1.25	PM542
10	5.0V @ 2.0A				U	3.50 2.25 1.62	PM545
2.9	12V @ 240mA				U	3.50 2.25 1.25	PM515
4.8	12V @ 400mA				U	3.50 2.25 1.62	PM516
7.2	12V @ 600mA				U	3.50 2.25 1.62	PM517
1.3	5.0V @ 250mA				C	3.00 2.00 1.00	PM529
1.2	12V @ 100mA				UC	2.25 1.75 1.00	PM563
1.5	15V @ 100mA				UC	2.25 1.75 1.00	PM576
1.2	24V @ 50 mA				UC	2.25 1.75 1.00	PM585

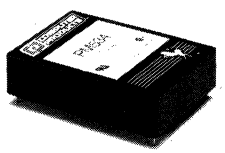
‡Forced air required. ▼Linear regulated output. Absence of a "+" or "-" indicates a floating output which can be referenced as either polarity.

AC/DC POWER SUPPLIES



Encapsulated Linear Modules, PCB Mount
Input Voltage 115 VAC(100, 220, or 240 VAC-Consult Factory)

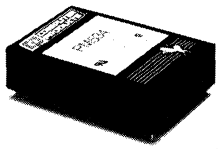
Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")			Model Number
0.6	+12V @ 25mA	–12V @ 25mA			U C	3.50	2.50	0.88	PM509
1.2	+12V @ 50mA	–12V @ 50mA			U C	3.50	2.50	0.88	PM510
2.9	+12V @ 120mA	–12V @ 120mA			U C	3.50	2.50	0.88	PM536
5.8	+12V @ 240mA	–12V @ 240mA			U C	3.50	2.50	1.25	PM537
9.6	+12V @ 400mA	–12V @ 400mA			U C	3.50	2.50	1.62	PM597
0.8	+15V @ 25mA	–15V @ 25mA			U C	3.50	2.50	0.88	PM538
2.0	+15V @ 65mA	–15V @ 65mA			U C	3.50	2.50	0.88	PM553
3.0	+15V @ 100mA	–15V @ 100mA			U C	3.50	2.50	0.88	PM505
4.5	+15V @ 150mA	–15V @ 150mA			U C	3.50	2.50	1.25	PM570
6.0	+15V @ 200mA	–15V @ 200mA			U C	3.50	2.50	1.25	PM565
10.5	+15V @ 350mA	–15V @ 350mA			U C	3.50	2.50	1.62	PM501
5.8	5.0V @ 300mA	+12V @ 180mA	–12V @ 180mA		U C	3.50	2.50	1.25	PM595
5.4	5.0V @ 500mA	+12V @ 120mA	–12V @ 120mA		U C	3.50	2.50	1.25	PM591
8.6	5.0V @ 1.0A	+12V @ 150mA	–12V @ 150mA		U C	3.50	2.50	1.62	PM592
6.0	5.0V @ 300mA	+15V @ 150mA	–15V @ 150mA		U C	3.50	2.50	1.25	PM594
5.5	5.0V @ 500mA	+15V @ 100mA	–15V @ 100mA		U C	3.50	2.50	1.25	PM590
9.5	5.0V @ 1.0A	+15V @ 150mA	–15V @ 150mA		U C	3.50	2.50	1.62	PM593



Encapsulated Linear Module, Chassis Mount
Input Voltage 115 VAC(100, 220, or 240 VAC-Consult Factory)

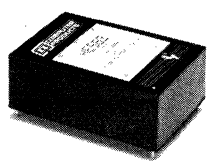
Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")			Model Number
2.5	5.0V @ 500mA				U C	4.00	2.70	1.45	PM334
5.0	5.0V @ 1.0A				U C	4.00	2.70	1.45	PM342
10	5.0V @ 2.0A				U	4.00	2.70	2.00	PM345
2.9	12V @ 240mA				U	4.00	2.70	1.45	PM315
4.8	12V @ 400mA				U	4.00	2.70	2.00	PM316
7.2	12V @ 600mA				U	4.00	2.70	2.00	PM317

AC/DC POWER SUPPLIES



Encapsulated Linear Module, Chassis Mount
Input Voltage 115 VAC (100, 220, or 240 VAC—Consult Factory)

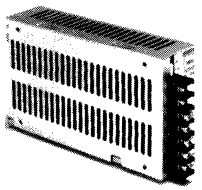
Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")	Model Number
2.9	+12V @ 120mA	−12V @ 120mA			U C	4.00 2.70 1.45	PM336
5.8	+12V @ 240mA	−12V @ 240mA			U C	4.00 2.70 1.45	PM337
9.6	+12V @ 400mA	−12V @ 400mA			U C	4.00 2.70 2.00	PM397
3.0	+15V @ 100mA	−15V @ 100mA			U C	4.00 2.70 1.45	PM302
7.2	+15V @ 200mA	−15V @ 200mA			U C	4.00 2.70 1.45	PM365
12	+15V @ 350mA	−15V @ 350mA			U C	4.00 2.70 2.00	PM301
15	+15V @ 500mA	−15V @ 500mA			U C	4.00 2.70 2.00	PM396
5.8	5.0V @ 300mA	+12V @ 180mA	−12V @ 180mA		U C	4.00 2.70 1.45	PM395
5.4	5.0V @ 500mA	+12V @ 120mA	−12V @ 120mA		U C	4.00 2.70 1.45	PM391
8.2	5.0V @ 1.0A	+12V @ 150mA	−12V @ 150mA		C	4.00 2.70 2.00	PM392
6.0	5.0V @ 300mA	+15V @ 150mA	−15V @ 150mA		U C	4.00 2.70 1.45	PM394
5.5	5.0V @ 500mA	+15V @ 100mA	−15V @ 100mA		U C	4.00 2.70 1.45	PM390
9.5	5.0V @ 1.0A	+15V @ 150mA	−15V @ 150mA		C	4.00 2.70 2.00	PM393



Encapsulated Switching Modules
Input Voltage 115 VAC (230 VAC - Consult Factory)

Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")	Model Number
25	5.0V @ 5.0A					3.50 2.50 1.25	HE581
25	12V @ 2.2A					3.50 2.50 1.25	HE583
25	15V @ 1.8A					3.50 2.50 1.25	HE584
25	5.0V @ 5.0A					4.00 2.70 1.45	HE381
25	12V @ 2.2A					4.00 2.70 1.45	HE383
25	15V @ 1.8A					4.00 2.70 1.45	HE384

AC/DC POWER SUPPLIES

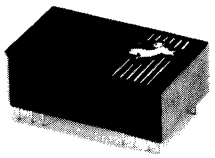


Enclosed Switchers
Input Voltage 115/220 VAC, user selectable (except as noted)

Output Power (Watts)	Output #1	Output #2	Output #3	Output #4	Safety Approvals	Size (L" x W" x H")	Model Number
15	5.0V @ 3.0A				U C	3.90 3.86 1.46	PGR111*
15	12V @ 1.2A				U C	3.90 3.86 1.46	PGR114*
15	5.0V @ 2.0A	+12V @ 0.3A	-12V @ 0.2A		U C	4.69 3.82 1.46	PGR131*
24	12V @ 1.2A	12V @ 1.2A			U	5.91 4.06 1.50	PGR221*
24	5.0V @ 3.0A	+12V @ 1.0A	-12V @ 0.2A		U	5.91 4.53 1.50	PGR231*
25	5.0V @ 5.0A				U	5.47 3.66 1.42	PHB201*
50	5.0V @ 10A				U	6.22 3.66 1.77	PHB301*
50	5.0V @ 3.0A	12V @ 3.0A			U C	7.09 3.94 1.18	PHB715
50	5.0V @ 5.0A	+12V @ 1.0A	-12V @ 1.0A		U C	7.09 4.92 1.18	PHB719
50	5.0V @ 5.0A	+15V @ 0.8A	-15V @ 0.8A		U C	7.09 4.92 1.18	PHB721
50	5.0V @ 5.0A	+12V @ 1.5A	-5V @ 0.5A		U C	7.09 4.92 1.18	PHB723
70	5.0V @ 5.0A	12V @ 4.0A			U	8.66 3.94 1.50	PHB731
70	5.0V @ 7.0A	+12V @ 1.5A	-12V @ 1.5A		U C	8.66 4.92 1.50	PHB737
70	5.0V @ 7.0A	+15V @ 1.2A	-15V @ 1.2A		U C	8.66 4.92 1.50	PHB739
70	5.0V @ 7.0A	+12V @ 2.0A	-5V @ 1.0A		U C	8.66 4.92 1.50	PHB741
70	5.0V @ 7.0A	+12V @ 2.0A	-12V @ 1.0A		U C	8.66 4.92 1.50	PHB743
80	5.0V @ 10A	+12V @ 1.0A	-12V @ 1.0A		U	8.66 4.92 1.50	PHB745
100	12V @ 8.4A				U	7.76 3.66 1.97	PHB403*
750	5.0V @ 100A	5.0V @ 10A	12V @ 10A	12V @ 6.0A	U C V T	13.70 8.00 5.10	XL750-4601
750	5.0V @ 100A	12V @ 10A	12V @ 6.0A	24V @ 4.0A	U C V T	13.70 8.00 5.10	XL750-3602
750	5.0V @ 100A	5.0V @ 10A	15V @ 8.0A	15V @ 8.0A	U C V	13.70 8.00 5.10	XL750-4604
750	5.0V @ 100A	5.0V @ 10A	12V @ 6.0A	12V @ 6.0A	U C V	13.70 8.00 5.10	XL750-4606
				Output #5 24V @ 4.0A			
				Output #5 24V @ 4.0A			
750	5.0V @ 100A	12V @ 10A	12V @ 10A		U C V T	13.70 8.00 5.10	XL750-3608
1000	5.0V @ 200A				U C T	11.00 8.00 5.00	HL1000-3605
1000	5.0V @ 150A	5.0V @ 10A	12V @ 20A	12V @ 20A	U C V	13.70 8.00 5.00	XL1000-4601
1000	5.0V @ 150A	12V @ 20A	12V @ 20A	24V @ 4.0A	U C V	13.70 8.00 5.00	XL1000-4606
				Output #5 5.0V @ 10A			
1000	5.0V @ 150A	12V @ 20A	12V @ 20A		U C V	13.70 8.00 5.00	XL1000-4608
1500	5.0V @ 300A				U C V	11.00 8.00 5.00	HL1500A-4605†

*115 VAC Only
† 220 VAC Only

DC/DC CONVERTERS



0.5 to 1.0 Watt isolated, single and dual output dips

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	5.0V @ 100mA		38	YES	1.25 x 0.8 x 0.4	PM621
5.0	4.5-5.5	12V @ 80mA		50	YES	1.25 x 0.8 x 0.4	PM623
5.0	4.5-5.5	±12V @ ±40mA		50	YES	1.25 x 0.8 x 0.4	PM671
5.0	4.5-5.5	±15V @ ±33mA		52	YES	1.25 x 0.8 x 0.4	PM672
12	10.8-13.2	12V @ 80mA		55	YES	1.25 x 0.8 x 0.4	PM633
12	10.8-13.2	±12V @ ±40mA		55	YES	1.25 x 0.8 x 0.4	PM681
12	10.8-13.2	±15V @ ±33mA		55	YES	1.25 x 0.8 x 0.4	PM682

1.0 to 1.5 Watts isolated, single and dual output dips

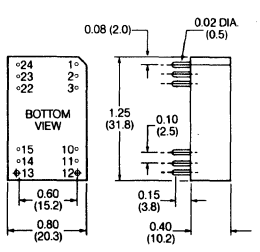
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	5.0V @ 220mA		64	NO	1.25 x 0.8 x 0.4	EM621
5.0	4.5-5.5	12V @ 125mA		67	NO	1.25 x 0.8 x 0.4	EM623
5.0	4.5-5.5	±12V @ ±62mA		66	NO	1.25 x 0.8 x 0.4	EM671
5.0	4.5-5.5	±15V @ ±50mA		67	NO	1.25 x 0.8 x 0.4	EM672
12	10.8-13.2	±12V @ ±62mA		73	NO	1.25 x 0.8 x 0.4	EM681

1.0 to 1.5 Watts isolated, single output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	5.0V @ 200mA		42	YES	2.0 x 1.0 x 0.38	H05S05/200W
12	10-14.5	5.0V @ 200mA		42	YES	2.0 x 1.0 x 0.38	H12S05/200W
24	20-28	5.0V @ 200mA		42	YES	2.0 x 1.0 x 0.38	H24S05/200W
48	42-56	5.0V @ 200mA		40	YES	2.0 x 1.0 x 0.38	H48S05/200W

Dimensions in inches (mm)

PM600, EM600



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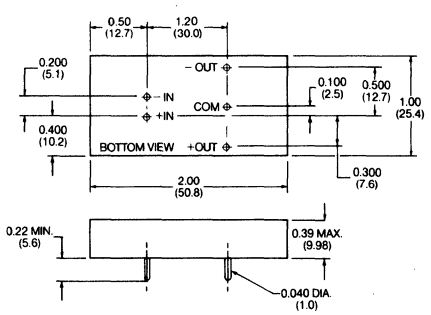
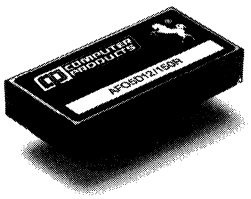


DC/DC CONVERTERS



1.8 Watts isolated, dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.65-5.5	±12V @ ±60mA		55	YES	2.0 x 1.0 x 0.38	EA05D12/60R
5.0	4.65-5.5	±15V @ ±60mA		65	YES	2.0 x 1.0 x 0.38	EA05D15/60R

3.0 Watts isolated, single and dual output dips

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	18-36	5.0V @ 500mA		78	YES	1.25 x 0.8 x 0.52	DR24SO5/500G
24	18-36	12V @ 250mA		83	YES	1.25 x 0.8 x 0.52	DR24S12/250G
24	18-36	±12V @ ±125mA		82	YES	1.25 x 0.8 x 0.52	DR24D12/125G
24	18-36	±15V @ ±100mA		82	YES	1.25 x 0.8 x 0.52	DR24D15/100G
48	36-72	5.0V @ 500mA		79	YES	1.25 x 0.8 x 0.52	DR48SO5/500G

5.0 Watts isolated, single and dual output (1"x2" case)

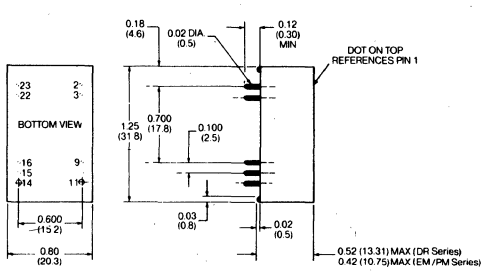
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.65-5.25	5.0V @ 1000mA		66	YES	2.0 x 1.0 x 0.38	AFC5-05S05
5.0	4.65-5.25	12V @ 420mA		69	YES	2.0 x 1.0 x 0.38	AFC5-05S12
5.0	4.65-5.25	15V @ 350mA		70	YES	2.0 x 1.0 x 0.38	AFC5-05S15
5.0	4.65-5.25	±12V @ ±150mA		66	YES	2.0 x 1.0 x 0.38	AFC5-05D12
5.0	4.65-5.25	±15V @ ±150mA		66	YES	2.0 x 1.0 x 0.38	AFC5-05D15
12	10.8-13.2	5.0V @ 1000mA		65	YES	2.0 x 1.0 x 0.38	AFC5-12S05
12	10.8-13.2	12V @ 420mA		68	YES	2.0 x 1.0 x 0.38	AFC5-12S12
12	10.8-13.2	15V @ 350MA		71	YES	2.0 x 1.0 x 0.38	AFC5-12S15
12	10.8-13.2	±12V @ ±150mA		66	YES	2.0 x 1.0 x 0.38	AFC5-12D12
12	10.8-13.2	±15V @ ±150mA		66	YES	2.0 x 1.0 x 0.38	AFC5-12D15

5.0 Watts non-isolated, ultra-wide input, single output

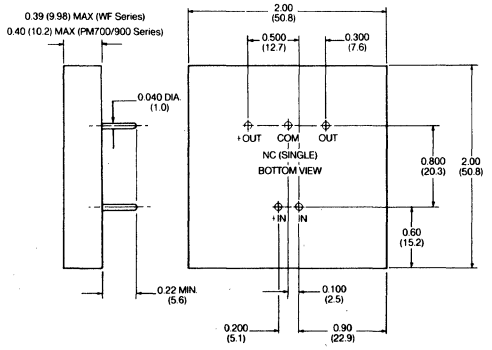
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	7.0-32	5.0V @ 1.0A		75	YES	2.0 x 2.0 x 0.4	WF12S05/1000Z

Dimensions in inches (mm)

DR



WF, PM900, EM900, FW



DC/DC CONVERTERS

5.0 to 6.0 Watts isolated, single and dual output (2"x2" case)

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.65-5.5	5.0V @ 1.0A		65	YES	2.0 x 2.0 x 0.4	PM901
5.0	4.4-6.5	5V @ 1A		66	YES	2.0 x 2.0 x 0.4	RM05S05/1000Z
5.0	4.65-5.5	12V @ 470mA		65	YES	2.0 x 2.0 x 0.4	PM903
5.0	4.65-5.5	15V @ 400mA		65	YES	2.0 x 2.0 x 0.4	PM904
5.0	4.65-5.5	±12V @ ±230mA		67	YES	2.0 x 2.0 x 0.4	PM951
5.0	4.65-5.5	±15V @ ±190mA		67	YES	2.0 x 2.0 x 0.4	PM952
5.0	4.4-6.5	±15V @ 190mA		66	YES	2.0 x 2.0 x 0.4	RM05D15/190Z
12	11.16-13.2	5.0V @ 1.0A		65	YES	2.0 x 2.0 x 0.4	PM911
12	11.16-13.2	15V @ 400mA		65	YES	2.0 x 2.0 x 0.4	PM914
12	11.16-13.2	±12V @ ±230mA		67	YES	2.0 x 2.0 x 0.4	PM961
12	11.16-13.2	±15V @ ±190mA		67	YES	2.0 x 2.0 x 0.4	PM962
24	22.32-26.4	5.0V @ 1.0A		65	YES	2.0 x 2.0 x 0.4	PM921
24	22.32-26.4	±12V @ ±230mA		67	YES	2.0 x 2.0 x 0.4	PM971
24	21.12-31.2	±15V @ 190mA		66	YES	2.0 x 2.0 x 0.4	RM24D15/190Z
48	44.64-52.8	5.0V @ 1.0A		65	YES	2.0 x 2.0 x 0.4	PM941
48	42.24-62.4	5V @ 1A		66	YES	2.0 x 2.0 x 0.4	RM48S05/1000Z
48	44.64-52.8	±12V @ ±230mA		67	YES	2.0 x 2.0 x 0.4	PM991

5.0 to 6.0 Watts isolated, single output

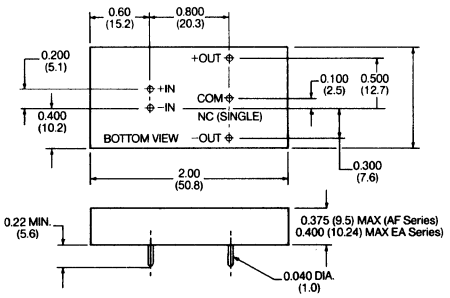
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	5.0V @ 1.0A		83	NO	2.0 x 1.0 x 0.38	K05S05/1000W
12	10-14	5.0V @ 1.0A		83	NO	2.0 x 1.0 x 0.38	K12S05/1000W
12	10-14	12V @ 500mA		80	NO	2.0 x 1.0 x 0.38	K12S12/500W
48	42-56	5.0V @ 1.0A		78	NO	2.0 x 1.0 x 0.38	K48S05/1000W

5.0 to 6.0 Watts isolated, single dual output

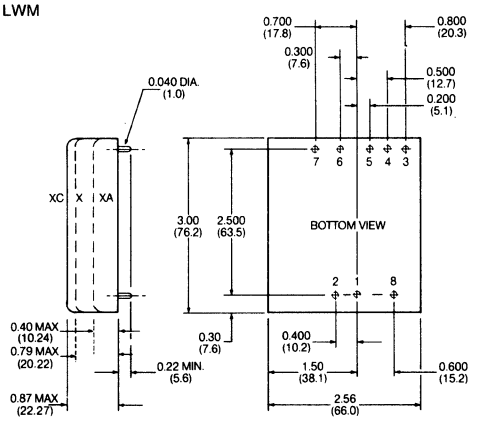
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	±15V @ ±200mA		75	NO	2.0 x 1.0 x 0.38	J05D15/200W
5.0	4.5-5.5	±18V @ ±165mA		79	NO	2.0 x 1.0 x 0.38	J05D18/165W
12	10-14	±15V @ ±200mA		82	NO	2.0 x 1.0 x 0.38	J12D15/200W
12	10-14	±18V @ ±165mA		82	NO	2.0 x 1.0 x 0.38	J12D18/165W

Dimensions in inches (mm)

EA, AFC5, J, K



C, WR "XC", ES, LWM



DC/DC CONVERTERS

5.0 & 9.0 Watts isolated, single and dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	5.0V @ 1.0A		75	NO	2.0 x 2.0 x 0.4	EM901
5.0	4.5-5.5	12V @ 600mA		75	NO	2.0 x 2.0 x 0.4	EM903
5.0	4.5-5.5	15V @ 500mA		75	NO	2.0 x 2.0 x 0.4	EM904
5.0	4.5-5.5	±12V @ ±375mA		75	NO	2.0 x 2.0 x 0.4	EM951
5.0	4.5-5.5	±15V @ ±300mA		75	NO	2.0 x 2.0 x 0.4	EM952
12	10.8-13.2	±15V @ ±300mA		75	NO	2.0 x 2.0 x 0.4	EM962

7.5 Watts isolated, wide input, single and dual output

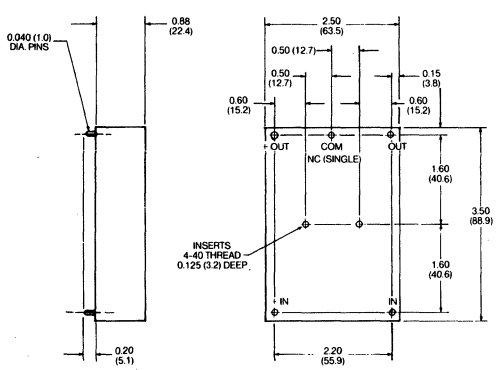
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
48	36-72	5.0V @ 1.5A		83	YES	2.0 x 2.0 x 0.4	FW48S05/1500Z
48	36-72	12V @ 625mA		83	YES	2.0 x 2.0 x 0.4	FW48S12/625Z
48	36-72	±12V @ ±325mA		83	YES	2.0 x 2.0 x 0.4	FW48D12/325Z
48	36-72	±15V @ ±300mA		83	YES	2.0 x 2.0 x 0.4	FW48D15/300Z

10 Watts isolated, triple output

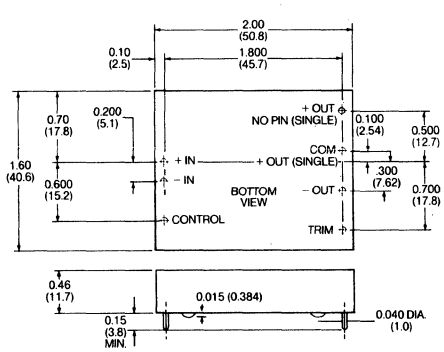
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.5-5.5	5.0V @ 750mA	±12V @ ±165mA	47	YES	3.0 x 2.56 x 0.75	C05T12/165X
5.0	4.5-5.5	5.0V @ 750mA	±15V @ ±165mA	50	YES	3.0 x 2.56 x 0.75	C05T15/165X
12	10-14	5.0V @ 750mA	±12V @ ±165mA	47	YES	3.0 x 2.56 x 0.75	C12T12/165X
12	10-14	5.0V @ 750mA	±15V @ ±165mA	50	YES	3.0 x 2.56 x 0.75	C12T15/165X
24	20-28	5.0V @ 750mA	±12V @ ±165mA	50	YES	3.0 x 2.56 x 0.75	C24T12/165X
24	20-28	5.0V @ 750mA	±15V @ ±165mA	54	YES	3.0 x 2.56 x 0.75	C24T15/165X
28	24-32	5.0V @ 750mA	±12V @ ±165mA	50	YES	3.0 x 2.56 x 0.75	C28T12/165X
28	24-32	5.0V @ 750mA	±15V @ ±165mA	54	YES	3.0 x 2.56 x 0.75	C28T15/165X
48	42-56	5.0V @ 750mA	±12V @ ±165mA	51	YES	3.0 x 2.56 x 0.75	C48T12/165X
48	42-56	5.0V @ 750mA	±15V @ ±165mA	54	YES	3.0 x 2.56 x 0.75	C48T15/165X

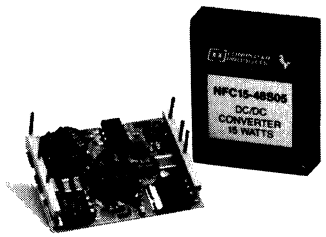
Dimensions in inches (mm)

PM800



NFC15





DC/DC CONVERTERS

10 & 12 Watts isolated, single and dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
5.0	4.65-5.5	±12V @ 525mA		65	YES	3.5 x 2.5 x 0.88	PM851
5.0	4.65-5.5	±15V @ 412mA		65	YES	3.5 x 2.5 x 0.88	PM852
12	11.16-13.2	12V @ 940mA		65	YES	3.5 x 2.5 x 0.88	PM813
12	11.16-13.2	±12V @ ±525mA		65	YES	3.5 x 2.5 x 0.88	PM861
12	11.16-13.2	±15V @ ±412mA		65	YES	3.5 x 2.5 x 0.88	PM862
24	22.32-26.4	5.0V @ 3.0A		65	YES	3.5 x 2.5 x 0.88	PM821
24	22.32-26.4	±12V @ ±525mA		67	YES	3.5 x 2.5 x 0.88	PM871
24	22.32-26.4	±15V @ ±412mA		67	YES	3.5 x 2.5 x 0.88	PM872
48	44.64-52.8	5.0V @ 2.0A		65	YES	3.5 x 2.5 x 0.88	PM841

15 Watts isolated, single and dual output

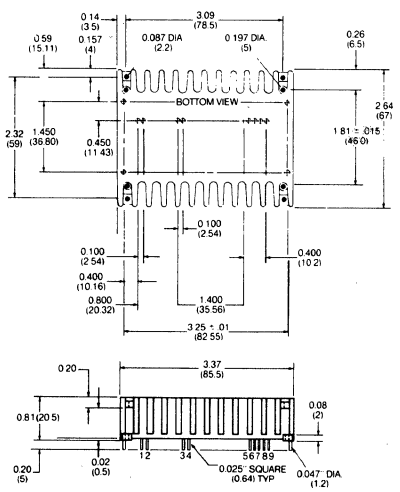
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
48	20-72	5.0V @ 3.0A		80	YES	2.0 x 1.6 x 0.46	NFC15-48S05
48	20-72	12V @ 1.2A		84	YES	2.0 x 1.6 x 0.46	NFC15-48S12
48	20-72	15V @ 1.0A		85	YES	2.0 x 1.6 x 0.46	NFC15-48S15
48	20-72	±12V @ ±625mA		83	YES	2.0 x 1.6 x 0.46	NFC15-48D12
48	20-72	±15V @ ±500mA		84	YES	2.0 x 1.6 x 0.46	NFC15-48D15

15 Watts isolated, single output

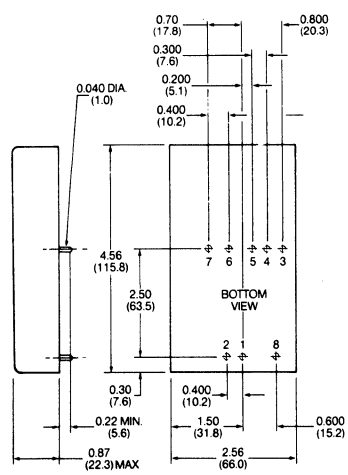
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-1.8	5.0V @ 3.0A		75	YES	3.0 x 2.56 x 0.83	WR12S05/3000XC
24	18-36	5.0V @ 3.0A		77	YES	3.0 x 2.56 x 0.83	WR24S05/3000XC
24	18-36	15V @ 1.0A		80	YES	3.0 x 2.56 x 0.83	WR24S15/1000XC
48	36-72	5.0V @ 3.0A		77	YES	3.0 x 2.56 x 0.83	WR48S05/3000XC

Dimensions in inches (mm)

FIGURE 9



WP, WR "U"



DC/DC CONVERTERS

15 Watts isolated, dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-1.8	±12V @ ±625mA		82	YES	3.0 x 2.56 x 0.83	WR12D12/625XC
12	9.0-1.8	±15 V @ ±500mA		82	YES	3.0 x 2.56 x 0.83	WR12D15/500XC
24	18-36	±12V @ ±625mA		84	YES	3.0 x 2.56 x 0.83	WR24D12/625XC
24	18-36	±15 V @ ±500mA		84	YES	3.0 x 2.56 x 0.83	WR24D15/500XC
48	36-72	±12V @ ±625mA		86	YES	3.0 x 2.56 x 0.83	WR48D12/625XC

15 Watts isolated, triple output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-1.8	5.0V @ 1.5A	±12V @ ±310mA	78	YES	3.0 x 2.56 x 0.83	ES12T12/310XC
12	9.0-1.8	5.0V @ 1.5A	±15V @ ±250mA	78	YES	3.0 x 2.56 x 0.83	ES12T15/250XC
12	9.0-1.8	5.0V @ 1.5A	12/–5.0V @ ±310/-500mA	78	YES	3.0 x 2.56 x 0.83	ES12T05/500XC
24	18-36	5.0V @ 1.5A	±12V @ ±310mA	80	YES	3.0 x 2.56 x 0.83	ES24T12/310XC
24	18-36	5.0V @ 1.5A	±15V @ ±250mA	80	YES	3.0 x 2.56 x 0.83	ES24T15/250XC
24	18-36	5.0V @ 1.5A	12/-5.0V @ ±310/-500mA	80	YES	3.0 x 2.56 x 0.83	ES24T05/500XC
48	36-72	5.0V @ 1.5A	±12V @ ±310mA	82	YES	3.0 x 2.56 x 0.83	ES48T12/310XC
48	36-72	5.0V @ 1.5A	±15V @ ±250mA	82	YES	3.0 x 2.56 x 0.83	ES48T15/250XC
48	36-72	5.0V @ 1.5A	12/–5.0V @ ±310/-500mA	82	YES	3.0 x 2.56 x 0.83	ES48T05/500XC

20 Watts isolated, single and dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	18-36	5V @ 4A		81	YES	2.0 x 1.6 x 0.46	NFC20-24S05
24	18-36	12V @ 1.67A		83	YES	2.0 x 1.6 x 0.46	NFC20-24S12
24	18-36	15V @ 1.33A		83	YES	2.0 x 1.6 x 0.46	NFC20-24S15
24	18-36	+12V @ 0.833A	–12V @ 0.833A	83	YES	2.0 x 1.6 x 0.46	NFC20-24D12
24	18-36	+15V @ 0.666A	–15V @ 0.666A	84	YES	2.0 x 1.6 x 0.46	NFC20-24D15
48	36-72	5V @ 4A		82	YES	2.0 x 1.6 x 0.46	NFC20-48S05
48	36-72	12V @ 1.67A		83	YES	2.0 x 1.6 x 0.46	NFC20-48S12
48	36-72	15V @ 1.33A		83	YES	2.0 x 1.6 x 0.46	NFC20-48S15
48	36-72	+12V @ 0.833A	–12V @ 0.833A	85	YES	2.0 x 1.6 x 0.46	NFC20-48D12
48	36-72	+15V @ 0.666A	–15V @ 0.666A	86	YES	2.0 x 1.6 x 0.46	NFC20-48D15

25 Watts isolated, triple output

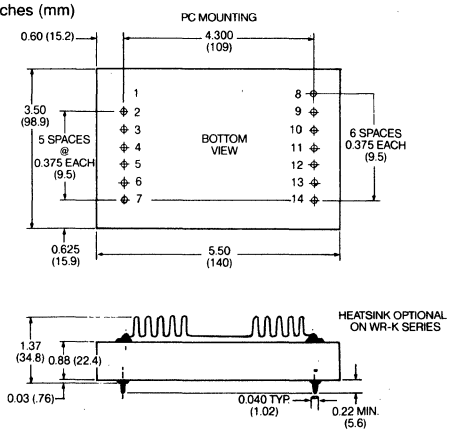
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
48	36-72	5V @ 5A	±12V @ 1A	82	YES	3.0 x 3.0 x 0.4	NFC25-48T0512
48	36-72	5V @ 5A	±15V @ 0.8A	82	YES	3.0 x 3.0 x 0.4	NFC25-48T0515

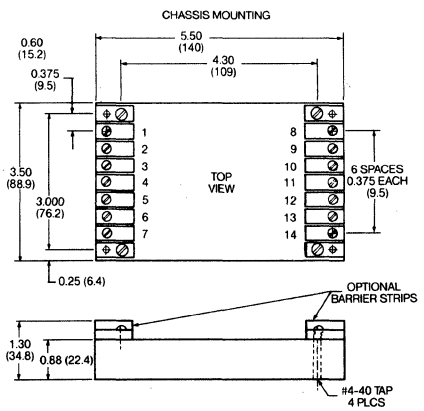
15 to 45 Watts, wide input, non-isolated single output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	7.0-40	5.0V @ 3.0A		80	YES	3.0 x 2.56 x 0.37	LWM12S05/3000XA
12	7.0-40	5.0V @ 5.0A		80	YES	3.0 x 2.56 x 0.83	LWM12S05/5000XC

Dimensions in inches (mm)

WR "K", WS





DC/DC CONVERTERS

25 to 30 Watts isolated, single output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	9.0-36	5.0V @ 5.0A		76	YES	4.56 x 2.56 x 0.87	WP24S05/5000U
24	9.0-36	6.0V @ 4.5A		77	YES	4.56 x 2.56 x 0.87	WP24S06/4500U
24	9.0-36	12V @ 2.5A		82	YES	4.56 x 2.56 x 0.87	WP24S12/2500U
24	9.0-36	15V @ 2.0A		83	YES	4.56 x 2.56 x 0.87	WP24S15/2000U
48	20-72	5.0V @ 5.0A		77	YES	4.56 x 2.56 x 0.87	WP48S05/5000U
48	20-72	6.0V @ 4.5A		78	YES	4.56 x 2.56 x 0.87	WP48S06/4500U
48	20-72	12V @ 2.5A		84	YES	4.56 x 2.56 x 0.87	WP48S12/2500U
48	20-72	15V @ 2.0A		85	YES	4.56 x 2.56 x 0.87	WP48S15/2000U

30 Watts isolated, single output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	18-36	5.0V @ 5.0A		77	YES	4.56 x 2.56 x 0.87	WR24S05/5000U
48	36-72	5.0V @ 5.0A		78	YES	4.56 x 2.56 x 0.87	WR48S05/5000U
48	36-72	12V @ 2.5A		81	YES	4.56 x 2.56 x 0.87	WR48S12/2500U
48	36-72	15V @ 2.0A		81	YES	4.56 x 2.56 x 0.87	WR48S15/2000U

30 Watts isolated, dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-1.8	±12V @ ±1.2A		82	YES	4.56 x 2.56 x 0.87	WR12D12/1250U
24	18-36	±12V @ ±1.2A		84	YES	4.56 x 2.56 x 0.87	WR24D12/1250U
24	18-36	±15V @ ±1.0A		84	YES	4.56 x 2.56 x 0.87	WR24D15/1000U
48	36-72	±12V @ ±1.2A		86	YES	4.56 x 2.56 x 0.87	WR48D12/1250U
48	36-72	±15V @ ±1.0A		86	YES	4.56 x 2.56 x 0.87	WR48D12/1000U

40 Watts isolated, single and triple output

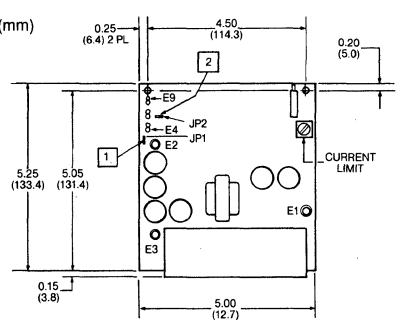
Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	18-36	5A @ 8A		80	YES	2.2 x 2.2 x 0.5	NFC40-24S05
24	18-36	12V @ 3.5A		82	YES	2.2 x 2.2 x 0.5	NFC40-24S12
24	18-36	15V @ 2.8A		82	YES	2.2 x 2.2 x 0.5	NFC40-24S15
24	18-36	5A @ 7.5A	±12V @ 750mA	80	YES	2.2 x 2.2 x 0.5	NFC40-24T12
24	18-36	5A @ 7.5A	±15V @ 750mA	80	YES	2.2 x 2.2 x 0.5	NFC40-24T15
48	36-72	5A @ 8A		81	YES	2.2 x 2.2 x 0.5	NFC40-48S05
48	36-72	12V @ 3.5A		83	YES	2.2 x 2.2 x 0.5	NFC40-48S12
48	36-72	15V @ 2.8A		83	YES	2.2 x 2.2 x 0.5	NFC40-48S15
48	36-72	5A @ 7.5A	±12V @ 750mA	81	YES	2.2 x 2.2 x 0.5	NFC40-48T12
48	36-72	5A @ 7.5A	±15V @ 750mA	81	YES	2.2 x 2.2 x 0.5	NFC40-48T15

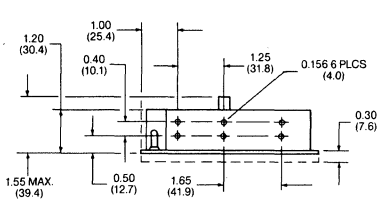
50 & 60 Watts isolated, single output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-1.8	5.0V @ 10A		80	YES	5.5 x 3.5 x 1.37	WR12S05/50K
12	9.0-1.8	12V @ 5.0A		82	YES	5.5 x 3.5 x 1.37	WR12S12/60K
24	18-36	12V @ 5.0A		83	YES	5.5 x 3.5 x 1.37	WR24S12/60K
48	36-72	5.0V @ 10A		82	YES	5.5 x 3.5 x 1.37	WR48S05/50K
48	36-72	12V @ 5.0A		84	YES	5.5 x 3.5 x 1.37	WR48S12/60K
48	36-72	15V @ 4.0A		84	YES	5.5 x 3.5 x 1.37	WR48S15/60K

Dimensions in inches (mm)

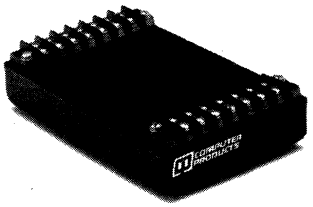
3T





+Chassis mount with screw terminals or heat sink versions optional.

DC/DC CONVERTERS



60 Watts isolated, dual output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-1.8	±12V @ ±2.5A		82	YES	5.5 x 3.5 x 1.37	WR12D12/60K
48	36-72	±12V @ ±2.5A		84	YES	5.5 x 3.5 x 1.37	WR48D12/60K
48	36-72	±15V @ ±2.0A		84	YES	5.5 x 3.5 x 1.37	WR48D15/60K

60 Watts isolated, triple output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
12	9.0-18	5.0V @ 5.0A	±12V @ ±1.2A	80	YES	5.5 x 3.5 x 1.37	WR12T05-12/55K
24	18-36	5.0V @ 5.0A	±12V @ ±1.2A	81	YES	5.5 x 3.5 x 1.37	WR24T05-12/55K
24	18-36	5.0V @ 5.0A	±15V @ ±1.0A	81	YES	5.5 x 3.5 x 1.37	WR24T05-15/55K
48	36-72	5.0V @ 5.0A	±12V @ ±1.2A	82	YES	5.5 x 3.5 x 1.37	WR48T05-15/55K
48	36-72	5.0V @ 5.0A	±15V @ ±1.0A	82	YES	5.5 x 3.5 x 1.37	WR48T05-15/55K

100 Watts isolated, single and triple output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
24	18-36	5.0V @ 20A		82	YES	5.5 x 3.5 x 1.37	WS24S05/100K1
24	18-36	12V @ 8.0A		82	YES	5.5 x 3.5 x 1.37	WS24S12/100K1
24	18-36	5.0V @ 10A	±12V @ ±2.0A	82	YES	5.5 x 3.5 x 1.37	WS24T05-12/100K1
24	18-36	5.0V @ 10A	±15V @ ±1.6A	82	YES	5.5 x 3.5 x 1.37	WS24T05-15/100K1
48	36-72	5.0V @ 20A		82	YES	5.5 x 3.5 x 1.37	WS48S05/100K1
48	36-72	12V @ 8.0A		82	YES	5.5 x 3.5 x 1.37	WS48S12/100K1
48	36-72	5.0V @ 10A	12V @ 4.0A	82	YES	5.5 x 3.5 x 1.37	WS48D05-12/100K1

150 to 360 Watts non-isolated, single output

Input Voltage Nominal (VDC)	Range (VDC)	Primary Output	Secondary Output	Efficiency (%)	Regulated Output	Size (L" x W" x H")	Model Number
	10-60	-4.5 to -30V @ 5.0A		75	YES	5.25 x 5.0 x 1.55	3T5AN-6130
	10-60	+4.5 to +15V @ 20A		75	YES	5.25 x 5.0 x 1.55	3T20AP-6115
	10-60	+4.5 to +30V @ 12A		75	YES	5.25 x 5.0 x 1.55	3T12AP-6130

+Chassis mount with screw terminals or heat sink versions optional.
++Heat sink version standard, chassis mount with screw terminals optional.

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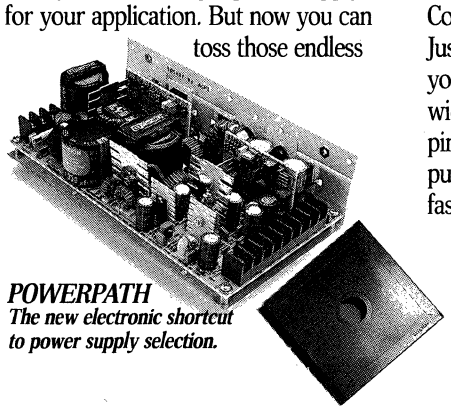

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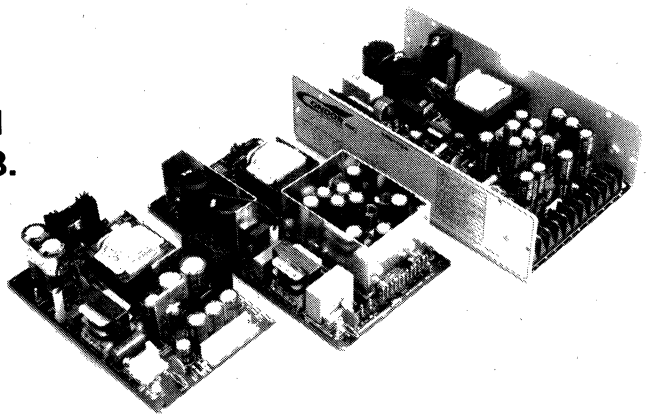

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MEDICAL SWITCHER RATINGS

MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	TOTAL POWER, WATTS	SIZE, INCHES
MS 30A	+5V @ 3A	+12V @ 0.5A	-12V @ 0.5A	–	–	30	5.00 X 3.00 X 1.35
MS 30B	+5V @ 3A	+15V @ 0.5A	-15V @ 0.5A	–	–	30	5.00 X 3.00 X 1.35
MS 45A	+5V @ 4A	+12V @ 3A (3.5A PK)	-12V @ 0.8A	-5V @ 0.2A	–	45	6.30 X 3.90 X 1.65
MS 45B	+5V @ 4A	+15V @ 2A (2.5A PK)	-15V @ 0.7A	-5V @ 0.15A	–	45	6.30 X 3.90 X 1.65
MS 65A	+5V @ 6A	+15V @ 2A (3.5A PK)	-15V @ 0.7A	-5V @ 0.5A	–	65	7.75 X 4.25 X 1.90
MS 65B	+5V @ 6A	+15V @ 2A (3.5A PK)	-15V @ 0.7A	+24V @ 1.2A (2A PK)	–	65	7.75 X 4.25 X 1.90
MS 65C	+5V @ 6A	+12V @ 2.5A (4A PK)	-12V @ 1A	-5V @ 0.5A	–	65	7.75 X 4.25 X 1.90
MS 65D	+5V @ 6A	+12V @ 2.5A (4A PK)	-12V @ 1A	+12V @ 0.7A	–	65	7.75 X 4.25 X 1.90
MS 65E	+5V @ 6A	+12V @ 2A (3.5A PK)	-12V @ 0.7A	+24V @ 1.2A (2A PK)	–	65	7.75 X 4.25 X 1.90
MS 80A	+5V @ 9A	+12V @ 3A (5A PK)	-12V @ 2A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
MS 80B	+5V @ 9A	+12V @ 3A (5A PK)	-12V @ 1A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
MS 80C	+5V @ 9A	+15V @ 1A	-15V @ 1A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
MS 110A	+5V @ 12A	+12V @ 3A (5A PK)	+12V @ 3A (5A PK)*	-12V @ 3A	-5V @ 0.6A	110	8.80 X 4.95 X 2.45
MS 110B	+5V @ 12A	+12V @ 3A (5A PK)	+12V @ 3A (5A PK)*	-12V @ 1A	-5V @ 0.6A	110	8.80 X 4.95 X 2.45
MS 110C	+5V @ 12A	+12V @ 3A (5A PK)	+15V @ 1A*	-15V @ 1A	-5V @ 0.6A	110	8.80 X 4.95 X 2.45
MS 110D	+5V @ 12A	+12V @ 3A (5A PK)	+24V @ 1.5A (3A PK)*	-12V @ 3A	-5V @ 0.6A	110	8.80 X 4.95 X 2.45
MS 110H	+5V @ 12A	+15V @ 1A	-15V @ 1A*	+24V @ 2A (3A PK)	-5V @ 0.6A	110	8.80 X 4.95 X 2.45

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MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	TYPE	CASE	SIZE, INCHES
MLL12-0.25-A	–	+12V @ 0.25A	-12V @ 0.25A	DUAL OUTPUT	L	4.25 X 3.25 X 1.80
MLL15-0.2-A	–	+15V @ 0.20A	-15V @ 0.20A	DUAL OUTPUT	L	4.25 X 3.25 X 1.80
MAA15-0.8-A	+12/15V @ 1.0/0.8A	-12/15V @ 1.0/0.8A	–	DUAL OUTPUT	AA	6.50 X 4.00 X 2.25
MBB15-1.5-A	+12/15V @ 1.7/1.5A	-12/15V @ 1.7/1.5A	–	DUAL OUTPUT	BB	7.00 X 4.88 X 2.95
MCC15-3-A	+12/15V @ 3.4/3.0A	-12/15V @ 3.4/3.0A	–	DUAL OUTPUT	CC	9.38 X 4.88 X 3.30
MAA512-A	5V @ 2.0A	9/15V @ 0.5A	–	DUAL OUTPUT	AA	6.50 X 4.00 X 2.25
MBB512-A	5V @ 3.0A	9/15V @ 1.25A	–	DUAL OUTPUT	BB	7.00 X 4.88 X 2.95
MCC512-A	5V @ 6.0A	9/15V @ 2.5A	–	DUAL OUTPUT	CC	9.38 X 4.88 X 3.30
MAA524-A	5V @ 2.0A	18/24V @ 0.3A	–	DUAL OUTPUT	AA	6.50 X 4.00 X 2.25
MBB524-A	5V @ 3.0A	18/24V @ 0.8A	–	DUAL OUTPUT	BB	7.00 X 4.88 X 2.95
MCC524-A	5V @ 6.0A	18/24V @ 2.0A	–	DUAL OUTPUT	CC	9.38 X 4.88 X 3.30
MCP323-A	12V @ 4.0A	5V @ 2.0A	–	DUAL OUTPUT	N	7.00 X 4.88 X 3.30
MCP510-A	12V @ 2.5A (7.5 PK)	5V @ 6.0A	–	DUAL OUTPUT	CP510	8.25 X 4.88 X 3.30
MTLL-5W-A	+5V @ 0.5A	+12/15V @ 0.1A	-12/15V @ 0.1A	TRIPLE OUTPUT	L	4.25 X 3.25 X 1.80
MTAA-16W-A	5V @ 2.0A	+12/15V @ 0.4A	-12/15V @ 0.4A	TRIPLE OUTPUT	AA	6.50 X 4.00 X 2.25
MBAA-40W-A	5V @ 3.0A	+12/15V @ 1.0/0.8A	-12/15V @ 1.0/0.8A	TRIPLE OUTPUT	BAA	10.25 X 4.00 X 2.95
MCAA-60W-A	5V @ 6.0A	+12/15V @ 1.0/0.8A	-12/15V @ 1.0/0.8A	TRIPLE OUTPUT	D	9.00 X 4.88 X 3.30
MCBB-75W-A	5V @ 6.0A	+12/15V @ 1.7/1.5A	-12/15V @ 1.7/1.5A	TRIPLE OUTPUT	CBB	11.00 X 4.88 X 3.30
MCP206-A	24V @ 3A (3.5 PK)	5V @ 3.0A	5V @ 1.0A	TRIPLE OUTPUT	CBB	11.00 X 4.88 X 3.30

MED 1 QUALITY PROGRAM

The MED 1 Quality Program is standard on all M-Series medical power supplies. It provides additional controls and testing which produces the extra level of quality that medical applications require. MED 1 is based in part on MIL-I-45208A, and includes the following procedures and tests in addition to the normal Condor quality assurance program.

1. **Lot Traceability:** Condor recordkeeping will include lot numbers, date of manufacture, test results and failure history. Each supply will be marked with a lot number and revision level.
2. **Extended Burn-In:** Burn-in duration is 24 hours for switching supplies and 8 hours for linear supplies. Test conditions are: full-rated load, room ambient temperature, and AC input power cycling.
3. **Safety Testing:** All units will be subjected to hipot and leakage current tests after burn-in. These tests are designed to identify potential failures that constitute the greatest risk of shock hazard in D.C. power supplies.
4. **Certificate of Conformance:** All power supplies shipped under the MED 1 program will be delivered with certificates of conformance to published specifications and the MED 1 Quality Program.

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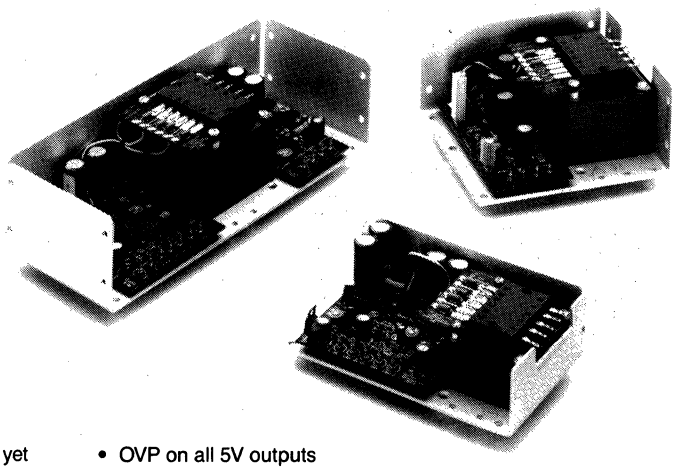
WORLD CLASS MEDICAL



Condor's international medical linears, designed to meet UL 544/IEC 601/CSA 1402-3.

Condor's medical linear power supplies offer innovative yet cost-effective design solutions for both high- and low-volume users.

Medical linear features:

- 38 models (single, dual & triple output)
- 3 power levels (5 to 92 watts)
- AC input: 110/120/220/240 VAC, 47-63 Hz
- OVP on all 5V outputs
- Meets EMI per FCC/VDE B
- Hermetically sealed power transistors and IC's
- MTBF 200,000+ hours per Mil Handbook 217D
- 8-hour burn-in with cycling
- Full 3-year warranty

MEDICAL LINEAR RATINGS

MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	TYPE	CASE	SIZE, INCHES
ML5-1/OVP-A	5V @ 1.0A	–	–	SINGLE OUTPUT	L	4.25 X 3.25 X 1.80
MB5-3/OVP-A	5V @ 3.0A	–	–	SINGLE OUTPUT	B	4.88 X 4.00 X 2.25
MC5-6/OVP-A	5V @ 6.0A	–	–	SINGLE OUTPUT	C	5.63 X 4.88 X 2.95
MD5-12/OVP-A	5V @ 12.0A	–	–	SINGLE OUTPUT	D	9.00 X 4.88 X 3.30
ML12-0.5-A	12V @ 0.5A	–	–	SINGLE OUTPUT	L	4.25 X 3.25 X 1.80
MB12-1.7-A	12V @ 1.7A	–	–	SINGLE OUTPUT	B	4.88 X 4.00 X 2.25
MC12-3.4-A	12V @ 3.4A	–	–	SINGLE OUTPUT	C	5.63 X 4.88 X 2.95
MD12-6.8-A	12V @ 6.8A	–	–	SINGLE OUTPUT	D	9.00 X 4.88 X 3.30
ML15-0.4-A	15V @ 0.4A	–	–	SINGLE OUTPUT	L	4.25 X 3.25 X 1.80
MB15-1.5-A	15V @ 1.5A	–	–	SINGLE OUTPUT	B	4.88 X 4.00 X 2.25
MC15-3-A	15V @ 3.0A	–	–	SINGLE OUTPUT	C	5.63 X 4.88 X 2.95
MD15-6-A	15V @ 6.0A	–	–	SINGLE OUTPUT	D	9.00 X 4.88 X 3.30
ML24-0.3A	24V @ 0.3-A	–	–	SINGLE OUTPUT	L	4.25 X 3.25 X 1.80
MB24-1.2-A	24V @ 1.2-A	–	–	SINGLE OUTPUT	B	4.88 X 4.00 X 2.25
MC24-2.4-A	24V @ 2.4A	–	–	SINGLE OUTPUT	C	5.63 X 4.88 X 2.95
MD24-4.8-A	24V @ 4.8A	–	–	SINGLE OUTPUT	D	9.00 X 4.88 X 3.30
MB28-1-A	28V @ 1.0A	–	–	SINGLE OUTPUT	B	4.88 X 4.00 X 2.25
MC 28-2-A	28V @ 2.0A	–	–	SINGLE OUTPUT	C	5.63 X 4.88 X 2.95
MD28-4-A	28V @ 4.0A	–	–	SINGLE OUTPUT	D	9.00 X 4.88 X 3.30

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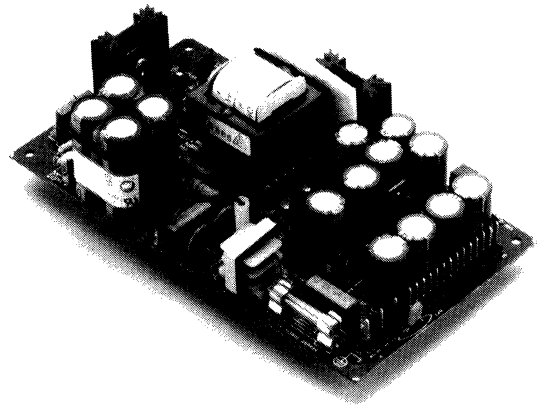
WORLD CLASS

Condor's "V" Series — agency-approved power supplies with high peak power for starting loads.



Our "V" Series multiple output switching power supplies meet the toughest domestic and international safety requirements, and are UL, CSA and TUV/VDE certified. "V" Series units give you the performance you need, too, with peak power levels for starting loads ranging from 125 to 140 percent of full rated power.

"V" Series features:

- Low cost
- 6 power levels — 30 to 125 watts
- 26 models — 2 to 5 outputs
- AC input: 90-132/180-264 VAC, 47-63 Hz
- Clean, low-cost, open-frame design
- Fully-protected — adjustable current limit, built-in OVP and reverse voltage protection
- Full load burn-in and 2-year warranty
- High peak current disk drive outputs plus closely regulated 3-terminal-type outputs
- Extremely versatile output configurations for tough applications
- Very high value for your purchasing dollar
- Isolated outputs can be used for positive or negative sources or in series with other outputs
- Pass vibration and shock per MIL-STD 810D

For high performance and world-class value in switching power supplies, call Condor!

"V" SERIES OUTPUT RATINGS

MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	TOTAL POWER, WATTS	SIZE, INCHES
VBA 326	+5V @ 3A	+12V @ 0.5A	-12V @ 0.5A	–	–	30	5.00 X 3.00 X 1.35
VBA 323	+5V @ 3A	+15V @ 0.5A	-15V @ 0.5A	–	–	30	5.00 X 3.00 X 1.35
VCA 326	+5V @ 4A	+12V @ 3A (3.5A PK)	-12V @ 0.8A	–	–	45	6.30 X 3.90 X 1.65
VCA 420	+5V @ 4A	+12V @ 3A (3.5A PK)	-12V @ 1.8A	-5V @ 0.25A	–	45	6.30 X 3.90 X 1.65
VCA 423	+5V @ 4A	+15V @ 2A (2.5A PK)	-15V @ 0.7A	-5V @ 0.15A	–	45	6.30 X 3.90 X 1.65
VCA 426	+5V @ 4A	+12V @ 3A (3.5A PK)	-12V @ 0.8A	-5V @ 0.2A	–	45	6.30 X 3.90 X 1.65
VEA 405	+5V @ 6A	+15V @ 2A (3.5A PK)	-15V @ 0.7A	-5V @ 0.5A	–	65	7.75 X 4.25 X 1.90
VEA 424	+5V @ 6A	+15V @ 2A (3.5A PK)	-15V @ 0.7A	+24V @ 1.2A (2A PK)	–	65	7.75 X 4.25 X 1.90
VEA 417	+5V @ 6A	+12V @ 2.5A (4A PK)	-12V @ 1A	-5V @ 0.5A	–	65	7.75 X 4.25 X 1.90
VEA 412	+5V @ 6A	+12V @ 2.5A (4A PK)	-12V @ 1A	+12V @ 0.7A	–	65	7.75 X 4.25 X 1.90
VEA 436	+5V @ 6A	+12V @ 2A (3.5A PK)	-12V @ 0.7A	+24V @ 1.2A (2A PK)	–	65	7.75 X 4.25 X 1.90
VFA 420	+5V @ 8A	+12V @ 2.5A (4.5A PK)	+12V @ 2.5A (4.5A PK)*	-12V @ 2.5A	–	85	7.75 X 4.25 X 1.90
VFA 421	+5V @ 8A	+12V @ 2.5A (4.5A PK)	+12V @ 2.5A (4.5A PK)*	-5V @ 2.5A	–	85	7.75 X 4.25 X 1.90
VFA 423	+5V @ 6A	+15V @ 2.5A (3.5A PK)	+15V @ 2.5A (3.5A PK)*	-5V @ 2.5A	–	85	7.75 X 4.25 X 1.90
VFA 430	+5V @ 8A	+12V @ 2.5A (4.5A PK)	+24V @ 2A (4A PK)*	-12V @ 2.5A	–	85	7.75 X 4.25 X 1.90
VHA 420	+5V @ 10A	+12V @ 3A (4.5A PK)	12V @ 3A (4.5A PK)*	-12V @ 2A	-5V @ 0.5A	100	8.40 X 4.60 X 2.20
VHA 423	+5V @ 7A	+15V @ 2.5A (4A PK)	–	-15V @ 2.5A (4A PK)	-5V @ 0.2A	100	8.40 X 4.60 X 2.20
VHA 426	+5V @ 10A	+12V @ 3A (4.5A PK)	12V @ 1A*	-12V @ 1A	-5V @ 0.2A	100	8.40 X 4.60 X 2.20
VHA 427	+5V @ 10A	+12V @ 3A (4.5A PK)	15V @ 1A*	-15V @ 1A	-5V @ 0.2A	100	8.40 X 4.60 X 2.20
VHA 428	+5V @ 13A	–	12V @ 3A (4.5A PK)*	-12V @ 3A (4.5A PK)	-5V @ 0.5A	100	8.40 X 4.60 X 2.20
VHA 430	+5V @ 10A	+12V @ 3A (4.5A PK)	24V @ 2.5A (4A PK)*	-12V @ 2A	-5V @ 0.5A	100	8.40 X 4.60 X 2.20
VKA 420	+5V @ 15A	+12V @ 4A (6A PK)	12V @ 3A*	-12V @ 3A	-5V @ 0.5A	125	10.40 X 4.60 X 2.20
VKA 423	+5V @ 10A	+15V @ 3A (4A PK)	–	-15V @ 3A (4A PK)	-5V @ 0.4A	125	10.40 X 4.60 X 2.20
VKA 426	+5V @ 15A	+12V @ 4A (6A PK)	12V @ 1A*	-12V @ 1A	-5V @ 0.2A	125	10.40 X 4.60 X 2.20
VKA 427	+5V @ 15A	+12V @ 4A (6A PK)	15V @ 1A*	-15V @ 1A	-5V @ 0.2A	125	10.40 X 4.60 X 2.20
VKA 430	+5V @ 15A	+12V @ 4A (6A PK)	24V @ 3A (4.5A PK)*	-12V @ 3A	-5V @ 0.5A	125	10.40 X 4.60 X 2.20

* Isolated outputs.

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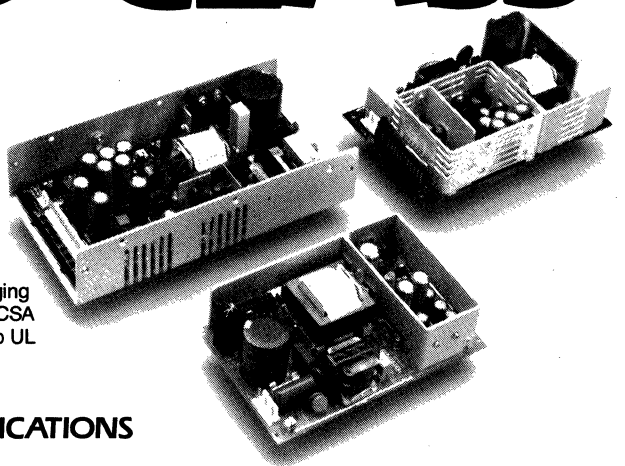
NEW FROM CONDOR!
Global Performance switching power supplies with the agency approvals you need.



Our new Global Performance Series switchers feature full-input autoranging (84-264V) and are approved to UL 1950, VDE level B EMI, IEC 950 and CSA TUV. All models also are available in medical configurations, approved to UL 544 and IEC 601.

SPECIFICATIONS

	GP MODELS	VPA MODELS
AC INPUT:	85-264 VAC, 47-63 Hz single phase.	90-132 VAC or 180-264 VAC, user selectable. 47-63 Hz single phase. (For optional autoswitchover add "-AS" to model number.)
DC OUTPUTS:	See output rating chart.	See output rating chart.
HOLD-UP TIME:	20 mS minimum @ full load and nominal line (115 VAC).	20 mS minimum at full load and nominal input voltage.
OVERLOAD PROTECTION:	Fully protected against short circuit and output overload on all outputs. Short circuit protection is cycling type on most outputs; foldback on outputs with 3-terminal regulator post regulation. Overload protection recovery after removal of fault is automatic.	Fully protected against short-circuit and output overload with cycling-type overload protection. Automatic recovery after removal of fault.
MINIMUM LOAD:	Turn-On/Standby. No minimum load required for proper operation. Normal Operation: Output #1 and/or #2 combined load current must meet the minimums listed below for proper regulation as other outputs are loaded. GPx55 1.0A GPx80 1.0A GPx130 2.0A Single output models Not required	An 8-amp minimum load is required on output #1. A 20% minimum load is required on quasi-regulated outputs.
OUTPUT NOISE AND RIPPLE:	0.5% RMS, 1% PK-PK maximum on all outputs.	0.5% RMS, 1.5% PK-PK maximum on all outputs.
TRANSIENT RESPONSE:	+5V main output: 500 mS typical response time for a 50 to 100% or 100 to 50% load change. Maximum voltage deviation: 5.0%.	+5V main output; 500 mS typical response time for a 50% to 100% or 100% to 50% load change.
OVERVOLTAGE	Built in on + output with firing point set at 6.2V ±0.6V.	Built in on + output with firing point set at 6.2V ±0.6V.
VOLTAGE ADJUSTMENT:	Built-in potentiometer adjusts voltage from 4.5V to OVP trip point (6.2V nominal) on the +5V output. A separate potentiometer adjusts output #2 ±5% minimum.	Built-in potentiometer adjusts voltage from 4.5V to OVP trip point (6.2V nominal) on main +5V output.
REVERSE VOLTAGE PROTECTION:	All outputs protected against inadvertent application of reverse voltage up to 1 times the rated current of the reversed output.	All outputs protected against inadvertent application of reverse voltage.
OVERSHOOT:	No output overshoot on turn on or turn off.	No output overshoot on turn on or turn off.
INPUT PROTECTION:	Internal A.C. fuse provided on all units. This fuse only blows if a catastrophic failure occurs in the unit; it does not blow on overload or short circuit. A.C. input protected against line transients by metal oxide varistors on all medical units.	Internal A.C. fuse provded on all units. This fuse only blows if a catastrophic failure occurs in the unit. It does not blow on overload or short curcuit. A.C. input protected from line transients by metal oxide varistors.
TEMPERATURE COEFFICIENT:	0.03% per °C typical for all outputs.	0.03% per °C typical for all outputs.
TEMPERATURE RATING:	0 to 50 °C at full rated output power with natural convection cooling in a non-restricted environment. For operation in a confined space, moving air may be required. For operation above 50 °C, it is important that the cooling vs. load profile is such that the heatsinks do not operate above 90 °C for extended periods.	0 to 50 °C at full rated power with 26 CFM forced air cooling. Cooling air should be ducted directly over the unit. For less air, derate output power by 1% per CFM of air. For convection cooling @ 296 watts, unit must be installed in non-restrictive environment.
EMI SPECIFICATIONS:	All models include built-in EMI filters to meet or exceed the conducted emissions requirements of FCC 20870 Class B and VDE 0871 Class B.	All VPA models are designed with built-in EMI filters to meet or exceed the conducted emissions requirements of FCC 20870 Class B and VDE 0871 Class B.
SAFETY SPECIFICATIONS:	All commercial models are designed to meet UL 1950, CSA 1402C Level 3, IEC 950, VDE EN60950 and VDE 0750. All medical models are designed to meet UL 544 and IEC 601-1.	All VPA models are designed to meet UL 1950, UL 508, CSA Bulletin 1402C Level 5, IEC 950.

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WORLD CLASS

GLOBAL PERFORMANCE SERIES OUTPUT RATINGS

MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	TOTAL POWER, WATTS	SIZE, INCHES
GPx40A	+ 5V @ 3A	+12V @ 2A (3PK)	-12V @ 0.5A	N/A	N/A	40	3.00 X 5.00 X 1.40
GPx40B	+ 5V @ 3A	+15V @ 2A (3 PK)	-15V @ 0.5A	N/A	N/A	40	3.00 X 5.00 X 1.40
GPx55A	+ 5V @ 6A	+12V @ 3A (5 PK)	+12V @ 1A	-12V @ 1A	N/A	55	6.30 X 3.90 X 1.66
GPx55B	+ 5V @ 6A	+12V @ 3A (5 PK)	-12V @ 1A	- 5V @ 1A	N/A	55	6.30 X 3.90 X 1.66
GPx55D	+ 5V @ 6A	+24V @ 1.5A (2 PK)	+12V @ 1A	-12V @ 1A	N/A	55	6.30 X 3.90 X 1.66
GPx55E	+ 5V @ 6A	+24V @ 1.5A (2 PK)	+15V @ 1A	-15V @ 1A	N/A	55	6.30 X 3.90 X 1.66
GPx55-5	+ 5V @ 11A	N/A	N/A	N/A	N/A	55	6.30 X 3.90 X 1.66
GPx55-12	+12V @ 4.7A	N/A	N/A	N/A	N/A	55	6.30 X 3.90 X 1.66
GPx55-15	+15V @ 3.7A	N/A	N/A	N/A	N/A	55	6.30 X 3.90 X 1.66
GPx55-24	+24V @ 2.3A	N/A	N/A	N/A	N/A	55	6.30 X 3.90 X 1.66
GPx80A	+ 5V @ 12A	+12V @ 3A (5 PK)	-12V @ 1A	+12V @ 1A	N/A	80	7.00 X 4.25 X 1.96
GPx80B	+ 5V @ 12A	+12V @ 3A (5 PK)	-12V @ 1A	- 5V @ 1A	N/A	80	7.00 X 4.25 X 1.96
GPx80C	+ 5V @ 12A	+12V @ 3A (5 PK)	-15V @ 1A	+15V @1A	N/A	80	7.00 X 4.25 X 1.96
GPx80D	+ 5V @ 12A	+24V @ 2A (3 PK)	-12V @ 1A	+12V @ 1A	N/A	80	7.00 X 4.25 X 1.96
GPx80E	+ 5V @ 12A	+24V @ 2A (3 PK)	-15V @ 1A	+15V @ 1A	N/A	80	7.00 X 4.25 X 1.96
GPx80-5	+ 5V @ 16A	N/A	N/A	N/A	N/A	80	7.00 X 4.25 X 1.96
GPx80-12	+12V @ 6.7A	N/A	N/A	N/A	N/A	80	7.00 X 4.25 X 1.96
GPx80-15	+15V @ 5.3A	N/A	N/A	N/A	N/A	80	7.00 X 4.25 X 1.96
GPx80-24	+24V @ 3.4A	N/A	N/A	N/A	N/A	80	7.00 X 4.25 X 1.96
GPx130A	+ 5V @ 20A	+12V @ 5A (8 PK)	-12V @ 1.5A	+12V @ 1.5A	N/A	130	8.50 X 4.50 X 2.00
GPx130B	+ 5V @ 20A	+12V @ 5A (8 PK)	- 5V @ 1.5A	-12V @ 1.5A	N/A	130	8.50 X 4.50 X 2.00
GPx130D	+ 5V @ 20A	+24V @ 3.5A (5 PK)	-12V @ 1.5A	+12V @ 1.5A	N/A	130	8.50 X 4.50 X 2.00
GPx130E	+ 5V @ 20A	+24V @ 3.5A (5 PK)	-15V @ 1.5A	+15V @ 1.5A	N/A	130	8.50 X 4.50 X 2.00
GPx130-5	+ 5V @ 26A	N/A	N/A	N/A	N/A	130	8.50 X 4.50 X 2.00
GPx130-12	+12V @ 11A	N/A	N/A	N/A	N/A	130	8.50 X 4.50 X 2.00
GPx130-15	+15V @ 8.7A	N/A	N/A	N/A	N/A	130	8.50 X 4.50 X 2.00
GPx130-24	+24V @ 5.5A	N/A	N/A	N/A	N/A	130	8.50 X 4.50 X 2.00
GPx200A	+ 5V @ 30A	+12V @ 8A (10 PK)	+12V @ 4A**	-12V @ 1.5A	***	200	9.00 X 5.00 X 2.40
GPx200C	+ 5V @ 30A	+12V @ 8A (10 PK)	+24V @ 2A**	-12V @ 1.5A	***	200	9.00 X 5.00 X 2.40
GPx200D	+ 5V @ 30A	+12V @ 8A (10 PK)	+12V @ 4A**	+15V @ 1.5A	***	200	9.00 X 5.00 X 2.40
GPx200E	+ 5V @ 30A	+12V @ 8A (10 PK)	+24V @ 2A**	+15V @ 1.5A	***	200	9.00 X 5.00 X 2.40
VPA 420	+ 5V @ 60A	+12V @ 12A (16 PK)	+12V @ 6A	+12V @ 6A	+ 5V @ 4A	400	13.00 X 5.00 X 2.50
VPA 423	+ 5V @ 60A	+12V @ 12A (16 PK)	+15V @ 6A	+15V @ 6A	+ 5V @ 4A	400	13.00 X 5.00 X 2.50
VPA 430	+ 5V @ 60A	+24V @ 8A (10 PK)	+12V @ 6A	+12V @ 6A	+ 5V @ 4A	400	13.00 X 5.00 X 2.50
VPA 433	+ 5V @ 60A	+24V @ 8A (10 PK)	+15V @ 6A	+15V @ 6A	+ 5V @ 4A	400	13.00 X 5.00 X 2.50

* Replace "x" in Model No. as follows: M = Medical version
C = Standard version for data processing, control, etc applications

** Floating output

*** Optional 5th output up to 2 amps @ + or - 5, 12 or 15V; consult factory

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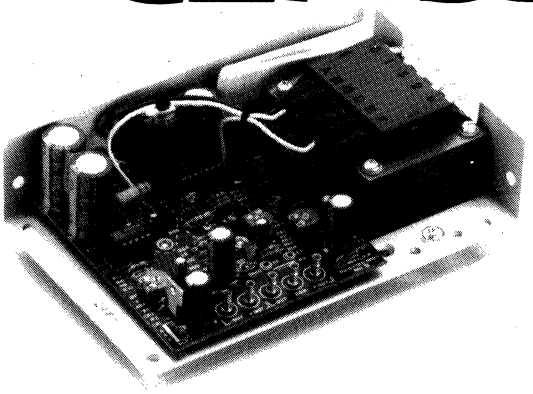
WORLD CLASS

Condor's International Plus Series linear power supplies — certified to UL544.



Condor's *International Plus Series* D.C. power supplies virtually eliminate primary-secondary shorting because each coil uses a separate bobbin surrounded by two layers of glass-impregnated nylon, giving complete mechanical and electrical isolation.

The best low-noise 723 regulator chips are used throughout the line, together with proven, reliable semiconductors. TO3-cased pass elements are hermetically sealed, and the latest high-density, high-ripple current rating capacitors from proven, high-quality vendors ensure long life and reliability.

International Plus Series features:

- 9 power levels — 3 to 288W
- 75 models (single, dual & triple output)
- AC input: 100/120/220/230/240 VAC, 47-63 Hz
- OVP on all 5V outputs
- Meets EMI per FCC/VDE B (most units)
- Meets and approved to IEC 950
- Hermetically sealed power transistors
- MTBF 200,000+ hours per Mil Hndbk 217D
- 2-hour burn-in with cycling
- Full 3-year warranty

Sixty-five *International Plus Series* models are approved to UL478/1012; CSA C22.2 and TUV certified to VDE 0806 and IEC 950. Twenty-six models are also approved to UL544.

INTERNATIONAL PLUS LINEAR RATINGS

SINGLE OUTPUT

MODEL NO.	VOLTAGE, VOLTS	CURRENT, AMPS	CASE	MODEL	VOLTAGE, VOLTS	CURRENT, AMPS	CASE
HA2-1.5-A+ *	2	1.5	A	HC15-3-A+	15	3.0	C
HB2-3-A+ *	2	3.0	B	HN15-4.5-A+	15	4.5	N
HC2-6-A+ *	2	6.0	C	HD15-6-A+	15	6.0	D
HN2-9-A+	2	9.0	N	HE15-9-A+	15	9.0	E
HD2-12-A+	2	12.0	D	F15-15-A+	15	15.0	F
HE2-18-A+	2	18.0	E	HA24-0.5-A+	24	0.5	B
HA5-1.5/OVP-A+ *	5	1.2	B	HB24-1.2-A+	24	1.2	B
HB5-3/OVP-A+ *	5	3.0	B	HC24-2.4-A+	24	2.4	C
HC5-6/OVP-A+ *	5	6.0	C	HN24-3.6-A+	24	3.6	N
HN5-9/OVP-A+	5	9.0	N	HD24-4.8-A+	24	4.8	D
HD5-12/OVP-A+	5	12.0	D	HE24-7.2-A+	24	7.2	E
HE5-18/OVP-A+	5	18.0	E	F24-12-A+	24	12.0	F
F5-25/OVP-A+	5	25.0	F	HA24-0.5-A (28)+	28	0.5	B
G5-35/OVP-A+	5	35.0	G	HB28-1.0-A+	28	1.0	B
CP197-A+ *	5	50.0	G	HC28-2-A+	28	2.0	C
HA15-0.9-A (12)+ *	12	0.9	B	HN28-3-A+	28	3.0	N
HB12-1.7A+ *	12	1.7	B	HD28-4-A+	28	4.0	D
HC12-3.4-A+ *	12	3.4	C	HE28-6-A+	28	6.0	E
HN12-5.1-A+	12	5.1	N	F24-12-A+	28	10.0	F
HD12-6.8-A+	12	6.8	D	HB48-0.5-A+	48	0.5	B
HE12-10.2-A+	12	10.2	E	HC48-1-A+	48	1.0	C
F15-15-A+	12	16.0	F	HD48-3-A+	48	3.0	D
HA15-0.9-A+ *	15	0.9	B	HE48-4-A+	48	4.0	E
HB15-1.5-A+ *	15	1.5	B	F48-6-A+	48	6.0	F

* UL544 approved.

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WORLD CLASS

INTERNATIONAL PLUS LINEAR RATINGS

MULTIPLE OUTPUT					SIZE CHART	
MODEL	OUTPUT 1	OUTPUT 2	OUTPUT 3	CASE	CASE	SIZE, INCHES
HAA5-1.5/OVP-A+ *	5V @ 1.5A	5V @ 1.5A	–	AA	B	4.88 X 4.00 X 2.25
HBB5-3/OVP-A+ *	5V @ 3A	5V @ 3A	–	BB	C	5.63 X 4.88 X 2.95
HCC5-6/OVP-A+ *	5V @ 6A	5V @ 6A	–	CC	N	7.00 X 4.88 X 3.30
HAA512-A+ *	5V @ 2A	9 to 15V @ 0.5A	–	AA	D	9.00 X 4.88 X 3.30
HBB512-A+ *	5V @ 3A	9 to 15V @ 1.25A	–	AA	E	14.00 X 4.88 X 3.55
HCC512-A+	5V @ 6A	9 to 15V @ 2.5A	–	CC	F	16.75 X 4.88 X 5.00
HAA524-A+ *	5V @ 2A	18 to 24V @ 0.3A	–	AA	G	16.75 X 4.88 X 5.30
HBB524-A+	5V @ 3A	18 to 24V @ 0.8A	–	BB	AA	6.50 X 4.00 X 2.25
HCC524-A+	5V @ 6A	18 to 24V @2A	–	CC	BB	7.00 X 4.88 X 2.95
HAD12-0.4-A+ *	+12 @ 0.4A	–12 @ 0.4A	–	B	CC	9.38 X 4.88 X 3.30
HAD15-0.4A+ *	+15 @ 0.4A	–15V@ 0.4A	–	B	BAA	10.25 X 4.00 X 2.95
HAA15-0.8A+	+12 to 15V @ 1A/0.8A	–12 to 15V @ 1A/8A	–	AA	CBB	11.00 X 4.88 X 3.30
HBB15-1.5A+ *	+12 to 15V @ 1.7A/1.5A	–12 to 15V @ 1.7A/1.5A	–	BB	NBB	11.00 X 4.88 X 3.30
HCC-15-3-A+	+12 to 15V @ 3.4A/3A	–12 to 15V @3.4A/3A	–	CC	DBB	14.25 X 4.88 X 3.55
HDD15-5-A+	+12 to 15V @ 5A	–12 to 15V @ 5A	–	E	DCC	15.00 X 4.88 X 4.55
HAA24-0.6A+	+18 to 24V @ 0.4A/0.6A	+18 to 24V @ 0.4A/0.6A	–	AA	CP510	8.25 X 4.88 X 3.30
HTAA-16W-A+ *	5V @ 2A	+12 to 15V @ 0.4/0.4A	–12 to 15V @ 0.4/0.4A†	AA		
HBAA-40W-A+ *	5V @ 3A	+12 to 15V @ 1/0.8A	–12 to 15V @ 1/0.8A†	BAA		
HCBB-105W-A+	5V @ 3A	+12 to 15V @ 3.4/3.0A	–12 to 15V @ 3.4/3.0A†	CBB		
HCAA-60W-A+	5V @ 6A	+12 to 15V @ 1/0.8A	–12 to 15V @ 1/0.8A†	D		
HCBB-75W-A+	5V @ 6A	+12 to 15V @ 1.7/1.5A	–12 to 15V @ 1.7/1.5A†	CBB		
CP131-A+	5V @ 9A	+12 to 15V @ 1.7/1.5A	–12 to 15V @ 1.7/1.5A†	NBB		
HDBB-105W-A+	5V @ 12A	+12 to 15V @ 1.7/1.5A	–12 to 15V @ 1.7/1.5A†	DBB		
HDCC-150W-A+	5V @ 12A	+12 to 15V @ 3.4/3A	–12 to 15V @ 3.4/3A†	DCC		

†No. 3 output usable at –5V, rate at ½ 15V current rating.
*UL544 approved.

DISK DRIVE/PRINTER SERIES RATINGS

MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	CASE
CP206-A+	24V, 3A (3.5 PK)	5V, 3A	5V, 1A	CBB
CP323-A+ *	12V, 4A	5V, 2A	NA	N
CP510-A+	12V, 2.5/7.5 PK	5V, 6A	NA	CP510

*UL544 approved.

FIXED DISK SERIES RATINGS

MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	CASE
CP379-A+	+5V @ 6A	+24V @ 3.5/8A PK	–5V or 12V @ 1.2A	NBB
CP498-A+	+5V @ 6A	+12V @ 5/10A PK	–5V or 12V @ 0.5A	NBB

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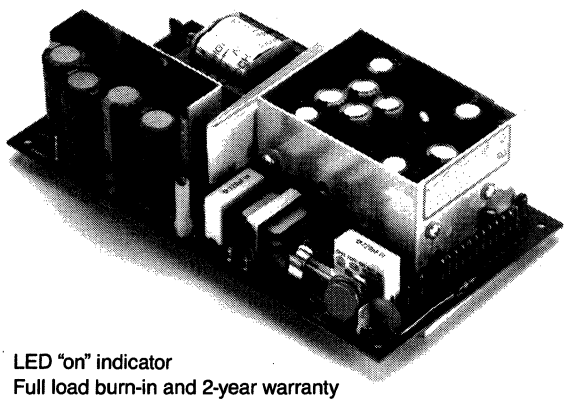

Condor's SDS and SDM Series power supplies meet FCC/VDE Level B and have agency safety approvals!

Every tough, versatile Condor single (SDS) or multiple (SDM) switching power supply meets the toughest domestic and international safety requirements, and is UL, CSA and TUV/VDE certified. All units also meet FCC 20870 Level B and VDE 0871 Class B above 150KHz.

SDS/SDM Series features:

- 5 power levels — 45 to 200 watts
- 20 single and 29 multiple-output models (up to 5 outputs)
- AC input: 90-132 VAC/180-264 VAC, 47-63 Hz
- Clean, low-cost, open-frame design
- Fully-protected — adjustable current limit, built-in OVP and reverse voltage protection
- LED "on" indicator
- Full load burn-in and 2-year warranty
- Powerfail signal and logic inhibit on 140 and 200W levels
- High peak current disk drive outputs plus closely regulated 3-terminal-type outputs
- Extremely versatile output configurations for tough applications
- Very high value for your purchasing dollar
- Isolated outputs can be used for positive or negative sources or in series with other outputs
- Pass vibration and shock per MIL-STD 810D

Condor SDS and SDM power supplies can meet your most demanding design requirements!

SDS SERIES SINGLE OUTPUT RATINGS

MODEL NO.	VOLTAGE, VOLTS	CURRENT, AMPS	TOTAL POWER, WATTS	SIZE, INCHES
SDS 45-5	5	9	45	6.30 X 3.94 X 1.825
SDS 45-12	12	3.8	45	6.30 X 3.94 X 1.825
SDS 45-15	15	3	45	6.30 X 3.94 X 1.825
SDS 45-24	24	1.9	45	6.30 X 3.94 X 1.825
SDS 80-5	5	16	80	7.75 X 4.25 X 1.90
SDS 80-12	12	6.7	80	7.75 X 4.25 X 1.90
SDS 80-15	15	5.3	80	7.75 X 4.25 X 1.90
SDS 80-24	24	3.4	80	7.75 X 4.25 X 1.90
SDS 110-5	5	22	110	8.80 X 4.75 X 1.90
SDS 110-12	12	9.2	110	8.80 X 4.75 X 1.90
SDS 110-15	15	7.3	110	8.80 X 4.75 X 1.90
SDS 110-24	24	4.6	110	8.80 X 4.75 X 1.90
SDS 140-5	5	28	140	10.30 X 4.75 X 2.20
SDS 140-12	12	11.7	140	10.30 X 4.75 X 2.20
SDS 140-15	15	9.4	140	10.30 X 4.75 X 2.20
SDS 140-24	24	5.9	140	10.30 X 4.75 X 2.20
SDS 200-5	5	40	200	12.80 X 4.75 X 2.45
SDS 200-12	12	16.7	200	12.80 X 4.75 X 2.45
SDS 200-15	15	13.4	200	12.80 X 4.75 X 2.45
SDS 200-24	24	8.4	200	12.80 X 4.75 X 2.45

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SDM SERIES MULTIPLE OUTPUT RATINGS							
MODEL NO.	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	TOTAL POWER, WATTS	SIZE, INCHES
SDM 45A	+5V @ 5A	+12V @ 2A (4A PK)	-12V @ 1A	–	–	45	6.30 X 3.94 X 1.825
SDM 45B	+5V @ 5A	+12V @ 1A	-12V @ 1A	–	–	45	6.30 X 3.94 X 1.825
SDM 45F	+5V @ 5A	+15V @ 1A	-15V @ 1A	–	–	45	6.30 X 3.94 X 1.825
SDM 80A	+5V @ 9A	+12V @ 3A (5A PK)	-12V @ 2A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
SDM 80B	+5V @ 9A	+12V @ 3A (5A PK)	-12V @ 1A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
SDM 80C	+5V @ 9A	+12V @ 1A	-12V @ 1A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
SDM 80E	+5V @ 7A	+15V @ 3A (5A PK)	-15V @ 2A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
SDM 80F	+5V @ 9A	+15V @ 1A	-15V @ 1A	-5V @ 0.6A	–	80	7.75 X 4.25 X 1.90
SDM 110A	+5V @ 12A	+12V @ 3A (5A PK)	12V @ 3A (5A PK)*	-12V @ 3A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 110B	+5V @ 12A	+12V @ 3A (5A PK)	12V @ 3A (5A PK)*	-12V @ 1A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 110C	+5V @ 12A	+12V @ 3A (5A PK)	12V @ 1A*	-12V @ 1A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 110D	+5V @ 12A	+12V @ 3A (5A PK)	5V @ 3A*	-12V @ 1A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 110E	+5V @ 10A	+15V @ 3A (5A PK)	15V @ 3A (5A PK)*	-15V @ 3A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 110F	+5V @ 12A	+12V @ 3A (5A PK)	15V @ 1A*	-15V @ 1A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 110G	+5V @ 12A	+12V @ 3A (5A PK)	24V @ 1.5A (3A PK)*	-12V @ 3A	-5V @ 0.6A	110	8.80 X 4.75 X 1.90
SDM 140A	+5V @ 15A	+12V @ 3A (5A PK)	12V @ 3A (5A PK)*	-12V @ 3A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM 140B	+5V @ 15A	+12V @ 3A (5A PK)	12V @ 3A (5A PK)*	-12V @ 1A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM140C	+5V @ 15A	+12V @ 3A (5A PK)	12V @ 1A*	-12V @ 1A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM 140D	+5V @ 15A	+12V @ 3A (5A PK)	5V @ 6A*	-12V @ 1A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM 140E	+5V @ 12A	+15V @ 3A (5A PK)	15V @ 3A (5A PK)*	-15V @ 3A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM 140F	+5V @ 15A	+12V @ 3A (5A PK)	15V / 1A*	-15V @ 1A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM 140G	+5V @ 15A	+12V @ 3A (5A PK)	24V @ 2.5A (4A PK)*	-12V @ 3A	-5V @ 0.6A	140	10.30 X 4.75 X 2.20
SDM 200A	+5V @ 20A	+12V @ 5A (8A PK)	12V @ 5A (8A PK)*	-12V @ 3A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45
SDM 200B	+5V @ 20A	+12V @ 5A (8A PK)	12V @ 5A (8A PK)*	-12V @ 1.2A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45
SDM 200C	+5V @ 20A	+12V @ 5A (8A PK)	12V @ 1.2A*	-12V @ 1.2A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45
SDM 200D	+5V @ 20A	+12V @ 5A (8A PK)	5V @ 7A*	-12V @ 1.2A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45
SDM 200E	+5V @ 16A	+15V @ 5A (8A PK)	15V @ 5A (8A PK)*	-15V @ 5A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45
SDM 200F	+5V @ 20A	+12V @ 5A (8A PK)	15V @ 1A*	-15V @ 1A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45
SDM 200G	+5V @ 20A	+12V @ 5A (8A PK)	24V @ 4A (6A PK)*	-12V @ 5A	-5V @ 0.6A	200	12.80 X 4.75 X 2.45

*Isolated outputs.

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CONVERSION DEVICES, INC.

EXCELLENCE IN CONVERSION TECHNOLOGY

0.5 TO 12 WATT, SINGLE AND DUAL OUTPUT DC/DC CONVERTERS

KEY FEATURES

- High Power Density
- Internal Input Filtering (Pi)
- High Switching Frequencies (>100Khz)
- Efficiences up to 75% @ FL
- 500VDC or 3000V P-P Typ. Voltage Isolation
- Up to ±0.03% Line/Load Regulation
- Very Low Output Ripple and Noise
- Short Circuit Protection
- Six-Sided EMI Shielded Case
- 100% Burn-In @ Full Load
- 2 Year Warranty
- Industry Standard Pinouts

Standard input voltage ranges from 5 to 48VDC with ± 10% to ±15% tolerance for telecommunications, data acquisition and conversion board level subsystems, process control, medical, local area network (LAN) transceivers, and other instrumentation applications where high isolation of data transmission is required in both analog and digital fields.

DC/DC CONVERTER LIST FOR YOUR POWER CONVERSION NEEDS

SERIES	POWER RATING (Watts)	EFFICIENCY % @ FL (Typ)	NUMBER OF OUTPUTS	INPUT VOLTAGE RANGE (VDC)	INPUT Pi FILTER	ISOLATION VDC (Min)	OUTPUT VOLTAGE (VDC)	OUTPUT RIPPLE & NOISE MV P-P (Typ)	DIMENSIONS INCHES (mm)	REGULATION (± %) LINE	REGULATION (± %) LOAD	POWER DENSITY W/In³ (Max)	BRIEF DESCRIPTION
F	2.0	75	1	5, 12	YES	500	9	50	1.25×0.8×0.4 (32×20×10.2)	1.2	8.0	5.5	24 Pin DIP, for LAN Transceivers
50	0.5	40	1	5	YES	500/1000	5	15	1.25×0.8×0.4) (32×20×10.2)	0.3	0.3	1.25	24-Pin DIP, Regulated, Up to 1MHZ Sw. Freq., I/O Isolated, Dense Package
100	1.0	52	1	5, 12, 18, 24, 28, 48	•	•	5, 12, 15	•	•	•	•	2.50	•
200	2.0	55	1 & 2	•	•	•	5, ±12, ±15	•	•	•	•	5.00	•
300	3.0	60	2	12, 18, 24, 28, 48	•	•	±15	•	•	•	•	7.50	•
200HI	2.0	55	1 & 2	5, 12, 15, 24, 28, 48	YES	2000	5, 12, 15, ±12, ±15	20	1.25×0.8×0.4 (32×20×10.2)	0.3	0.3	5.00	24-Pin DIP, Regulated, Up to 1MHZ Sw. Freq., Very High I/O Isolation for Industrial Applications (3000V P-P)
300HI	3.0	60	1 & 2	•	•	•	•	•	•	•	•	7.50	
200E	2.5	65	1 & 2	5, 12, 24, 28, 48	YES	500	5, ±12	15	2.0×1.0×0.350 (51×25.5×8.96)	0.3	0.3	3.50	Economy, Very Low Profile, Regulated
300E	3.0	65	•	•	•	•	12, 15, ±15	•	•	•	•	4.30	
500E	5.0	70	•	•	•	•	5, 12, 15, ±12, ±15	20	2.0×2.0×0.375 (51×51×9.5)	0.3[1] 0.03[2]	0.3[1] 0.03[2]	3.30	Economy, High Efficiency, Regulated
500	5.0	80	1 & 2	5, 12, 18, 24, 28, 48	YES	500	5, 12, 15, ±5, ±12, ±15	20	2.0×1.0×0.350 (51×25.5×8.96	0.03	0.03	7.00	High Efficiency, Very Low Profile, Half the Competitions' Size
600	6.0	65	2	5, 12, 18, 24, 28, 48	YES	500	±12, ±15	10	2.0×2.0×0.400 (51×51×10.2)	0.03	0.03	3.75	Premium Performance, Regulated for Instrumentation Applications
900	9.0	65	1	•	YES	•	12, 15	•	•	•	•	5.60	•
1000	10.0	67	2	•	YES	•	±12, ±15	•	•	•	•	6.25	•
600H	6.0	70	2	5, 12, 18, 24, 28, 48	YES	500	±5, ±12, ±15	10	2.0×2.0×0.375 (51×51×9.5)	0.03	0.03	4.00	High Efficiency, Regulated, Very Low Noise, Low Profile for Instrumentation Applications
900H	9.0	70	1	•	YES	•	5, 12, 15	•	•	•	•	6.00	•
1200H	12.0	75	2	•	YES	•	±5, ±12, ±15	•	•	•	•	8.00	•

NOTES: 1. Single Output Models, 2. Dual Output Models

As a power conversion supplier, our product lines address the needs of OEM computer oriented industrial, medical, military instrumentation and telecommunications markets. We demonstrate our capabilities and leadership role by providing innovative state-of-the-art products combining the latest technological developments. We are dedicated to offering high quality, reliable products with excellent specifications. At reasonable prices.
Our reliability program is based on strong engineering and on the concept that our products have been designed in advance and offered for sale *only after* they have demonstrated proven performance.

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7.5 TO 60W SINGLE, DUAL AND TRIPLE OUTPUT DC/DC CONVERTERS

KEY FEATURES

- Very Low Profile Packages
- Very High Power Density
- Internal Input Filtering (Pi)
- Wide Input Ranges
- High Switching Frequencies (> 100KHz)
- Efficiences up to 83% @ FL
- High I/O Voltage Insulation
- Outout OV Protection
- Over/Under Voltage Shutdown
- Short Circuit Protection
- Remote ON/OFF Control
- Extended Operating Temperature Ranges
- 100% Burn-In @ Full Load
- 2 Year Warranty

A large selection of regulated DC/DC converter models with a wide (2:1) input voltage range is available from 7.5 to 60 watts with very low profile and dense power packages. This new generation of DC/DC converters utilizes surface mount technology for ruggedness, long-term reliability and performance. Maintaining conservative design rules throughout, complemented by quality maufacturing and test standards, we accomplish excellent component stress levels and high MTBF. All product families below are suitable for wide application requirements in telecommunications, portable and battery powered equipment, aircraft, robotics and computer subsystem instrumentation.

DC/DC CONVERTER LIST FOR YOUR POWER CONVERSION NEEDS

SERIES	POWER RATING (Watts)	EFFICIENCY % @ FL (Typ)	NUMBER OF OUTPUTS	INPUT VOLTAGE RANGE (VDC)	INPUT PI FILTER	ISOLATION VDC (Min)	OUTPUT VOLTAGE (VDC)	OUTPUT RIPPLE & NOISE MV P-P (Typ)	DIMENSIONS INCHES (mm)	REGULATION (± %) LINE	REGULATION (± %) LOAD	POWER DENSITY W/In³ (Max)	BRIEF DESCRIPTION
700PW	7.5	80	1 & 2	9-18, 18-36, 36-72	YES	500	5, 12, 15 ±5, ±12, ±15	75	2.0×1.0×0.375 (51×25.5×9.5)	0.5[1] 1.0[2]	0.2[1] 1.0[2]	10.00	Wide Input Range, High Density and Low Profile, High Efficiency for Portable Equipment
800	8.0	82	1, 2 & 3	9-18, 18-36, 36-72	YES	1000	5, 12, 15 ±5, ±12, ±15	75	2.0×2.0×0.375 (51×51×9.5)	0.5[1] 0.5[2] 5.0[3]	0.2[1] 1.0[2] 5.0[3]	10.5	Wide Input Range, High Density and Low Profile, High Efficiency for Portable Equipment & Telecom.
1500	15.0	85	1, 2 & 3	9-18, 18-36, 36-72	NO	500	5, 12, 15 ±5, ±12, ±15 5/±12.5/±15	50	2.0×2.0×0.375 (51×51×9.5)	0.2[1] 1.0[2] 5.0[3]	0.2[1] 1.0[2] 5.0[3]	10.00	Wide Input Range, High Density. Very High Efficiency
1600	16.0	85	1, 2 & 3	9-18, 18-36, 36-72	YES	500	5, 12, 15 ±5, ±12, ±15 5/±12.5/±15	50	2.0×2.0×0.375 (51×51×9.5)	0.5[1] 0.5[2] 5.0[3]	0.2[1] 1.0[2] 5.0[3]	10.60	Wide Input Range, High Density. Very High Efficiency. Input Pi Filter Network
2000	20.0	80	1, 2 & 3	9-18, 18-36, 36-72	YES	500	5, 6, 12, 15 ±5, ±12, ±15 5/±12.5/±15	Refer to Note 4	3.0×2.56×0.750 (76.2×66×19)	0.5[1] 0.5[2] 5.0[3]	0.5[1] 0.5[2] 5.0[3]	3.50	Wide Input Range, High Density. High Efficiency
2100	20.0	85	1, 2 & 3	9-18, 18-36, 36-72	NO	500	5, 12, 15 ±5, ±12, ±15 5/±12.5/±15	50	2.0×2.0×0.375 (51×51×9.5)	0.2[1] 1.0[2] 5.0[3]	0.2[1] 1.0[2] 5.0[3]	13.30	Wide Input Range, Highest Density, Very High Efficiency
2500	25.0	80	1, 2 & 3	9-18, 18-36, 36-72	YES	500	5, 6, 12, 15 ±5, ±12, ±15 5/±12.5/±15	Refer to Note 4	3.0×2.56×0.750 (76.2×66×19)	0.5[1] 0.5[2] 5.0[3]	0.5[1] 0.5[2] 5.0[3]	4.30	Wide Input Range, High Density. High Efficiency
3000LP	25-30	82	1, 2 & 3	9-18, 18-36, 36-72	YES	500	5, 12, 15 ±5, ±12, ±15 5/±12.5/±15	Refer to Note 4	3.0×2.56×0.375 (76.2×66×9.5)	0.5[1] 1.0[2] 5.0[3]	0.5[1] 5.0[2] 5.0[3]	10.40	Very Low Profile, Wide Input Range. High Density, High Efficiency
6000	50-60	83	1, 2 & 3	9-18, 18-36, 36-72	YES	500	5, 12, 15 ±5, ±12, ±15 5/±12.5/±15	Refer to Note 4	WITH HEAT SINK (4.56×2.56×1.250) (115.8×66×31.75)	0.5[1] 0.5[2] 5.0[3]	0.5[1] 0.5[2] 5.0[3]	6.85	Wide Input Range, High Density, Half the Competitions' Volume

NOTES: 1. Single Output Models, 2. Dual Output Models, 3. Dual Output of Triple Output Models, 4. 1% of FS Output

We tailor our products to fit your needs.

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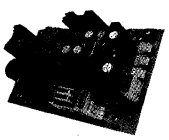
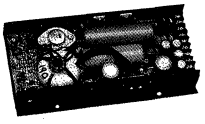
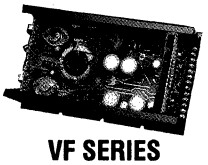
PROVEN UNIVERSAL INPUT EXPERTISE

Converter Concepts invented universal input technology more than a decade ago. Although many power supply manufacturers have recently introduced products that imitate our performance, none can match our level of proven field

SWITCHING POWER SUPPLIES SELECTION GUIDE



SERIES	VL SERIES			WI SERIES			VT/VX SERIES					VF SERIES	
WATTS	10	40	50	25	40	60	15	25	50	75	100	65	100
UNIVERSAL INPUT	●	●	●	●	●	●	●	●	●	●	●	●	●
INPUT VOLTAGE:													
90-250 AC 100-350 DC				●	●	●	●	●	●	●	●	●	●
85-264 AC 120-365 DC	●	●	●										
10-40 DC→DC							●	●	●				
20-60 DC→DC	●						●	●	●	●	●	●	●
NUMBER OF OUTPUTS:													
1	●	●		●	●	●	●	●	●	●	●	●	●
2				●	●	●	●	●	●	●	●	●	●
3		●	●	●	●	●	●	●	●	●	●	●	●
4			●	●	●	●					●	●	●
PACKAGE:													
OPEN FRAME				●	●	●	●	●	●	●	●	●	●
ENCLOSED MODULE							●	●	●	●	●	●	●
PC BOARD	●	●	●										
SAFETY APPROVALS:													
UL		●	●	●				●	●	●			
CSA		●	●	●									
VDE		●	●	●									
FEATURES:	Features the application of surface mount technology in a low-cost PC board construction. Designed for high-volume applications requiring safety approvals and rigid EMI specifications. *VL Products feature a 1 year warranty.			Features the application of surface mount technology in an open frame switcher. The WI product line offers the user a flexible mounting scheme that provides excellent heat conduction to the mounting surface. *WI Products feature a 1 year warranty.			The versatile product easily modified to meet unique customer specifications. DC to DC models available in addition to Converter Concepts' universal AC input models. Rugged packaging in either open frame or enclosed package gives the VT/VX series maximum performance with a demonstrated MTBF in excess of 150,000 hrs. Many options available.					Features include a UPS (fail safe) system that allows operation from an AC power source or a DC power source. The VF also includes an integral battery charger. The VF product is a must if information retention is important during brown out of power line failures.	

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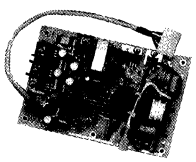
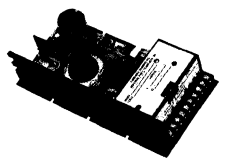
reliability. No wonder we can back our designs with an exclusive two-year warranty.*
Converter Concepts' in-house surface mount capabilities created a totally integrated manufacturing environment.
The result is greater reliability and total Made-In-America quality at a competitive price.

The standard power supplies listed below meet the demands of most design parameters. In applications that have specific performance requirements, Converter Concepts' engineers can design a power supply to meet your exact needs.

For more information, call (800) 253-5227.

VM SERIES	VI SERIES	 CP SERIES	XT SERIES	 HV SERIES
80	120	22	25	100
●	●	●	●	●
●	●	●		●
			●	
	●		●	
	●		●	●
	●		●	
●	●	●		
●	●			●
●	●		●	●
		●		
●		●	●	
		●	●	
		●	●	
Features UL 544 Recognition for use in medical applications, very flexible product with many options available.	Features output power capability up to 150 watts. Many output models available with many options possible. Excellent mounting scheme for either open frame or enclosed package.	Features an optional cable assembly, PC board construction and is designed for low power computer peripheral applications. *CP Products feature a 1 year warranty.	External, ultra-small design delivers improved line and load regulation, overcurrent/ overvoltage protection plus surface mount technology. *XT Products feature a 1 year warranty.	Offers an automatic degausser circuit and is designed for high-resolution color monitors and gas discharge displays.

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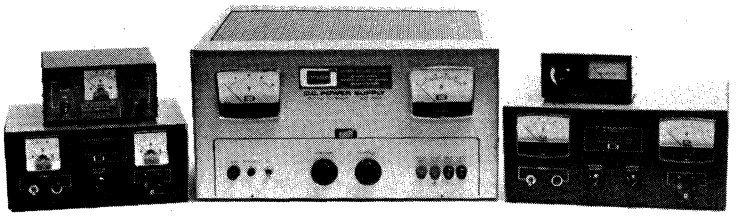
CRITERION

REGULATED DC POWER SUPPLIES



MODEL NUMBER	MAXIMUM VOLTAGE	MAXIMUM CURRENT
VR-5-20	5V	20A
VR-5-30	5V	30A
VR-5-40	5V	40A
VR-5-50	5V	50A
VR-5-100	5V	100A
VR-5-200	5V	200A
VR-5-500	5V	500A
VR-10-10	10V	10A
VR-10-20	10V	20A
VR-10-30	10V	30A
VR-10-40	10V	40A
VR-10-50	10V	50A
VR-10-100	10V	100A
VR-10-200	10V	200A
VR-20-5	20V	5A
VR-20-10	20V	10A
VR-20-20	20V	20A
VR-20-30	20V	30A
VR-20-40	20V	40A
VR-20-50	20V	50A
VR-20-100	20V	100A
VR-40-2	40V	2A
VR-40-5	40V	5A
VR-40-10	40V	10A
VR-40-20	40V	20A
VR-40-30	40V	30A
VR-40-40	40V	40A

MODEL NUMBER	MAXIMUM VOLTAGE	MAXIMUM CURRENT
VR-40-50	40V	50A
VR-60-1	60V	1A
VR-60-2	60V	2A
VR-60-5	60V	5A
VR-60-10	60V	10A
VR-60-20	60V	20A
VR-60-30	60V	30A
VR-60-40	60V	40A
VR-80-0.5	80V	0.5A
VR-80-1	80V	1A
VR-80-2	80V	2A
VR-80-5	80V	5A
VR-80-10	80V	10A
VR-80-20	80V	20A
VR-80-30	80V	30A
VR-100-0.5	100V	0.5A
VR-100-1	100V	1A
VR-100-2	100V	2A
VR-100-5	100V	5A
VR-100-10	100V	10A
VR-100-20	100V	20A
VR-150-0.2	150V	0.2A
VR-150-0.5	150V	0.5A
VR-150-1	150V	1A
VR-150-2	150V	2A
VR-150-5	150V	5A
VR-150-10	150V	10A

MODEL NUMBER	MAXIMUM VOLTAGE	MAXIMUM CURRENT
VR-200-0.1	200V	0.1A
VR-200-0.2	200V	0.2A
VR-200-0.5	200V	0.5A
VR-200-1	200V	1A
VR-200-2	200V	2A
VR-200-5	200V	5A
VR-200-10	200V	10A
VR-300-0.1	300V	0.1A
VR-300-0.2	300V	0.2A
VR-300-0.5	300V	0.5A
VR-300-1	300V	1A
VR-300-2	300V	2A
VR-300-5	300V	5A
VR-400-0.05	400V	0.05A
VR-400-0.1	400V	0.1A
VR-400-0.2	400V	0.2A
VR-400-0.5	400V	0.5A
VR-400-1	400V	1A
VR-400-2	400V	2A
VR-500-0.02	500V	0.02A
VR-500-0.05	500V	0.05A
VR-500-0.1	500V	0.1A
VR-500-0.2	500V	0.2A
VR-500-0.5	500V	0.5A
VR-500-1	500V	1A
VR-500-2	500V	2A

SPECIFICATIONS:

INPUT VOLTAGE: – 120 V, 60 Hz, single phase
– Unit will operate with ± 10% change in input voltage.

Output Voltage: – Continuously variable from zero to the maximum voltage indicated in above table.

Output Current: – Zero to maximum indicated in above table.
– Current is limited to approximately 10% greater than this, even on a short circuit.

Line Regulation: – If the input line voltage changes ± 10% from its nominal 120 V, the output voltage will change no more than ± 0.03% or ± 15 mV, whichever is greater (at any load current within rating).

Load Regulation: – For changes in load current from zero to rated maximum, the output voltage will change no more than 0.15% or 50 mV, whichever is greater (at any line voltage within rating).

Ripple: – The rms value of the ripple voltage will be no greater than 0.05% or 20 mV, whichever is greater (at any line voltage or load current within rating).

Short Circuit: Proof – Output may be shorted continuously without damage to the unit. Power supply recovers automatically to normal when short is removed.

For more information on power supplies with higher outputs please contact:

CRITERION

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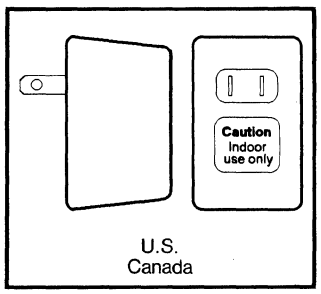
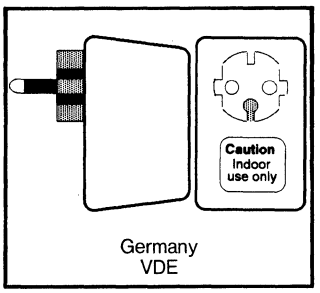
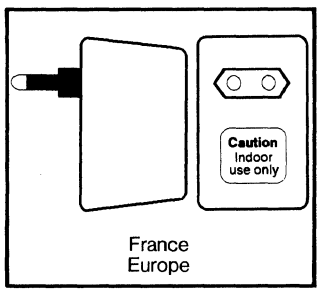
SELECTION AND QUALITY AT COMPETITIVE PRICES-THE CUI/STACK DIFFERENCE



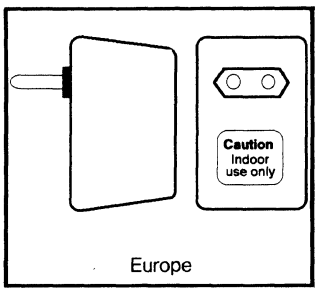
U.S.
Canada



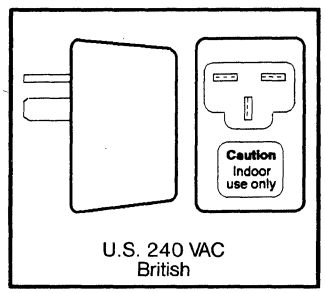
Germany
VDE



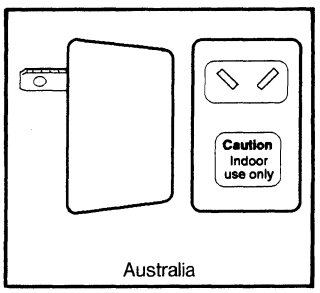
France
Europe



Europe



U.S. 240 VAC
British



Australia

Only a partial list of US/Canadian types are shown. Many other input & output configurations are available with international approvals.

MODEL #	V	mA	UL	CSA	MODEL #	V	mA	UL	CSA
DPD030010	3.0	100	Y	Y	DPD120300	12.0	300	Y	Y
DPD030020	3.0	200	Y	Y	DPD120040	12.0	400	Y	Y
DPD030030	3.0	300	Y	Y	DPD120050	12.0	500	Y	Y
DPD030040	3.0	400	Y	Y	DPD120060	12.0	600	Y	Y
DPD030050	3.0	500	Y	Y	DPD120070	12.0	700	Y	Y
DPD045010	4.5	100	Y	Y	DPD120080	12.0	800	Y	Y
DPD045020	4.5	200	Y	Y	DPA120083	12.0	830	Y	Y
DPD045030	4.5	300	Y	Y	DPA120100	12.0	1000	Y	Y
DPD045040	4.5	400	Y	Y	DPD120120	12.0	1200	Y	N
DPD045050	4.5	500	Y	Y	DPA130070	13.0	700	Y	Y
DPD045060	4.5	600	Y	Y	DPD150020	15.0	200	Y	Y
DPD045200	4.5	2000	Y	Y	DPD150030	15.0	300	Y	Y
DPD050200	5.0	2000	Y	N	DPD150040	15.0	400	Y	Y
DPD055050	5.5	500	Y	Y	DPD150050	15.0	500	Y	Y
DPD060010	6.0	100	Y	Y	DPD150060	15.0	600	Y	Y
DPD060020	6.0	200	Y	Y	DPD150070	15.0	700	Y	N
DPD060030	6.0	300	Y	Y	DPD150080	15.0	800	Y	N
DPD060040	6.0	400	Y	Y	DPD150090	15.0	900	Y	N
DPD060050	6.0	500	Y	Y	DPD160010	16.0	100	Y	Y
DPD060060	6.0	600	Y	Y	DPD160020	16.0	200	Y	Y
DPD060080	6.0	800	Y	Y	DPD160030	16.0	300	Y	Y
DPD060090	6.0	900	Y	Y	DPD160040	16.0	400	Y	Y
DPD060100	6.0	1000	Y	Y	DPD160050	16.0	500	Y	Y
DPA060150	6.0	1500	Y	Y	DPD160060	16.0	600	Y	Y
DPD060200	6.0	2000	Y	N	DPA160075	16.0	750	Y	Y
DPD075010	7.5	100	Y	Y	DPD180828	18.0	200	Y	Y
DPD075020	7.5	200	Y	Y	DPD180030	18.0	300	Y	Y
DPD075030	7.5	300	Y	Y	DPD180040	18.0	400	Y	Y
DPD075040	7.5	400	Y	Y	DPD180050	18.0	500	Y	Y
DPD075050	7.5	500	Y	Y	DPA180060	18.0	600	Y	Y
DPD075060	7.5	600	Y	Y	DPD180060	18.0	600	Y	N
DPD075070	7.5	700	Y	Y	DPD180070	18.0	700	Y	N
DPD075080	7.5	800	Y	Y	DPD180080	18.0	800	Y	N
DPD075090	7.5	900	Y	Y	DPD100010	20.0	100	Y	Y
DPA075150	7.5	1500	Y	Y	DPD200020	20.0	200	Y	Y
DPD090003	9.0	30	Y	Y	DPD200030	20.0	300	Y	Y
DPD090005	9.0	50	Y	Y	DPD200040	20.0	400	Y	Y
DPD090010	9.0	100	Y	Y	DPD200060	20.0	600	Y	N
DPD090020	9.0	200	Y	Y	DPD200070	20.0	700	Y	N
DPD090030	9.0	300	Y	Y	DPD220030	22.0	300	Y	Y
DPD090040	9.0	400	Y	Y	DPD220040	22.0	400	Y	Y
DPD090050	9.0	500	Y	Y	DPD220050	22.0	500	Y	N
DPD090060	9.0	600	Y	Y	DPD220060	22.0	600	Y	N
DPD090070	9.0	700	Y	Y	DPD240010	24.0	100	Y	Y
DPD090080	9.0	800	Y	Y	DPD240020	24.0	200	Y	Y
DPD090090	9.0	900	Y	Y	DPD240030	24.0	300	Y	Y
DPD090100	9.0	1000	Y	Y	DPD240040	24.0	400	Y	Y
DPD120005	12.0	50	Y	Y	DPA240045	24.0	450	Y	Y
DPD120100	12.0	100	Y	Y	DPD240050	24.0	500	Y	N
DPD120200	12.0	200	Y	Y	DPD240060	24.0	600	Y	Y

Note: All models with a DPD prefix are available with approvals in both AC and DC output. Those with a DPA prefix are available only in AC output with approvals.

ORDERING INFORMATION

DP D 015 008 X

Model	Type	Volts	Current	Special
DP-Plug-in DT-Desk Top	A-A/C D-D/C R-Regulated D/C	Shown in 10ths (015=1.5V)	mA×10 (010=100mA)	G-Ground Pin C-Center tap D-Dual output S-Switchable input

Be sure to specify the input and output options you require. Many other connectors and plug configurations are available; simply forward your custom requirement and our engineering department willl be happy to work with you.

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9640 SW Sunshine Ct. G700
Beaverton, OR 97005

FAX: (503) 643-6129

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FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES
TECHNICAL INFORMATION
WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
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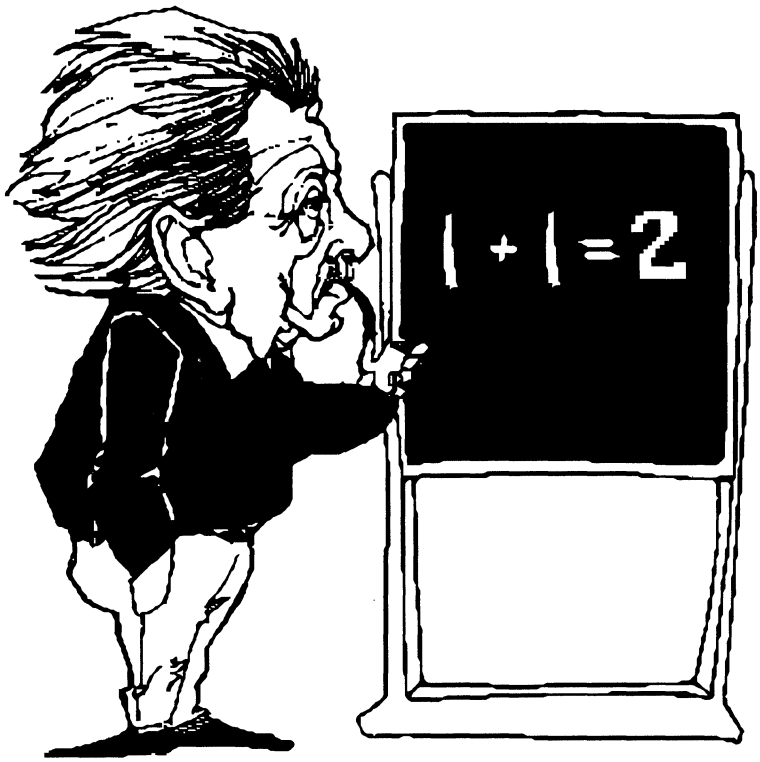
If your power problem is simple...



We'll tell you where to go!

Our commitment: designing and building the difficult – from one-of-a-kind military test systems to high volume commercial power supplies.

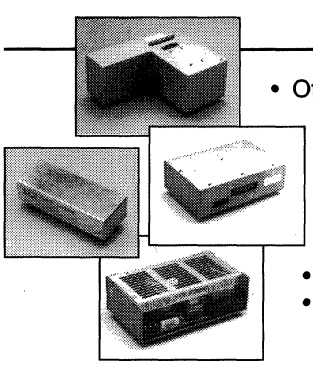
Our experience: everything from the slightly unconventional to exotic military hardware.

Our promise: if your particular power requirement can be satisfied with a standard, off-the-shelf product, we'll tell you where and how to get it.

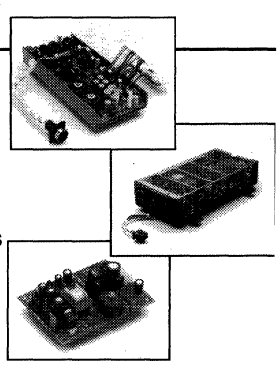
You'll find us as pragmatic as we are inventive. We work hand in hand with your engineers and purchasing people to keep your costs down and make sure you get the manufactured product in spec and on time. We have the staff, the skills, the technology and the experience to handle your unique demands with dispatch and efficiency.

Learn how we can help you, as we have helped scores of Fortune 500 manufacturers. A copy of our capability brochure and application notes will be sent as soon as you inquire.

Custom Power Systems for:



- Off Line Switchers
- DC/DC Converters
- Battery Chargers
- Laser Supplies
- Motor Controls
- Special Packaging
- Multiple Outputs/Inputs
- Unusual Operating Ranges
- Combination AC/DC Inputs
- Unusual Electrical Specs–Tight Regulation, Ultra-low Noise
- Uncommon Voltages and/or Currents
- Redundant Power Supplies
- Uninterruptable Power Supplies
- Vibration Solutions
- Unusual Environmental Needs
- None Of The Above, But Another Design Problem



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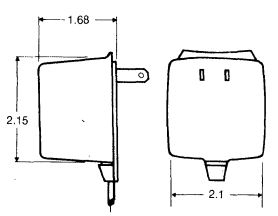
Wall Plug-in & Desktop Power Sources & Battery Chargers

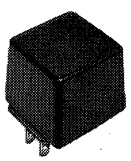
• Converters AC/AC • AC/DC

PRODUCT LINE —

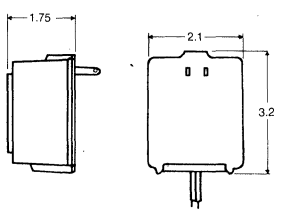
- AC/AC SUPPLIES
- AC/DC SUPPLIES regulated/ Unregulated
- REGULATED/UNREG. CHARGERS for LEAD-ACID BATTERIES & NICAD BATTERIES



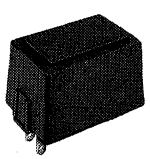
'C' SIZE



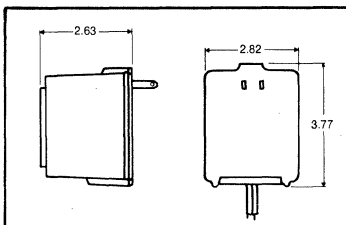
12 VA or 4 W max.



'D_2' SIZE
WALL PLUG-IN OR DESKTOP

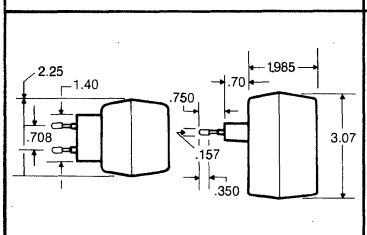


12 VA or 9 W max.



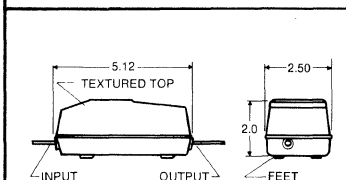
'E' SIZE
WALL PLUG-IN OR DESKTOP

56 VA or 35 W max.



D 'EURO' WALLSTYLE

20 VA or 9 W max.



DPC DESK TOP

20 VA or 13 W max.

OUR SPECIALTIES and SERVICES:

- Designed to your specifications
- Designed to UL and CSA requirements.
- Total quality assurance
- UL and CSA submittals upon request.
- Medical/Dental UL544 available
- Need a sample quick? D&B will send you an engineered sample in a week or less.
- Never an engineering charge
- No minimum quantity order
- Production deliveries start in 2 - 3 weeks.

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MIL-I-45208 and MIL-C-45662A

ALL PRODUCTS DESIGNED & MANUFACTURED IN USA.

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Short Run Experts!

SMALL QUANTITIES OUR SPECIALTY
QUICK DELIVERIES OUR POLICY

• Regulated DC Supplies • Battery Chargers and more . . .

MECHANICAL CONSIDERATIONS

HOUSING MATERIAL:
Black ABS, self extinguishing

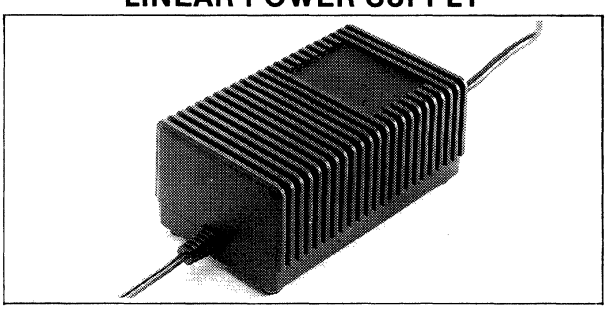
INPUT/OUTPUT CORDS
- All industry standard miniature molded cordsets are stocked.
- IEC Connectors, unit and cord mounted.

OPTIONS:

- L.E.D. charge or power-on indicator light.
- Ground pin - can be carried through with secondary.
- Center-taped secondary on AC/AC.
- European Input desktop for D_2 and E units.
- Japanese or other World-Wide input voltages and frequencies.
- Switchable 120 VAC/240 VAC 60/50 Hz. available in all case sizes.
- ±DC non-regulated and regulated outputs.
- Custom Hot-Stamping facilities.
- Custom designs to meet your exact requirements are available on request.
- Military equivalents available.

Featured Products

LINEAR POWER SUPPLY



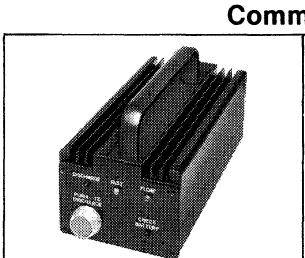
6.3″L x 3.8″W x 3.0″H

Line Regulation	.1%
Load Regulation	3%
Ripple	1mv RMS max.
Input Voltage	105-126 60/50 Hz
Single Outputs	5 VDC @ 2.5 amps 12 VDC @ 2 amps 15 VDC @ 1.5 amps 24 VDC @ 1 amp 48 VDC @ .5 amp
Dual & Triple Outputs	Many combinations available call factory for information

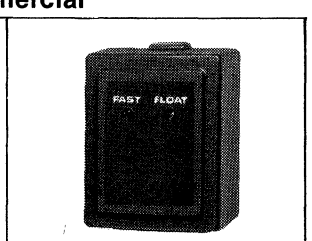
AVAILABLE OPTIONS
- 115/230 Switch Selectable input
- 210-252 VAC 60/50 Hz input • 100 VAC 60/50 Hz input
- Remote Sensing gives 1% load regulation
- Overvoltage Protection (Crowbar Type)

BATTERY CHARGERS

Commercial



MULTI STAGE/WITH DISCHARGE
up to 5 amps



WALL PLUG-IN DUAL STAGE
up to 1.5 amps

Military

FOR NICAD MILITARY BATTERIES

FSCM 54337

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For the '90's DEL puts more power than ever to work for you.

For over three decades, we've been the prime supplier for both standard and custom, rack and modular, high voltage power supplies, transformers and capacitors.

There isn't only one reason why more and more companies are putting Del Electronics to work for them. There's every reason.

Put Del's experience and expertise to work for you.

For 35 years, Del has been the leader in the design, development and production of high voltage power conversion systems for an ever-growing number of applications. Our most advanced technologies have been typically used for X-ray sources, pulsed and CW lasers, photomultiplier tubes, ion pumps and E-Beams, to name a few.

Put Del innovation to work for you.

For the 1990's, Del's research and development team will be there to assist in all your ever-changing power conversion requirements. Drawing on 35 years of experience and engineering expertise in power sources, we have led the way in areas as diverse as military CRT's, medical and industrial X-ray systems, oil exploration and an abundance of other OEM and laboratory applications. For example, Del is now offering a new RHVS series, a high voltage, high frequency resonant sine wave switching supply in a 19" rack mount configuration up to 1KW.*

Put Del quality and value to work for you.

Del power supplies are built with proven state-of-the-art technology with a dedication to quality and reliability which far exceeds commercial standards. Yet, when it comes to price, we offer the competition a run for their money.

Put Del power to work for you!

Call us with your specific requirements. And, if we don't have a standard product to suit your application, we can develop one.

DEL

For complete details on any of our power supplies contact the sales department at:

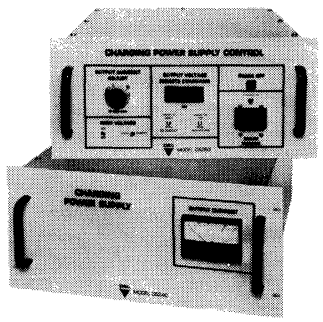
DEL ELECTRONICS CORP.

250 East Sandford Boulevard / Mount Vernon, NY 10550
TEL: (914) 699-2000 / TWX: (710) 562-0130 / FAX: (914) 699-4005

CUSTOM POWER CONVERSION SYSTEMS

DEL leads the way in designing standard and custom HV power conversion equipment for laboratory, military and industrial OEM applications. Some further examples of our custom capabilities are listed below:

Capacitor Charging Power Supplies (Multiplier PFN's)



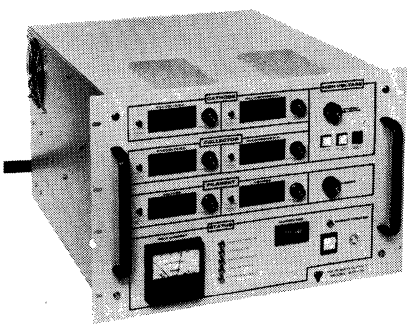
Features

- ▼ Fast Acting Current Source
- ▼ Start/Stop Command and Charge Status
- ▼ Local and Remote Monitor Capabilities
- ▼ External and Internal Interlocks
- ▼ Automatic Crowbar Circuit
- ▼ Peak HV Memory Read Out

Specifications

Input: 208, VAC ± 10% 3 phase, 50/60Hz
Output: 100 mA @ 50kV
Current Regulation: 0.1% NL to FL
Ripple: 0.5% Pk-Pk
Stability: 0.1% per hr.
Charging Rate: 50Hz
Size: Two Standard 8¾" High, 19" Racks

TWT Test Bed Power Supplies



Features

- ▼ Multiple Outputs
- ▼ Digital Metering of all Outputs
- ▼ Elapsed Time Indicator
- ▼ Adjustable Overcurrent Tripouts for all Outputs.
- ▼ Fault Diagnostics
- ▼ External Interlocks
- ▼ Helix Current Monitoring

Specifications

Input: 115 VAC ±10%, 1 phase 60Hz

1. **Cathode:** Output: 0-6kVDC Negative
   Output Current: 20mA
   Regulation: 1%
   Ripple: 4 Volts Pk-Pk
2. **Collector:** Positive Polarity fixed ratio 30% of cathode changes proportionately to a change in the cathode.
   Output Current: 240 mA
   Regulation: 5%
   Ripple: 10 Volts Pk-Pk
3. **Filament:**
   Output: 0-8 VAC @ 4 Amps min.
   (Floating with respect to cathode)
   Size: Standard 15¾" High, 19" Rack

Other Typical Applications:

- **Airport X-ray Inspection Equipment**
- **Electrostatics for Spray Painting**
- **Electron Beam Welding**
- **Laser Surgery**
- **Laser Guidance Systems**
- **Medical CT Scanners**
- **Military CRT Displays**
- **Oil Exploration**
- **Photomultiplier Tube**
- **Radar Systems: Airborne, Shipboard and Ground**
- **Traveling Wave Tubes**
- **Air Precipitators**
- **Industrial X-ray Machines**
- **Electrophoresis**
- **Ion Pumps**
- **Flocking**
- **Scanning Electron Microscopes**
- **Non-Impact Printers**
- **CRT Testing**
- **Spot Knocking**

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RESONANT SINE WAVE POWER CONVERTERS

RHVS SERIES 300-1000 WATTS

Regulated HV Power Supplies

Features

- Uses the most advanced resonant sine wave switching technology
- Voltage regulation better than 0.005% for load and line
- 0.05% RMS Ripple
- Low stored energy
- Provides high efficiency and stability
- Standard 19″ Rack
- Available in 300, 500 and 1000 Watt models up to 125 kilovolts

Remote Capabilities

Remote Programming:
Voltage and Current: 0 to 10 VDC, analog
Remote Monitor Output:
Voltage and Current: 0 to 10 VDC, analog
1% accuracy
Remote Enable/Disable: TTL compatible
External Interlock: Dry contact closure
External Reference: 10.4 volts

Performance Specifications

Input: Selectable 115 or 220 VAC 50 or 60Hz
Output: Continuously adjustable from 0 to maximum rated output via local or remote controls. See chart below.
Voltage Regulation:
Line: ± 0.005% for a ± 10% line change
Load: ± 0.005% N.L. to full load change
Current Regulation:
Line: ± 0.05%
Load: ± 0.2%, 10% to full load
Ripple: 0.05% RMS at max. output
Stability: 0.01%/hr., 0.05%/8hrs after ½ hour
Temperature Range:
Operating: – 20°C to 55°C
Storage: – 40°C to 85°C
Temperature Co-efficient: 0.01/°C
Output Protection: Overvoltage, arc and adjustable short circuit
Slow Start: 3 seconds (zero to max. output)

Physical Specifications

Front Panel Controls and Metering

1. HV ON push button with light
2. HV OFF/Reset push button with light
3. Voltage and current control by 10 turn potentiometers (0.1% Resolution)
4. 3½ Digit LED Digital Panel Meters for both voltage and current, 1% accuracy
5. Voltage and current mode lights

Construction

Both the 300 and 500 Watt models are housed in a standard, 5¼″ high, 19″ racks, whereas all 1kW units are 10½″ high, 19″ racks. The typical depth in the RHVS series is 16″.
Note: Models 30kV and below are reversible. A floating output allows for either end to be grounded.

RHVS SERIES MODELS

kV	300 Watts	mA	500 Watts	mA	1 Kilowatt	mA
1	RHVS 1-300R	300	RHVS 1-500R	500	RHVS 1-1000R	1000
2	RHVS 2-300R	150	RHVS 2-500R	250	RHVS 2-1000R	500
3	RHVS 3-300R	100	RHVS 3-500R	166	RHVS 3-1000R	300
5	RHVS 5-300R	60	RHVS 5-500R	100	RHVS 5-1000R	250
10	RHVS 10-300R	30	RHVS 10-500R	50	RHVS 10-1000R	100
15	RHVS 15-300R	20	RHVS 15-500R	33	RHVS 15-1000R	65
20	RHVS 20-300R	15	RHVS 20-500R	25	RHVS 20-1000R	50
30	RHVS 30-300R	10	RHVS 30-500R	15.5	RHVS 30-1000R	33
40	RHVS 40-300*	7.5	RHVS 40-500*	12.5	RHVS 40-1000*	25
50	RHVS 50-300*	6	RHVS 50-500*	10	RHVS 50-1000*	10
60	RHVS 60-300*	5	RHVS 60-500*	8.5	RHVS 60-1000*	16.5
80	RHVS 80-300*	3.75	RHVS 80-500*	6.5	RHVS 80-1000*	12.5
100	RHVS 100-300*	3	RHVS 100-500*	5	RHVS 100-1000*	10
125	RHVS 125-300*	2	RHVS 125-500*	4	RHVS 125-1000*	8

*Specify P for positive, N for negative or R for reversible polarity.

Ordering Example:	RHVS (SERIES)	40 (40kV)	300 (300 Watts)	R (Reversible Polarity)	/100 (100 Volt Input)	/OL (Overload Tripout)

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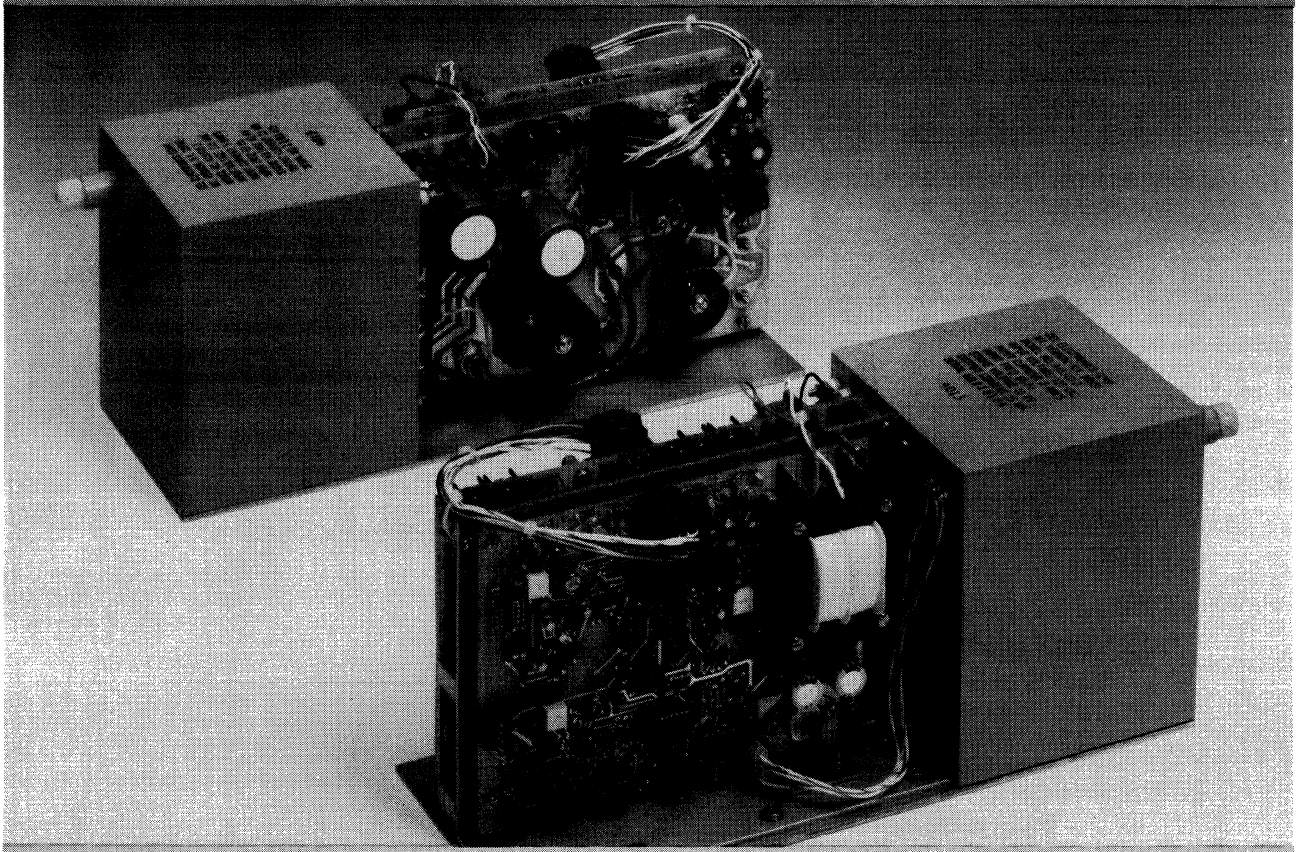
LASER POWER SUPPLIES



Typical CO_2 Laser Supply

FEATURES

- **Ballast Resistance Eliminated**
- **Switch Mode, Current Regulator**
- **High Efficiency**
- **Modular Construction**
- **Convection Cooling**

Description:

The DEL Model 201 is a current regulated supply which drives a CO_2 laser to produce a reliable, high performance system. A proprietary circuit utilizing high frequency regulator technology results in an efficient supply.

Regulated current as low as 0.5 mA is possible without a relaxation oscillation. A 2 ms settling time is achievable under pulse operation.

High system efficiency is achieved by eliminating the lossy ballast resistance normally required for loop stability.

User Controls:

Enable Signal: TTL low-HV off; high-HV on***
Output Current Control: 0.5V input for 0-25 mA output
Output Analogs: 0-5V for 0-25 mA output

Specifications

Striking Voltage	40 kV*	**Pulse Rate**	1 kHz - 150 us rise time**
Operating Voltage	10-25 kV D.C.	**Polarity**	pos/neg - specified with order
Output Power	350 Watts	**Size**	5″ x 14″ x 7″ high
Output Current	0.5-25 mA	**Weight**	20 lb.
Ripple	high freq. ≥1 kHz - 5%	**Cooling**	convection
	low freq. ≤ 1 kHz - 1%	**High Voltage Term.**	AMP-LGH Style
Regulation	0.5% - 2 ms settling time	**Input Voltage**	110 AC, 50/60 Hz, ±10%

*Lower striking voltage requirement to be specified with order.
**Max. to 90% ***The power supplies are pulseable using the TTL enable signal.

DEL

Complete engineering specifications are yours on request.

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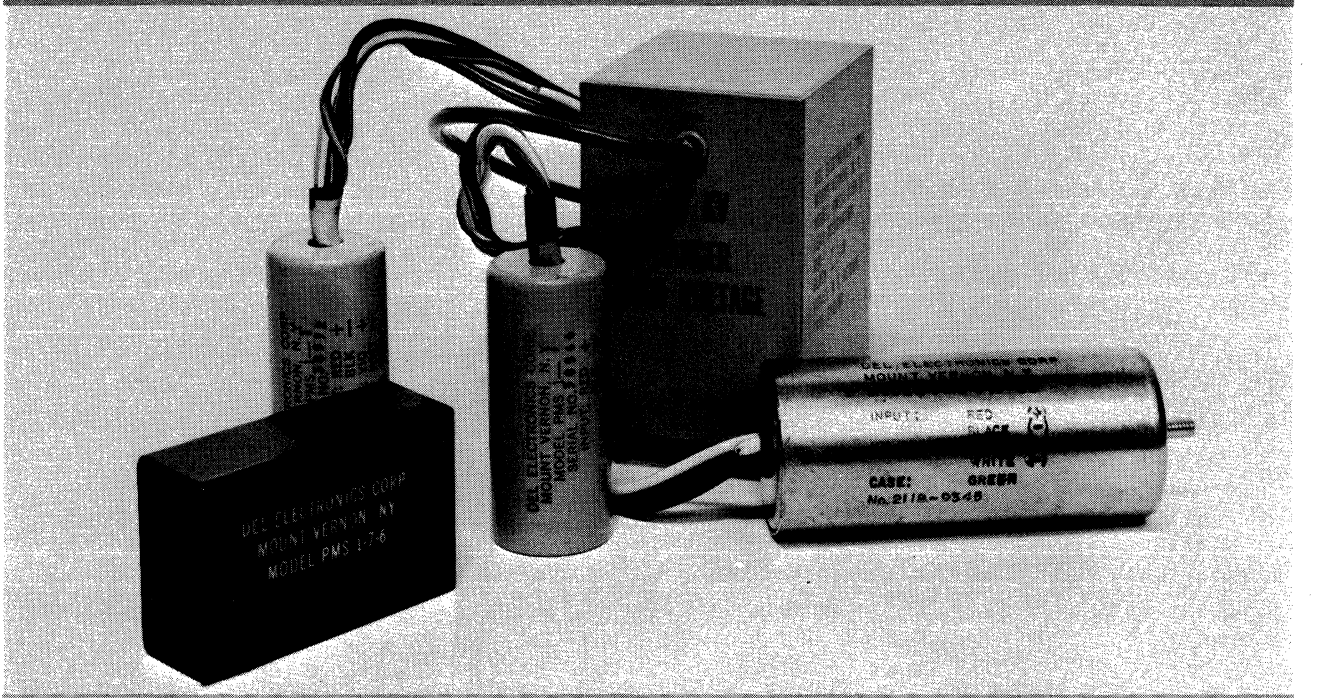
PMS SERIES



Photomultiplier Power Supplies

FEATURES

- Output isolated from Input
- Output proportional to Input
- Output momentary short circuit protected
- Reversible Polarity
- Temperature range O° to 60°C
- Small
- Lightweight
- Shielded

Description:

The DEL PMS Series is a family of highly reliable, compact, DC to DC proportional converters for use as power sources for photomultiplier and other tube applications. The series utilizes high frequency technology with low energy storage and arc protection.

Insulated, 8"- long, output high voltage leads are floating and fully isolated from the input leads and the case.

Shielding is provided by a steel case, except for the PC board mountable unit PMS 1-7-7.

Specifications

Model	Input DC	Output			Ripple P to P	Size L x W x H or Diameter x L	Mounting
		Voltage	Current	Min. Load (Meg. OHMS)			
PMS1-1	3-15V	300-1500V	1 mA	1.5	1.5V	1 x 2-1/4	Loop Clamp
PMS1-7-7	3-15V	300-1500V	1 mA	1.5	6.0V	2.4 x 1.5 x .81	P.C. Board
PMS3-.5	3-15V	300-3000V	0.5 mA	6.0	7.5V	1-1/4 x 2-3/8	8/32 Studs
PMS5-.5	3-15V	500-5000V	0.5 mA	10.0	10.0V	1-7/16 x 3-1/8	8/32 Studs
PMS8-.8	3-15V	800-8000V	0.8 mA	10.0	8.0V	2-1/2 x 3	8/32 Studs
PMS10-025*	3-10V	3kV-10kV	.025 mA	400.0	50.0V	2-1/16 x 2-5/16 x 3-1/8	4 Studs

Complete engineering specifications are yours on request.

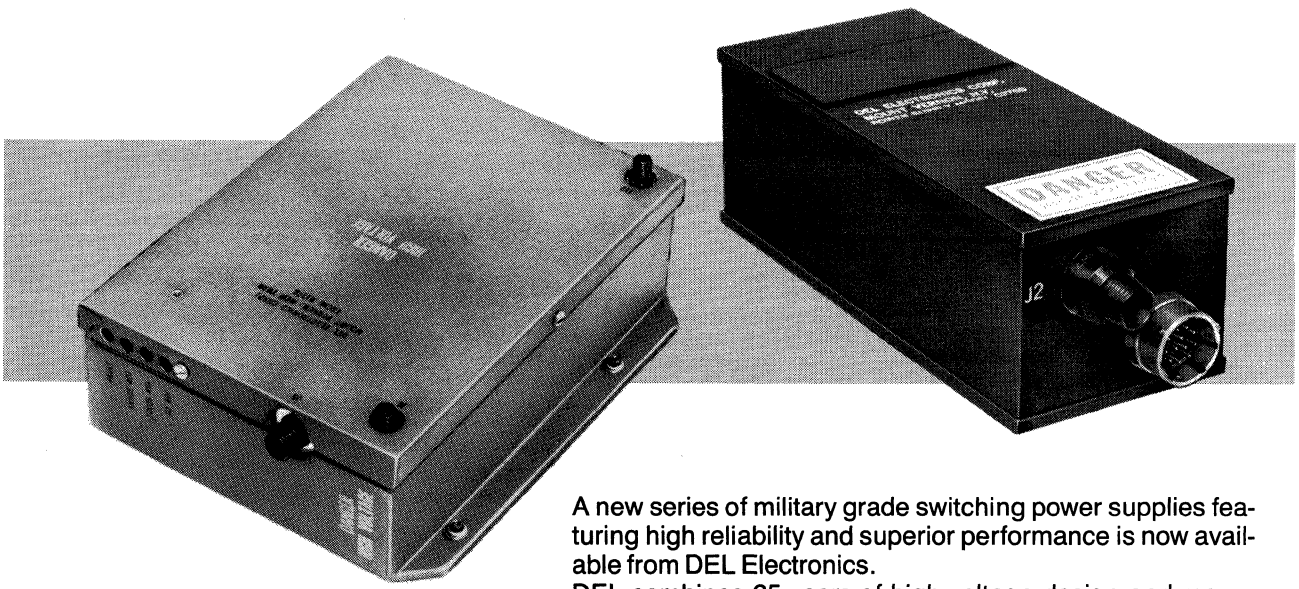
DEL

Put Del Power to Work for You!

DEL ELECTRONICS CORP.

250 East Sandford Boulevard / Mount Vernon, NY 10550
TEL: (914) 699-2000 / TWX: (710) 562-0130 / FAX: (914) 699-4005

HIGH VOLTAGE CRT POWER SUPPLIES



A new series of military grade switching power supplies featuring high reliability and superior performance is now available from DEL Electronics.
DEL combines 35 years of high voltage design and manufacturing expertise to produce equipment utilizing state-of-the-art circuitry and packaging. These units have been developed for, and sold to, leading OEM display manufacturers.

FEATURES:

- **Outputs To 40W**
- **Color & Monochrome Applications**
- **Dynamic Focus**
- **TTL Enable/Disable**
- **Arc & Short Circuit Protected**
- **MTBF Exceeds 40,000 Hrs.**

TYPICAL SPECIFICATION:

MODEL	OUTPUTS	VOLTAGE	OUTPUT CURRENT	REGULATION		RIPPLE	INPUT POWER	FEATURES	SIZE (INCHES)
				LINE	LOAD				
	Anode	25 kV	1.2mA	0.05%	0.05%	1V Pk-Pk		Mil-Spec	
	Focus	7 to 9 kV	25uA	0.05%	0.1%	1V Pk-Pk		Mil-E-5400	
102	Dynamic Focus	0 to 500V					27V to 30V DC	Temp: −54° C to +60° C	7.25x 8.50x 1.78
	G2	625V	20uA	0.1%	0.5%	0.2V Pk-Pk		Dynamic Focus	
	G1	−150V	1mA	0.5%	0.5%	0.4V Pk-Pk		Input: 10V Pk	

Special Requirements: DEL will custom-design a unit to meet your specific requirements. Call the factory for additional information and application engineering assistance.

DEL

Put Del Power to Work for You!

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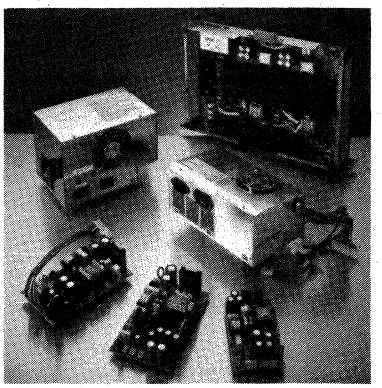
SWITCHING POWER SUPPLIES



SURFACE MOUNTED MODELS

SMP-18AP
SMP-20BP
SMP-30BP
SMP-40BP
SMP-40SP
SMP-83AB
SMP-70AP
SMP-75KP
SMP-100MB
SMP-150BL
SMP-145CB
SMP-193AB

Superb design capability, high production capacity and low defect rate have made Delta become the choice supplier to many leading companies in computer and electronics industries.

FEATURES

- Power range: 10W to 500W for models currently designed.
- Design capability: up to 1000W.
- MOSFET circuits for high frequency units.
- UL, CSA, TUV approved or approval in process.
- All units tested in our screen rooms to meet FCC docket 20780, part 15 & VDE 0871 regulations for conducted EMI.
- Overvoltage protection for + 5V; short circuit protection for all outputs.
- High efficiency: 70% typical.
- 100% dynamic burn-in.
- 200% computerized functional test before and after burn-in.
- MTBF: 100,000 hrs typical for standard models below 100W; 80,000 hrs typical for standard models over 100W.

SPECIFICATIONS ON REPRESENTATIVE MODELS

PART NO.*	MAX PWR OUTPUT (WATTS)	+5V				+12V				+12V				−12V				−5V			
		Imin A	Imax A	Tol. %	Ripple & Noise mVp-p	Imin A	Imax A	Tol. %	Ripple & Noise mVp-p	Imin A	Imax A	Tol. %	Ripple & Noise mVp-p	Imin A	Imax A	Tol. %	Ripple & Noise mVp-p	Imin A	Imax A	Tol. %	Ripple & Noise mVp-p
SMP-18AP	18	—	—	—	—	0	1.5	±5	100	—	—	—	—	—	—	—	—	—	—	—	—
SMP-20BP**	20	0.3	1.5	±3	50	0.2	1.0	±5	120	—	—	—	—	0.04	0.1	±10	120	—	—	—	—
SMP-30BP**	30	0.4	2.0	±3	50	0.3	1.5	±5	120	—	—	—	—	0.04	0.2	±10	120	—	—	—	—
SMP-40BP**	40	0.5	2.5	±3	50	0.4	2.0	±5	120	—	—	—	—	0.04	0.3	±10	120	—	—	—	—
SMP-40SP**	40	0.5	2.5	±3	50	0.4	2.0	±5	120	—	—	—	—	0.04	0.3	±10	120	—	—	—	—
DPS-40GP	39	0.25	0.9	±5	125	+28V 0.08	+28V 1.2	±10	1400	—	—	—	—	0.025	0.1	±5	150	—	—	—	—
DPS-60DP	68	3	6	±3	100	+14V 0	+14V 2.6	+7.2 −5.7	280	—	—	—	—	0	0.1	±5	240	—	—	—	—
DPS-40NP	42	0.5	2.5	±3	50	0.2	0.5	±5	120	+32V 0.4	+32V 0.7	±5	200	0.04	0.1	±10	120	—	—	—	—
DPS-50BP	63	1.2	6.0	±2	50	0.5	2.0	±5	120	—	—	—	—	0	0.5	±5	120	0	0.5	±5	50
DPS-50MP	54	0.6	3.0	±1	60	+15V 0.4	+15V 2.0	±5	150	+15V 0	+15V 0.3	±2	100	−15V 0	−15V 0.3	±2	100	—	—	—	—
DPS-52BB	55	2.5	7.0	+5 −4	150	0.2	1.2	+5 −4	360	—	—	—	—	0.04	0.3	±10	600	0.04	0.3	±10	250
SMP-83AB	83	A 1.3 B 0	8.8 0.06	±5 ±10	100 200	A 0 B 0	0.8 0.6	±5 ±10	200 200	+250V 0	+250V 0.12	±2.4	400	0	0.2	±10	200	−25V 0	−25V 0.02	±5	400
DPS-66AP	72	+22V 0.2	+22V 0.3	±3	250	0.35	0.45	±5	250	+75V 0.2	+75V 0.3	±3	250	+135V 0.15	+135V 0.25	±3	500	−6.3V 0.63A typ.		±5	200
SMP-70AP	70	+9V 0.22	+9V 1.1	±5	90	+24V 0.5	+24V 2.5	±5	240	—	—	—	—	—	—	—	—	—	—	—	—
SMP-75KP	77	0.3	1.5	±5	125	+24V 0.02	+24V 0.2	+20 −5	1200	0	0.21	±5	125	0	0.21	±5	125	+24V 0.2	+24V 2.6	±5	1200
DPS-80BP	86	5.1V 1.0	5.1V 5.5	±3	50	0.005	0.5	±10	150	—	—	—	—	0.005	0.5	±10	150	+24V 0.7	+24V 1.9	±3	50
SMP-100MB	105	2	10	+5 −4	75	0.04	4.2	+5 −4	150	—	—	—	—	0.04	0.3	+10 −9	360	0	0.3	+10 −8	150
DPS-87BB	85	2.5	10.0	+5 −4	150	0.4	2.5	+5 −4	360	—	—	—	—	0.05	0.25	±10	600	0.05	0.3	±10	250
DPS-90AL	88	2.0	8.5	+5 −3	50	0.025	2.1	+20 −5	150	0.7	1.5	±5	150	0.025	0.2	+10 −17	150	—	—	—	—
SMP-150BL	100	0.5	1.5	±5	100	0	1	±5	100	0.2	0.4	±5	100	0	0.3	±5	100	+24V 0	+24V 3	±5	200
DPS-145BB	146	2.8	19.0	+5 −4	150	0.5	3.8	+5 −4	360	—	—	—	—	0.04	0.3	+10	600	0.04	0.3	+10	250
SMP-145CB	141	2.8	18.0	+5 −4	100	0.5	3.8	±5	200	—	—	—	—	0	0.3	+10 −8	240	0	0.3	+10 −8	150
SMP-193AB	139	6	17	±4	150	0.1	4	±5	360	—	—	—	—	0	0.35	±10	360	0	0.3	±5	150
DPS-200EB-1**	232	2.5	23.0	±3	60	0	9.0	±3	60	—	—	—	—	0	0.5	±5	100	0	0.5	±5	100
DPS-206AP	187	0.5	8.5	+5 −4	50	1.0	12	+5 −4	100	—	—	—	—	—	—	—	—	—	—	—	—
DPS-360BL	360	−24V 1.5	−24V 15	±0.4	240	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
DPS-450AB	432	−48V 0.1	−48V 9	±5	450	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Call Delta For All Your Switching Power Supplies

OVER 400 EMI FILTERS UL CSA VDE APPROVED / SEND FOR YOUR FREE CATALOG OR CONSULT FACTOR FOR INFORMATION.

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2000 AERIAL CENTER PKWY, SUITE 114, MORRISVILLE, NC 27560 U.S.A. TEL: (919) 380-8883 FAX: (919) 380-8383

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LAN COMPONENTS USER GUIDE

ITEM	APPLICATION	PART NAME	PART NO.	REMARK	PAGE
1	ARCNET	LAN DRIVER	LAND9325	STD PACKAGE	2 / 3
		LAN DRIVER	LAND9326	HALF HEIGHT PACKAGE	
		LAN DRIVER	LAND9336	SINGLE SOURCE +5V	
		LAN DRIVER	LAND9304	HIGH IMPEDANCE	
2	ETHERNET IEEE 802.3 10BASE2 & 10BASE5	PULSE TRANSFORMER	THB16J03	FOR CHEAPERNET ; 500V	4
		PULSE TRANSFORMER	THB16J04	FOR ETHERNET ; 500V	
		PULSE TRANSFORMER	THX16J03	FOR CHEAPERNET ; 2KV	
		PULSE TRANSFORMER	THX16J04	FOR ETHERNET ; 2KV	
		PULSE TRANSFORMER	THB16J12	LOW PROFILE ; 2KV	
		PULSE TRANSFORMER	THB16J15	LOW PROFILE ; 2KV	
	ETHERNET IEEE 802.3 10BASE2, 10BASE5 & 10BASE-T	DC TO DC CONVERTER	DPS05R09	STD PACKAGE ; 500V	5
			DPS12R09		
			DPS05C09	REINFORCED PACKAGE ; 2KV	
			DPS12C09		
			DPS05S09	OPEN PCB PACKAGE ; 2KV	
			DPS12S09		
			DPS05E09	OPEN PCB PACKAGE WITH ENABLE PIN ; 2KV	
			DPS12E09		
			DPS05M09	COMPACT PACKAGE WITH ENABLE PIN ; 2KV	
			DPS12M09		
			DPS05RB09	LOW PROFILE PACKAGE ; 500V	
			DPS12RB09		
	ETHERNET IEEE 802.3 10BASE-T ONLY	PULSE TRANSFORMER	THB16Z01	COMPONENT KIT FOR 2000V	6
		COMMON CHOKE	THL08S01/ THR08S01		
		LAN FILTER	LANF7234		
		LAN FILTER	LANF72344	FOUR LANF7234'S IN ONE	7
		LAN FILTER	LANF7235	COMPACT LANF72344	8
		LAN FILTER	LANF7235S	SMD VERSION	
		LAN FILTER	LANF7236	LANF7235 WITH COMMON CHOEK	
3	TOKEN RING	PULSE TRANSFORMER	THL08F01	SINGLE 1:1:2:2	9
		PULSE TRANSFORMER	THL08F02	SINGLE 1:1:1:1	
		PULSE TRANSFORMER	THX16Z01	DUAL 1:1:2:2	
		PULSE TRANSFORMER	THX16Z04	DUAL 1:1:1:1	
		PULSE TRANSFORMER	THX20Z03	LOW PROFILE 1:1:1CT:1CT	
4	STARLAN	PULSE TRANSFORMER	THJ04E01	SINGLE 1:1	10
		PULSE TRANSFORMER	THZ08W01	DUAL 1:1	
5	IBM 3270 INTERFACE	PULSE TRANSFORMER	THE06A03	SINGLE 1:1:1	11
6	ISDN 'S' INTERFACE	PULSE TRANSFORMER	THM06C01	1:2 ; 500V	12
		PULSE TRANSFORMER	THM06C02	1:2:5 ; 500V	
		PULSE TRANSFORMER	THM06C03	1:4 ; 500V	

Specifications are subject to change without notice

GENERAL INTRODUCTION

A DC-DC converter is designed to alter a DC voltage for more flexible application, to isolate the primary from external load and to eliminate ground-loop effects. The typical application is shown in Figure 1 wherein a single output is distributed to various loads through DC-DC converters hence produces following advantages:

1. The main power supply is highly simplified.
2. Wire connection is streamlined to prevent wiring error and to facilitate maintenance.
3. The interference between different circuits is minimized due to the independence of power sources.
4. The addition or modification of circuits become much easier.

Call Delta For All Your LAN Components

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DYNAGE Power

551 Third Avenue P.O. Box 95
Canistota, SD 57012
Telephone: (605) 296-3462
Fax: (605) 296-3231
Telex: 753243 (OAKLEAFINC)

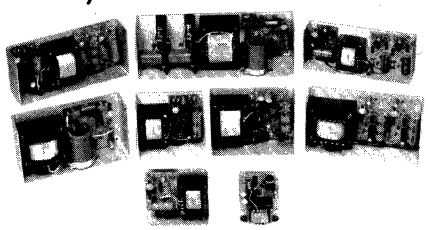
OPEN FRAME POWER SUPPLIES, Q SERIES (linear)

SINGLE OUTPUT MODELS		
Model	Rating	Price 1-24
5 Volts		
QSA5 - 1.2 OVP	5V@ 1.2A	$23.95
QSB5 - 3.0 OVP	5V@ 3.0A	29.95
QSC5 - 6.0 OVP	5V@ 6.0A	51.95
QSN5 - 9.0 OVP	5V@ 9.0A	71.95
QSD5 - 12.0 OVP	5V@ 12.0A	81.95
12 Volts		
QSA12 - 0.5	12V@ 0.5A	$23.95
QSB12 - 1.7	12V@ 1.7A	29.95
QSC12 - 3.4	12V@ 3.4A	46.95
QSN12 - 5.1	12V@ 5.1A	66.95
QSD12 - 6.8	12V@ 6.8A	76.95
15 Volts		
QSA15 - 0.5	15V@ 0.5A	$23.95
QSB15 - 1.5	15V@ 1.5A	29.95
QSC15 - 3.0	15V@ 3.0A	46.95
QSN15 - 4.5	15V@ 4.5A	66.95
QSD15 - 6.0	15V@ 6.0A	76.95
24 Volts		
QSB24 - 1.2	24V@ 1.2A	$29.95
QSC24 - 2.4	24V@ 2.4A	46.95
QSN24 - 3.6	24V@ 3.6A	66.95
QSD24 - 4.8	24V@ 4.8A	76.95

Features:

- **Low Cost**
- **115,220,230 and 240 VAC, 47-63Hz/Input**
- **Overvoltage Protection for All 5V Outputs**
- **Transformer - 2500V Isolation with Primary to Secondary Shield**
- **Two Hour "burn-in" on all units.**
- **RFI/EMI Free Operation**
- **U.L. Recognized and CSA Approved**
- **2 Year Warranty, Factory Repair Service**
- **Quantity-Volume Discounts**

OVP-12 Overvoltage Protector	
1-24	$7.95



The Q Series line of open frame power supplies, introduced in 1980, supersede the previous open frame models that have been in production since 1971.

SPECIFICATIONS:

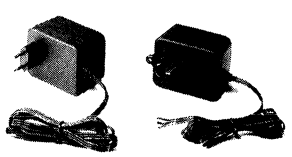
A.C. Input	115, 220, 230, 240 volts ± 10% 50-400Hz. Load rating should be reduced by 10% when used at 50Hz
D.C. Output	5 volts to 24 volts (See tables)
Output Adjustment:	Minimum of ± 5%
Line Regulation:	< ± 0.05% for 10% line change
Load Regulation:	< ± 0.05% for 50% load change.
Ripple & Noise:	Units up to 15 volts — < 1mV R.M.S. Above 15 volts —< 3m R.M.S.
Transient Response:	< 30µ Secs. for 50% load change.
Overload Protection:	Automatic. Re-entrant current limit.
Overvoltage Protection:	Built into all 5v outputs. Set at 6.2v ± 0.4 volts. Other voltages optional "add-on" packages are available.
Output Isolation.	All outputs isolated from each other. Isolation output to frame, 30 megohms min., at 500 VDC
Remote Sensing:	All Models
Stability:	< ± 0.3% for 24 hours after warm up
Operating Temperature:	0° C to +50° full rating then linear derating to 40% at 70°C.
Storage Temperature:	-55°C to + 85°C.
Temperature Coefficient:	± 0.03% °C.
Efficiency:	5v units 45% 12 - 15v units 55% 24v units 60%
Vibration:	Per MIL-STD-801B, Method 514 Procedure 1, curve AB (to 50Hz).
Shock:	Per MIL-STD-801B, Method 516 Procedure V
Burn-in:	Each unit undergoes a 2 hour burn-in and is fully re-tested before shipment.
Packaging:	All units individually boxed and labeled.

DUAL OUTPUT MODELS (Outputs Isolated)			
Model	Ratings		Price
	Output #1	Output #2	1-24
QDA12 15	12V @ 1.0A, or 15V @ 0.8A	12V @ 1.0A, or 15V @ 0.8A	$40.95
QDB12 15	12V @ 1.7A, or 15V @ 1.5A	12V @ 1.7A, or 15V @ 1.5A	51.95
QDC12 15	12V @ 3.4A, or 15V @ 3.0A	12V @ 3.4A, or 15V @ 3.0A	84.95
QDB5 12	5V @ 3.0A	9-15V @ 1.25A	56.95
QDC5 12	5V @ 6.0A	9-15V @ 2.50A	91.95

TRIPLE OUTPUT MODELS (Outputs Isolated)				
Model	Ratings			Price
	Output #1	Output #2	Output #3	1-24
QTC1	5V @ 3.0A	12V @ 1.0A, or 15V @ 0.8A	12V @ 1.0A, or 15V @ 0.8A	$72.95
QTD1	5V @ 6.0A	12V @ 1.7A, or 15V @ 1.5A	12V @ 1.7A, or 15V @ 1.5A	96.95
QTD2	5V @ 2.5A	5V @ 0.5A	24V @ 3.0A (3.4 peak)	119.95
QTE1	5V @ 12.0A	12V @ 1.3A, or 15V @ 1.3A	12V @ 1.3A, or 15V @ 1.3A	240.00
QTG1	5V @ 12.0A	12V @ 2.8A, or 15V @ 2.8A	12V @ 2.8A, or 15V @ 2.8A	285.60

DIMENSIONS			
Case Size	Dimensions, inches	Case Size	Dimensions, inches
QSA	3.75×3.00×1.25	QSD	9.00×4.87×2.75
QSB	4.87×4.00×1.62	QDC	9.38×4.87×2.75
QSC	5.62×4.87×2.50	QTC1	10.25×4.00×2.50
QDA	6.50×4.00×1.62	QTD1	11.00×4.87×2.75
QSN QDB	7.00×4.87×2.50	QTE1, QTG1	15.00×4.87×4.00

WALL PLUG-IN POWER SOURCES

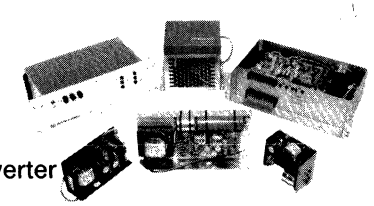


- AC-AC
- AC-DC (Unreg.)
- AC-DC (Reg.)
- Low Pricing
- Both Domestic and European Types

These are ideal power sources for modern microcomputers, alarm equipment, microprocessor-based units, games, calculators, and other similar equipment.

Call us to discuss your specific needs.

CUSTOM POWER SUPPLIES



- Switching
- Linear
- DC to DC Converter
- Ferroresonant

Dynage will design, to your specifications, for a wide range of applications.

At Dynage, custom power supplies are professionally designed and skillfully manufactured to achieve outstanding reliability and performance.

Call us to discuss your requirements. Our outstanding power supply design team offers seasoned engineering solutions to your power supply requirements.

DYNAGE Power
DIVISION OF OAKLEAF, INC.

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Tel: (605) 296-3462 Fax: (605) 296-3231
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DYNAGE Power

BATTERY CHARGERS

Ni-Cad – Gell Cell – Sealed Lead Acid – Others

NI-CAD CHARGERS*

Float Type - The least costly float charger design, with the C/10 charge rate usually recommended, require 14 to 16 hours for the batteries to charge from a full discharge. Specify the ampere-hour rating and the voltage rating of your nic-cad battery when ordering your low cost C/10 float charger. Float types with quick charge rates (4 to 5 hours) with C/3.33 or other charge rates are also available. Dual mode units for a combination of quick or fast charge and float charge are described below.

2-mode, time controlled, type - The chargers with time-controlled dual mode provide quick charge (C/3.33) for 4 hours and then revert to float charge (C/10, C/30, or C/50) continuously are availalbe. Internal timer is reset with external switch on charger unit to set charge at "quick rate" for fixed time period. The above time-controlled dual mode can also be applied to have C/10 float charge rates run for 16 hours and then revert to a C/30 or C/50 smaller float charge rate.

2-mode, temperature controlled types - The chargers with temperature controlled dual mode to provide fast charge (C/1) until battery temperature high limit is reached and then revert to float charge (C/10, C/30 or C/50) continuously are available. The temperature sensor must be assembled with the battery pack and connected with separate conductor of the output cord of the charger unit.

Custom Types - Contact us to design battery chargers to meet your requirements.

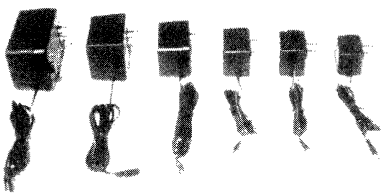
GELL CELL CHARGERS**

Float Type - These chargers with a single fixed voltage provide optimum battery life in standby type applications and will maintain a battery in the fully charged condition at the float voltage of 2.28 to 2.30 volts per cell. The float type charger delivers a constant potential to the battery and is current limited to 20% or less of the 20 hr capacity of the battery. This type is used for products that activate in the event of a power failure and for applications where the charger is always connected to the battery. These chargers can be simultaneously used as a power supply and a charger.

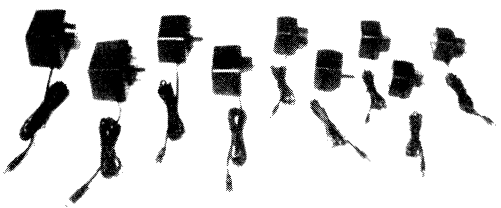
Cyclic (2-mode) Type - These chargers are designed to quickly recharge batteries without danger of overcharging and are suited for applications where batteries are repeatedly being discharged and recharged. The dual modes consist of (1) fast charge constant potential of about 2.50 volts per cell with current limit to 40% or less of the rated 20 hr capacity of the battery and (2) float charge constant potential of about 2.29 volts per cell with current limit to 20% or less of the rated 20 hr capacity of the battery. The automatic switchover from fast charge to float charge is initiated by sensing the charge current and switching to "Float" at a set point of about C/100 under the fast charge constant potential condition.

* Contact Sales Office for button cell chargers.

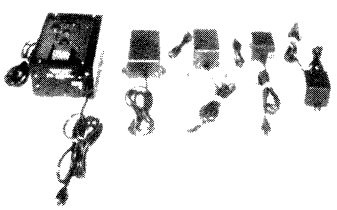
** Also starved electrolyte lead acid chargers.



Wall plug-in units for North American receptacles.



Wall plug-in units for various International receptacles.



Desktop and wall mount units with input cords for North American receptacles or various International receptacles.

GATES SEALED (TO 50 PSI) LEAD ACID BATTERIES

Same as for Gell Cell except:

Float Type - Same as Gell Cell Charger except use constant potential of 2.3 to 2.4 volts per cell with current limit set at 200% or less of the rated 20 hr capacity.

Cyclic Type - Same as Gell Cell Charger except use constant potential up to 2.6 volts per cell with current limit set to 200% or less of the rated 20 hr capacity.

● **Low Prices** ● **High Quality** ● **Custom Designs**

Call or FAX us for your special requirements!

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DYNAGE Power

DIVISION OF OAKLEAF INC.

DYNAGE Power

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Canistota, SD 57012
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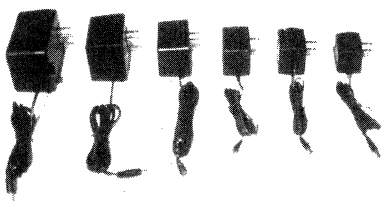
WALL PLUG-IN, DESK TOP, AND WALL MOUNT UNITS

AC/AC, AC/DC, and AC/DC Regulated

AC/AC ADAPTERS

Up to 14 case sizes are offered with a variety of output cord and connector configurations to meet your specific requirement. Units can be custom designed to meet your input and output ratings. Plug types for many different countries are available. Several standard models with UL, CSA and other approvals are offered.

Centertapped or multi-secondary versions with three or four conductor output cords are availalbe. Screw terminal outputs are also offered on some case sizes.

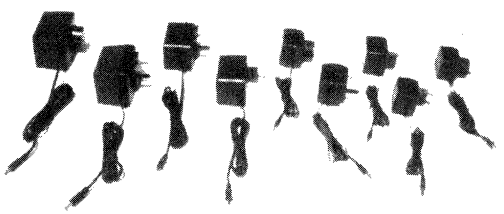


Wall plug-in units for North American receptacles.

AC/DC ADAPTERS

These adapters are unregulated, filtered, DC output units offered in up to 14 case sizes with a wide variety of output cord and connector configuation. Dual or triple DC outputs with three or four conductor output cords are available. Input plug types of many different countries are offered.

UL and CSA approved standard models are available. Units designed to meet VDE, TUV, and others are also offered.



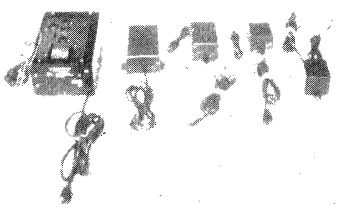
Wall plug-in units for various International receptacles.

LINEAR REGULATED POWER SUPPLIES

The larger case sizes are used for the linear regulated DC power supply units. Some of the larger cases are of the wall plug-in type mainly for North American receptacles. Most of the larger cases are of the desktop (or wall mount) style.

Single or multiple regulated outputs are offered with 2, 3, 4, or 5 conductor output cords available. Input cords for most countries are available in the desk top or wall mount units.

Custom designs can be made to meet your specific requirements.



Desktop and wall mount units with input cords for North American receptacles or various International receptacles.

SWITCHING POWER SUPPLIES

the switching regulated power supplies are offered primarily in the larger case sizes. Some versions are available in wall plug-in type cases but most offerings are in desk top units. Units are designed to meet EMI requirements per FCC Docket 20780 Class B. Wide input voltage ranges of 90–130 and 180-260 VAC are standard.

Custom designs can be made to meet your specific requirements.

- Low prices
- High quality.

- Custom designs to meet your exact requirements.
- Standard designs available with UL and CSA approvals.
- UL, CSA, and VDE submittals upon request.
- Quick delivery on preproduction units (made in USA)
- Plugs for Continental Europe, UK, Australia, North America, and others.

DYNAGE Power
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eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

Dynapower Custom Rack

Dynapower Custom Rack Mount Power Supplies combine high precision and solid stability in a compact and extremely reliable system. Designed to your specifications, and constructed from our standard subassemblies, Dynapower Custom Rack Mount Power Supplies provide specialized equipment at off-the-shelf prices.

Deciding which power supply to purchase is often tough. Specifications from different manufacturers don't always mean the same thing, and trying to compare various brands of power supplies can be very confusing. On top of that, you have to either buy a catalogued item, or pay the price for custom designed and built equipment.

Dynapower solves these problems with its new line of Standard Custom Rack Mount Power Supplies. The Standard means that they are assembled from standard subassemblies, proven in hundreds of power supply installations throughout the world. The Custom signifies that each power supply is constructed from these standard components to meet your particular specifications.

Typical SCR System Specifications:

Voltage regulation	0.01%
Current regulation	0.01%
Tempcos (15°C to 35°C)	
Internal reference	2 ppm/°C
Voltage control	200 ppm/°C
Current control	200 ppm/°C
Current Stability	<0.02% with constant ambient, input and load
Ambient temperature	0 - 40°C
Ripple	<0.2%
Standard Rack Mount Size	
	16" High
	20" Deep
	19" Wide

Standard Features

- Step-start on secondary SCR units
- Soft-start on primary SCR units
- Push-button local/remote Stop-Start control
- Phase loss/reversal protection
- Overtemperature protection
- 10 turn output controls
- Automatic voltage/current crossover
- Constant voltage/current mode indicators
- Magnetic circuit breaker
- Remote current programming
- Remote voltage sensing
- Digital meters
- Output inhibit
- Copper wound transformers and inductors
- External connections
- Adjustable load compensation
- Quick delivery
- High efficiency
- Exclusive warranty

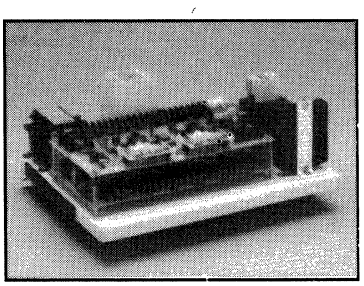
Applications

- Superconducting Magnets
- Semiconductor Ovens
- Illumination Systems
- Crystal Growth
- General DC Power
- Laboratories
- Focusing Magnets
- Precision Plating
- Research Facilities
- Battery Formation

When you order a Dynapower Custom Rack Mount power supply, we help you determine the configuration that best meets your needs. Dynapower will then design and construct your power system from standard components, with each subassembly being fully tested and correct for the total design. You will be involved in the specification and design stages, ensuring that the equipment you receive is the equipment you want.

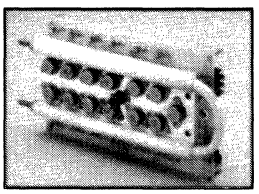
Input/Output

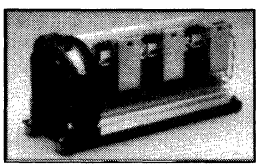
Line inputs and DC outputs can be virtually any level desired. Single phase inputs are available in power supplies up to 1 kw, while three phase is required for outputs of over 1 kw. Standard input voltages are 230, 460, and 600 vac, with others as options. DC outputs of up to 500 amperes and 600 volts are available. Maximum output in a standard size rack mount is 10 KVA. Higher outputs are possible with larger enclosures or different configurations.



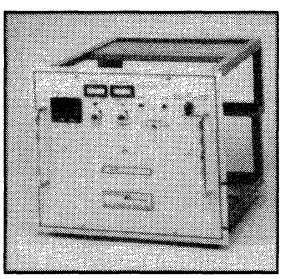
Standard electronics consist of precision regulators and firing circuits. Regulator boards are equipped with switches allowing precise compensation for the resistance and inductance of the load. Standard current and voltage regulations are 0.01% of rating. Optional regulators provide current regulation of 0.001% or better, and voltage regulation of 0.2% or better. Also available are RS-232, IEEE-488, and GPIB interfaces.

Mount Power Supplies





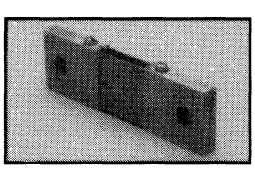
Either forced air or direct water cooling is available on a Dynapower rack mount unit. Air cooled designs incorporate highly efficient aluminum heatsinks, while water cooled units utilize unique Dynapower electrolytically pure copper heatsinks. Each is designed to maximize heat dissipation and minimize semiconductor junction temperatures. The cooling method most appropriate will depend on where the system is located, the physical size of the unit, and the power rating.



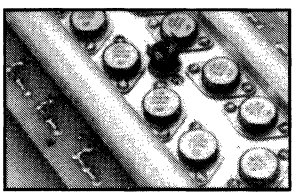
Dynapower not only manufactures enclosures for power supplies, but also peripherals such as instrumentation and data acquisition systems. For example, Dynapower can design and manufacture an enclosure that contains a power supply, a strip chart recorder, an industrial PC, and a precision voltmeter. Additionally, this enclosure can be mounted on casters allowing a convenient means to transport equipment from one location to another. Dynapower manufactures cabinets to satisfy your particular requirements.

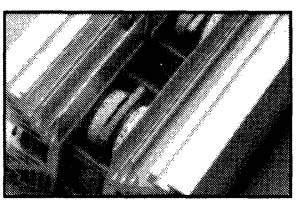
Rectification

AC-DC transformation is performed by one of three rectification methods: phase control SCR, series pass transistor, or pulse width modulated switch mode. The particular configuration utilized will be determined by your output power, regulation, ripple, and noise requirements.

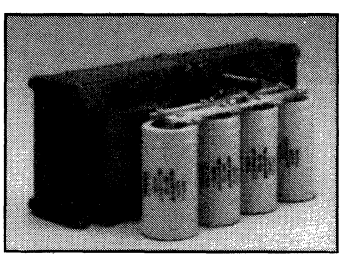


One of the critical aspects of successful precision power supply operation is the ability to accurately measure the output current. This is especially important when the power supply is used to power bending or focusing magnets. The standard Dynapower rack mount power supply utilizes a precision shunt to monitor the output current. This shunt, when combined with our standard precision electronics, provides regulation of at least 0.01%. Dynapower also manufactures a precision current measuring device, the Dynapower ZFCT (Zero Flux Current Transductor), with accuracies of 0.0001% or better. The ZFCT is contained in its own temperature controlled 19" rack mount enclosure. The most cost-effective current measurement configuration will be determined by your specific needs.





Dynapower utilizes only the highest quality semiconductor devices available. If the power supply is a phase control SCR design, the rectification configuration will be either primary thyristor/secondary diode or secondary thyristor, depending on the desired output voltage. Series pass and switch mode units incorporate high power, top quality transistors. No matter which design is selected, the semiconductors will be utilized at no more than 50% of their rated values, ensuring unsurpassed reliability and performance. Optional semiconductor features, such as crowbar and reversing systems, follow the same conservative design criteria.



Ripple control is of paramount importance in precision power supplies. Dynapower offers both active and passive filtering systems that can reduce ripple to virtually any level desired. The standard passive system consists of an efficient split leg choke combined with computer grade capacitors, providing a minimum ripple component. Active systems, such as the unique Dynapower Ripple Bucker, reduce ripple even more. The degree of ripple reduction required will be determined by your particular application.

For additional information concerning your specific power supply needs, please write or call:

DYNAPOWER CORPORATION

Corporate Headquarters:
P.O. Box 9210 ■ South Burlington, VT 05407 ■ (802) 860-7200
1-800-292-6792 ■ FAX: (802) 864-3782

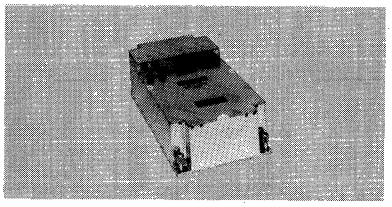
Midwest Sales and Service Facility:
(313) 553-4300 ■ 1-800-521-6792 ■ FAX: (313) 553-9096

EG&G POWER SYSTEMS, INC.

LEADERSHIP IN MILITARY POWER SUPPLIES

MIL-Q-9858A

CUSTOM AND STANDARD DESIGNS

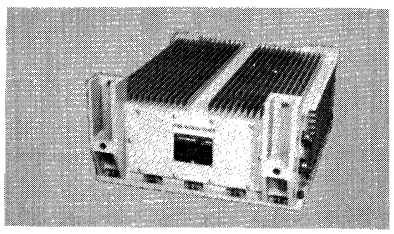


SHIPBOARD SWITCHING POWER SUPPLY
P/N 2-12150-01

Input Power: 115VAC, 60Hz, 3ϕ per MIL-STD-1399, Sec. 103, Type 1

Outputs	Reg.	Noise
+5VDC @ 70A	±1%	50mV p-p
−50VDC @ 1A	±1%	50mV p-p
+12VDC @ 1A	±1%	120mV p-p
−12VDC @ 2A	±1%	120mV p-p

Size: 10 × 6.25 × 3 inches
Weight: 12 pounds
Environment: (MIL-E-16400):
Temp.: 0 to 75°C
Humidity: to 95%
Fungus: MIL-STD-810
Vibration: MIL-STD-167
Shock: 75g's
Cooling: Convection/Conduction
Efficiency: 66%
EMI: MIL-STD-461 Notice I
MTBF: 40,000 hours @ 60°C, N_S

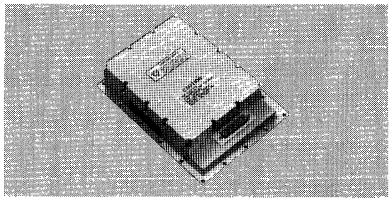


SHIPBOARD SWITCHING POWER SUPPLY
P/N 5498058

Input Power: 115VAC, 60 or 400Hz, 3ϕ per MIL-STD-1399, Sec. 103, Type 1

Outputs	Reg.	Noise
±20VDC @ 2.5A	±1%	3% Max.
±28.5VDC @ 10A	±1%	3% Max.
±30VDC @ 10A	±1.5%	3% Max.
±33VDC @ 10A	±1%	3% Max.
+33VDC @ 10A	±1%	3% Max.

Size: 26 × 22 × 12 inches
Weight: 185 pounds
Environment: (MIL-E-16400G)
Temp.: 0° to 50°C
Humidity: 0 to 95%. MIL-STD-810
Vibration: MIL-STD-167-1
Shock: MIL-STD-901C
Cooling: Conduction/Convection
Efficiency: 75%
EMI: MIL-STD-461A
MTBF: 80,000 hours, each regulator @ 50°C, N_S

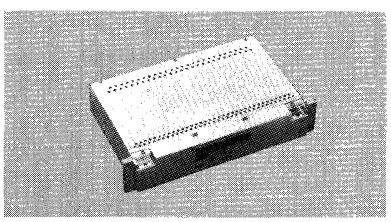


RADIATION HARDENED AIRBORNE DC-DC CONVERTER
P/N 2-18800

Input Power: 28VDC per MIL-STD-704C

Outputs	Reg.	Noise
5VDC @ 15A	±2%	100mV p-p
15VDC @ 0.5A	±2%	100mV p-p
15VDC @ 0.5A	±2%	100mV p-p
+5.15VDC @ .4A	±2%	100mV p-p
1.0 Amp Current Source		
12.5VDC @ .18A	±2%	200mV p-p

Size: 10 × 7.6 × 2.7 inches
Weight: 7.0 pounds
Environment:
Temp.: −54°C to +65°C
Shock: 15 gpk, 11 msec.
Vibration: 10.7gRMS Random
Nuclear Environment
Cooling: Conduction
Efficiency: 62%
EMI: MIL-STD-461
MTBF: 201,000 hours @ 60°C, A_{IC}

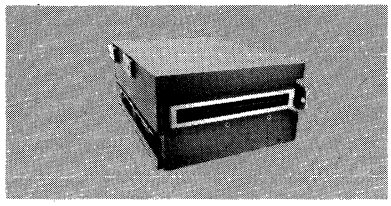


AIRBORNE POWER SUPPLY
P/N 2-11470

Input Power: +28VDC per MIL-STD-704

Outputs	Reg.	Noise
+20VDC @ .69A	±5%	100mV p-p
+12VDC @ .975A	±5%	100mV p-p
+5VDC @ 11.28A	±5%	100mV p-p
−14.7VDC @ 2.3A	±2%	100mV p-p

Size: 7.63 × 5.6 × 1.69 inches (incl. mounting flanges)
Weight: 4 pounds
Environment:
Temp.: −54°C to 100°C
Altitude: 0.560 to 15.5 psia
Acceleration: ±10g's, all axes
Vibration: MIL-E-5400, Curve IV
Shock: MIL-T-5422, 30g's
Explosive Atmosphere: MIL-E-5400
Humidity: MIL-T-5422, Para. 4.4
Salt Spray: MIL-T-5422, Para. 4.5
Sand & Dust: MIL-T-5422, Para. 4.7
Fungus: MIL-T-5422, Para. 4.8
Cooling: Conduction through mounting flanges
EMI: MIL-STD-461A (CE01, CE03, RS02, RS03, RE02, CS01, CS02)
MTBF: 27,000 hours

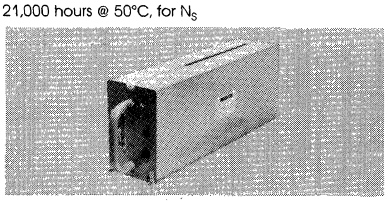


AIRBORNE/SHIPBOARD HIGH DENSITY SWITCHING POWER SUPPLY
P/N 2-16200-01

Input Power: 115/200VAC, 400Hz, 3ϕ per MIL-STD-704A or 270VDC

Outputs	Reg.	Noise
+5.2VDC @ 200A	±4%	2%
−6.5VDC @ 4.5A	±3%	3%
+6.5VDC @ 2.5A	±3%	3%
+15.0VDC @ 7.1A	±2.5%	1%
−15.0VDC @ 1.9A	±2.5%	1%
+5.9VDC @ .6A	±3.4%	2%
+5.0VDC @ 1.0A	±10%	4%
+8.3VDC @ .065A	±12.0%	2.5%
+5.0VDC @ .17A	±6.0%	2%
±15.0VDC @ .2A	±4.7%	4.7%
±5.1VDC @ 1.8A	±8.0%	2%

Size: 6.09 × 9.51 × 3.65 inches **Weight:** 13 lbs.
Environment: (MIL-E-5400T)
Temp.: −54°C to +71°C
Humidity: MIL-E-5400, Para. 3.2.24.4
Vibration: Special High Vibration and Gunfire
Shock: MIL-S-901, Class 1
Cooling: Air Cooled Central Heat Exchanger
Efficiency: 75%
EMI: MIL-STD-461, Class A1b and A4
MTBF: 12,000 hours for Class 2x Auf
21,000 hours @ 50°C, for N_S



AIRBORNE TRANSCEIVER POWER SUPPLY
P/N 2-17100

Input Power: 208VAC, 400Hz, 3ϕ per MIL-STD-704

Outputs	Reg.	Noise
200VDC @ 25mA	±5%	2000mV p-p
100VDC @ 160mA	±5%	1000mV p-p
28VDC @ 55A, 50% duty cycle	±3.5%	200mV p-p
9VDC @ 6.5A	±11%	45mV p-p
3VDC @ 11A	±6.7%	15mV p-p
16VDC @ 350mA	±7%	80mV p-p

Size: 1/2 ATR Long **Weight:** 30 pounds
Environment:
Temperature-Shock: MIL-STD-810 Method 503
Temperature-Pressure: MIL-STD-810 Method 504
Humidity: MIL-STD-810 Method 507
Salt Fog: MIL-STD-810 Method 509
Fungus: MIL-STD-810 Method 508
Shock: 15g half sine, 11ms
Vibration 8.9gRMS random
Nuclear Environment
Cooling: Forced air
Efficiency: 80%
EMI: MIL-STD-461
MTBF: 41,000 hours @ 60°C, A_{IC}

LEADERSHIP IN MILITARY QUALIFIED LOW VOLTAGE SWITCHING POWER SUPPLIES

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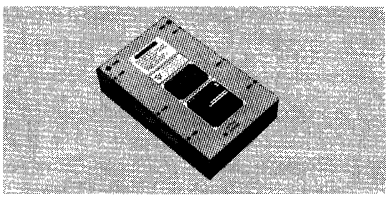
EG&G POWER SYSTEMS, INC.

LEADERSHIP IN MILITARY POWER SUPPLIES

MIL-Q-9858A

CUSTOM AND STANDARD DESIGNS

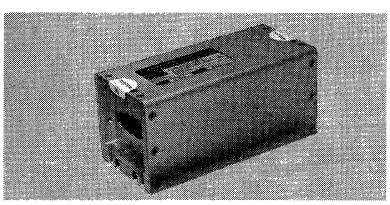


NAVY STANDARD POWER SUPPLY PROGRAM (SPSP)
P/N 5854683/*

Input Power: 115VAC, 60Hz, 3ϕ
or 155VDC per MIL-STD-1399, Sec. 300

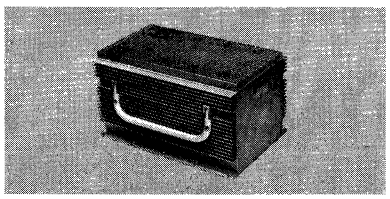
/1 Outputs	Reg.	Noise
5VDC @ 70A	±1%	65mV p-p
5VDC @ 80A	±1%	65mV p-p
/2 Outputs	**Reg.**	**Noise**
5VDC @ 50A	±1%	65mV p-p
15VDC @ 11A	±1%	25mV p-p
15VDC @ 11A	±1%	25mV p-p
/3 Outputs	**Reg.**	**Noise**
28VDC @ 20A	±1%	280mV p-p
/8 Outputs	**Reg.**	**Noise**
5VDC @ 50A	±1%	65mV p-p
15VDC @ 2A	±1%	75mV p-p
15VDC @ 2A	±1%	75mV p-p

Size: 6.80 × 10.80 × 2.48 inches
Weight: 12 pounds
Environment:
Temp.: −10°C to +60°C
Temp. transient (1 hour): +80°C
Shock: MIL-S-901 Class 1
Vibration: MIL-STD-202
Humidity: 0 to 95% MIL-STD-810
Salt fog: MIL-STD-810
Thermal shock: MIL-STD-202
Cooling: Conduction to coldplate
Efficiency: 70%
EMI: MIL-STD-461
MTBF: 100,000 hours @ 50°C (60°C for /8) N_S



DC TO DC CONVERTER

Input Power: 28VDC
Output Power: −5VDC @ 8A
Size: 5.5 × 2.5 × 2.5
Weight: 1.5 lbs.
Environment: (MIL-E-16400)
Efficiency: 70%
Features: For use with the AN/UYK 44 Computer in combination with SPSP Power Supply P/N 5854683/3.
MTBF: 890,000 hours @ 60°C, N_s

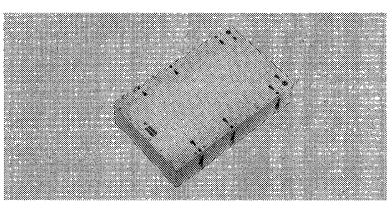


CONDUCTED INTERFERENCE ATTENUATOR

Input Power: 115VAC, 3ϕ Δ or Y
Output Power: 155 or 270VDC up to 4.5 kilowatts
Size: from 295 to 1000 cu. inches
Weight: from 14 to 75 lbs.
(consult factory for other sizes)
Environment: (MIL-E-16400)
Power Factor: > 0.98
EMI: MIL-STD-461, CE01, CE03
Features: Provides electrical solution to CE01 limits of MIL-STD-461 and the 3% harmonic distortion limits of MIL-E-16400 and DOD-STD-1399 Sec. 300.
MTBF: 360,000 hours @ 60°C, N_S

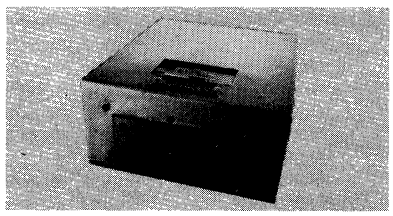
CONDUCTED INTERFERENCE ATTENUATORS FOR U.S. NAVY SHIPBOARD ELECTRONICS SYSTEMS

BACKGROUND: Electrical power generation and distribution systems on board U.S. Navy ships and submarines have problems with power supplies that produce excessive harmonic currents due to rectifying and filtering the AC line. These currents distort the AC waveform of the distribution system which produces several harmful effects such as: conducted interference in attached equipment, low power factor, increased mechanical wear in rotating equipment, and increased heating in electrical equipment. While various military specifications limit harmonic currents produced by user equipment to very low levels, methods used to date to meet these specifications pay significant penalties in cost, reliability, or efficiency, or all three. EG&G Power Systems has developed a patented multi-phase transformer approach which limits harmonic currents due to AC line rectification and filtering to specified levels without suffering the penalties of prior methods. These mutli-phase transformers are combined with rectifiers in a unit called a Conducted Interference Attenuator (CIA) which can be used to convert any 3-phase AC input to any DC voltage without exceeding military specification limits on harmonic currents.



BATTERY CHARGER TRANSFER SWITCH

Input Power: 155VDC
Output Power: 115VDC @ .6A
or 180VDC @ 2A
Size: 6.8 × 2.48 × 10.8 inches
Weight: 10 lbs.
(consult factory for other sizes)
Environment: MIL-E-16400
Features: Charges lead acid batteries. Constant current charging with constant current trickle or constant float voltage when charged.
MTBF: 139,000 hours @ 60°C, N_S

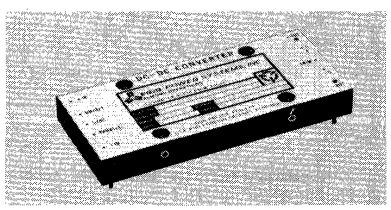


SHIPBOARD SWITCHING POWER SUPPLY
P/N 2-15800-01

Input Power: 115VAC, 50 to 400Hz, 1ϕ
per MIL-STD-1399A, Sec. 103, Type 1

Outputs	Reg.	Noise
+5VDC @ 20A	±1%	50mV p-p
−15VDC @ 2.5A	±1%	150mV p-p

Size: 7 × 6 × 3 inches
Weight: 7.5 lbs.
Environment: (MIL-E-16400)
Temp.: −20°C to +85°C (Baseplate)
Shock: MIL-STD-901, Class 1
Vibration: MIL-STD-167-1, Type 1
Humidity: 0 to 95%, MIL-STD-810
Cooling: Cold plate
Efficiency: 70%
MTBF: 40,000 hours @ 40°C, N_S
Redundancy: Built-in Diode OR-ing



100 WATT HIGH DENSITY DC TO DC CONVERTER
P/N 2-20100

Input Power: 28, 48, 155 or 270VDC per MIL-STD-704 or MIL-STD-1399

Outputs Available	Reg.	Noise
5VDC @ 20A	±1%	100mV p-p
6VDC @ 16A	±1%	120mV p-p
12VDC @ 8.5A	±1%	240mV p-p
15VDC @ 6.67A	±1%	300mV p-p
28VDC @ 3.5A	±1%	560mV p-p
±15VDC @ 3.3A ea.		
5VDC @ 15A, ±15VDC @ 1A ea.		

Size: 4.6 × 2 × .515 inches
Weight: .45 pounds
Environment:
Temp.: −55°C to +85°C
Humidity: 0 to 100%
Shock: MIL-S-901 Class 1
Sine Vibration: MIL-STD-167
Random Vibration: 8 gRMS
Cooling: Conduction to coldplate
Efficiency: 77-83%
MTBF: 91,000 hours with 65°C baseplate, Auf

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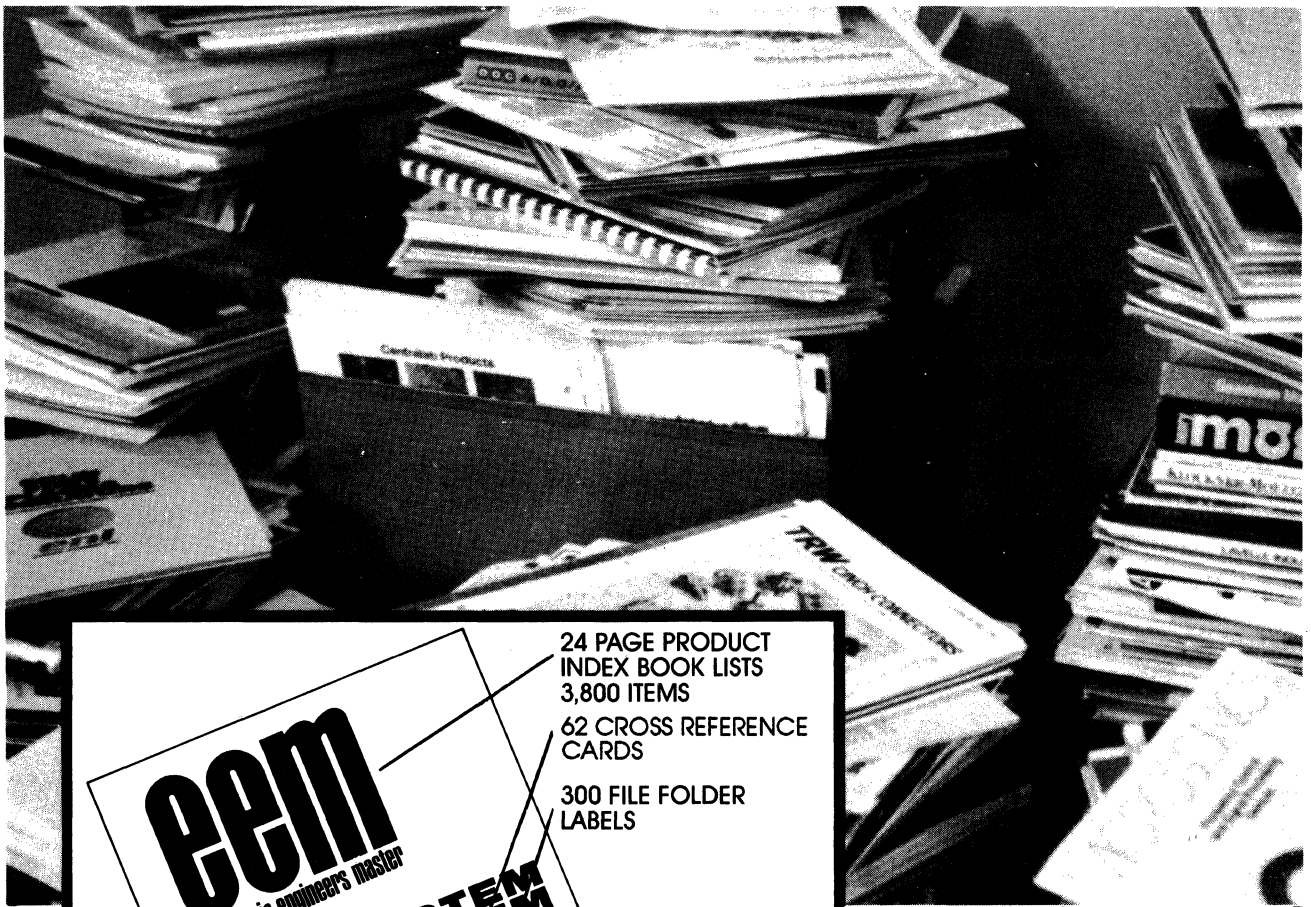

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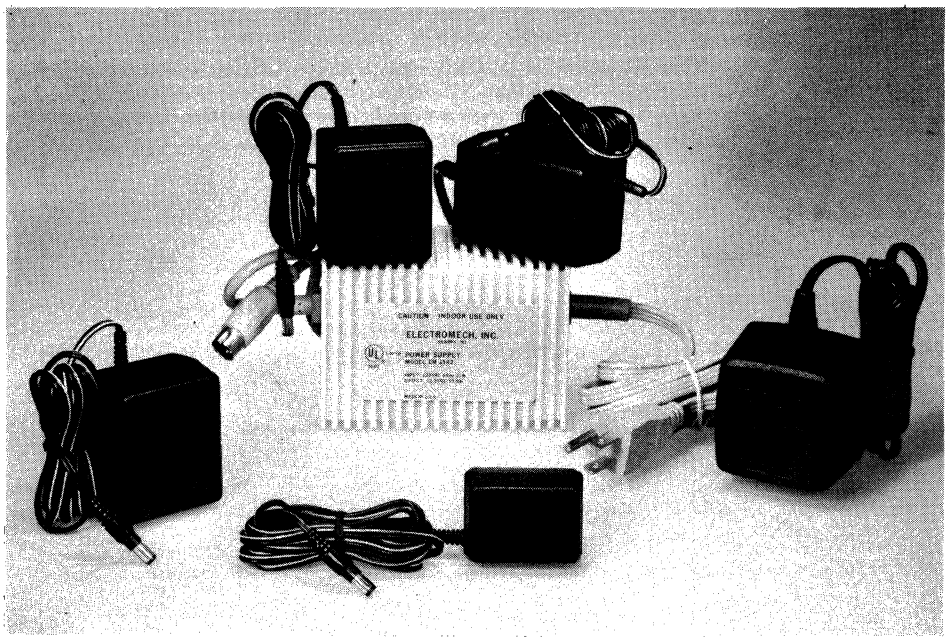

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- **BATTERY CHARGERS**
- **LINEAR SUPPLIES**

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.1VA to 1KVA (DESK TOP)

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Output—.1V to 200V (WALL PLUG-IN)
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.01A to 400A (DESK TOP)

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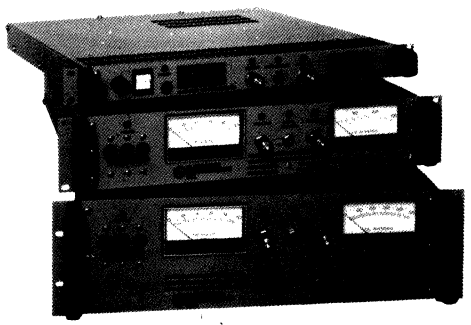
DC SWITCH MODE POWER SUPPLIES

EMS SERIES

U/L RECOGNIZED



MAJOR SPECIFICATIONS

AC input voltage:
100-132/200-264 V, 47-63 Hz,
1ϕ (600W & 1000W models)
190-253V, 46-63 Hz, 1ϕ (2500W model)
190-253V, 45-63 Hz, 3ϕ (2500W model)
190-253V, 46-63 Hz, 3ϕ (5000W model)

DC output:
Zero to value shown in model designation (volts-amps. See chart.)

Mechanical Specifications:
600W & 1000W: 1¾" H x 19" rack x 17"D 15 lbs.
4.4cm H x 48.3cm x 43.0cm D 7 kg
2500W: 3½"H x 19" rack x 18"D 35 lbs.
8.9cm H x 48.3cm x 43.0cm D 15.9 kg
5000W: 5¼"H x 19" rack x 22"D 60 lbs.
13.3cm H x 48.3cm x 55.9cm D 27 kg
10,000W: 8¾"H x 19" rack x 22"D, 105 lbs.

1ϕ SINGLE PHASE 1ϕ

OUTPUT RATINGS (1)			(2) RIPPLE (MV) P-P CARRIER	MODEL NUMBER
WATTS	VOLTS (DC)	AMPS		
600	7.5	75	100	EMS 7.5-75
1000	7.5	130	75	EMS 7.5-130
2000	7.5	250	75	EMS 7.5-250
2500	7.5	300	75	EMS 7.5-300
600	10	60	100	EMS 10-60
1000	10	100	75	EMS 10-100
2000	10	200	75	EMS 10-200
2500	10	250	75	EMS 10-250
600	20	30	100	EMS 20-30
1000	20	50	75	EMS 20-50
2000	20	100	75	EMS 20-100
2500	20	125	75	EMS 20-125
600	30	20	100	EMS 30-20
1000	30	33	75	EMS 30-33
2000	30	65	75	EMS 30-65
2500	30	80	75	EMS 30-80
600	40	15	100	EMS 40-15
1000	40	25	75	EMS 40-25
2000	40	50	75	EMS 40-50
2500	40	60	75	EMS 40-60
600	60	10	100	EMS 60-10
1000	60	18	75	EMS 60-18
2000	60	33	75	EMS 60-33
2500	60	40	75	EMS 60-40
600	80	7.5	100	EMS 80-7.5
1000	80	13	100	EMS 80-13
2000	80	25	100	EMS 80-25
2500	80	30	100	EMS 80-30
1000	100	10	100	EMS 100-10
2000	100	20	100	EMS 100-20
2500	100	25	100	EMS 100-25
1000	150	7	120	EMS 150-7
2000	150	13	120	EMS 150-13
2500	150	16	120	EMS 150-16
1000	300	3.5	150	EMS 300-3.5
2000	300	6	150	EMS 300-6
2500	300	8	150	EMS 300-8
1000	600	1.6	250	EMS 600-1.6
2000	600	3.3	250	EMS 600-3.3
2500	600	4	250	EMS 600-4

(1) Optional DC outputs are available at extra cost. Consult factory
(2) RMS ripple approx. 30% of P.P. carrier ripple

3ϕ THREE PHASE 3ϕ

OUTPUT RATINGS (1)			(2) RIPPLE (MV) P-P CARRIER	MODEL NUMBER
WATTS	VOLTS (DC)	AMPS		
2500	7.5	300	75	EMS 7.5-300
5000	7.5	600	75	EMS 7.5-600
7500	7.5	1000	75	EMS 7.5-1000
2500	10	250	75	EMS 10-1000
5000	10	500	75	EMS 10-500
10000	10	1000	75	EMS 10-1000
2500	20	125	75	EMS 20-125
5000	20	250	75	EMS 20-250
10000	20	500	75	EMS 20-500
2500	30	80	75	EMS 30-80
5000	30	165	75	EMS 30-165
10000	30	333	75	EMS 30-333
2500	40	60	75	EMS 40-60
5000	40	125	75	EMS 40-125
10000	40	250	75	EMS 40-250
2500	60	40	75	EMS 60-40
5000	60	80	75	EMS 60-80
10000	60	165	75	EMS 60-165
2500	80	30	100	EMS 80-30
5000	80	60	100	EMS 80-60
10000	80	125	100	EMS 80-125
2500	100	25	100	EMS 100-25
5000	100	50	100	EMS 100-50
10000	100	100	150	EMS 100-100
2500	150	16	120	EMS 150-16
5000	150	33	120	EMS 150-33
10000	150	65	150	EMS 150-66
2500	300	8	150	EMS 300-8
5000	300	16	150	EMS 300-16
10000	300	33	150	EMS 300-33
2500	600	4	250	EMS 600-4
5000	600	8	250	EMS 600-8
10000	600	16	250	EMS 600-16

(1) Optional DC outputs are available at extra cost consult factory
(2) RMS ripple approx. 30% of P.P. carrier ripple

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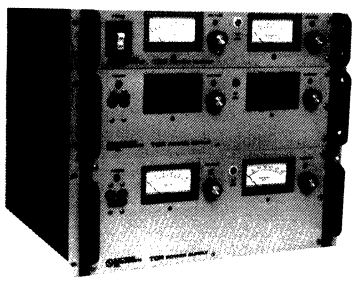
SCR-REGULATED DC POWER SUPPLIES

TCR SERIES SINGLE-PHASE MODELS



MAJOR SPECIFICATIONS

AC input voltage:
105-130V, 47-63 Hz (600, 1000 and 1800W Models)
190-253V, 47-63 Hz (2800W Model) 190-253V
Input options available on 600, 1000, and 1800W Models.

DC output:
Zero to value shown in model designation (volts-phase-amps). See chart. Regulation 0.1%.

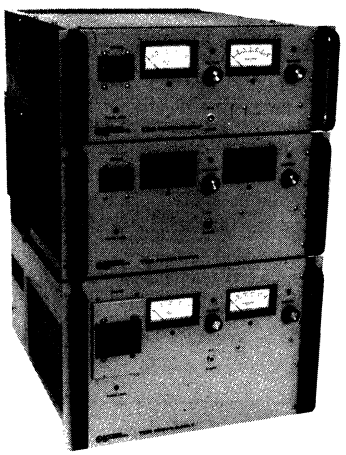
Options:
Over voltage protection available on all units at additional cost. Digital panel meters available at no additional cost.

Sizes:
600 and 1000 watt: 3½″ High, 19″ rack by 18½″ Deep
1800 watt: 5¼″ High, 19″ rack by 18½″ Deep
2800 watt: 7″ High, 19″ rack by 18½″ Deep

Model	Ripple mV RMS
TCR 7.5S70	80
TCR 7.5S115	80
TCR 7.5S200	80
TCR 7.5S300	80
TCR 10S50	80
TCR 10S90	80
TCR 10S165	80
TCR 10S240	80
TCR 20S30	80
TCR 20S50	80
TCR 20S90	80
TCR 20S135	80
TCR 40S15	100
TCR 40S25	75
TCR 40S45	100
TCR 40S70	100

Model	Ripple mV RMS
TCR 60S10	120
TCR 60S18	75
TCR 60S30	90
TCR 60S45	90
TCR 80S8	150
TCR 80S13	80
TCR 80S23	120
TCR 80S34	100
TCR 150S4	300
TCR 150S7	150
TCR 150S12	200
TCR 150S18	200
TCR 300S2	500
TCR 300S3	250
TCR 300S6	300
TCR 300S9	300
TCR 600S1	1000
TCR 600S1.6	700
TCR 600S3	700
TCR 600S4.5	750

TCR SERIES THREE-PHASE MODELS



MAJOR SPECIFICATIONS

AC input voltage:
190-253 VAC 3φ50/60 Hz Standard. Optional nominal inputs 200V, 380V, 415V, 440/460/480.

DC output:
Zero to value shown in model designation (volts-phase-amps). See chart. Regulation 0.1%.

Options:
Over voltage protection available on all units at additional cost. Digital panel meters available at no additional cost.

Sizes:
2.5 KW: 7″ High, 19″ rack by 23.35 (includes output terminal)
5.0 KW: 8.75″ High, 19″ rack by 23.25 (includes output terminal)
10.0 KW: 12.25″ High, 19″ rack by 24.25 (includes output terminal)

Model	Ripple mV RMS
TCR 7.5T300	30
TCR 6T600	30
TCR 6T900	30
TCR 10T250	35
TCR 10T500	35
TCR 10T750	35
TCR 20T125	20
TCR 20T250	20
TCR 20T500	20
TCR 30T100	15
TCR 30T200	15
TCR 40T60	15
TCR 40T125	15
TCR 40T250	15
TCR 50T200	16

Model	Ripple mV RMS
TCR 80T30	25
TCR 80T60	25
TCR 100T100	40
TCR 120T20	40
TCR 120T40	40
TCR 160T15	60
TCR 160T30	50
TCR 160T60	60
TCR 250T10	90
TCR 250T20	80
TCR 250T40	90
TCR 500T5	125
TCR 500T10	125
TCR 500T20	125

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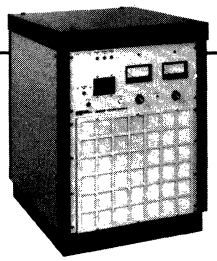
EMHP SERIES THREE-PHASE MODELS 20, 30, 60 KILOWATTS



FEATURES

- Low cost
- Quick delivery time
- High efficiency
- High performance

APPLICATIONS

- Electromagnets
- Magnetic beam bending
- Cryogenic magnets
- Precision electroplating
- DC motor power
- Large relay systems
- Inverter power source
- High energy electronic systems
- Electrochemical processes
- High-power illumination systems
- Thermodynamic and thermonuclear research
- Battery charging
- Industrial DC power

MAJOR SPECIFICATIONS

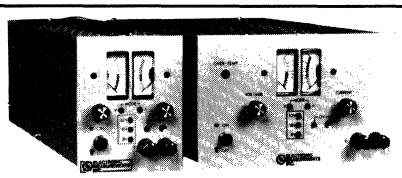
AC Input Voltage: 460 VAC ± 10%, 60 Hz. Optional inputs available.

DC Output: regulation, 0.1%; stability, 0.05%.
Size 1: 30″H × 22¼″W × 27¾″D
Size 2: 34⅝″ × 27½″W × 29¼″D
Size 3: 44½″H × 27½″W × 33¼″D

Ripple	Voltage Model	Current (V)	Voltage Ripple (mV rms)	Current Ripple (A rms)
SIZE 1 (20 KW maximum)				
EMHP 10-1000	0-10	0-1000	50	5
EMHP 20-750	0-20	0-750	60	2.25
EMHP 30-600	0-30	0-600	70	1.4
EMHP 40-450	0-40	0-450	80	0.9
EMHP 60-300	0-60	0-300	100	0.5
EMHP 80-250	0-80	0-250	120	0.4
EMHP 150-130	0-150	0-130	180	0.2
EMHP 300-60	0-300	0-60	300	0.06
EMHP 600-30	0-600	0-30	400	0.02
SIZE 2 (30 KW maximum)				
EMHP 10-1500	0-10	0-1500	50	7.5
EMHP 20-1000	0-20	0-1000	60	3.0
EMHP 30-800	0-30	0-800	70	2.0
EMHP 40-600	0-40	0-600	80	1.2
EMHP 60-500	0-60	0-300	100	0.8
EMHP 80-375	0-80	0-375	120	0.6
EMHP 150-200	0-150	0-200	180	0.25
EMHP 300-100	0-300	0-100	300	0.10
EMHP 600-50	0-600	0-50	400	0.03
SIZE 3 (60 KW maximum)				
EMHP 10-3000	0-10	0-3000	50	15
EMHP 20-1500	0-20	0-1500	60	2.25
EMHP 30-1250	0-30	0-1250	70	3.0
EMHP 40-1000	0-40	0-1000	80	2.0
EMHP 60-750	0-60	0-750	100	1.3
EMHP 80-600	0-80	0-600	120	0.9
EMHP 150-350	0-150	0-350	180	0.42
EMHP 300-200	0-300	0-200	300	0.20
EMHP 600-100	0-600	0-100	400	0.07

ATR SERIES LINEAR POWER SUPPLIES

ATR-100



ATR-250

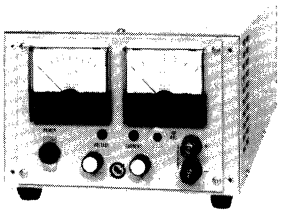
FEATURES:

ATR-100 and ATR-250 are 100 and 250 watt, wide range, linear, DC power supplies. Through a unique switching circuit these units produce essentially a constant power output capability so that as the output voltage requirement is lower the available current output is higher. The units are fully metered, programmable and have a self contained OVP circuit.

MODEL	OUTPUT RANGES		
ATR 100	0-8V 0-10A	8-18V 0-5A	18-32V 0-3A
ATR 100B	0-16V 0-5A	16-36V 0-2.5A	36-64V 0-1.5A
ATR 100C	0-32V 0-2.5A	32-64V 0-1.3A	64-128V 0-0.75A
ATR 250	0-8V 0-25A	8-18V 0-13A	18-32V 0-7A
ATR 250B	0-16V 0-12A	16-36V 0-6A	36-64V 0-3.5A
ATR 250C	0-32V 0-6A	32-64V 0-3.0A	64-128V 0-1.75A

Operating Temp: 0°C to +40°C at full rating
Storage Temp: −40°C to +85°C
Over Voltage Protection: Adjustable from 2.5V to 128V
Cooling: Fan cooled, thermostatically-protected
Weight: 18 lbs. (ATR-100); 32 lbs. (ATR-250)
Size: 4″Wx5″H x 18″D (ATR-100); 8″W x 5″H x 18″D (ATR-250)
Rack adapter systems available.

HCR SERIES DC MODELS - 250 WATTS



MAJOR SPECIFICATIONS

AC Input Voltage: 105-130V, 47-63 Hz or 190-253 V, 47-63 Hz. Optional inputs available.

DC Output: Regulation, voltage mode — ±0.1%; regulation, current mode - ±0.25%, 8 hours; temperature coefficient — 0.02%/°C.

Weight: 45 lbs.

Size: 5″H x 7⅝″W x 18½″D

Rack Adaptors: Available for 1 & 2 units.

Output Voltage (V)	Output Current (A)	Voltage Ripple (mV rms)	Current Ripple (mA rms)	Model
0-7.5	0-30	80	450	HCR 7.5-30
0-10	0-25	80	55	HCR 10-25
0-20	0-13	80	55	HCR 20-13
0-20	0-8	90	45	HCR 30-8
0-40	0-6	100	27	HCR 40-6
0-60	0-4	120	15	HCR 60-4
0-80	0-3	150	9	HCR 80-3
0-150	0-2	300	3	HCR 150-2
0-300	0-0.9	500	1.5	HCR 300-0.9

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EMTL-488 SPECIFICATIONS

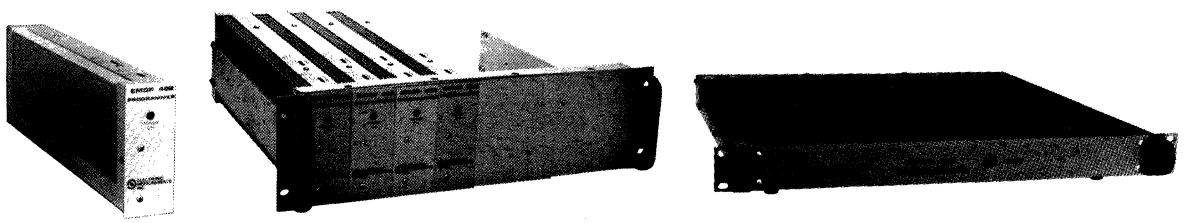
INPUT	
AC Voltage	95-130 VAC or 190-260 VAC. 1Φ 47-63 Hz
Power	15 watts per card
Data Format	ASC II/ISO-7
Factors	AHI – acceptor handshake EHI – source handshake L4 – base listener T6 – base talker, Serial poll

OUTPUT	
Channel A	0-5 volts @ .024% resolution (12 bits)
B	0-100 millivolts @ .024 resolution (12 bits)
Talker Function	two channel digitized analog response of the controlled power-supply to the programmed bus command. Four digit resolution
Zero Adjust	± 10 millivolts.
Output Impedence	Channel A less than .05 ohms Channel B less than .05 ohms
Programming Time	1500 micro seconds from execute command
Programming Range	00.00% to 99.99% of output voltage
Data Transfer Time	2K bytes per second
Transfer Format	byte serial/bit parallel
Linearity Error	± 1/2 L.S.B.
Polarity	Unipolar

MODEL NUMBERS

Part Number	Rack Size	Output
EMTL-488-1-XX	1/8th	Dual channel
EMTL-488-2-XX-XX-XX	Full	3 dual channel
EMTL-488-3-XX	—	Dual channel, programming card
RA-4 kit	Full	Rack adapter to mount up to 8 units into a standard 5¼" relay rack

XX = dc output voltage of power supply to be controlled.



EMDP SERIES SPECIFICATIONS

An interface/control unit to remotely control outputs of E/M power supplies.

Interface: IEEE-488 1978 standard for programmable instrumentation; AM1, L1, SHO1, TO, SRO, RLO, PPO, DCO, DTO, CO; average data transfer rate 2K bytes per second: byte serial, bit parallel.

Output: one to six independent, unipolar analog sources mutually isolated for potentials not to exceed 800 VDC.

MODELS

Part Number	Rack Size	Resolution	Output
EMDP-100/3	1/8	Standard	Single Analog
EMDP-100/4	1/8	High	Single Analog
EMDP-200 3/3	1/8	3 digit both channels	Dual Analog
EMDP-200 4/4	1/8	4 digit both channels	Dual Analog
EMDP-200 4/3	1/8	channel A 4 digit channel 2 3 digit	Dual Analog
EMDP-600	Full	as above - per card IEEE Bus Address: 3 each dual channel cards. 1 Bus Address per card.	1-6 channels: 1 to 3

Message: ASCII/ISO 7 bit code

Programming Range: (1) to 5 VDC or (2) 0 to 10 VDC

Output Resolution: Standard .001 x full scale or High .0001 x full scale

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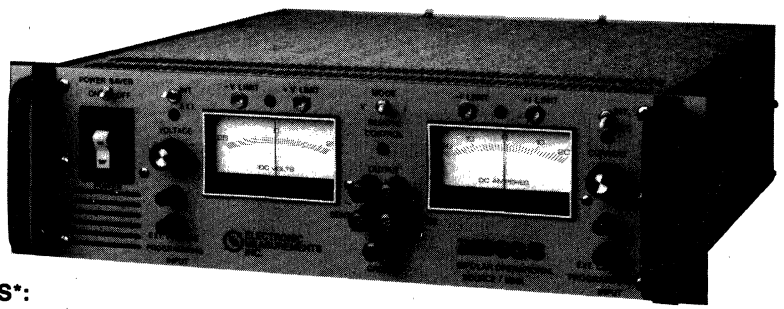
The BOS/S™

A bi-polar power supply that delivers both positive and negative voltage. As a SOURCE it delivers *both* positive *and* negative current from the supply. As a SINK it dissipates power at any polarity from an active load. All BOS/S's may be series or parallel generated, and an IEEE-488 or RS-232 programmable option is available.



MAJOR SPECIFICATIONS
AC Input: 105-125 vac 50/60 Hz; or 200-250 vac 50/60 Hz

DC OUTPUT RANGES*:

PWR	Eo	Io	Eo	Io	Eo	Io	Eo	Io	Eo	Io	Eo	Io
100W	±20	±5	—		±50	±2	—		±100	±1	—	
200W	±20	±10	±36	±6	±50	±4	±72	±3	±100	±2	—	
400W	±20	±20	±36	±12	±50	±8	±72	±6	±100	±4	±200	±1

*Optional outputs available, consult factory.

TEMP. COEFFICIENT: V=.01%/°C I=.03%/°C
OPER. TEMP: 0°C – +55°C
OUTLINE DIMENSION:
100W=5¼"H×12½"W×17"D 36 lbs.
200W=5¼"H×12½"W×17"D 40 lbs.
400W=5¼"H×19"W×17"D 55 lbs.

RIPPLE: (rms): V=3 mV I=.05%
RACK ADAPTER systems available.
SIZE:
100W: 5¼"H×12½"W×17"D; 13.3cm H×31.1cm W×43.2cm D
200W: 5¼"H×12½"W×17"D; 13.3cm Hx31.1 cm W×43.2cm D
400W: 5¼"H×19"W×17"D; 13.3cm H×48.3cm W×43.2cm D

HVS SERIES

200 WATT SINGLE OUTPUT AC TO DC HIGH FREQUENCY, SWITCHING POWER SUPPLY

INPUT CHARACTERISTICS: AC voltage; 90-132 and 180-264 VAC field selectable, single phase, 47-63 Hz.

OUTPUT CHARACTERISTICS: @ 40°C

MODEL	VOLTAGE	CURRENT	EFFICIENCY
HVS-50-4	50 VDC	4.0A	85%
HVS-100-2	100 VDC	2.0A	85%
HVS-120-1.7	120 VDC	1.7A	85%
HVS-120-1.8	150 VDC	1.3A	85%
HVS-180-1 1	180 VDC	1.1A	85%
HVS-250-0.8	250 VDC	0.8A	85%
HVS-300-0.6	300 VDC	0.6A	90%
HVS-380-0.5	380 VDC	0.5A	90%

FOR OTHER VOLTAGE/CURRENT LEVELS CONSULT FACTORY.

VOLTAGE ADJUSTMENT RANGE: through a range of +5% to –20% of the nominal setting.

REGULATION - (Line): 0.1% over the range of the input.
(Load): 0.5% for a 100% load change.
RIPPLE: 0.25%
TRANSIENT RESPONSE: output voltage returns to within 1% within 5 milli seconds.
OVER VOLTAGE PROTECTION: output power is removed when the output voltage exceeds an internal set pont. The adjustment range is from 90-110% of the output voltage.
TEMPERATURE: Operating 0 to 70°C derate 1% per degree C for each degree above 40°C. Storage temperature –40 to +85C. TC is 0.02% per degree C.
COOLING: natural convection operating range can be extended by using forced air.
STABILITY: .05% for eight hour period after a 30 minute warm-up.
ISOLATION: 2500 VAC input to output and input to case; 500VAC output to case.
TERMINATIONS: (Input) Molex 15-31-1046 or equal
(Output) Molex 15-31-1036 or equal
WEIGHT: 3 pounds
SIZE: 2⅜"H×5"W×10"D
U.L. RECOGNIZED

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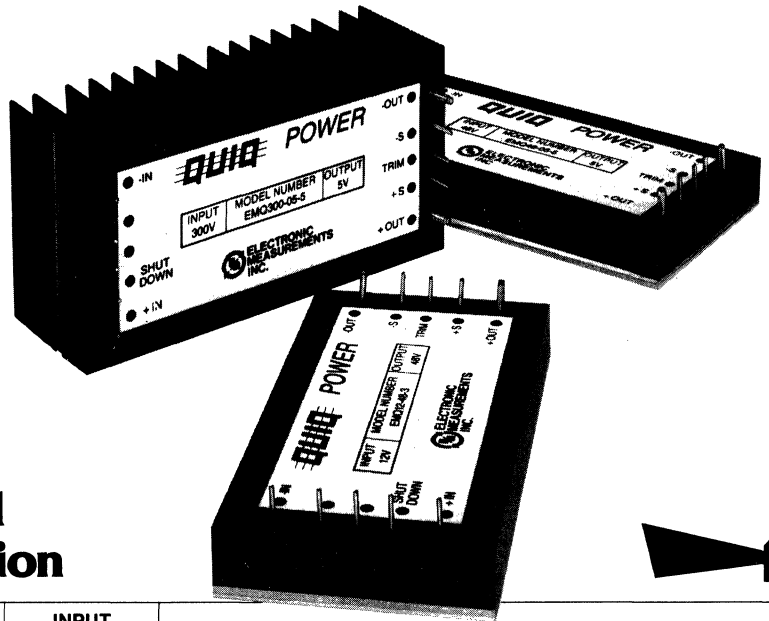
The MAGIC MODULE™

HIGH DENSITY DC-DC CONVERTERS



Model Selection

NOMINAL INPUT VOLTAGE (VDC)	INPUT VOLTAGE RANGE (VDC)		OUTPUT VOLTAGE (VDC)					OUTPUT POWER (WATTS)
	MIN.	MAX.	5V	12V	15V	24V	48V	
300	200 (170)[1]	400 (425)[2]	EMQ300-05-40	EMQ300-12-16	EMQ300-15-13	EMQ300-24-8	EMQ300-48-4	200
			EMQ300-05-30	EMQ300-12-12	EMQ300-15-10	EMQ300-24-6	EMQ300-48-3	150
			EMQ300-05-20	EMQ300-12-8	EMQ300-15-6	EMQ300-24-4	EMQ300-48-2	100
			EMQ300-05-15	EMQ300-12-6	EMQ300-15-5	EMQ300-24-3		75
			EMQ300-05-10	EMQ300-12-4	EMQ300-15-3	EMQ300-24-2	EMQ300-48-1	50
150	100 (90)[1]	200 (240)[2]	EMQ150-05-40	EMQ150-12-16	EMQ150-15-13	EMQ150-24-8	EMQ150-48-4	200
			EMQ150-05-30	EMQ150-12-12	EMQ150-15-10	EMQ150-24-6	EMQ150-48-3	150
			EMQ150-05-20	EMQ150-12-8	EMQ150-15-6	EMQ150-24-4	EMQ150-48-2	100
			EMQ150-05-15	EMQ150-12-6	EMQ150-15-5	EMQ150-24-3		75
			EMQ150-05-10	EMQ150-12-4	EMQ150-15-3	EMQ150-24-2	EMQ150-48-1	50
48	40 (36)[1]	60 (72)[2]	EMQ48-05-40	EMQ48-12-16	EMQ48-15-13	EMQ48-24-8	EMQ48-48-4	200
			EMQ48-05-30	EMQ48-12-12	EMQ48-15-10	EMQ48-24-6	EMQ48-48-3	150
			EMQ48-05-20	EMQ48-12-8	EMQ48-15-6	EMQ48-24-4	EMQ48-48-2	100
			EMQ48-05-15	EMQ48-12-6	EMQ48-15-5	EMQ48-24-3	EMQ48-48-1	75
24	20 (18)[1]	30 (36)[2]	EMQ24-05-30	EMQ24-12-12	EMQ24-15-10	EMQ24-24-6	EMQ24-48-3	150
			EMQ24-05-15	EMQ24-12-6	EMQ24-15-75	EMQ24-24-3		75
12	11 (10)[1]	20 (24)[2]	EMQ12-05-20	EMQ12-12-8	EMQ12-15-8	EMQ12-24-4	EMQ12-48-2	100
			EMQ12-05-10	EMQ12-12-4	EMQ12-15-4	EMQ12-24-2	EMQ12-48-1	50

1. Voltage at which unit will support 75% of full load and still maintain load regulation.
2. Unit will withstand this input voltage for up to 10 seconds (maximum duty cycle of 1%).

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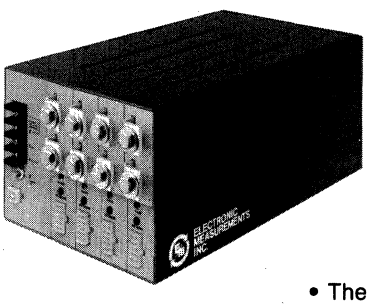
The MAGIC MODULE™ SYSTEM

Over 100,000 Combinations of High Density, High Performance, Multiple Output Power Systems – Without Any Development Time...Development Costs or – Regulatory Agency Delay!

Up to 3,000 Watts Output



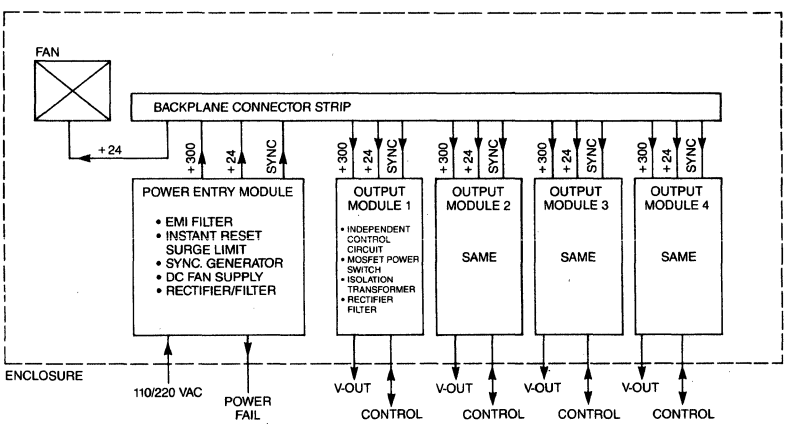
The QUIQ Power Systems represents a break-through in the way power systems are designed, specified and produced. At the same time, these systems are totally compatible with existing applications.

Using the most advanced electronic thermal and packaging concepts, the QUIQ system permits any one of thousands of custom configurations to be arranged with unprecedented simplicity.

The standardized design and manufacture process contribute to enhanced reliability and cost effectiveness of volume-based manufacturing.

- Custom systems without development time or cost; up to 12 outputs in a single supply package 5″ x 7″ x 11.5″
- Permits operation of converter modules in satellite mode (remote module)
- High frequency power magnetics, including state-of-the-art planar windings, for maximum repeatability
- Troubleshooting or retrofit greatly simplified because of simple removal/ replacement of independent modular elements
- Master clock circuit in power entry module synchronizes all units, provides surge limiting control signals, generates voltage for long-life, low voltage fan and provides an external sync signal
- Predictable operating temperatures for all power semiconductor junctions
- The reliability of a standardized, fixed-frequency, forward converter, current mode design regardless of the custom configuration
- High efficiency: Minimum of 80% regardless of output voltage levels

QUIQ SYSTEM ARCHITECTURE



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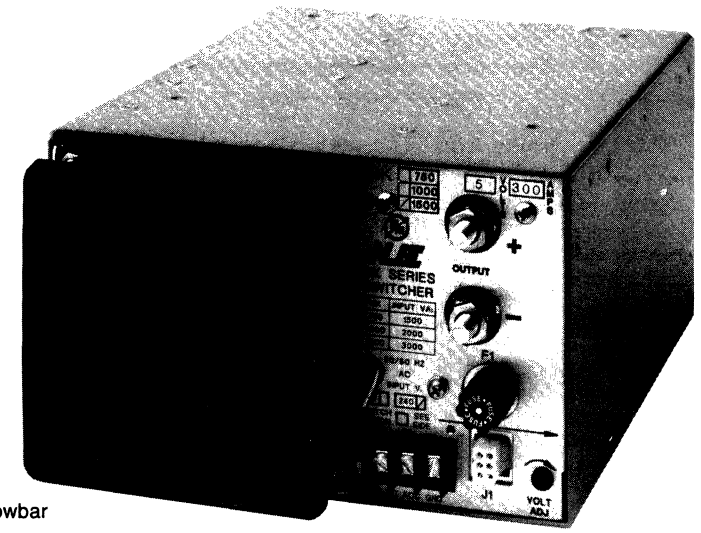
NJE

POWER SUPPLIES

SWITCHERS

5-YEAR WARRANTY!



SPECIFICATIONS

Input
Single-phase standard, 3-phase optional.
MK750 and MK1000 units
120 VAC (+10% -25%), 47-63 Hz standard.
240 VAC (+10% -25%), 47-63 Hz optional.
120/240 VAC Switch Option available.
MK1500 units
240 VAC (+10% -25%), 47-63 Hz standard.
120 VAC optional.

Efficiency
Up to 85% depending upon model.

Protection
Voltage: Overvoltage shutdown standard, crowbar overvoltage optional.
Current: Automatic current limit/foldback.
Thermal: Automatic shutdown when internal heat sink temperature exceeds safe limit. Automatic restarting when temperature returns to normal.
Reverse Voltage: Supply is protected from damage due to reverse polarity voltage across DC output terminals.

Cooling
Integral fan provides forced air cooling.

Operating Temperature
0° TO 71°C ambient; full output to 50°C.
Derate 2% per °C to 71°C.

Mechanical
5 x 8 x 11″

Convenience Functions
Inhibit/Remote Shutdown
Margin Check
Power fail/output good signal

Agency Approvals
U.L. Recognized
C.S.A. Certified
TUV Approved (Specify MKA)

SINGLE-OUTPUT MODELS

MODEL	VOLTS	AMPS	MODEL	VOLTS	AMPS
MK750-2-150	2	150	MK750-21-40	21	40
MK1000-2-200	2	200	MK1000-21-53	21	53
MK1500-2-300	2	300	MK1500-21-80	21	80
MK750-5-150	5	150	MK750-24-35	24	35
MK1000-5-200	5	200	MK1000-24-47	24	47
MK1500-5-300	5	300	MK1500-24-70	24	70
MK750-12-65	12	65	MK750-28-30	28	30
MK1000-12-87	12	87	MK1000-28-40	28	40
MK1500-12-130	12	130	MK1500-28-60	28	60
MK750-15-55	15	55	MK750-36-24	36	24
MK1000-15-73	15	73	MK1000-36-33	36	33
MK1500-15-110	15	110	MK1500-36-48	36	48
MK750-18-46	18	46	MK750-48-18	48	18
MK1000-18-61	18	61	MK1000-48-25	48	25
MK1500-18-92	18	92	MK1500-48-36	48	36

NOTE: Consult factory for non-standard voltages.

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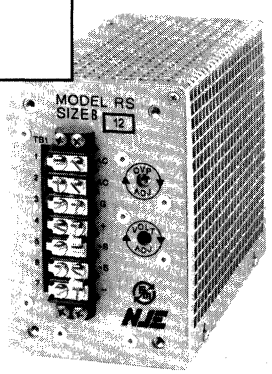
NJE POWER SUPPLIES

LINEARS



For Low-Noise And High Reliability

Our RS Series is designed for extremely high reliability in applications where an open-frame design is not desirable. These fully enclosed linear power supplies feature a 5-year warranty and are available in many 'industry-standard' models. Output ranges from 2 to 500 volts, up to 175 amps.

OPTIONS

- Special Input Voltage
- Series Start
- Thermostat
- Load-Sharing Redundancy

MANY RACK OPTIONS

- Standard 16″ And 21″ Trays
- Sequential Starting
- Custom Front Panels & Assemblies
- Meters
- Chassis Slides
- Special Finishes
- Plus Others . . .

SPECIFICATIONS

Input:
Voltage: 105-132V rms
Protection: fuse

Output
Line Regulations: 0.01% + 1 mv
Load Regulation: 0.01% + 1 mv
Ripple & Noise: 1.0 mv rms; 3 mv, Pk-Pk
Transient Response: 50 microseconds to 0.1%
Stability: (long-term drift/24-hr. period): 0.1%
Overshoot (on or off): None

Protection
Current (fold-back adjustment): 75% – 125%
Voltage: Internal crowbar standard 5-volt models, optional on all other

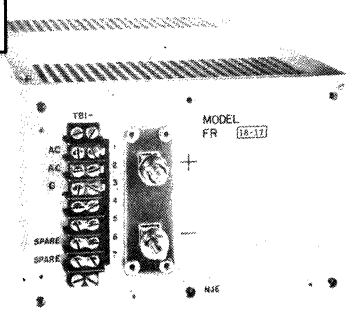
Remote Programming
Resistance: 500 ohms/volt
Voltage: 1 volt per volt

Remote Sensing: Provided

Temperature Range:
Operating: – 20°C to + 71°C
Storage: -55°C to + 85°C

FERRORESONANT

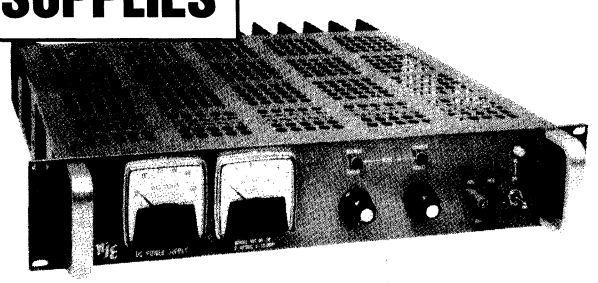
The FR Series of ferroresonant power supplies provide the ultimate in reliability. They are available in standard case sizes with efficiency ratings of up to 90%.



For Ultimate Reliability

- 8.5 - 50 Volts, Up To 100 Amps
- Many Standard And Custom Models Available Which Provide Up to 2500 Watts
- Inherent Overload Plus Over-Voltage Protection
- Inherent Input & Surge Suppressing
- Both 50 And 60 Hz Operation
- More Efficient Than Switchers

LAB SUPPLIES



The SVC series for general purpose laboratory and test equipment use. All supplies have excellent regulation in both the constant voltage and constant current modes. All supplies are equipped with front panel meters for voltage and current monitoring.

FIVE YEAR WARRANTY

A PRODUCT OF

ELECTRONIC MEASUREMENTS INC.

CALL TOLL FREE 1-800-631-4298

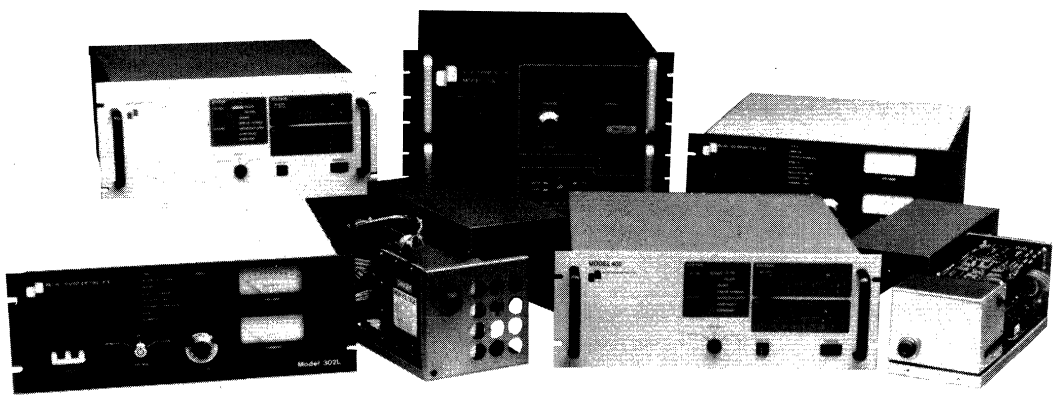
405 Essex Road, Neptune, New Jersey 07753, In NJ, HI, AL & Can. 908-922-9300, TELEX 132-424, FAX 908-922-9334

a.l.e. systems, inc.

150 Homer Avenue, Ashland, MA 01721 (508) 881-5252 • FAX (617) 235-6588

A.L.E. is a leader in the design and manufacture of advanced switchmode power conversion systems for high power, high voltage applications. Our broad experience solving complex high voltage problems for the OEM and laboratory environments include power supplies for dye, excimer, TEA, vapor, Yag, CO_2, lasers and other pulsed power applications world wide.

Capacitor Charging Supplies: The A.L.E. Series of high voltage capacitor charging supplies is available with power outputs of 500 to 15,000 Joules per second. All units are available with full scale voltages to 50kV. Most models are available in both fully instrumented and OEM versions. All types are highly resistant to external electromagnetic interference.



Supplies for CO_2 Lasers: A.L.E.'s patented converter topology produces a controlled high voltage current source for operating CW CO_2 lasers. Available with output powers of 250W and 500W and operating voltages of 4.5kV to 24kV, these units allow ballastless operation of negative impedance discharges. A.L.E.'s CO_2 supplies provide strike potentials up to 40kV and can be operated in parallel for greater output.

High Voltage D.C. Supplies: A.L.E. also has the capability of producing high power D.C. supplies on a custom basis. Providing outputs of 2kW to 30kW and voltages to 80kV, A.L.E.'s converter capabilities encompass a broad range. Our proprietary high voltage conversion stages use a minimal number of multiplication stages resulting in very low levels of stored energy.

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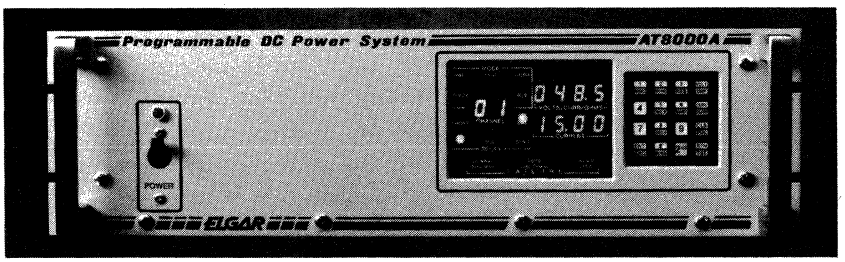
Programmable DC Power Systems

AT8000A Programmable DC Power System



- 16 channels, up to 19,200W at a single bus address
- 6 channels, up to 1200W, in a single 5.25" drawer
- Parallel programming
- Sub-modular construction
- Programmer, keyboard/display
- Confidence test on command
- Fault isolation to replaceable module level
- Qualifiable to MATE guidelines
- Programmable shut-down sequence

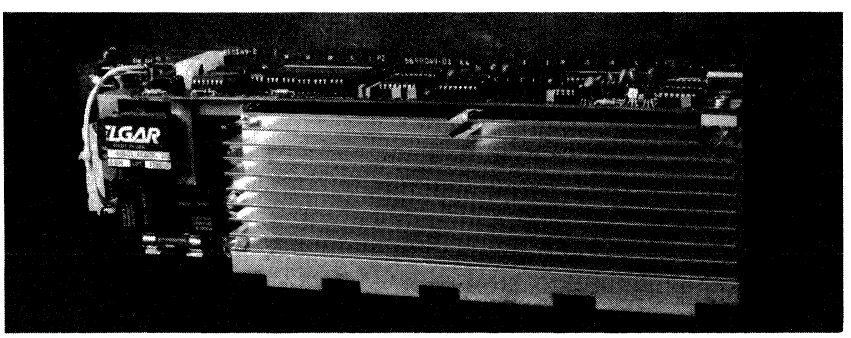
Elgar's AT8000A Programmable DC Power System holds from 1 to 6 totally independent channels of DC power in a 5.25" rack-mount chassis. By using expansion chassis, it can be expanded to 16 output channels controlled by an internal master programmer, either from the front-panel keyboard or remotely via IEEE-488 GPIB using one selectable bus address. It integrates programmer, power and load modules, built-in test equipment and all signal/load interfaces into the most compact and powerful package available.
Using 200W modules, a single-chassis system can deliver up to 1,200W. Adding additional modules and chassis can raise total power to 19,200W at a single bus address. Programmable paralleling can provide any combination of 200W increments up to 1,200W per channel.

Front-panel Keyboard/Display includes a 16 pad, multilevel keyboard with increment/decrement keys plus an LED display to speed and simplify programming. The system can show programmed values or, with the built-in test option, actual measured values, as well as channel number, voltage and current. It allows complete local/ manual control of most functions, alerts the operator to identified system malfunctions and prompts the operator for ease of programming and operation.

Internal Programmer can employ either user-friendly ABLE (Atlas Based Language Extension) or optional CIIL (Control Interface Intermediate Language) for complete voltage, current and general system control.

DC Power Modules employ a high efficiency linear design for fast response and low noise. Eight standard output voltage ranges are available: 0 to 7, 10, 20, 32, 40, 80, 160 and 320 VDC — and the design makes modification to accommodate special voltage application requirements quick and easy. Outputs are completely isolated and all operate in programmable voltage or constant current mode. There's over current sensing and over voltage protection with SCR crowbar shutdown. Load isolation (confidence) relays are standard and polarity switching relays are optional.

NEW Electronic DC Load Modules



Elgar's versatile new 300W Electronic DC Load Modules can be installed in the AT8000A Programmable DC Power Systems to simulate all real-world characteristics for testing, evaluation and burn-in of DC power supplies, batteries, capacitors and other power components.
The DC load modes of operation are: constant current, constant voltage, constant resistance, short circuit, and transient operations.
Programmable slew rates automatically duplicate the dynamic behavior of real-world load conditions, while analog modulation with external input accurately duplicates complex load waveforms. Remote sensing capabilities increase flexibility while maximizing programming and readback accuracy.

Auxiliary Drive Module (ADM)

Elgar's Auxiliary Drive Module (ADM) is a digital-to-analog converter which adds two versatile functions to AT8000A Systems. It can act as:

- Two programmable analog signals to drive external AC or DC power sources or other electronic equipment.
- A programmable connect/disconnect relay driver for controlling an external power relay.

With an ADM, a non-Elgar external bulk supply can take on the same personality as an AT8000A DC module — extending the AT8000A's normal power-per-module from 200W. ADM's occupy a single AT8000A slot and are addressed as a single channel from the front panel keyboard or over the IEEE-488 bus. The ADM has 2 separate isolated outputs (one each for programming voltage and current) plus two programmable relays which can serve as contact closures to activate external high-power disconnect/isolation relays or serve as status indicators. Optional Built-In Test (BIT) for readback of voltage and current measurement of the external device is also available.

60LO1
Maximum power 300W continuous
Voltage range 3-60V
Current ranges 0-6A, 0-60A
Resistance range 0.1-100 ohm
Modes of operation Constant current, constant voltage, constant resistance, short circuit and transient operations

120LO1
Maximum power 300W continuous
Voltage range 3-120V
Current ranges 0-3A, 0-30A
Resistance range 0.1-1.0K ohm
Modes of operation Constant current, constant voltage, constant resistance, short circuit and transient operations

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Programmable DC Power Systems

AT4000 Programmable DC Power System

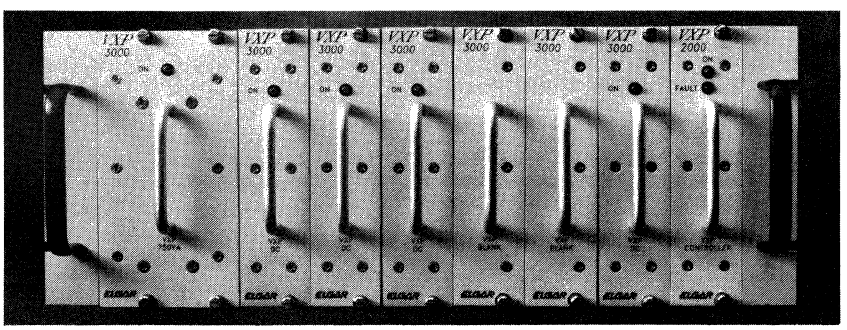
Elgar's AT4000 Programmable DC Power System is a half-rack version of the AT8000A. It holds from 1 to 3 "instrument-on-a-card" DC power supplies in a 7" chassis. Each chassis can provide up to three 150W channels — for a maximum of 450W per chassis. As in the 6-channel AT8000A, it is controlled from either the front-panel keyboard or remotely via the IEEE-488 BUS using one selectable bus address.

SPECIFICATIONS:
Configuration 1 to 3 output channels per 7" high, half rack chassis
Full rated output power Up to 150W per channel
Other specifications See AT8000A section

The AT4000 integrates programmer, power modules, built-in test equipment and all interfaces into a compact, powerful package. Software can be developed in the laboratory with the AT4000 and then be transferred to AT8000A production systems with no modifications.

By adding virtually the same powerful capabilities offered by the AT8000A at a reduced size, the AT4000 can support requirements for smaller manual bench-top DC power supplies, programmable bench-top power sources, ATE production test systems and verification test systems.

VXP3000 Programmable Power System



Elgar's VXP3000 Programmable Power System is the state-of-the-art solution for test systems where high power density, small size and flexibility are the key priorities.

The unique chassis design employs 1.8 inch wide slots which accept one controller module and up to eight power modules or three 750VA AC modules. The ability to provide both AC and DC power in one chassis and at one GPIB address is further enhanced by an Auxiliary Drive Module (ADM). This module allows the VXP controller to program external bulk or high power DC power supplies as if they were standard VXP power modules.

CONTROLLERS
IEEE-488 controller With ABLE or CIIL (MATE) syntax
Slave controller for use with expansion chassis or as an interface to a VXP1000 power programmer located in a VXI chassis

DC POWER MODULES
Output voltage range 0-7, 10, 14, 20, 32, 40, 60, 100 and 200 VDC; 1.8" standard width (up to 8 modules per chassis)
Full rated output power 200W for 10, 14, 20, 32, 40, 60, 100 and 200 VDC modules; 140W for 7 VDC module; 1.5 KW, 4-wide module available at 100 VDC
Parallelable For load sharing (available for 140W and 200W modules)
Series connectable Up to 400 VDC

AC POWER MODULES
Full rated output power 750 VA
Output voltage range 0-135 VAC, 3.6" double-wide size
Frequency range 350-999.9 Hz (45-350 Hz with reduced specifications)
Configurable For up to 2250 VAC single-phase or up to 6750 VA three-phase
Parallelable For higher power requirements by using the special plug-in VXP-LSM module
Auxiliary output A 0-26 VAC/2A output proportional to the main output voltages provided. An optional 5 VAC/5A auxiliary output is available.
Fast current limit protection Against short circuits
Efficiency Over 80%

SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

ELPAC POWER SYSTEMS

A Division of Elpac Electronics, Inc.
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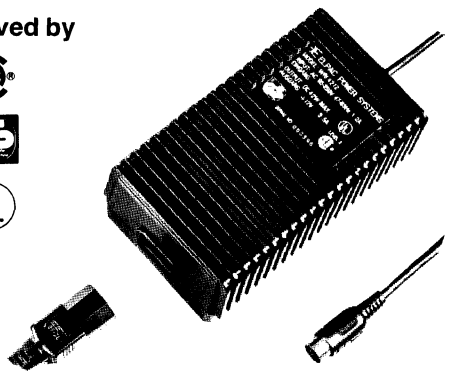
EXTERNAL POWER SUPPLIES

Approved by



WIDE RANGE INPUT SERIES SWITCHING POWER SUPPLY

PLUG THEM IN ANYWHERE IN THE WORLD!
APPROVED BY ALL MAJOR REGULATORY AGENCIES.

Designed to operate from any standard voltage source worldwide, qualifiable to Level B noise emission standards (FCC 20780 Level B: VDE 0871, Level B) making the entire Series available for residential and consumer applications. Features 90-250VAC, 47-440 Hz or 110-350 VDC; internationally approved IEC input connector; 13 standard tabletop models; Single, dual or triple outputs; optional output cables/connectors; warranty one year. Customs available. Contact Sales for Details.

REGULATED TABLETOPS - SINGLE OUTPUT

MODEL	OUTPUT V	OUTPUT A	MAX POWER	MIN LOAD
WRI 3012	12	2.5	30W	8W
WRI 3014	24	1.25	30W	4W
WRI 4212	12	3.5	42W	8W
WRI 4214	24	1.75	42W	8W
WRI 5215	30	1.75	52W	8W

WRI SERIES REGULATED TABLETOPS DUAL OUTPUT

MODEL	OUTPUT V	OUTPUT A	OUTPUT V	OUTPUT A	MAX PWR	MIN LOAD
WRI 2721	5	4.0	12	.5	27W	1W
WRI 3021	5	2.0	12	1.5/2.5	30W	8W
WRI 3025	5	3.0	5	3.0	30W	8W
WRI 4221	5	3.0	12	2.5/4.0	42W	8W

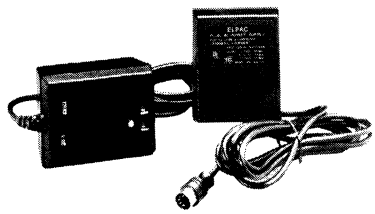
WRI SERIES REGULATED TABLETOPS TRIPLE OUTPUT

MODEL	OUTPUT V	OUTPUT A	OUTPUT V	OUTPUT A	OUTPUT V	OUTPUT A	MIN LOAD
WRI 2731	5	3.0	12	.5	-12	0.5	1W
WRI 3031	5	2.0	12	1.5/2.5	-12	0.5	8W
WRI 4231	5	3.0	12	2.5/4.0	-12	0.5	8W
WRI 4232	5	4.8	12	1.5/2.5	-12	0.5	8W

PS SERIES - UNREGULATED SINGLE OUTPUT WALLMOUNTS

Single output, 1.5 watts to 8 watts, UL & CSA approved. Input voltage: 120 VAC, 60 Hz, Output connector: Output jack on a 6ft two-conductor cable; Operating temperature 0-30C; thermal current limited; input to output isolation: 1250 volts.

MODEL	OUTPUT VOLTS/AMPS	CONNECTOR	MAX NO LOAD	MIN FULL LOAD	SIZE L x W x H
PS 027	9.0v, 0.3A	female	14.0v	9.0v	1.40 x 1.72 x 2.24
PS 045	9.0v, 0.5A	male	14.0v	9.0v	1.65 x 2.00 x 2.44
PS 033	12.0v, 0.4A	female	16.0v	12.0v	1.65 x 2.00 x 2.44



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WM SERIES REGULATED WALLMOUNTS

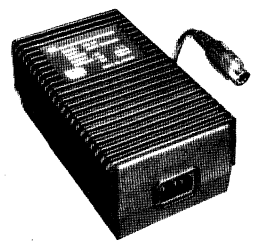
Single and multiple output; 2.5 watts to 15 watts, UL 1310 Listed, CSA approved. Input voltage: 115 VAC, 60 Hz; Output ripple: 20 millivolts (p-p); operating temperature 0 to 40 degrees C; standard 5 pin DIN connector; combined regulation ±5%; fusing: internal, non-replaceable; thermal current limited; dielectric voltage: 1500 VAC, RMS.

MODEL	OUTPUTS 1	2	3	CONNECTOR TYPE
WM 025	+5v, 500mA	—	—	760
WM 053	+5v, 380mA	-5v, 180mA	+12v, 180mA	DIN
WM 063	+5v, 380mA	-12v, 180mA	+12v, 180mA	DIN
WM 075	+5v, 1.5A	—	—	DIN
WM 093	+5v, 860mA	-5v, 300mA	+12v, 300mA	DIN
WM 112	+5v, 800mA	—	-12v, 600mA	DIN
WM 113	+5v, 860mA	-12, 300mA	+12v, 300mA	DIN
WM 144	+12v, 1.2A	—	—	DIN

WM SERIES REGULATED TABLETOPS

Single and multiple output; 10 watts to 23 watts; UL 1310 Listed, CSA approved. Specification same as wallmounts with options of cords, connectors and shielded output cable.

MODEL	OUTPUTS 1	2	3	CONNECTOR TYPE
WM 100	+5v, 1.0mA	-5v, 1.0	—	DIN
WM 150	+5v, 3.0A	—	—	DIN
WM 133TT	+5v, 860mA	-12v, 300mA	+12v, 300mA	DIN
WM 217	+5v, 2.0A	-12v, 900mA		DIN
WM 220-1	+5v, 2.0A	+12v, 500mA	-12v, 500mA	DIN
WM 230	+5v, 1.0A	-12v, 1.5/2.5A	—	DIN
WM 240	+24v, 1.0A	—	—	DIN



Approved for Common Market

CMI SERIES LINEAR POWER SUPPLIES PENETRATE THE EUROPEAN MARKET QUICKLY

Designed to help U.S. and Canadian companies penetrate the European market without the usual regulatory agency approval delays. All five models are TUV approved and accept input voltages ranging from 200-250 VAC, 50 Mz - typical voltages throughout continental Europe, the United Kingdom and Australia.

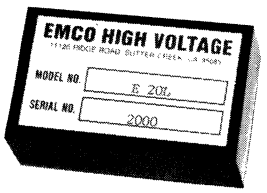
MODEL	OUTPUTS 1	2	3	CONNECTOR TYPE
CMI 0531	5v, 380A	+12, 180mA	-12v, 180mA	DIN
CMI 0811	5v, 1.5A	—	—	DIN
CMI 1231	5v, 1A	+12v, 300mA	-12v, 300mA	DIN
CMI 1511	5v, 3A	—	—	DIN
CMI 1411	12v, 1.2A	—	—	DIN
CMI 2411	24v,1A	—	—	DIN
WM217-EURO	5v, 2A	+12, 900mA	—	DIN
WM200-1 EURO	5v, 2A	+12v, 500mA	-12v, 500mA	DIN

FAX (714) 241-7293 TEL (714) 979-4440

PROPORTIONAL PC MODULES

100 to 10,000 VDC UP TO 3 Watts

E Series



ELECTRICAL SPECIFICATIONS

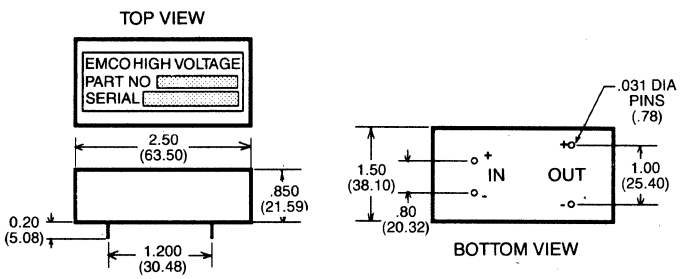
- Input/Output Floating
- 3,500 Volts Isolation*9
- Operating Temp −10 to +60 C
- Efficiency >60% Typ.
- Output 3 WATTS Min.

PHYSICAL SPECIFICATIONS

- Size: 2.5″ × 1.5″ × 0.85″
- Weight: 3 Ounces
- Fully Epoxy Encapsulated
- Four Pin P.C. Mounting
- Black Glass/Epoxy Case

FEATURES

- EFFICIENT DC TO DC CONVERSION
- EASY P.C. BOARD MOUNTING
- INPUT/OUTPUT PROPORTIONAL
- LOW COST, COMPACT MODULE
- INAUDIBLE >25 KHz CONVERTER
- VERY LOW RIPPLE AND NOISE
- RFI FILTERED, 3 INPUT SECTIONS
- EXCEPTIONAL RELIABILITY



Dimensional Tolerances: Inches .XX ± .03
Metric equivalents in parenthesis: (.XX ± .75)

* * SPECIFICATION TABLE

Model	Output/Volts	Input Volts	*1 Output Current	*1 Input Current	*2 Ripple	*3 Input Current NL	*4 Efficiency
E03	100 – 300	4-12	10 m.a.	350 m.a.	0.01%	125 m.a.	60%
E05	166 – 500	4-12	6 m.a.	350 m.a.	0.01%	125 m.a.	65%
E10	333–1,000	4-12	3 m.a.	350 m.a.	0.02%	125 m.a.	65%
E15L	500–1,500	4-12	2 m.a.	250 m.a.	0.02%	125 m.a.	65%
E15	500–1,500	4-12	2 m.a.	350 m.a.	0.5%	125 m.a.	65%
E20	666–2,000	4-12	1.5 m.a.	350 m.a.	0.25%	125 m.a.	70%
E20L	666–2,000	4-12	1.5 m.a.	350 m.a.	0.02%	125 m.a.	70%
E30	1,000–3,000	5-15	1 m.a.	310 m.a.	0.25%	150 m.a.	60%
E40	1,333–4,000	5-15	0.75 m.a.	310 m.a.	0.5%	150 m.a.	60%
E50	1,666–5,000	5-15	0.6 m.a.	310 m.a.	0.5%	150 m.a.	60%
E60	2,000–6,000	5-15	0.5 m.a.	310 m.a.	0.5%	150 m.a.	60%
E80	2,600–8,000	5-15	0.25 m.a.	290 m.a.	0.75%	150 m.a.	55%
E101	3,300–10,000	5-15	0.20 m.a.	250 m.a.	1.00%	150 m.a.	55%

*NOTES: 1. At Maximum Output Voltage. 2. Peak to Peak Ripple @ Maximum Output. 3. Max. Input Voltage, Nom. No load Current. 4. Maximum Output Power. 5. Add an N to Model Number for Reversed Output Polarity. (i.e. E10N). 6. The Output Power of the E SERIES is PROPORTIONAL to the Input Voltage. 7. At Full Input Voltage, the Output Voltages are typically +10% at NO LOAD to −10% at FULL LOAD. 8. Other Pin-Outs, Flying Leads, or Thru Holes available; Consult Factory. 9. Isolation relates to primary/secondary windings. Transformer operates at ½ rated output voltage; i.e. Model E60 transformer runs at 3000 volts, enabling secondary to float at 3,500 volts.

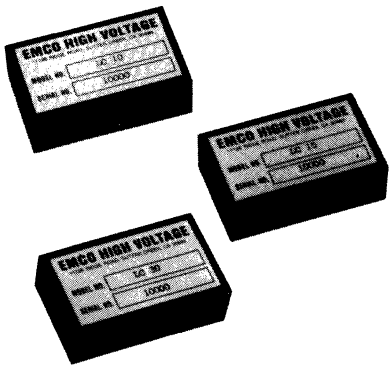
* * OTHER INPUTS/OUTPUTS AVAILABLE

EMCO
Emco High Voltage Company
11126 Ridge Rd., Sutter Creek, CA 95685
209-223-EMCO • TELEX: 510-100-8006 • FAX: 209-223-2779

LOW NOISE PC MODULES

60 to 2,000 VDC @ 1.5 Watts

L Series



FEATURES

- FOUR PIN-OUT OPTIONS or
- FLYING LEAD OPTION
- EXCEPTIONAL RELIABILITY
- VERY LOW RIPPLE AND NOISE
- R.F.I. FILTERING/SHIELDING
- FLOATING OPTION VOLTAGE
- LOW COST/HIGH PERFORMANCE
- SMALL COMPACT MODULE
- ONE YEAR LIMITED WARRANTY

PHYSICAL CHARACTERISTICS

Size: 2.5 x 1.5 x .85 inches
Weight: 3 Ounces (87 grams) Appx.
Packaging: Fully Encapsulated
Case Material: Black Glass/Epoxy
Potting Compound: Hard Polyurethane
Pins: 0.030 Diameter, 0.20 Minimum Length
Wires: #22 AWG Stranded

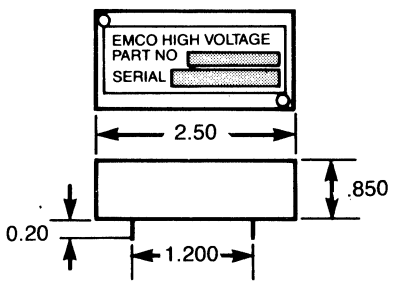
ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: 2 to 12 Volts
OUTPUT RANGE: SEE TABLE
REGULATION: Output Tracks Input
OUTPUT RIPPLE: 0.025% Peak to Peak
ISOLATION: 3,500 VOLTS (Primary to Secondary)
OPERATING TEMPERATURE: –10 to +60 deg C
STORAGE TEMPERATURE: –40 TO +85 deg C

*SPECIFICATION TABLE

MODEL	VOLTAGE	CURRENT
L03-	60 to 300	5.0 ma
L05-	100 to 500	3.0 ma
L10-	200 to 1,000	1.5 ma
L12-	250 to 1,200	1.3 ma
L15-	300 to 1,500	1.0 ma
L20-	400 to 2,000	.75 ma

* OTHER INPUTS/OUTPUTS AVAILABLE



MINIATURE LOW POWER CONVERTERS

250 to 2,400 VDC @ < 1 Watt

D Series

FEATURES

- MINIATURE CASE SIZE
- EXCEPTIONAL RELIABILITY
- FLOATING OUTPUT VOLTAGE
- SHORT CIRCUIT PROTECTION
- LOW COST/HIGH PERFORMANCE
- R.F.I. FILTERING/SHIELDING
- HIGH CONVERSION FREQUENCY

PHYSICAL CHARACTERISTICS

SIZE: 1.5 x 1.5 x .63 Inches
WEIGHT: 1.5 Ounces Appx.
MOUNTING: Four (4) P.C. Pins
PINS: 0.040 dia, 0.3 inches long
PACKAGING: Fully Encapsulated
CASE MATERIAL: Black Glass-Epoxy
POTTING: Hard Polyurethane

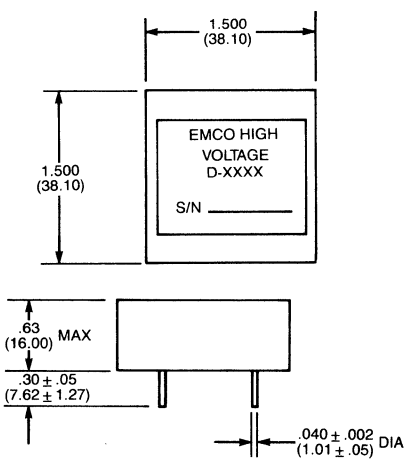
ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: 10 Volts
LOAD REGULATION: 5% (Half to Full Load)
LINE REGULATION: Output follows Input
OUTPUT RIPPLE: 0.5% Peak to Peak
OPERATING TEMPERATURE: –10 to +60 deg C
STORAGE TEMPERATURE: –40 to +85 deg C
ISOLATION: 3,000 Volts (Input to Output)

*SPECIFICATION TABLE

MODEL	VOLTAGE	CURRENT
D2400	2,400	50 UA
D1200	1,200	100 UA
D1000	1,000	100 UA
D500	500	200 UA
D250	250	250 UA

* OTHER INPUTS/OUTPUTS AVAILABLE



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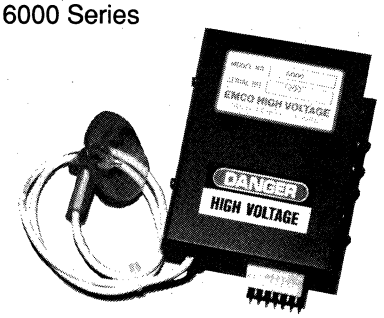
REGULATED MULTIPLE OUTPUT CRT SUPPLY

8,000 to 18,000 VDC @ 10 Watts

6000 Series



FEATURES

- EXCELLENT REGULATION
- VERY LOW OUTPUT RIPPLE
- EXCEPTIONAL RELIABILITY
- R.F.I. FILTERING/SHIELDING
- SHORT CIRCUIT PROTECTION
- MULTIPLE OUTPUT VOLTAGES
- HIGH CONVERSION FREQUENCY
- REVERSE POLARITY PROTECTED

APPLICATIONS

Cathode Ray Tubes • CRT Focus & Bias • Lasers • Photomultiplier Tubes Capacitor Charging • Computer Displays • Medical Electronics

ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: 24 Volts DC (21-28)
OUTPUT VOLTAGE: See Table
LOAD REGULATION: 0.1% Static
LOAD REGULATION: 0.1%/100 UA Dynamic
LINE REGULATION: 0.05% (21-28 Volts)
RIPPLE VOLTAGE: See Table
ADJUSTMENT RANGE: 5% Min
TEMPERATURE COEFFICIENT: 200 PPM/deg C Max
OPERATING TEMPERATURE: –10 to +60 deg C
STORAGE TEMPERATURE: –40 to +85 deg C

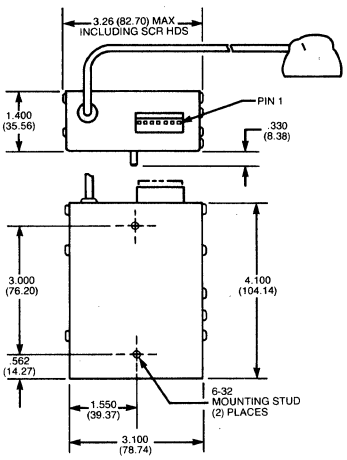
OPTIONS

- Input Voltages from 10 Volts to 36 Volts
- Two Auxiliary Outputs + or – up to 1,100 Volts
- Alternate Connectors (Amp 1-480425-0)
- Output Voltage Monitor
- Overvoltage Protection
- Remote on-off control
- Adjustability to ±25%

*SPECIFICATION TABLE

MODEL	VOLTAGE	CURRENT	RIPPLE
6008	8,000	1.00 ma	6 Vp-p
6010	10,000	1.0 ma	6 Vp-p
6012	12,000	0.83 ma	6 Vp-p
6014	14,000	0.71 ma	6 Vp-p
6016	16,000	0.625 ma	8 Vp-p
6018	18,000	0.555 ma	8 Vp-p

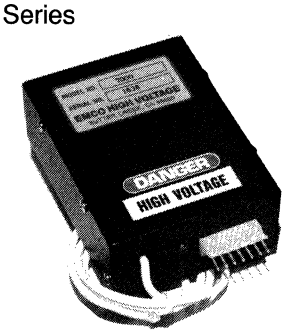
* OTHER INPUT/OUTPUTS AVAILABLE



FULLY ADJUSTABLE REGULATED HV SUPPLY

0 to 20,000 VDC @ 5 Watts

7000 Series



FEATURES

- 0 to 100% ADJUSTABLE OUTPUT
- VOLTAGE PROGRAMMABLE
- RESISTANCE PROGRAMMABLE
- EXCELLENT REGULATION
- R.F.I. FILTERING/SHIELDING
- SHORT CIRCUIT PROTECTION
- VERY LOW OUTPUT RIPPLE
- REVERSE POLARITY PROTECTED

APPLICATIONS

Cathode Ray Tubes • CRT Focus & Bias • Laser Power Source Photomultiplier Tubes • Capacitor Charging • Computer Displays • Test Equipment

ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: 24 Volts DC (21-28)
LOAD REGULATION: 0.1% Static
LOAD REGULATION: 0.1%/100 UA Dynamic
LINE REGULATION: 0.05% (21-28 Volts)
RIPPLE VOLTAGE: See Table
ADJUSTMENT RANGE: 5% Min
TEMPERATURE COEFFICIENT: 200 PPM/deg C Max
OPERATING TEMPERATURE: –10 TO +60 DEG C
STORAGE TEMPERATURE: –40 to +85 deg C

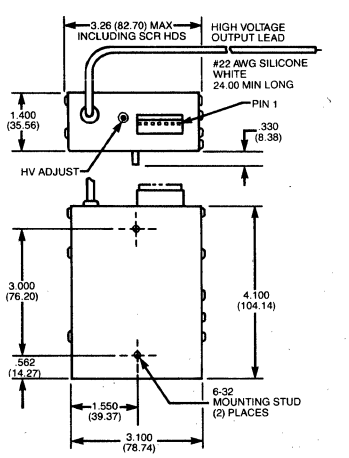
OPTIONS

- Negative Output Voltage
- Other input voltages
- Alternate mountings
- Alternate Connectors (Amp 1-480425-0)
- Output Voltage Monitor
- Overvoltage Protection
- Remote on-off control

*SPECIFICATION TABLE

MODEL	VOLTAGE	CURRENT	RIPPLE
7030	3,000	1.6 ma	6 Vp-p
7050	5,000	1.00 ma	10 Vp-p
7100	10,000	0.50 ma	20 Vp-p
7150	15,000	0.375 ma	30 Vp-p
7200	20,000	0.25 ma	40 Vp-p

* OTHER INPUT/OUTPUTS AVAILABLE



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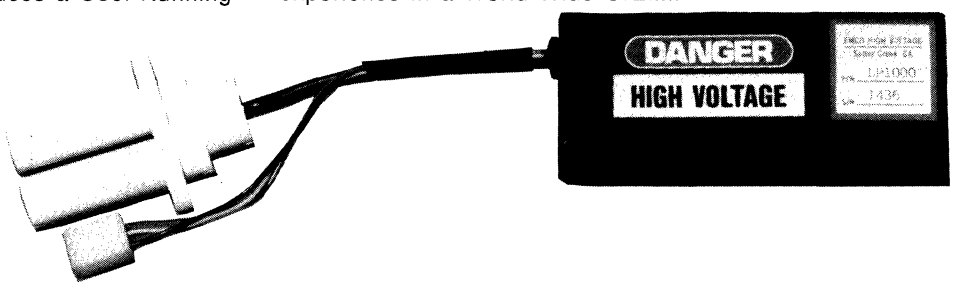
HE-NE LASER POWER SUPPLIES

DESCRIPTION

Today's demand for a quality end product can only be achieved by incorporating quality components and sub assemblies. This line of Helium Neon Laser Power Supplies boasts a True Efficiency of at least 85%. Improved efficiency produces a Cool Running Power Supply, which in turn, not only ensures increased reliability; but also allows Your product to perform at it's best, and Keep performing.
With over 20 years of High Voltage Power Supply Design and Manufacture experience in a World Wide O.E.M. market, our expertise allows us to produce the most efficient, reliable He-Ne Power Supply available. Numerous electrical and mechanical configurations are offered; custom modifications are readily accommodated.

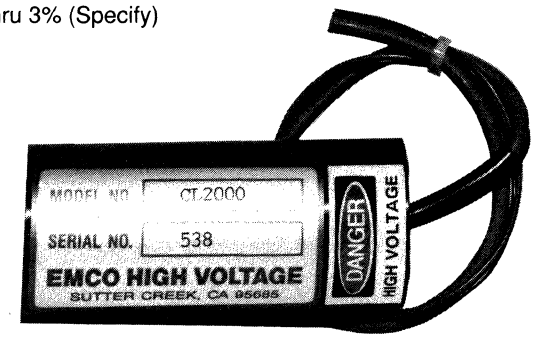


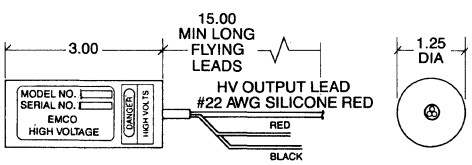
ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: 12 VDC (+/-2)
STARTING VOLTAGE: >8 KVDC (Nom)
OUTPUT VOLTAGE RANGE:
1,000VDC thru 3,000VDC (Specify)
OUTPUT CURRENT RANGE: 3mA
thru 7mA (Specify)
OUTPUT POWER: Up to 25 Watts
OUTPUT CURRENT RIPPLE RANGE:
.25% thru 3% (Specify)
OUTPUT CURRENT
REGULATION: <1%
EFFICIENCY:
85% Min.
OPERATING TEMPERATURE:
–10 to +50 Degrees C
STORAGE TEMPERATURE:
–25 to +75 Degrees C

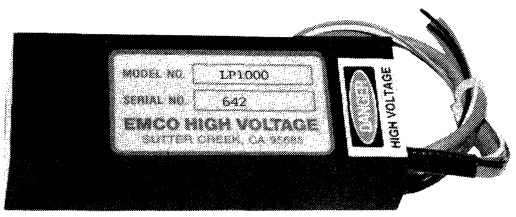
OPTIONS

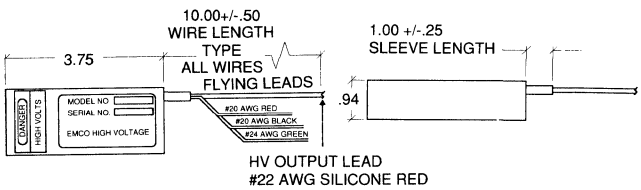
- Alternate Wire Terminations
  Alden, Amp, etc.
- * Mounting Variations
  End Mount, Pem Nuts, etc.
- Package Configuration
  Cylinder, Square, etc.
- Ttl Control
  Remote, Internal
- Current Adjust
  Remote, Internal





WIRE COLOR	FUNCTION
RED	(+) INPUT
BLACK	. RETURN
LARGE RED	(+) OUTPUT





WIRE COLOR	FUNCTION
RED	(+) INPUT
BLACK	INPUT/OUTPUT RETURN
GREEN	ON/OFF CONTROL
LARGE RED	(+) OUTPUT

NOTES:

1. ELECTRICAL SPECIFICATIONS:
   INPUT VOLTAGE: +12 VOLTS DC
   OUTPUT VOLTAGE: +1600 +/–200 VOLTS
   OUTPUT CURRENT: 6 MA +/–100 UA
   RIPPLE: 1% MAX
   STRIKING VOLTAGE: >8,000 VOLTS
2. DIMENSIONAL TOLERANCES: +/–.03
3. UNIT WEIGHT: APPROX 4 OZ
4. CONSTRUCTION: BLACK GLASS EPOXY
   SOLID ENCAPSULATION

NOTES:

1. ELECTRICAL SPECIFICATIONS:
   INPUT VOLTAGE: +12 VOLTS DC (10-16 VOLTS)
   OUTPUT VOLTAGE: +2100 +/–100 VOLTS
   OUTPUT CURRENT: 3.0 MA +/–.2 MA
   STRIKING VOLTAGE: >9,000 VOLTS
   ON/OFF CONTROL: OFF: <1 VOLT
   ON: >5 VOLTS
2. DIMENSIONAL TOLERANCES: +/–.03
3. OPERATING TEMP: 0 TO +170F
4. UNIT WEIGHT: APPROX 4.5 OZ

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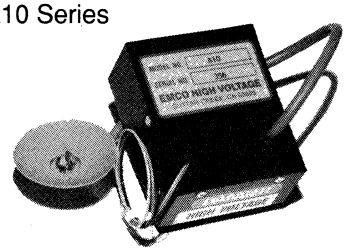
MINIATURE RUGGED CRT SUPPLY

10,000 VDC @ 10 Watts

A10 Series



FEATURES

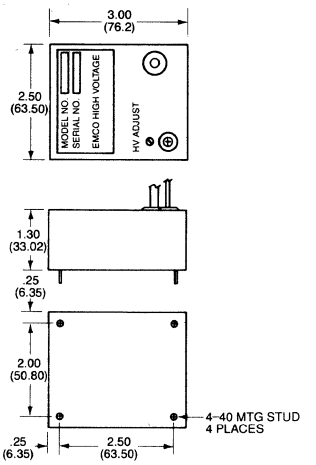
- PRECISION REGULATED & RIPPLE
- SHORT CIRCUIT PROOF
- REVERSE POLARITY PROTECTION
- RFI FILTERING/SHIELDING
- AIRBORNE APPLICATION TO 70,000 FEET

ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: +24 to +32 VDC
INPUT REGULATION: .01%
HIGH VOLTAGE OUTPUT: +10,000 VDC @ 1 MA
OUTPUT REGULATION: 0.025%
OUTPUT RIPPLE: 0.025%
ADJUSTMENT RANGE: +/-5%
AUXILIARY OUTPUT: +500 VDC @ 1mA
OPERATING TEMPERATURE: -55 to +80 Degrees C

OPTIONS

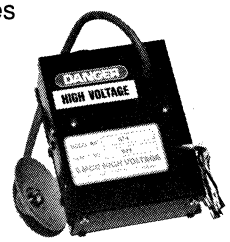
- Other Input Voltages
- Alternate High Voltage Outputs
- Auxiliary Output Voltages
- Single Output Only
- Alternate Input/Output Connectors



PRECISION REGULATED CRT

14,000 VDC @ 14 Watts

S14 Series



FEATURES

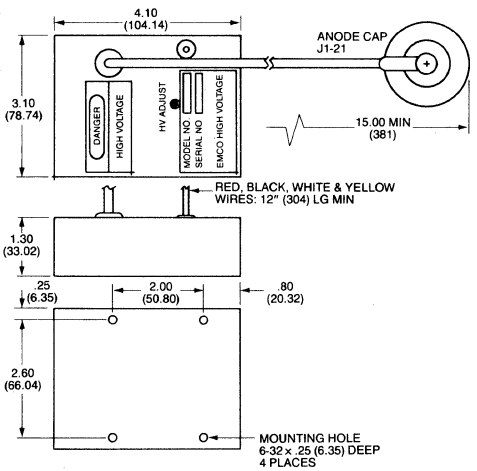
- PRECISION REGULATED & RIPPLE
- REMOTE ON/OFF CONTROL
- SHORT CIRCUIT PROOF
- REVERSE POLARITY PROTECTION
- RFI FILTERING/SHIELDING
- AIRBORNE APPLICATION TO 70,000 FEET

ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: +13 to +32 VDC
INPUT REGULATION: .05%
HIGH VOLTAGE OUTPUT: +14,000 VDC @ 1 MA
ADJUSTMENT RANGE: +/-5%
AUXILIARY OUTPUT: +75 VDC (Fixed) @ 50mA
OUTPUT REGULATION: 0.05%
OUTPUT RIPPLE: 0.05%
OPERATING TEMPERATURE: -55 to +80 Degrees C

OPTIONS

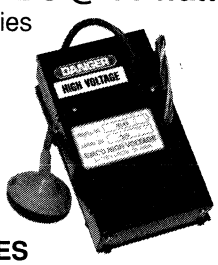
- Alternate High Voltage Outputs
- Alternate Video Voltages
- Single Output Only
- Input/Output Connectors



PRECISION CRT MULTIPLE OUTPUT

14,000 VDC @ 14 Watts

S143 Series

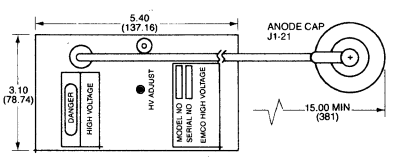


FEATURES

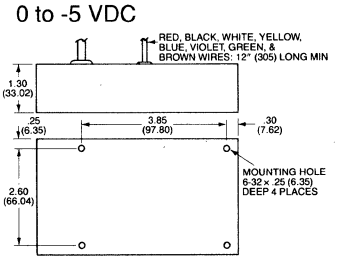
- PRECISION REGULATION & RIPPLE
- REMOTE ON/OFF CONTROL
- REMOTE SCREEN & FOCUS PROGRAMMABILITY
- SHORT CIRCUIT PROOF
- REVERSE POLARITY PROTECTION
- RFI FILTERING/SHIELDING
- AIRBORNE APPLICATION TO 70,000 FEET

ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE: +13 to +32 VDC
INPUT REGULATION: .05%
OPERATING TEMPERATURE: -55 to +80 degrees C
STORAGE TEMPERATURE: -55 to +90 degrees C
OUTPUT NO. 1:
HIGH VOLTAGE OUTPUT: +14,000 VDC @ 1 MA
OUTPUT REGULATION: 0.05%
OUTPUT NO. 2:
VIDEO VOLTAGE OUTPUT: +75 Volts (Fixed) @ 50 Ma
OUTPUT REGULATION: 0.5%
OUTPUT RIPPLE: 0.5%



OUTPUT NO. 3:
FOCUS VOLTAGE OUTPUT: +1,500 to 3,000 VDC @ 20 UA
OUTPUT REGULATION: 0.1%
OUTPUT RIPPLE: 0.1%
PROGRAMMING VOLTAGE: 0 to -5 VDC
OUTPUT NO. 4:
SCREEN VOLTAGE OUTPUT: +500 to +1,000 VDC @ 50 UA
OUTPUT REGULATION: 0.1%
OUTPUT RIPPLE: 0.1%
PROGRAMMING VOLTAGE: 0 to -5 VDC



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PRECISION PHOTOMULTIPLIER SUPPLY

1,000, 1,500 and 2,000 VDC @ 10 WATTS

PD Series

FEATURES

- EXCELLENT REGULATION
- LOW RIPPLE AND NOISE
- SHORT CIRCUIT PROOF AND ARC PROOF
- LOW TEMPERATURE COEFFICIENT
- EXTENSIVE INPUT FILTERING
- LOCAL/ REMOTE PROGRAMMING

PHYSICAL CHARACTERISTICS

Size: 4.1" x 5.1" x 1.5" (W x L x H)
Weight: 1.5 lbs. (approx.)
Case Material: Aluminum
Finish: Black Anodize
Input Connector: Molex 09-75-2074
Mating Connector: Molex 09-50-3071
Output Connection: Flying Lead, Shielding RG59A/U
Mounting: Four #6-32 Inserts
Packaging: Fully RTV Rubber Encapsulated

*SPECIFICATION TABLE

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT
PD1000	200 to 1,000	10 MA
PD1500	300 to 1,500	7 MA
PD2000	400 to 2,000	5 MA

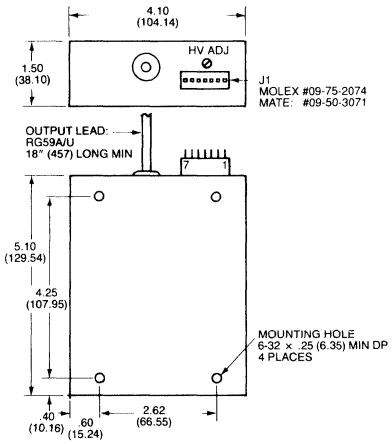
* OTHER INPUT/OUTPUT VOLTAGES AVAILABLE

OPTIONS

- Three Output Voltages
- Alternate Mounting
- Negative Output
- Alternate Input Voltages

ELECTRICAL SPECIFICATIONS

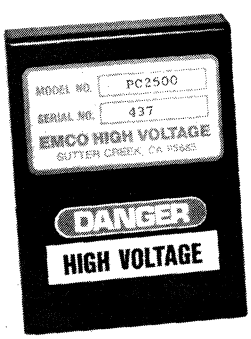
INPUT VOLTAGE: +24 to +30 VDC
OUTPUT VOLTAGE: See Table
LOAD REGULATION: 0.001%
OUTPUT REGULATION: 0.001%
RIPPLE: 4mV (P-P)
OUTPUT ADJUSTMENT RANGE: 20% to 100%
TEMPERATURE COEFFICIENT: 50 PPM/degrees C
OPERATING TEMPERATURE: -10 to +60 degrees C
STORAGE TEMPERATURE: -40 to +85 degrees C



P.C. MOUNT PHOTOMULTIPLIER SUPPLY

1,500, 2,000 and 2,500 VDC

PC Series



FEATURES

- HIGHLY REGULATED
- ULTRA LOW RIPPLE AND NOISE
- COST COMPETITIVE
- REMOTE VOLTAGE PROGRAMMING
- VOLTAGE MONITOR
- MINIATURE PACKAGE SIZE
- DIRECT PC BOARD MOUNT

OPTIONS

- Positive or Negative output (signified by a P or N)
- Short Circuit & Arcing Protection
- Current Monitor
- Alternate Pin-Out
- Reverse Polarity Protection

*SPECIFICATION TABLE

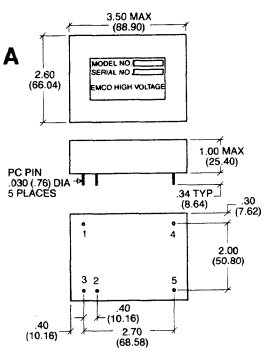
MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT
PC 1500	1,500 VDC	1 mA
PC 2000	2,000 VDC	.5 mA
PC 2500	2,500 VDC	.5 mA

* OTHER INPUT/OUTPUT VOLTAGES AVAILABLE

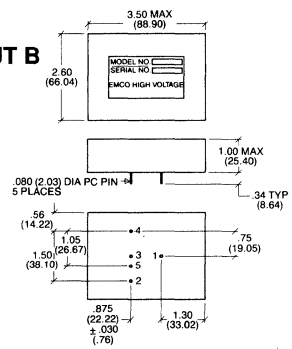
ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE:
+15 Volts DC (±5%)
OUTPUT VOLTAGE: See Table
CONTROL VOLTAGE:
0 to 10 Volts DC=0 to 2500 Volts DC
OUTPUT REGULATION: 0.004%
OUTPUT RIPPLE: 25 mV
OPERATING TEMPERATURE:
-10 to +60 DEGREES C
STORAGE TEMPERATURE:
-25 to +70 Degrees C

PINOUT A



PINOUT B



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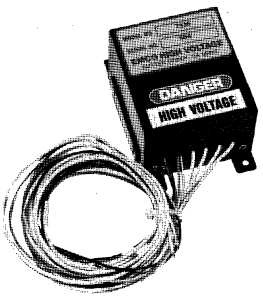
MULTIPLE OUTPUT CRT WITH FLOATING FILAMENT

3,250 VDC (+/-)

733 Series



DESCRIPTION

The Model 733 CRT High Voltage Power Supply is unique in its miniature package, offering multiple outputs, including a floating filament voltage supply. This package can be made available with alternate output voltages, in addition to those described here. The high voltage outputs are separate; +3,250 VDC @ 20 µA, and a –3250 VDC @ 200µA. Three auxiliary outputs are provided, one at –160 VDC @ 140 µA (Ref to the –3250 VDC), a +250 VDC @ 15 mA, and the Floating Filament of +6.3 VRMS @ 120 mA (With Respect to the –3250 VDC). Output Regulation and Ripple are rated at 1%. Input voltage is +14 to +16 VDC @ 560mA.

PHYSICAL CHARACTERISTICS

Size: 3.5" x 2.5" x 1.62" (L x W x H)
Weight: 12 Ozs.
Case Material: Aluminum
Finish: Black Anodize
Input Connections: Flying Leads
Output Connections: Flying Leads
Packaging: Fully RTV Encapsulated
Mounting: Thru Holes for #4 screws (4)

9,000 VDC

E09 Series

DESCRIPTION

The Model E09 is a High Voltage module, with one auxiliary output. This module is packaged in a compact P.C. mount configuration. Specified input voltage range is +9.5 to + 15VDC, with a high Voltage Output of +9,000 VDC @ 25µA (±500 volts). Oaximum at Full Load. The auxiliary output voltage is –1,000 VDC @ 120µA, with Output Regulation of <1%. Alternative voltages are readily available.

PHYSICAL CHARACTERISTICS

Size: 4.00" x 2.00" x .90" (Lx W x H)
Weight: 8 Ozs.
Case Material: Steel
Finish: Blue Texture Paint
Input Connections: P.C. Pins
Output Connections: H.V. -#22 AWG 30 KV Silicone Rubber Lead
Auxiliary: P.C. Pin
Packaging: Fully RTV Encapsulated
Mounting: P.C. Pins (4) .031 Dia.

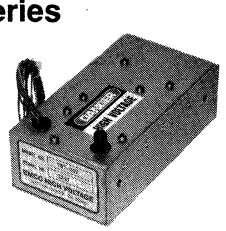
CUSTOM HIGH VOLTAGE SUPPLIES CRT/PMT/LASER, ETC.

For more than two decades, EMCO High Voltage Co. has designed and manufactured High Voltage Power Supplies for such applications as *HE-NE Lasers, C.R.T.'s, Photomultipliers,* and *Capacitor Charging Equipment.*

Specifically, we emphasize Precision, Low Power (up to 50 watts), High Voltage applications. Our product line ranges from lower voltage, low current photodetector bias supplies through medium voltage photomultiplier products, to C.R.T. power supplies with multiple outputs and floating filament voltages. We also manufacture High Reliability, wide temperature (–55 to +85 C) Airborne/Shipboard C.R.T. supplies.

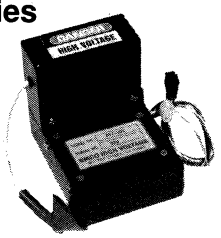
Custom requirements and modifications to existing standard products are welcome. EMCO's extensive design inventory and use of CAD/CAM design and manufacture, allows for prompt and cost competitive quotations; as well as timely and reliable prototype capabilities. Please feel free to contact your Representative, or the factory direct to discuss your custom requirements.

767 Series



Input Voltage: +10 to +30 VDC
High Voltage Output: +10,000 VDC @ 100uA
Output No. 2: +5 VDC @ 1 Amp
Output No. 3: +500 to +900 VDC, Adjustable
Output No. 4: -100 VDC
Output No. 5: -100 to 300 VDC, Adjustable
Output No. 6: +6.3 VAC RMS ±5% @ 500 mA
Op. Temp..: -55 C to +70C
Alt.: 70,000 Ft
Shock, Vibration, Humidity, EMI: DO160 Compliable

762 Series



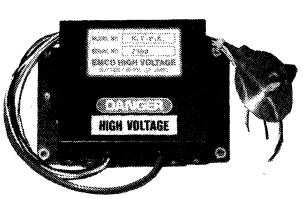
Input Voltage: +28 VDC
High Voltage Output: +14,000 VDC @ 500 UA
Output No. 2: +3,000 VDC @ 50uA
Output No. 3: +1,000 VDC @ 50uA
Output No. 4: +85 VDC @ 35 uA

LP Series

Input Voltage: +10 to +14 VDC
Output Voltage: 1,000 to 3,000 VDC
Output Current: 3 mA to 8 mA
Striking Voltage: +10,000 VDC
Efficiency: >75%

777 Series

Input Voltage: +26 @ 400 mA
High Voltage Output: +12,000 VDC ±2% @ 400 uA
Output No. 2: +800 VDC @ 1 mA
Output No. 3: -116 VDC @ 1 mA



EMCO
Emco High Voltage Company
11126 Ridge Rd., Sutter Creek, CA 95685
209-223-EMCO • TELEX: 510-100-8006 • FAX: 209-223-2779

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

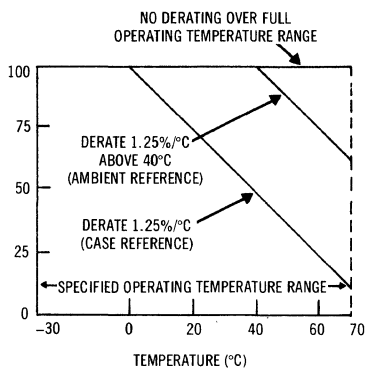


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

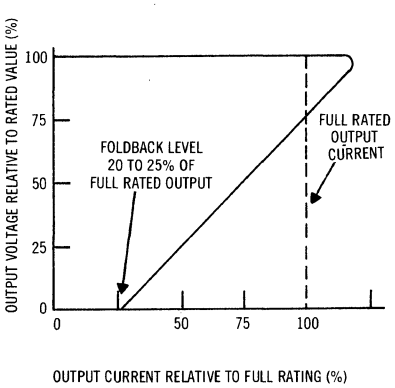


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

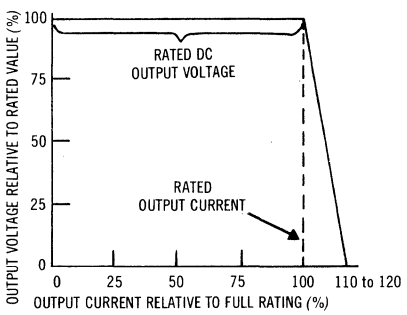


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

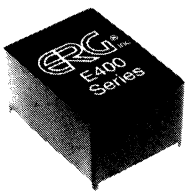
Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

DC-DC Converters

for power on the P.C. board up to 25W

Ideal for any end-use where up to 25W is needed from battery or other low-voltage source. No reason to design "special" multiple output power supplies for your unique application! Mount up to 4.2W per cu. in. on your P.C. board. Operating efficiencies to 85%. For as little as $1/W! We'll **transform** the way you look at DC-DC conversion!



Step-Down Regulated DC-DC Converters

ERG P/N	Input VDC
E424-050B50 (E337)	16-32 VDC
E412-050B50 (E339)	9-16 VDC
E405-120A20 (E399)	4-6 VDC

Output Voltage: 5.00 VDC +/− 3%
12.00 VDC +/− 3% (E399)
Includes Line & Load Regulation & Set Point

Output Current: 0 - 500 MADC

Operating Temperature: 0 - 70°C

Efficiency: 80% (Typical)

Size: 1" × 1.35" × .7" high

Other Input/Output Combinations Available!

Match our converter to your power need!

Your Power Requirements	ERG Converter Series	Options	Input	Output	Size	Weight	Package
Up to 3W	E700	Single, center tap (± voltages) Unregulated, regulated (single output only)	5,9,12,15 V DC standard	5-500 V DC (your choice)	unregulated: 1.1" (27.94 mm) × 1.2" (30.48 mm) × .91" (23.11 mm) high regulated: 1.43" (36.32 mm) × 1.50" (38.10 mm) × 1.03" (26.16 mm) high	30 gms. unregulated 40 gms. regulated	Plastic
	E500*	Single, center tap (± voltages)	5,9,12,15 V DC standard	5-500 V DC (your choice)	1.00" (25.40 mm) × 1.38" (35.05 mm) × 0.70" (17.78 mm) high	20 gms.	Plastic
Up to 6W	E1600	Center tap (± voltages) available	5,9,12,15 V DC standard	5-500 V DC (your choice)	1.30" (33.02 mm) × 1.88" (47.75 mm) × .82" (20.83 mm) high	44 gms.	Plastic
Up to 12W	E900	Dual output	5,12,15 V DC standard	5-500 V DC (your choice)	2" (50.80 mm) × 2.5" (63.50 mm) × .98" (24.9 mm) high	122 gms.	Aluminum
Up to 25W	E1200	Single output only	12,15 V DC standard (others available)	5-500 V DC (your choice)	2" (50.80 mm) × 2.5" (63.50 mm) × 1.19" (30.23 mm)	185 gms.	Aluminum

*For high-volume requirements, E500 delivers same performance as E700 at significantly lower unit cost!
Mounting: P.C. board standard
Encapsulation: All ERG converters are fully encapsulated
Isolation (in/out): 600V RMS (60 Hz. breakdown for 1 min.) standard
Temperature: 0–70° C. standard. Wider ranges available. 85° C. case max. 25° C. temp. rise typical for E1200
All specifications subject to change without notice.

Contact ERG with your special requirements:

Endicott Research Group, Inc.
2601 Wayne Street, Endicott, NY 13760
607-754-9187 FAX 607-754-9255

ERG Smart Force™ DC-AC Inverters compensate for the aging characteristics (brightness loss over time) of electroluminescent (EL) phosphors to improve EL lamp useful life. Smart Force™ Inverters automatically adjust operting voltage and frequency as the impedence of the EL lamp changes. Thus, providing an almost constant brightness throughout the life of the lamp. (See Typical Relative Brightness VS Time Performance Curve below.)

TAILORED INVERTERS:

Because all EL lamps are not electrically the same, ERG offers a Dedicated Series for different EL lamp brands. As a result of working jointly with the various manufacturers of EL to define each lamp brand's characteristics, ERG can offer the best matched inverter for ANY MANUFACTURERS EL LAMP!

Each DEDICATED inverter series is tailored specifically to the required voltages, frequency and load characteristics of the specific area of selected manufacturers EL lamp. Each Series offers four different output voltage configurations (providing different brightness levels), 3 different package sizes with a wide range of input voltages available providing maximum flexibility!

DEDICATED SERIES INVERTERS CONSIST OF:

JLA Series ... Imported EL Backlit Displays
LPS Series ... Loctite Luminescent Systems, EL Products

SMART FORCE™ DC-AC INVERTER SPECIFICALLY DESIGNED FOR IMPORTED LCD BACKLIGHTS!

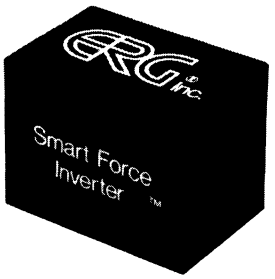
Endicott Research Group's JLA Series Smart Force™ DC-AC Inverter is tailored specifically to match the power requirements of EL backlites which are incorporated into imported LCD display modules. Designed to match the load characteristics of these imported EL lamps, the JLA series provides maximum performance and increased useful life.

The JLA Series Inverters offer the exclusive ERG Smart Force™ feature, which automatically adjust the operating voltage and frequency as the impedence of the EL lamp varies overtime. The low power consumption (typically less than 200 milliwatts per unit load, Brightness Code 2) allows the electroluminescent lamp to become an ideal light source in many battery operated devices.

JLA Series inverters are ideal for powering EL backlit modules from Densitron, Hitachi, Epson, NEC, Optrex, Satori, Seiko, Sharp, Toshiba and others...It is available in 4 different output voltage configurations and in 3 different package sizes (depending on output) for maximum, design flexibility.

SMART FORCE™ INVERTERS

FOR ELECTROLUMINESCENT LAMPS



GENERAL SPECIFICATIONS:

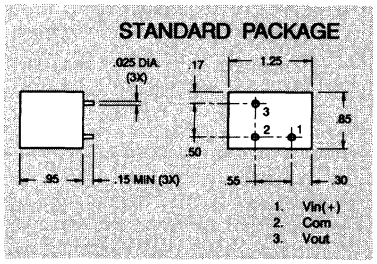
Input: 3, 5, 6, 9, 12, 15, 18, 24, 28 VDC (your choice)
Output: 60-130 V RMS @ 400-700 Hz. nom.
Package: Nylon, epoxy filled
Mounting: PCB Mount standard
Temperature Range:
Operating: -25° C to + 85°C
Storage: -40° C to + 100°C

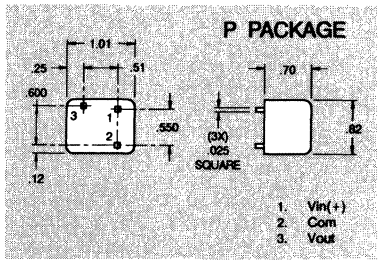
STANDARD PACKAGE

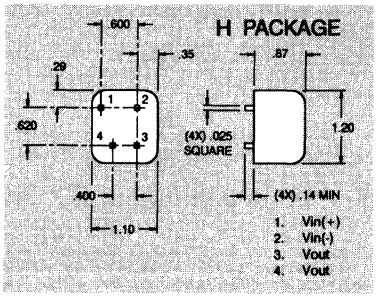
MINIATURIZED "P" PACKAGE

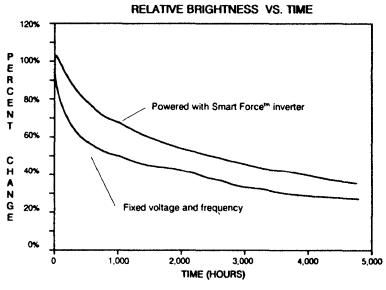
"H" PACKAGE SERIES IDEAL FOR LARGER EL LAMPS

SUPER "H" FOR HIGH EFFICIENCY APPLICATIONS









NO MATTER WHOSE EL LAMP...ERG HAS THE RIGHT INVERTER!!!

NO OTHER COMPANY IN THE WORLD OFFERS A WIDER RANGE OF DC-AC INVERTERS FOR EL LAMP APPLICATIONS!

AND NO OTHER COMPANY OFFERS THE SMART FORCE™ FEATURE!

ASK ABOUT OUR E200 SERIES DC-AC INVERTER FOR COLD CATHODE TUBE BACKLIGHT APPLICATIONS!

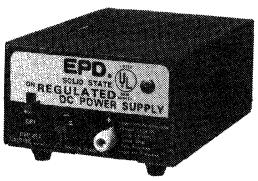
Contact ERG with your special requirements:

Endicott Research Group, Inc.
2601 Wayne Street, Endicott, NY 13760
607-754-9187 FAX 607-754-9255

EPD
ELECTRONICS INC.
P.O. BOX 2517, GARDENA, CA 90247
16921 S. Western Ave., No. 300, Gardena, CA 90247 (213) 515-4996

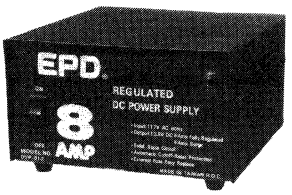
FULLY REGULATED DC POWER SUPPLY

CONVERTS 117AVC INTO 13.8V WITH:
- AUTOMATIC CUTOFF RESETABLE SHORT PROTECTION
- FUSE PROTECTION • LED INDICATOR



DVP 312 INPUT: 117VAC 60HZ
OUTPUT: 13.5VDC
3A CONSTANT
5A SURGE CURRENT

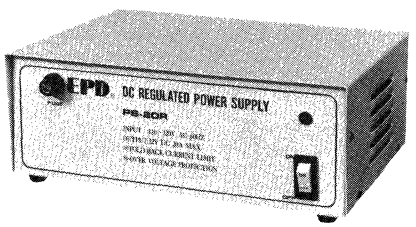
DVP 612 INPUT: 117VAC 60HZ
OUTPUT: 13.5VDC
6A CONSTANT
8A SURGE CURRENT



DVP 812 INPUT: 117VAC 60HZ
OUTPUT: 13.8VDC
8A CONSTANT
9A SURGE

HIGH POWER REGULATED DC POWER SUPPLY

INPUT: 117VAC 60HZ
OUTPUT: 13.8VDC
PS-20R 20 AMPERE MAX.
FUSE PROTECTION
OVERVOLTAGE PROTECTION
WEIGHT 12 LBS.
SIZE 4.4″H × 11.2″W × 10″D



WALL MOUNT AC-DC ADAPTORS

DV6-W3 MULTI-VOLTAGE (6) 300MA. 12W
INPUT: 117VAC 60HZ
OUTPUT: 3V 4.5V 6V 7.5V 9V 12V
POLARITY SWITCHABLE UNIVERSAL PLUG

DV6-W5 MULTI-VOLTAGE (6) 500MA. 12W
INPUT: 117VAC 60HZ
OUTPUT: 3V 4.5V 6V 7.5V 9V 12V
POLARITY SWITCHABLE UNIVERSAL PLUG

DV-6500
INPUT: 117VAC
OUTPUT: 6VDC 500MA. MINI PLUG

DV-9300
INPUT: 117VAC
OUTPUT: 9VDC 300MA. MINI PLUG

DV-9500
INPUT: 117VAC 60HZ
OUTPUT: 9VDC 500MA. MINI PLUG

DV-1250
INPUT: 117VAC 60HZ
OUTPUT: 12VDC 500MA. MINI PLUG

DV-1280
INPUT: 117VAC 60HZ
OUTPUT: 12VDC 800MA. MINI PLUG

REGULATED & SEMI-REGULATED POWER SUPPLIES

Ruggedly-constructed, low voltage D.C. power supplies for use in design, development, testing of transistor circuitry . . . for servicing and operating auto, aircraft, marinecraft radio, electronic equipment . . . for production line testing, industrial and educational laboratory work and many other applications.

Precision made and engineered to give unequalled performance life per dollar. Features include: Voltage regulation, AC ripple filtering, adjustable output voltage, large easy-to-read meters, isolated output terminals, 1-year warranty.

INPUT—*Regulated Models:* 105-125 V. AC. 60 Hz *Industrial and General Purpose Models:* 117 V. AC 60 Hz. Models available to fit W.E. and EIA racks. Custom-design or modification of standard units to your specs.

INVERTER — Transistorized. Converts 12 V. DC to 117 V. AC, 60 Hz to operate equipment from car, truck or boat battery, or other 12 V. DC source for camping, traveling, boating. Reverse polarity and short circuit protection.

REGULATED

Model	Figure	Output DC Volts	Output Current	Line Reg.**	Load Reg.*	Max. Ripple, RMS	Meters††	DC Imp. Ohms*	Size (H x W x D)	Wt. Lbs.	Net Price
PSR-12-25	A	0-25	0-500mA	0.01% + 2mV	0.01%	100μV	0-30V/600mA	.006	5¼ x 3⅛ x 9⅛	6	$259.50
PSR-12-50	A	0-50	0-250mA	0.01% + 2mV	0.01%	100μV	0-60V/300mA	.02	5¼ x 3⅛ x 9⅛	6	259.50

INDUSTRIAL

Model	Figure	Output DC Voltage	Output Amps.	Load Regulation* (V/A)†	Max. Ripple %	Meters††	DC Impedance Ohms*	Size (H x W x D)	Wt. Lbs.	Net Price
EF	B	0-28 0-14	0-5 0-5	0.9 (1-5A) 0.6 (1-5A)	1.0 1.0	0-50V, 0-6A	0.9 (1-5A) 0.6 (1-5A)	7 x 12 x 8½	21	$327.50
EFB	B	0-32 0-16	0-4 0-8	1.25 1.0	0.1 0.1	0-40/20V, 0-10A	1.25 1.0	7 x 12 x 8½	26	370.50
EFBR‡		0-32 0-16	0-4 0-8	1.25 1.0	0.1 0.1	0-40/20V, 0-10A	1.25 1.0	8¾ x 19 x 8½	34	429.50
GFL	C	0-125	0-5	1.5	0.5	0-150V, 0-5A	1.5	9¾ x 14¼ x 14¼	88	797.50
GFLR‡	H	0-125	0-5	1.5	0.5	0-150V, 0-5A	1.5	10½ x 19 x 14¼	100	867.50
NFB	C	0-32	0-15	0.4	0.75	0-50V, 0-25A	0.4	9¾ x 14¼ x 14¼	84	745.50
NFBR‡	H	0-32	0-15	0.4	0.75	0-50V, 0-25A	0.4	10½ x 19 x 14¼	97	797.50
PS-5	C	0-55	0-10	0.8	0.5	0-75V, 0-15A	0.7	9¾ x 14¼ x 14¼	70	709.50
PS-5R‡	H	0-55	0-10	0.8	0.5	0-75V, 0-15A	0.7	10½ x 19 x 14¼	89	765.50
PS-1000-32	D	0-32	0-30	0.2	0.75	0-50V, 0-30A	0.2	9¾ x 14¼ x 19¼	113	1035.50
PS-1000-55	D	0-55	0-20	0.5	0.5	0-75V, 0-30A	0.5	9¾ x 14¼ x 19¼	113	1035.50
PS-1000-125	D	0-125	0-8A	1.0	Less than 1%	0-150V, 0-10A	1.0	9¾ x 14¼ x 19¼	113	1035.50

GENERAL PURPOSE

D-612T	B	0-16 0-8	0-10 0-10	0.44 (3-10A) 0.3 (3-10A)	0.5 @ 5A 2 @ 10A	0-20V, 0-10A	0.44 (3-10A) 0.3 (3-10A)	7 x 12 x 8½	22	$249.50
H	B	12 (adj.) 6 (adj.)	0-10 0-20	0.23 (3-10A) 0.15 (3-20A)	5 5	0-20V, 0-30A	0.23 (3-10A) 0.15 (3-20A)	7 x 12 x 8½	30	279.50
EC-1	E	12 (adj.)	0-5	1.4	0.5	None	1.4	10¾ x 4⅜ x 6½	11	119.50
EC-2	E	0-16	0-5	1.8	0.5	0-20V, 10A	1.8	10¾ x 4⅜ x 6½	11	185.50
PS-30	F	12 (adj.)	0-30	0.12 (6-30A)	1	0-20V, 0-50A	0.27	9¾ x 14¼ x 14¼	68	557.50
PS-50	F	12 (adj.)	0-50	0.17	0.5	0-20V, 0-50A	0.17	9¾ x 14¼ x 19¼	106	755.50

INVERTER

TI250B	J	**Input:** 12 vdc. **Output:** 117 vac, 60 Hz, 250 **VA** max. **Voltage Regulation:** 15% max. no load to full load constant battery voltage. **Frequency Regulation:** 4 Hz max. no load to full load.	4½ x 10 x 7½	13	207.50

‡Rack mounted version.
*No-load to full-load unless otherwise specified.
†Output voltage change for each ampere of output current change, except on regulated units, % applies for either line or load.
††All 2% accuracy except 5% for general purpose units. Rectifiers: Selenium and Silicon ("avalanche" characteristics on Industrial units).
**From 105-125 VAC.

EPSCO, INC. 1115 HILLTOP DRIVE UNIT A2, ITASCA, IL 60143-1120 • (708) 250-0410 • FAX (708) 250-0521

Prices Subject to Change Without Notice.

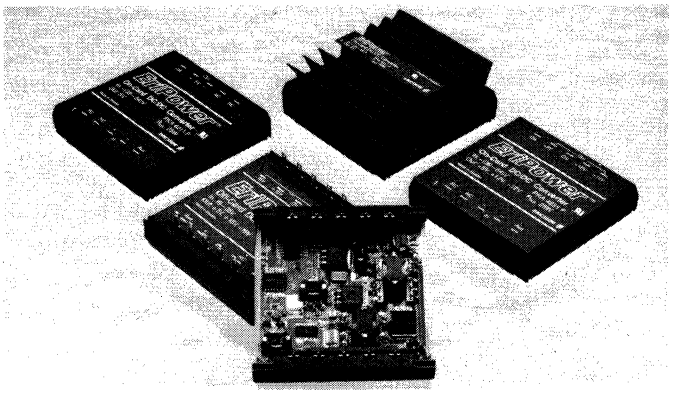
ERICSSON EriPower™

THE RELIABLE SOURCE

DC/DC Converters 25 - 40W

PKA Series

- **-45°C to +85°C ambient temperature range, no derating**
- **+115°C max. case temperature**
- **MTBF>2,000,000 hours at +45°C per MIL -HDBK 217E**
- **Efficiency 80-85%**
- **500VDC isolated or non-isolated models**
- **Complete, no extra filters or heatsinks required**
- **Parallelable for redundancy and power upgrading**
- **Compact, 3" x 3" x 0.7"**



Compact On-Card and Off-Card mountable power modules in hybrid technology

The PKA-series of DC/DC converters consists of 40 models, available in non-isolated or 500VDC input/output isolated versions. The single, dual and triple output converters with input ratings of 19-35VDC or 39-64VDC and with an output power of 25-40W, are recognized as the industry standard for miniaturized On-Card converters. The ambient temperature range is -45°C to +85°C without derating. Low profile 40W models with an additional height of only 2 mm (compared to the 25-30W models) have a temperature range of -45°C to +65°C. Using thickfilm hybrid technology, very efficient thermal management combined with a 300kHz switching frequency has made it possible to achieve a verified MTBF of >200 years. Two transistor topologies based upon proprietary drive and control circuits have facilitated the use of only highly reliable ceramic capacitors instead of electrolytics (one of the keys to the MTBF-figures). The reliability makes them ideal in Telecom, Datacom and Medical applications. Their low weight and height in addition to their electrical and mechanical ruggedness offer possibilities for use as distributed power sources directly on PCB:s (On-Card) or Chassis (Off-Card) mounted in Industrial, Airborne and other demanding applications. Special design care has been taken regarding the mechanical performance. Consequently, the vibration, shock and bump specifications normally associated with components such as resistors and capacitors. Output characteristics together with accurate laser trimming of output voltages in the highly automated production line makes it possible to parallel the PKA:s in great numbers.

Product Program

V_{in}	V_o/I_omax		$P_o$max	Non-isolated		Isolated	
	O/P1	O/P2 & P3		On-Card	Off-Card	On-Card	Off-Card
24V=	5V/5A		25W	PKA2212P	PKA2212C	PKA2211P1	PKA2211CI
	12V/2.5A		30W	PKA2314P	PKA2314C		
	12V/2A	12V/2A	30W			PKA2323PI	PKA2323CI
	15V/1.6A	15V/1.6A	30W			PKA2325PI	PKA2325CI
	+ 5V/5A	± 12V/1A	25W	PKA2231P	PKA2231C	PKA2231PI	PKA2231CI
	+ 5V/5A	± 15V/0.8A	25W	PKA2232P	PKA2232C	PKA2232PI	PKA2232CI
48V=	5V/5A		25W	PKA4211P	PKA4211C	PKA4211PI	PKA4211CI
	5V/8A		40W	PKA4411P	PKA4411C	PKA4411PI	PKA4411CI
	5V/8A		40W	PKA4411PL		PKA4411PIL	
	+ 12V/2.5A		30W	PKA4313P	PKA4313C		
	+ 12V/2A	12V/2A	30W	PKA4321P	PKA4321C		
	12V/2A	12V/2A	30W			PKA4323PI	PKA4323CI
	+ 5V/5A	± 12V/1A	25W	PKA4231P	PKA4231C	PKA4231PI	PKA4231CI
	+ 5V/5A	± 15V/0.8A	25W	PKA4232P	PKA4232C	PKA4232PI	PKA4232CI

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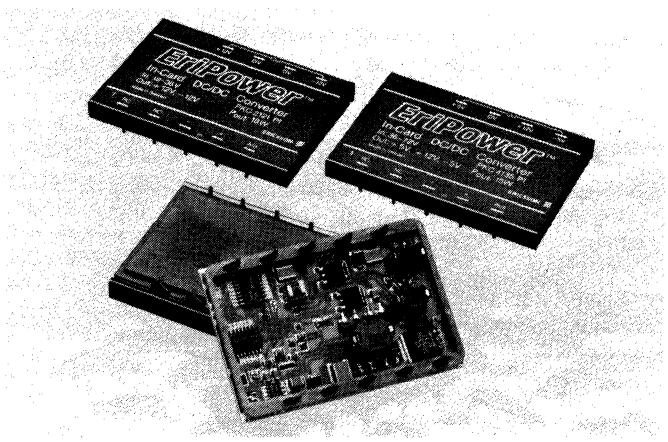
EriPower™

THE RELIABLE SOURCE

DC/DC Converters 15 - 18W

PKC Series

- **-45°C to +85°C ambient temperature range, no derating**
- **+115°C max. case temperature.**
- **MTBF>2,000,000 hours at +45 C per MIL -HDBK 217E**
- **Efficiency 80-87%**
- **500VDC isolation**
- **Complete, no extra filters or heatsinks required**
- **Parallelable for redundancy and power upgrading**
- **All outputs well regulated**
- **Compact, 2.17" x 3.15" x 0.42"**
- **Low profile 0.33" (In-Card mounting)**



500VDC isolated compact On-Card and In-Card mountable power modules in hybrid technology

The PKC-series of DC/DC converters consists of 14 models with input ratings of 19-35VDC or 36-72VDC and with an output power of 15-18W. They are specifically designed for distributed power supply requirements and their outputs can easily be parallelled for power upgrading or redundancy. The ambient temperature range is -45°C to +85°C without derating. The converters can either be mounted as On-Card with a maximum height over the PCB of 10.7 mm/0.42" or as In-Card, i.e. into a punched hole in the PCB, with a height over the board of 8.5 mm/0.33" thus allowing 3TE/0.6" board spacing in a rack. The PKC-series converters has up to three well regulated outputs which will stay within 3% of their nominal voltage for all specified load, line and temperature ranges.

The PKC-series of DC/DC converters does normally not require external components even when used in sensitive applications. Conducted RFI is within the VDE 0871 curve A and FCC 20780 class A. The mechanical design conforms to the IEC 68-2 specifications, normally appliable to discrete components such as resistors and capacitors.

Surface mount hybrid technology provides excellent thermal management and with the 300kHz switching frequency it has been possible to use ceramic capacitors only within the design thus achieving an MTBF>200 years. Together with the low weight (50g/1.76ozs.) this makes them ideal for Telecom, Datacom, Airborne, Industrial and Medical applications.

Product Program

V_{in}	V_o/I_omax			$P_o$max	Article
	O/P1	O/P2	O/P3		
24V=	5V/3A			15W	PKC2111PI
	12V/1.5A			18W	PKC2113PI
	+ 12V/1.2A		- 12V/1.2A	18W	PKC2121PI
	+ 15V/1A		- 15V/1A	18W	PKC2126PI
	+ 5V/3A	+ 12V/0.6A	- 12V/0.6A	15W	PKC2131PI
	+ 5V/3A	+ 15V/0.5A	- 15V/0.5A	15W	PKC2132PI
	+ 5V/3A	+ 12V/0.6A	- 5V/1A	15W	PKC2135PI
48V=	5V3A			15W	PKC4111PI
	12V/1.5A			18W	PKC4113PI
	+ 12V/1.2A		- 12V/1.5A	18W	PKC4121PI
	+ 15V/1A		- 15V/1A	18W	PKC4126PI
	+ 5V/3A	+ 12V/0.6A	- 12V/0.6A	15W	PKC4131PI
	+ 5V/3A	+ 15V/0.5A	- 15V/0.5A	15W	PKC4132PI
	+ 5V/3A	+ 12V/0.6A	- 5V/1A	15W	PKC4135PI

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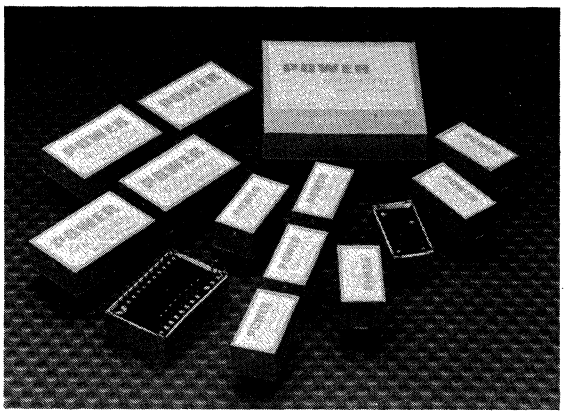
ERICSSON POWER industries

DC/DC Converters 0.3 - 6W



- **MTBF > 200,000 hours at 30°C according to MIL-HDBK 217 D (4 PIR and 7 PIR 150,000 hours)**
- **Isolation voltage 500 VDC (33 PR has 2,500 VDC)**
- **Isolation resistance > 10 Mohm at 50 VDC**
- **High power density and low heat dissipation**
- **Single and dual output: 5,9,12,15, ± 15 and ± 18V**
- **Output voltage accuracy ± 5%, ± 2% on request (8 PIR has ± 1%)**
- **Permanent short circuit protection**
- **Input filter standard on all units**
- **RFI shielding standard on 4 PI, 7 PI, 8 PI and 33 PR, optional on 2 PI**
- **Operating temperature: -25° to +70°C**
- **Storage temperature: -50°C to +125°C**
- **All DIL 24 compatible units are available in 12 pins type X package**

Power Industries is a new series of 0.3 to 6W hybridized DC/DC converters, which offers single and dual 5, 9, 12 and 15V outputs from 5, 12, 24 and 48V inputs. The program includes both non-regulated and regulated converters plus special LAN versions. All for professional applications in telecom and industrial.
A high switching frequency 80-120 kHz together with an efficient temperature management gives power densities higher than conventional circuit designs in the same standard housings. Short circuit protection is utilized with a fold-back characteristic, to minimize power dissipation.
The case material is self extinguishing and the potting is approved for aeronautical applications. The units are tested under +40°C and +95% RH during 56 days.

Regulated DC/DC converters PR,PPR,PIR

Input	Power	Outputs							
		5V	Io(mA)	9V	Io(mA)	12V	Io(mA)	15V	Io(mA)
5VDC	0.5-2W	2 PIR 0505 S	100			2 PIR 0512 S 2 PIR 0512 D	100 ± 80	2 PIR 0515 S 2 PIR 0515 D	100 ± 65
	1.5W	3 PIR 0505 S	300						
	2-3W	4 PIR 0505 S	400	*4 PIR 0509 S	270	4 PIR 0512 S 4 PIR 0512 D	210 ± 105	4 PIR 0515 S 4 PIR 0515 D	165 ± 85
	3-4W	7 PIR 0505 S	600			7 PIR 0512 S 7 PIR 0512 D	290 ± 145	7 PIR 0515 S 7 PIR 0515 D	230 ± 115
	5-6W	8 PIR 0505 S	1000			8 PIR 0512 S 8 PIR 0512 D	500 ± 250	8 PIR 0515 S 8 PIR 0515 D	400 ± 200
12VDC	0.5-2W	2 PIR 1205S	100			2 PIR 1212 S 2 PIR 1212 D	100 ± 80	2 PIR 1215 S 2 PIR 1215 D	100 ± 65
	1.5W	3 PIR 1205	300						
	2.25W			*33 PR 1209 S	- 250				
	2-3W	4 PIR 1205 S	500	* 4 PIR 1209 S	330	4 PIR 1212 S 4 PIR 1212 D	250 ± 125	4 PIR 1215 S 4 PIR 1215 D	200 ± 100
	3-4W	7 PIR 1205 S	600			7 PIR 1212 S 7 PIR 1212 D	330 ± 165	7 PIR 1215 S 7 PIR 1215 D	260 ± 130
	5-6W	8 PIR 1205 S	1000			8 PIR 1212 S 8 PIR 1212 D	600 ± 250	8 PIR 1215 S 8 PIR 1215 D	400 ± 200
24VDC	0.5-2W	2 PIR 2405 S	100			2 PIR 2412 S 2 PIR 2412 D	100 ± 80	2 PIR 2415 S 2 PIR 2415 D	100 ± 65
	2.5-3W	2 PPR 2405 S	500			2 PPR 2412 S 2 PPR 2412 D	250 ± 125	2 PPR 2415 S 2 PPR 2415 D	200 ± 100
	1.5W	3 PIR 2405 S	300						
	2-3W	4 PIR 2405 S	500			4 PIR 2412 S 4 PIR 2412 D	250 ± 125	4 PIR 2415 S 4 PIR 2415 D	200 ± 100
	3-4W	7 PIR 2405 S	600			7 PIR 2412 S 7 PIR 2412 D	330 ± 165	7 PIR 2415 S 7 PIR 2415 D	260 ± 130
	5-6W	8 PIR 2405 S	1000			8 PIR 2412 S 8 PIR 2412 D	500 ± 250	8 PIR 2415 S 8 PIR 2415 D	400 ± 200
48VDC	2.5-3W	2 PPR 4805 S	500			2 PPR 4812 S 2 PPR 4812 D	250 ± 125	2 PPR 4815 S 2 PPR 4815 D	200 ± 100
	1.5W	3 PIR 4805 S	300						
	5-6W	8 PIR 4805 S	1000			8 PIR 4812 S 8 PIR 4812 D	500 ± 250	8 PIR 4815 S 8 PIR 4815 D	400 ± 200

S-Single D-Dual *Special LAN-converter

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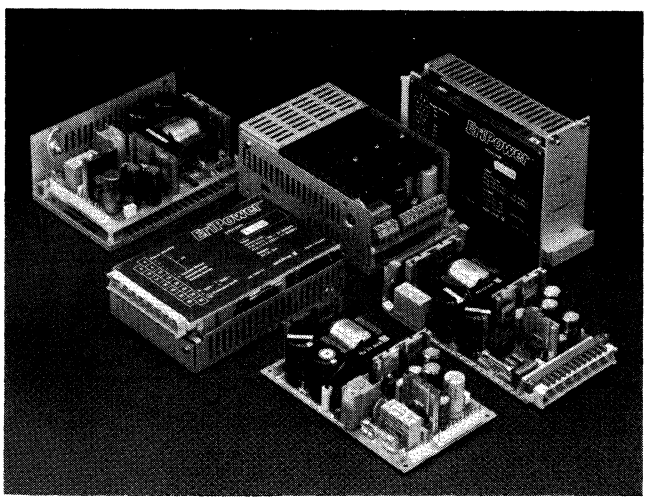
ERICSSON EriPower™

THE RELIABLE SOURCE

AC/DC Switching Power Supplies 60 - 100W

- **MTBF>300,000h at +35°C.**
- **Efficiency 78-87%**
- **Ambient temperature -10 to + 70°C.**
- **Open frame and Eurocard versions available.**
- **Input 115/230 VAC**
- **Interference suppression to VDE 0871B, FCC 15-JB**
- **VDE, UL, CSA approved.**
- **Agency approvals**
- **Designed to safety standards:**
  IEC 380, 435, 950
  VDE 0805, 0806
  UL 478, 1012
  CSA 22.2, No 143, 154, 220
  BS 6301
- **Protection against:** **Overload**
  Short circuit
  Overvoltage
- **Power fail signal**

3267



Rack mounting PLB 11

The PLB-series of EriPower™ Switching Power Supplies, constitute highly reliable MOSFET-switchers suitable for a wide range of professional OEM applications. The series conform to world safety standards stated by IEC, VDE, UL, CSA and BS. The series accomodate RFI-filters and conform to the regulations set by VDE and FCC. Input voltage can be selected to 115VAC or 230VAC by means of an on-board jumper.

The mechanical design of PLB 11 Plug-in units is in conformance with IEC 297-3 and DIN 41494 (the base for Euro-Rack or VME mechanical standards) while the PLB 62/63 are chassis versions with Pin Conectors respectively Screw Terminals of the principal supply.

The "Optimized Flyback Technology" used in the PLB series is the result of a long experience in Power Supply design. Special care has been taken in order to find a technology that besides offering cost effective designs also offers high reliability and high efficiency. Efficiency is typically 78-85% depending on output voltage. A power warning DC signal, proportional to the high voltage DC-level on the Hold-Up capacitors and consequently a measure of the stored energy, facilitates flexible Power Fail Signal designs.

Product Program

Output Volt Ampere			Max Power W	Typical Efficiency %	Model number 1)		
O/P 1 Regulated	O/P 2	O/P 3 Regulated			19" rack type	Pin connector	Screw connector
5V/20A			100	79	PLB 1111-	—	PLB 6311-
12V/8A			100	82	PLB 1112-	PLB 6212-	—
24V/4A			100	84	PLB 1115-	PLB 6215-	—
28V/3.5A			100	87	PLB 1116-	—	PLB6316-
48V/2A			100	85	PLB 1118-	PLB 6218-	—
+ 5V/8A	- 5V/4A		60	79	PLB 1121-	PLB 6221-	—
+ 12V/3.6A	- 12V/1.8A		65	82	PLB 1122-	PLB 6222-	—
+ 15V/3A	- 15V/1.7A		70	82	PLB 1123-	PLB 6223-	—
+ 5V/8A	+ 12V/2A	- 12V/0.8A	60	78	PLB 1131-	PLB 6231-	—
+ 5V/8A	+ 15/2A	- 15V/0.8A	60	78	PLB 1133-	PLB 6233-	—

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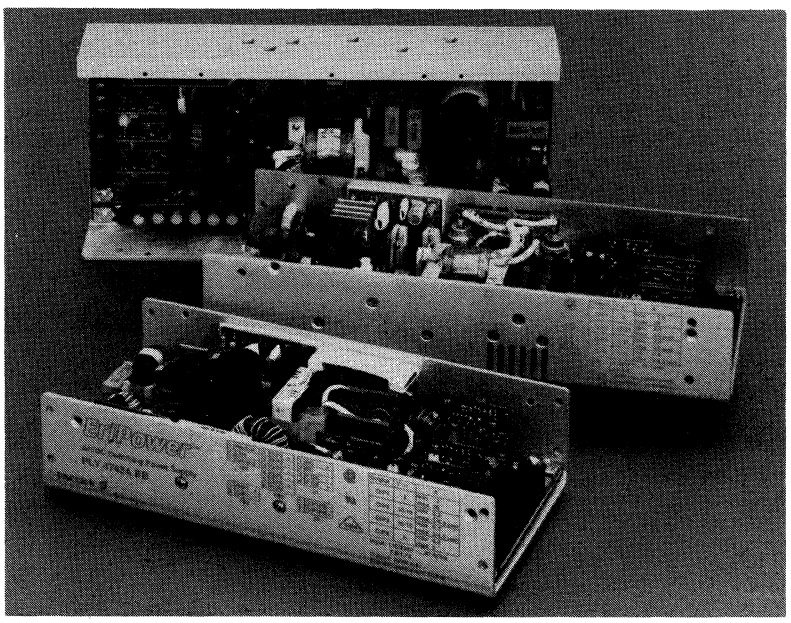
ERICSSON EriPower™

THE RELIABLE SOURCE

- **Quad independent, regulated and adjustable outputs**
- **1.5 x rated current for disc drives start-up surge current**
- **Approved by CSA, UL and VDE. Designed to CSA 22.2, UL 478, UL 1012 and VDE 0806 plus IEC 380/950**
- **RFI suppression in conformance to FCC subpart 15J and VDE 0871 curve B**
- **Protected against: Overload, Over-voltage, Overcurrent, Overheating, No Load, Reverse Voltage, Short Circuit and Brownouts**



PLY-series Quad Output versatile 150-400W flexible Switchers in standard footprint

The PLY series of regulated quad output switchers constitutes a series of versatile standard open frame Power Supplies. Standard footprints and a very wide range for adjusting the outputs, make them ideal not only for substituting an existing Power Supply but also for applications requiring "odd" voltages. Combining and adjusting the outputs makes possible to meet almost every voltage needed.

High frequency MOSFET switching, surface mounting and a compact design contribute to the attractively small dimensions. Output 2-4 are post regulated and floating, giving possibilities for series connections of selected outputs. The voltages can be adjusted within a wide range and for one of the outputs as much as from 11.5VDC to 26VDC. An attractive feature is the outputs possibility for surge current (1.5 times max. continuous) which allows start-up of disc drives.

The products are approved from major safety agencies, offering a security to the user in his application for such safety approval of the complete equipment. The PLY 47—have universal input voltage, making it possible to connect them either to 115VAC or 230VAC without selecting the input while the PLY 48/49—are user selectable by means of a strap.

The products are protected against overload, overvoltage, overcurrent, overheating, no lead, reverse voltage, short circuit and brownouts. A Power OK signal is available as well as the possibility for Remote Control and Remote Sense.

A 100% cycled Burn-In procedure and ATE testers at both pre and post Burn-In are guarantees for high and smooth quality. An MTBF figure of 100,000h makes these switchers ideal for applications within computers, communications and industrial systems.

Product Program

Model number	Max output power W	Output Volts/Ampéres (max. continuous at forced air cooling, + 40°C)				Weight	Cooling CFM
		O/P1	O/P2	O/P3	O/P4		
PLY 4743A	150	5V/20A	10-15V/3A (Peak 4.5A)	10-15V/3A (Peak 4.5A)	5V/2A	1.8 kg (4.0 lb)	8
PLY 4743B	175	5V/25A	10-15V/3.5A (Peak 5.3A)	10-15V/3.5A (Peak 5.3A)	5V/2A	1.8 kg (4.0 lb)	15
PLY 4743C	200	5V/30A	10-15V/4A (Peak 6A)	10-15V/4A (Peak 6A)	5V/2A	1.8 kg (4.0 lb)	15
PLY 4844A	250 (Peak 300)	5V/35A	11.5-26V/4A (Peak 6A)	4.75-16V/4A (Peak 6A)	4.75-16V/3A (Peak 4.5A)	2.3 kg (5.0 lb)	20
PLY 4844B	300 (Peak 360)	5V/45A	11.5-26V/6A (Peak 9A)	4.75-16V/8A (Peak 12A)	4.75-16V/4A (Peak 6A)	2.3 kg (5.0 lb)	25
PLY 4844C	400 (Peak 480)	5V/55A	11.5-26V/7A (Peak 10.5A)	4.75-16V/10A (Peak 15A)	4.75-16V/6A (Peak 9A)	3.2 kg (7.0 lb)	30

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FARNELL ADVANCE POWER

(216) 349-0755 FAX (216) 349-0142

Multi-output Switch Mode Power Supplies 30-1500 Watts

The Company

Farnell Advance Power is a division of Farnell Instruments Ltd., with over 20 years of experience in producing quality power supplies.

Product Line

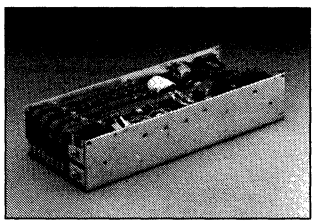
Farnell products include open frame and enclosed switch mode power supplies with single and multiple outputs ranging up to 2500 watts, linear power supplies, and a wide range of telecommunications products. Farnell power supplies are manufactured in the UK; designed and, in many cases, listed to international standards including BS, UL, VDE, CSA, IEC, BT and BABT.

Availability

Inventories of Farnell power supplies are maintained in the U.S.A. for prompt shipment. For complete specifications and the name of your nearest Farnell Advance sales representative, contact Farnell Advance, 32111 Aurora Road, Solon, Ohio 44139. **PHONE (216) 349-0755. FAX (216) 349-0142.**

NEW. Compact U-shape 350-watt switcher with universal input, multiple outputs.

Compact 2-1/2" x 5" x 12" U-shape chassis simplifies cost, design and service problems. New AF/AR series offers up to nine outputs per unit, current share N+1 redundancy, and automatic adjustment to all A.C. inputs from 90 to 264 volts, 45 to 440 hz. Built-in cooling optional. Call today.



A.C. Input/Fixed Outputs

Output Power	Cooling	Output Ratings					Model Number
30W	C	+5V 3A	+12V 2A	-12V 0.3A			NU030P300
40W	C	+5V 6A	+12V 2A	-12V 0.5A			NU040P300
40W	C	+5V 6A	+12V 2A	+24V 0.5A			NU040P301
40W	C	+5V 6A	+15V 2A	-15V 0.5A			NU040P302
50W	C	+5V 6A	-5V 1A	+12V 1A	-12V 1A	+24V 1A	N050R110
50W	C	+5V 6A	-5V 1A	+15V 1A	-15V 1A	+24V 1A	N050R201
55W	C	+5V 3.5A	+12V 3A	-(+)12V 1A			NA055P300
55W	C	+5V 3.5A	+12V 3A	+(-)24V 1A			NA055P301
55W	C	+5V 3.5A	+15V 3A	-(+)15V 1A			NA055P302
55W	C	+5V 6A	F5V 1A	+12V 3A	F12V 2A		NA055P401
55W	C	+5V 6A	+12V 3A	F12V 1A	F12V 1A		NA055P413
55W	C	+5V 6A	+12V 3A	F12V 2A	F24V 1A		NA055P400
55W	C	+5V 6A	+15V 3A	F15V 2A	F24V 1A		NA055P403
75W	C	+5V 8A	+12V 3A	F12V 2A			NA075P300
75W	C	+5V 8A	-5V 1A	+12V 3A	+12V 1A		NA075P414
75W	C	+5V 8A	F5V 1A	+12V 3A	F12V 2A		NA075P401
75W	C	+5V 8A	+12V 3A	+(F)12V 2A	-(F)12V 0.5A		NA075P402
75W	C	+5V 8A	+12V 3A	F12V 2A	F24V 1A		NA075P400
75W	C	+5V 8A	+15V 3A	F15V 2A	F24V 1A		NA075P403
90W	C	+5V 10A	-5V 1A	+12V 5A	-12V 2A	+24V 1A	N090R109
90W	C	+5V 10A	-5V 1A	+15V 5A	-15V 2A	+24V 1A	N090R132
100W	C	+5.2V 7.5A	+12V 0.35A	-12V 0.15A	+24V 0.25A	+78 - 110V 0.6A	NM100R501
100W	C	+5.2V 7.5A	+12V 0.35A	-12V 0.15A	+24V 0.25A	+82 - 114V 0.6A	NM100R500
110W	C	+5V 12A	+12V 6A	-(+)12V 3A			NA110P300
110W	C	+5V 12A	+15V 6A	-(+)15V 3A			NA110P302
110W	C	+5V 10A	+12V 3.5A	+(-)12V 1.5A	-(+)12V 0.7A		NQ110P400
110W	C	+5V 12A	-(+)5V 1A	+12V 5A	-(+)12V 2A		NA110P401
110W	C	+5V 12A	+12V 5A	+(-)12V 3A	-(+,F)12V 2A		NA110P402
110W	C	+5V 12A	+12V 5A	-(+)12V 2A	+(-,F)24V 2A		NA110P400
110W	C	+5V 12A	+15V 5A	-(+)15V 2A	+(-,F)24V 2A		NA110P403
110W	C	+5V 12A	-(+)5V 1A	+12V 5A	+(-)12V 2A	-(+,F)12V 2A	NA110P501
110W	C	+5V 12A	-(+)5V 1A	+12V 5A	-(+)12V 2A	+(-,F)24V 2A	NA110P500
110W	C	+5V 12A	-(+)5V 1A	+15V 5A	-(+)15V 2A	+(-,F)24V 2A	NA110P503

Cooling: C – Convection, F – Forced Air, I – Integral Fan. Polarities in Parentheses ( ) indicate alternatives which are available on special order. Many other combinations are available on special order. For custom power supplies or information about any supplies listed, **CONTACT FARNELL ADVANCE, (216) 349-0755, FAX (216) 349-0142.**

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FARNELL ADVANCE POWER
(216) 349-0755 FAX (216) 349-0142

Multi-output Switch Mode Power Supplies 30-1500 Watts

Output Power	Cooling	Output Ratings					Model Number
140W	C	+5V 17A	+12V 7A	F12V 3A			NA140P300
140W	C	+5V 17A	F5V 1.5A	+12V 5A	F12V 3A		NA140P401
140W	C	+5V 17A	+12V 5A	F12V 3A	F12V 1.5A		NA140P402
140W	C	+5V 17A	+12V 5A	F12V 3A	F24V 3A		NA140P400
140W	C	+5V 17A	F5V 1A	+12V 5A	F12V 3A	F12V 1.5A	NA140P501
140W	C	+5V 17A	F5V 1A	+12V 5A	F12V 3A	F24V 3A	NA140P500
140W	C	+5V 17A	F5V 1A	+15V 5A	F15V 3A	F24V 3A	NA140P503
142W	C	+5V 20A	+12V 1.75A	-12V 1.75A			MGT5-20C/VO34
152W	C	+5V 20A	+15V 1.75A	-15V 1.75A			MGT5-20C
162W	C	+6V 20A	+12V 1.75A	-12V 1.75A			GT6-20AB
172W	C	+6V 20A	+15V 1.75A	-15V 1.75A			GT6-20A
200W	C	F5V 30A	F12V 5A	F12V 5A			NA200R300
200W	C	+5V 30A	+12V 7A	F12V 5A			NA200P300
200W	C	F5V 30A	F12V 5A	F24V 3A			NA200R301
200W	C	F5V 30A	F15V 4.5A	F15V 4.5A			NA200R303
200W	C	F5V 30A	F24V 3A	F24V 3A			NA200R304
200W	C	+5V 30A	F5V 1A	+12V 7A	F12V 5A		NA200P401
200W	C	+5V 30A	+12V 7A	F12V 5A	F12V 1.5A		NA200P402
200W	C	+5V 30A	+12V 7A	F12V 5A	F24V 3A		NA200P400
200W	C	+5V 30A	F5V 1A	+12V 7A	F12V 5A	F12V 5A	NA200P501
200W	C	+5V 30A	F5V 5A	+12V 7A	F12V 5A	F12V 5A	NA200P502
200W	C	+5V 30A	F5V 1A	+12V 7A	F12V 5A	F24V 3A	NA200P500
200W	C	+5V 30A	F5V 1A	+15V 7A	F15V 5A	F24V 3A	NA200P503
200W	C	+5V 40A	-5V 5A	+12V 10A	-12V 10A	+24V 8A	A200B
200W	C	+5V 40A	-5V 5A	+12V 10A	-12V 10A	+24V 8A	A200D
200W	C	+5V 40A	-5V 5A	+12V 10A	-12V 10A	+24V 8A	A200S
200W	C	+5V 40A	-5V 5A	+15V 10A	-15V 10A	+24V 8A	A201B
200W	C	+5V 40A	-5V 5A	+15V 10A	-15V 10A	+24V 8A	A201D
200W	C	+5V 40A	-5V 5A	+15V 10A	-15V 10A	+24V 8A	A201S
240W	C	F5V 30A	F5-15V 4A	F12-16V 6A	F12-16V 6A	F12-24V 6A	NF350R500M
240W	C	F5V 30A	F5-15V 4A	F12-16V 6A	F12-24V 6A	F48-56V 5A	NF350R505M
250W	C	F5V 30A	F5-15V 4A	F12-16V 10A	F12-16V 6A	F12-24V 6A	NF500R500M
250W	C	F5V 30A	F5-15V 4A	F12-16V 6A	F12-24V 6A	F48-56V 5A	NF500R505M
250W	C	F5V 50A	F5V 1.5A	F12V 6A	F12V 6A	F24V 5A	NA300R500M
250W	C	F5V 50A	F5V 1.5A	F12V 6A	F12V 6A	F48V 2.5A	NA300R505M
250W	C	F5V 50A	F5V 1.5A	F15V 6A	F15V 6A	F24V 5A	NA300R503M
250W	C	F5V 50A	F5V 1.5A	F12V 6A	F15V 6A	F48V 2.5A	NA300R506M
270W	C	F5V 35A	F5-15V 4A	F12-16V 6A	F12-16V 6A	F12-24V 6A	NF350R500
270W	C	F5V 35A	F5-15V 4A	F12-16V 6A	F12-24V 6A	F48-56V 5A	NF350R505
300W	C	F5V 36A	F5-15V 4A	F12-16V 10A	F12-16V 6A	F12-24V 6A	NF500R500
300W	C	F5V 36A	F5-15V 4A	F12-16V 6A	F12-24V 6A	F48-56V 5A	NF500R505
300W	F	+5V 40A	-5V 1A	+12V 5A	-12V 5A	+24V 5A	N300R113U
300W	F	+5V 40A	-5V 1A	+15V 5A	-15V 5A	+24V 5A	N300R135U
300W	F	F5V 40A	F5-15V 4A	F12-16V 6A	F12-16V 6A	F12-24V 6A	NF350R500M
300W	F	F5V 40A	F5-15V 4A	F12-16V 6A	F12-24V 6A	F48-56V 5A	NF350R505M
300W	C	F5V 50A	F5V 1.5A	F12V 6A	F12V 6A	F24V 5A	NA300R500
300W	C	F5V 50A	F5V 1.5A	F12V 6A	F12V 6A	F48V 2.5A	NA300R505
300W	C	F5V 50A	F5V 1.5A	F15V 6A	F15V 6A	F24V 5A	NA300R503
300W	C	F5V 50A	F5V 1.5A	F12V 6A	F15V 6A	F48V 2.5A	NA300R506

Cooling: C – Convection, F – Forced Air, I – Integral Fan. Polarities in Parentheses ( ) indicate alternatives which are available on special order. Many other combinations are available on special order. For custom power supplies or information about any supplies listed, **CONTACT FARNELL ADVANCE, (216) 349-0755, FAX (216) 349-0142.**

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FARNELL ADVANCE POWER
(216) 349-0755 FAX (216) 349-0142

Multi-output Switch Mode Power Supplies 30-1500 Watts

Output Power	Cooling	Output Ratings					Model Number
350W	F or I	F5V 50A	F12V 6A	F12V 6A			AF3501300*
350W	F or I	F5V 50A	F12V 6A	F12V 6A	F12V 6A		AF3503402*
350W	F or I	F5V 50A	F5V 6A	F12V 6A	F12V 6A	F24V 3A	AF3501500*
350W	F or I	F5V 50A	F5V 6A	F12V 6A	F12V 6A	F48V 2A	AF3504505*
350W	F or I	F5V 50A	F12V 6A	F12V 6A	F12V 6A	F12V 6A	AF3503580*
350W	F	F5V 50A	F5 - 15V 4A	F12 - 16V 6A	F12 - 16V 6A	F12 - 24V 6A	NF350R500
350W	I	F5V 50A	F5 - 15V 4A	F12 - 16V 6A	F12 - 16V 6A	F12 - 24V 6A	NF350R500W
350W	F	F5V 50A	F5 - 15V 4A	F12 - 16V 6A	F12 - 24V 6A	F48 - 56V 5A	NF350R505
350W	I	F5V 50A	F5 - 15V 4A	F12 - 16V 6A	F12 - 24V 6A	F48 - 56V 5A	NF350R505W
400W	F	F5V 48A	F5 - 15V 4A	F12 - 16V 10A	F12 - 16V 6A	F12 - 24V 6A	NF500R500M
400W	F	F5V 48A	F5 - 15V 4A	F12 - 16V 6A	F12 - 24V 6A	F48 - 56V 5A	NF500R505M
500W	F	F5V 60A	F5 - 15V 4A	F12 - 16V 10A	F12 - 16V 6A	F12 - 24V 6A	NF500R500
500W	I	F5V 60A	F5 - 15V 4A	F12 - 16V 10A	F12 - 16V 6A	F12 - 24V 6A	NF500R500W
500W	F	F5V 60A	F5 - 15V 4A	F12 - 16V 6A	F12 - 24V 6A	F48 - 56V 5A	NF500R505
500W	I	F5V 60A	F5 - 15V 4A	F12 - 16V 6A	F12 - 24V 6A	F48 - 56V 5A	NF500R505W
540W	C	+5V 60A	+15V 8A	-15V 8A			MGT400
900W	C	F5V 150A	F5V 15A	F5V 15A			P1000 series
1000W	C	F5V 150A	F5V 15A	F5V 15A	F12V 15A		P1000 series
1000W	C	F5V 150A	F12V 15A	F24V 8A	F48V 5A		P1000 series
1000W	C	F5V 150A	F5V 15A	F5V 15A	F12V 15A	F24V 8A	P1000 series
1000W	C	F5V 150A	F5V 15A	F5V 15A	F12V 15A	F48V 5A	P1000 series
1000W	C	F5V 150A	F5V 15A	F12V 15A	F12V 15A	F12V 15A	P1000 series
1000W	C	F5V 150A	F5V 15A	F12V 15A	F12V 15A	F24V 8A	P1000 series
1000W	C	F5V 150A	F5V 15A	F12V 15A	F12V 15A	F48V 5A	P1000 series
1000W	C	F5V 150A	F12V 15A	F12V 15A	F12V 15A	F12V 15A	P1000 series
1000W	C	F5V 150A	F12V 15A	F12V 15A	F12V 15A	F24V 8A	P1000 series
1000W	C	F5V 150A	F12V 15A	F12V 15A	F24V 8A	F24V 8A	P1000 series

D.C. Input/Fixed Outputs – 180, 300 Watts

* Optional 24V, 10A main output available. Dual output cards for auxiliary positions also available. Nine total outputs possible.

Output Power	Cooling	Output Ratings					Model Number
180W	C	+5V 20A	-5V 1A	+12V 5A	-12V 5A	+24V 2A	ND180P500
180W	C	+5V 20A	-5V 1A	+15V 5A	-15V 5A	+24V 2A	ND180P810
300W	C	+5V 40A	-5V 1A	+12V 5A	-12V 5A	+24V 5A	ND300P500
300W	C	+5V 40A	-5V 1A	+15V 5A	-15V 5A	+24V 5A	ND300P505

A.C. Input/Configurable Output Supplies

Output Power	Cooling	Main Output (One per unit. Adj. Range)	Auxiliary Outputs (Up to four per unit. Adj. Range)	Model Number
350W	F OR I	-5V 50A, +5V 50A, or +12V 20A, or +24V 11A, or +48V 5A	-2V 7A, +2V 7a, -5V 7A, +5V 7A, -8V 7A, +8V 7A, -12V 7A, +12V 7A, -15V 7A, +15V 7A, -18V 5A, +18V 5A, -24V 5A, +24V 5A, -36V 2.5A, +36V 2.5A, -38V 2.5A, +48V 2.5A, +48V 3A	P350 series
500W	F OR I	-5V 60A, +5V 60A, or +12V 25A, or +24V 13A, or +48V 6A		P500 series
1500W	I	5.0V 170A, 5.2V 170A, 5.5V 170A	2.5V 20A, 5V 20A, 12V 15A, 15V 12A, 18V 10A, 24V 7.5A, 28V 6.4A, 36V 4.5A, 48V 3.4A, 54V 3.4A	KXA series
1500W	I	5.0V 200A, 5.2V 200A, 5.5V 200A		KXF series
1500W	I	12V 70A, 13V 70A, 14V 70A, 15V 65A, 18V 56A, 24V 42A, 26V 38.5A, 28V 36A, 30V 33A, 48V 21A, 50V 20A, 52V 19A, 54V 18.5A, 56V 18A, 60V 16.5A		KXA series

Cooling: C – Convection, F – Forced Air, I – Integral Fan. Polarities in Parentheses ( ) indicate alternatives which are available on special order. Many other combinations are available on special order. For custom power supplies or information about any supplies listed, **CONTACT FARNELL ADVANCE, (216) 349-0755, FAX (216) 349-0142.**

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FERRANTI INTERNATIONAL
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MINIATURE HIGH VOLTAGE POWER SUPPLIES

Standard Products 'Quick Selection Chart'

Standard Products Performance Characteristics

MODEL NO.	Output Proportional to Input	Floating Bias Supply	Multiple Output	Low Power Battery Operated	PMT	CRT	Focus	Dynamic Focus	Switching Penetration	X-Ray Microscope	High Alt. Version	Volume in Cubic Inches	Output Voltage Range	Max. current rating: −55° to +71°C Full Rating (−55° to +85°C Reduced Rating)	Max. current rating: 0° to 55°C
C-½	●	●	●									3	Center Tapped	*	32mA
C-2T	●	●	●									3	Center Tapped	*	8mA
C-8T	●	●	●				●					3	Center Tapped	*	2mA
C-15	●	●			●		●					3		*	1mA
C-30	●	●			●		●					3		*	500µA
CS-18						●			●			180		*	200µA
DF-18			●			●	●	●				314		*	500µA
DF-20			●			●	●	●						*	100µA
F-6		●					●					7		16mA	*
F-12		●			●		●					7		8mA	*
F-25		●			●		●					7		4mA	*
F-50		●				●	●					7		2mA	*
F-50A		●				●	●				●	7		2mA	*
G-6						●	●				●	15		500µA	*
G-10						●					●	15		500µA	*
G-12						●					●	15		500µA	*
H-16F			●			●	●				●	31		500µA	*
H-20						●				●	●	31		500µA	*
H-20N						●				●	●	31	Neg.	500µA	*
H-30						●				●	●	44		300µA	*
K-15(Z)	●	●			●		●				●	2		1mA	*
K-30(Z)	●	●			●		●				●	2		500µA	*
LR-2					●							33		*	10mA
LR-2N					●							33	Neg.	*	10mA
LR-3					●							33		*	6.6mA
LR-3N					●							33	Neg.	*	6.6mA
LR-6						●	●					33		–	3.3mA
LR-15			●			●	●					33		– –	1.3mA
LR-20			●			●	●					33		–	1mA
LR-25			●			●						33		*	1.5ma
LU-15	●		●			●	●					27		*	300µA
MG-3					●		●					7		1mA	*
MG-12						●						7		500µA	*
MR-18-1						●					●	10		*	300µA
MR-18-2						●					●	10		*	300µA
Q-15(Z)	●	●		●	●		●				●	3		400µA	*
Q-30(Z)	●	●		●	●		●				●	3		200µA	*
SM-25			●			●	●	●				97	Regulated + 1%	*	1.2mA
ST-10N	●			●								7	Neg.	10µA	*
ST-10P	●			●								7	Pos.	10µA	*

Above current ratings proportional to output voltage when units are operated at less than rated output voltage. *NOTE: Contact Factory

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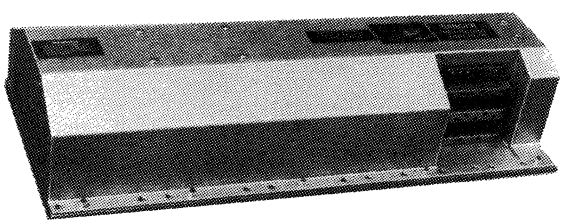

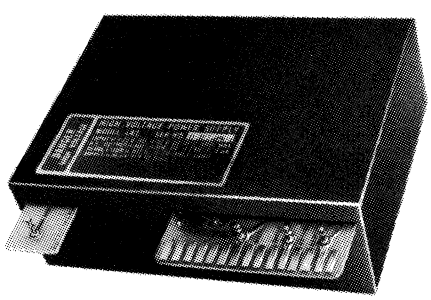

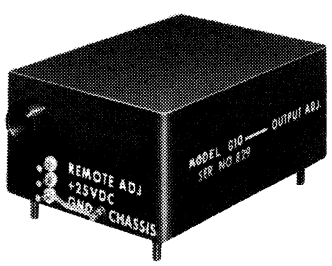

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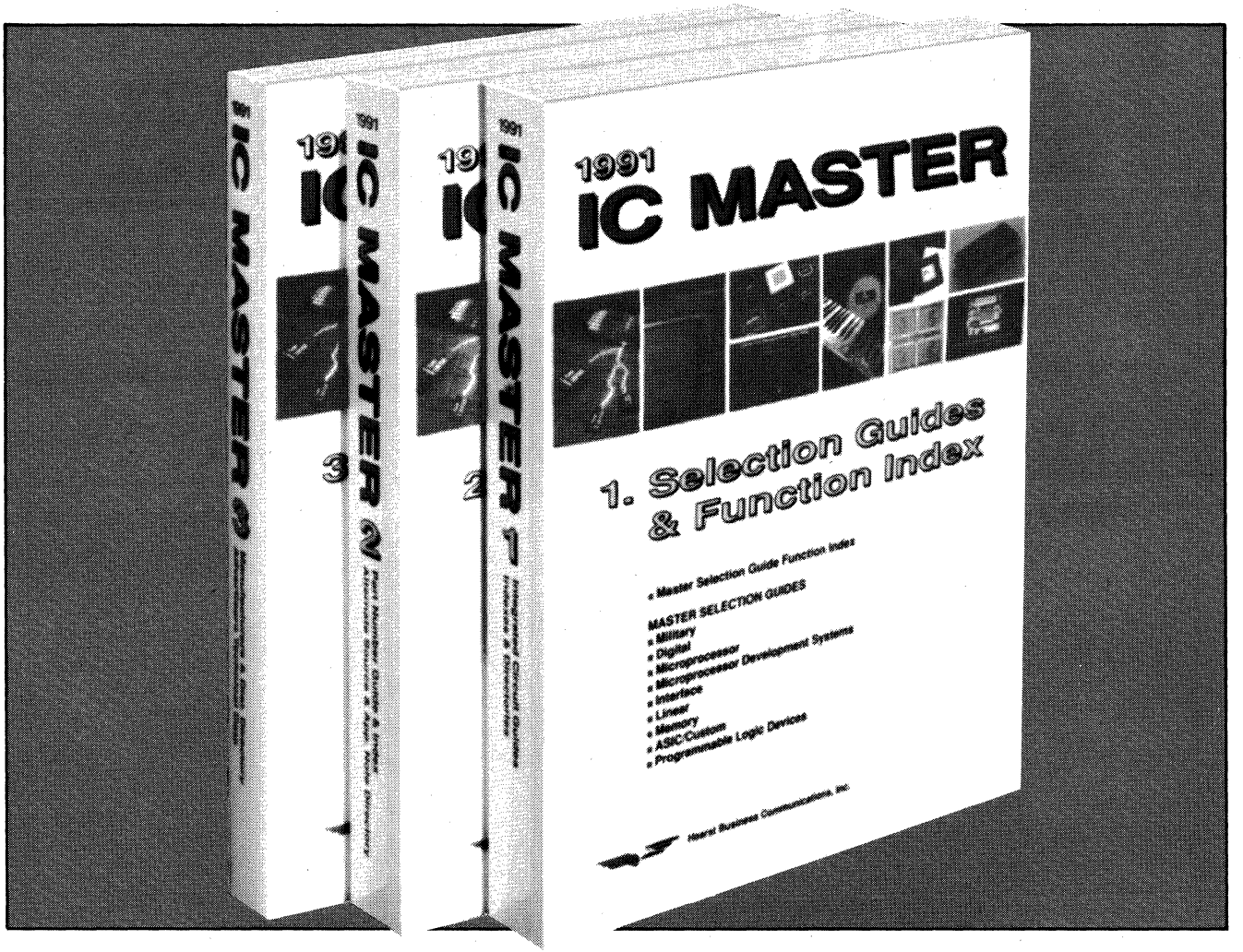

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MODEL NUMBER	OUTPUT	MIN. BAT. CAP.	CHARGE TYPE *	SHORT CIRCUIT PROOF	REVERSE POLARITY PROTEC.	W/LED W/O LED	CASE SIZE lxwxh, mm
11.1301	**6 V/200 mA**	**4.5 Ah**	**W**	**_**	**_**	**_**	**70x40.5x39.5**
11.2997	6 V/300 mA	8.0 Ah	W	_	_	_	70x40.5x39.5
11.1303	**12 V/100 mA**	**2.6 Ah**	**W**	**_**	**_**	**_**	**70x40.5x39.5**
11.1304	12 V/200 mA	4.5 Ah	W	_	_	_	70x40.5x39.5
11.6300	**12 V/130 mA**	**0.7 Ah**	**IU**	**_**	**_**	**yes**	**76x48.5x39.5**
11.6301	12 V/300 mA	1.4 Ah	IU	_	_	yes	96x58x48
11.6302	**6 V/200 mA**	**1.2 Ah**	**IU**	**_**	**_**	**yes**	**76x48.5x39**
11.6303	6 V/600 mA	3 Ah	IU	yes	_	yes	96x63x48
11.6304	**12 V/500 mA**	**2.6 Ah**	**IU**	**yes**	**_**	**yes**	**96x63x48**
11.6305	24 V/250 mA	1.4 Ah	IU	yes	_	yes	96x63x48
11.6307	**12 V/1 A**	**4.5 Ah**	**IU**	**yes**	**yes**	**yes**	**150x80x70**
11.6308	24 V/1 A	4.5 Ah	IU	yes	yes	yes	200x100x75

*W - Float Charge IU - Regulated voltage current control

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LINEAR

ADJUSTABLE WIDE RANGE OUTPUT

MODEL NUMBER	VERSION	ADJUSTMENT	OUTPUT RANGE		CASE SIZE
			VOLTS	AMPS	lxwxh, mm
11.4070	Euro	x	1 - 11 VDC	600 - 60 mA	96x58x48
11.4600	UK	x	1 - 11 VDC	600 - 60 mA	96x58x48
11.4911	USA	x	1 - 11 VDC	600 - 60 mA	96x58x48
11.6349	Japan	x	1 - 11 VDC	600 - 60 mA	96x58x48
11.7097	Euro	o	1 - 11 VDC	600 - 60 mA	96x58x48
11.7098	UK	o	1 - 11 VDC	600 - 60 mA	96x58x48
11.7099	USA	o	1 - 11 VDC	600 - 60 mA	96x58x48
11.4071	Euro	x	10 - 24 VDC	280 - 60 mA	96x58x48
11.4601	UK	x	10 - 24 VDC	280 - 60 mA	96x58x48
11.4912	USA	x	10 - 24 VDC	280 - 60 mA	96x58x48

MODEL NUMBER	VERSION	ADJUSTMENT	OUTPUT RANGE		CASE SIZE
			VOLTS	AMPS	lxwxh, mm
11.6350	Japan	x	10 - 24 VDC	280 - 60 mA	96x58x48
11.7100	Euro	o	10 - 24 VDC	280 - 60 mA	96x58x48
11.7101	UK	o	10 - 24 VDC	280 - 60 mA	96x58x48
11.7102	USA	o	10 - 24 VDC	280 - 60 mA	96x58x48
11.6246	Euro	x	5,2-15 VDC	2000-750 mA	96x63x48.5
11.7077	Euro	x	3-12 VDC	900 - 500 mA	96x63x48.5
11.7103	UK	x	3-12 VDC	900 - 500 mA	96x63x58.5
11.7092	USA	x	3-12 VDC	900 - 500 mA	96x63x55.5
FW3289	USA	-	12 VDC	@ 1 A	96x63x55
FW3299	USA	-	12 V	@ .500 mA	96x58x55

x = Internally adjustable o = Externally adjustable - = Not adjustable

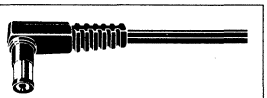
FEATURES

- Wall-mount power supplies
- Single output
- Safety agencies approvals
- Available in U.S., U.K., European and Japanese versions
- Available through distribution

LINEAR MULTIPLE OUTPUT

MODEL NUMBER	VERSION	OUTPUT			CASE SIZE
		1	2	3	lxwxh, mm
11.7093	Euro	+5 @ 1 A	+12 VDC @ 0.2 A	-12 VDC @ 0.2 A	150v80x70
11.7372	USA	+5 @ 1 A	+12 VDC @ 0.2 A	-12 VDC @ 0.2 A	150x80x70

OUTPUT CONNECTORS*

MODEL NUMBER	DIMENSIONS, mm	DESCRIPTION	
Din 45323	90°- Inside diameter - 1.95 Outside diameter - 5.6 or 6.2 Length 14.0	Hollow co-axial plug right angle	
Din 45323	Inside diameter - 2.1 Outside diameter - 5.5 Length 11.0	Hollow co-axial plug Available in 30 different dimensions	
Din 45318	Diameter - 2.5 Length - 11.5	Jack plug	
Din 45318	Diameter - 3.5 Length - 14.5	Jack plug	
Circular Din Plug	-	3-5 pin din plug Available upon request	

* Other connectors available upon request.

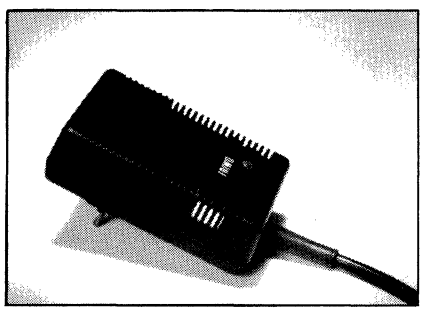
WE SPECIALIZE IN CUSTOMER SPEC PRODUCTS

FRIWO
U.S. Sales Office, Frederick, Maryland
Phone: (301) 694-7479 FAX: (301) 694-7698

FRIWO

SWITCHER

FRIWO primary switched plug-in and desk power supplies are especially designed to meet higher power requirements for microprocessor and peripheral systems in power ranges from 15-100 Watts. FRIWO's solutions are primary switched units in order to increase the power ranges in these fields of applications. Custom designed units are delivered within 10-12 weeks.



SPECIFICATIONS

- Input voltage 220 V/50 Hz
- Ripple noise ≤ 1%
- Efficiency: ≥ 75%
- Operation temperature 0 - +50°C
- Storage temperature -40 - + 80°C

FEATURES

- Wall plug-in and desktop styles
- Single and multiple output models available
- Switcher regulation ± 5%
- Ranges 15 W to 100 W
- Some available with 120 V/60 Hz
- Available through distribution

WALL PLUG-IN, SINGLE OUTPUT ≤ 30 W

MODEL NUMBER	OUTPUT	CASE SIZE l x w x h, mm
11.3018	5 V @ 3 A	80x128x40
11.3038	**12 V @ 1.3 A**	**80x128x40**
11.3039	15 V @ 1 A	80x128x40
11.3040	**24 V @ .650 mA**	**80x128x40**
11.7094	12 V @ .2-2.5 A	63x96x51

DESKTOP, SINGLE OUTPUT ≤ 100 W

MODEL NUMBER	OUTPUT	CASE SIZE l x w x h, mm
11.7136	12 V @ 4 A	150x80x72
11.7266	**24 V @ 2 A**	**150x80x72**
11.6855	13.2 V @ 3 A	75x118x41
11.6854	**13.2 V @ 5 A**	**88x138x46**
11.6853	13.2 V @ 7 A	92x156x50

INTERNALLY ADJUSTABLE SWITCHERS

MODEL NUMBER	VERSION	ADJUST-MENT	OUTPUT RANGE		CASE SIZE l x w x h, mm
			VOLTS	AMPS	
11.7094	Euro	-	12 VDC	200-2500 mA	96x63x51
11.7095	**UK**	-	**12 VDC**	**200-2500 mA**	**96x63x48**
11.7096	USA	-	12 VDC	200-2500 mA	96x63x56
11.7201	**Euro**	**x**	**5-15 V**	**3.2-1.7 A**	**96x63x51**
11.7202	Euro	x	15-42 V	1300-650 mA	96x63x91
11.7255	**USA**	**x**	**5-15 V**	**3.2-1.7 A**	**96x63x56**
11.7257	USA	x	15-42 V	1300-650 mA	96x63x56

x = Internally adjustable 0 = Externally adjustable - = Not adjustable

WALL PLUG-IN, MULTIPLE OUTPUT ≤ 25 W

MODEL NUMBER	OUTPUT					CASE SIZE l x w x h, mm
	1	2	3	4	5	
11.3403	5 V @ 0.4-5 A	+12 V @ 800 mA	-12 V @ 800 mA	_	_	80x128x55
11.4254	**5 V @ 0.4-2 A**	**+12 V @ 700 mA**	**+12 V @ 700 mA**	_	_	**80x128x55**
11.4806.500	5 V @ 1.5 A	+12 V @ 300 mA	-12 V @ 300 mA	+24 V @ 100 mA	-24 V @ 100 mA	80x128x40

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GAMMA HIGH VOLTAGE RESEARCH INC.

Designers/Manufacturers—High Voltage Power Supplies

1096 North US Hwy. #1, Ormond Beach, FL 32174 • TEL. 904-677-7070 • FAX. 904-677-3039

HIGH VOLTAGE POWER SUPPLIES

REGULATED CONSTANT VOLTAGE CONSTANT CURRENT

1KV to 400KV
30 WATTS to 3000 WATTS

NEW

SERIES RR

FEATURES

LOW STORED ENERGY: The use of high frequency (>20KHz), high voltage power supply techniques allows stored energy to be minimized thus insuring maximum safety to operating personnel and sensitive loads.

PROGRAMMING OUTPUT VOLTAGE & OUTPUT CURRENT: This feature allows output voltage or output current to be remotely programmed from either an external voltage source or with external potentiometers from the internal reference voltage. A zero to +5V voltage source is required for full scale programming. Internal circuitry insures that the output voltage and output current cannot be externally programmed beyond the maximum settings of the front panel controls.

CONSTANT VOLTAGE/CONSTANT CURRENT WITH AUTOMATIC CROSSOVER: Dual control loops allow either voltage or current to be precisely regulated. Each parameter is controlled and limited by a ten-turn potentiometer on the front panel. The constant voltage/constant current automatic crossover feature allows the power supply to be used as a voltage regulated current limited system or as a current regulated voltage limited system. Thus, both output voltage and output current are totally under operator control under all load conditions, including overload and arc-over conditions.

OVERLOAD, ARC-OVER & SHORT CICRUIT PROTECTION: Full protection against any overload condition is inherent in the constant voltage/constant current design concept. This is augmented by the liberal use of surge limiting resistors and reactive limiting. On 600W, 1KW and 3KW units customer may select either constant current or a variable overload trip by means of a front panel mounted switch.

VOLTAGE REGULATION: Line and load regulation is better than 0.005%. Note: On 1000 watt and 3000 watt units load regulation is better than 0.01%.

CURRENT REGULATION: Current regulation is better than 75uA.

RIPPLE: At 150 watts ripple of 0.02%. At 300, 600 and 1000 watts ripple of 0.05%. At 3000 watts ripple of 0.1%.

EFFICIENCY: Efficiency is typically greater than 75% at full load.

EXTERNAL POLARITY REVERSAL (Reversible Units Only): A reversing switch mechanism located at the rear of the power supply facilitates polarity reversal.

EXTERNAL INTERLOCK/OUTPUT INHIBIT: Circuitry is provided so that the user can, if desired, inhibit output voltage. External contact closure located on the rear terminal strip will enable the power supply. Open contacts will inhibit the power supply.

FLOATING GROUND: This feature allows the low end return of the power supply to be isolated with respect to chassis ground. Consult factory.

REMOTE OUTPUT VOTAGE & CURRENT MONITORING: Voltage monitoring and true output current conitoring signals are provided at the rear terminal strip.

MODULAR CONSTRUCTION: Modular construction techniques are used throughout this design thus reducing downtime in critical applications.

OPTIONS

ZERO VOLTAGE START INTERLOCK (ZVS): To prevent accidental damage to loads, the output voltage control must be set to zero before the high voltage can be applied.

VARIABLE OVERVOLTAGE PROTECTION (VOV): This option causes the power supply to shut down when the output voltage exceeds the setting of the overvoltage control potentiometer located at the rear of the power supply. (adjustable from 20% to 110% of maximum rated output voltage.)

VARIABLE OVERLOAD TRIPOUT (VOL): This option causes the power supply to shut down when the output current equals the setting of the front panel current control (adjustable from 20% to 110% of maximum output current of the power supply.) Standard feature on 600W, 1000W and 3000W units. Front panel control allows user to activate this feature when desired.

DIGITAL PANEL METER: SINGLE METER (SDPM) — TWO METERS (DDPM): A Single 3½ digit meter reading both voltage and current is available. This meter replaces the two analog meters normally provided. Two 3½ digit meters can also be provided in place of the two analog meters normally provided.

SLOW START (SS): The slow start option enables the output voltage of the power supply to ramp to its maximum output voltage setting at a linear rate. This rate can be factory set from one to fifteen seconds.

SLAVED BI-POLAR OPERATION (SBP): Any two power supplies of the same voltage rating may be operated as a Bi-Polar pair. One power supply acting as the master controller will control both power supplies from zero to maximum rated output voltage. The output voltages of both supplies will track each other within 2% from 10% to maximum rated output voltage. Each power supply is also capable of operating independently.

TTL (TTL): Compatible "enable" line.

AUXILIARY OUTUT/FOCUS TAP (FT): This option provides an independent auxiliary output which is variable from zero to maximum rated voltage up to 15KV to 300uA maximum. Control is achieved via front panel mounted potentiometer. For other voltages and power levels consult factory. Multiple auxiliary outputs are also available. Consult factory.

REMOTE CONTROL PANEL (RCP): Any standard model can be supplied with a control panel remote from the basic power supply. 20 feet of appropriately shielded interconnection is provided. This remote control panel replaces the front panel normally provided on standard units.

220 VOLT INPUT — 50/60 Hz (220): 220 volt, 50/60 Hz. Input is available.

BENCH CABINET (BC): A deluxe style cabinet is available for all models.

ORDERING INFORMATION: *ADD LETTERS IN PARENTHESIS AS SUFFIX TO MODEL NUMBER.*

SIZE/WEIGHT: 60, 150 & 300 WATT UNITS: 16″ DEEP X 19″ WIDE
600, 1000 & 3000 WATT UNITS: 17″ DEEP X 19″ DEEP

	60 WATT UNITS			150 and 300 WATT UNITS		
HEIGHT	FIXED	REVERSIBLE	WEIGHT	FIXED	REVERSIBLE	WEIGHT
5¼″	Up to 125kV	Up to 40kV	35 lbs. max.	Up to 125kV	Up to 40kV	35 lbs. max.
10½″	—	50 to 100kV	75 lbs. max.	—	50 to 100kV	75 lbs. max.
5¼″ OPEN STACK	—	—	—	150 to 400kV	N/A	25 lbs. max. (Plus H.V. Assembly)

	600 and 1000 WATT UNITS			3000 WATT UNITS		
HEIGHT	FIXED	REVERSIBLE	WEIGHT	FIXED	REVERSIBLE	WEIGHT
5¼″	Up to 100kV	Up to 20kV	35 lbs. max.	—	—	—
10½″	125kV	30 to 100kV	85 lbs. max.	—	—	—
5¼″ OPEN STACK	150 to 400kV	N/A	25 lbs. max. (Plus H.V. Assembly)	—	—	—
15¾″	—	—	—	Up to 125kV	Up to 100kV	150 lbs. max.
10½″ OPEN STACK	—	—	—	150 to 400kV	N/A	85 lbs. max. (Plus H.V. Assembly)

GAMMA HIGH VOLTAGE RESEARCH INC.

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HIGH VOLTAGE POWER SUPPLIES

REGULATED CONSTANT VOLTAGE CONSTANT CURRENT

1KV to 400KV
30 WATTS to 3000 WATTS

NEW

SERIES RR TO 300 WATTS

SPECIFICATIONS

INPUT VOLTAGE: 105-125V RMS at 5 Amps maximum (50-60 Hz)

OUTPUT VOLTAGE: Continuously adjustable from zero to maximum output voltage ratings of power supply. See Model selection guide.

***VOLTAGE REGULATION:** Line: Better than ±0.005% over specified input range. Load: 0.005% for full load change.

***CURRENT REGULATION:** Line: Better than ±0.005% over specified input range. Load: Better than 75uA for a 75% change in compliance voltage.

‡RIPPLE: 60 and 150 Watt units: 0.02% 300 Watt units: 0.05%

***TEMPERATURE COEFFICIENT:** 100ppm/°C over the range of 0 to 60°C.

***STABILITY:** 0.01%/hour. 0.03%/8 hours.

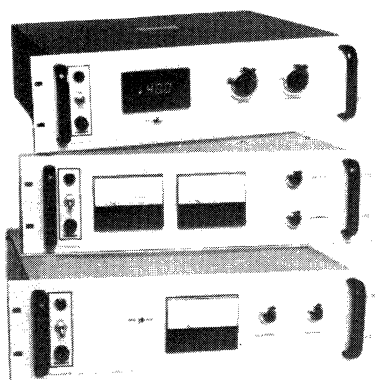
CONTROLS:
1. Power (HV ON)
2. Output Voltage (10-turn potentiometer)
3. Output Current (10-turn potentiometer)

INDICATORS:
1. Power (HV ON)
2. Output Voltage (meter ±2% of full scale)
3. Output Current (meter ±2% of full scale)

CONNECTORS:
1. High Voltage: All models are provided with 6 feet of shielded high voltage cable. The cables are fitted with bushings to mate with a re-entrant receptacle.
2. Input: 3-wire line cord.
3. Low Voltage. Rear mounted barrier terminal block for:
   a) External Interlock
   b) Voltage Programming
   c) Current Programming
   d) V/I Monitors

MODEL SELECTOR GUIDE†

OUTPUT VOLTAGE (kV)	60 WATT MODELS		150 WATT MODELS		300 WATT MODELS	
	Model	(mA) Rating	Model	(mA) Rating	Model	(mA) Rating
0-1.5	RR1.5-40	40	RR1.5-100	100	—	—
0-3	RR3-20	20	RR3-50	50	RR3-100	100
0-5	RR5-12	12	RR5-30	30	RR5-60	60
0-10	RR10-6	6	RR10-15	15	RR10-30	30
0-15	RR15-4	4	RR15-10	10	RR15-20	20
0-20	RR20-3	3	RR20-7.5	7.5	RR20-15	15
0-30	RR30-2	2	RR30-5	5	RR30-10	10
0-40	RR40-1.5	1.5	RR40-3.75	3.75	RR40-7.5	7.5
0-50	RR50-1.25	1.25	RR50-3	3	RR50-6	6
0-60	RR60-1	1	RR60-2.5	2.5	RR60-5	5
0-80	RR80-.75	0.75	RR80-1.8	1.8	RR80-3.75	3.75
0-100	RR100-.6	0.6	RR100-1.5	1.5	RR100-3	3
0-125	RR125-.5	0.5	RR125-1.2	1.2	RR125-2.5	2.5
0-150	N/A		RR150-1	1	RR150-2	2
0-200	N/A		RR200-.75	0.75	RR200-1.5	1.5
0-300	N/A		RR300-.5	0.5	RR300-1	1
0-400	N/A		RR400-.375	0.375	RR400-.75	0.75



SERIES RR TO 300 WATTS

*For voltage range from 10% to 100% of rated output. ‡For voltages 150KV and above consult factory. †Lower and higher power models are available. Consult factory.
All units are available in positive or negative polarity. Units up to 100kV are also available in reversible polarity. Add P, N or R as suffix to Model Number to indicate polarity desired.

SERIES RR 600 WATTS, 1000 WATTS, 3000 WATTS

SPECIFICATIONS

INPUT VOLTAGE: 600W: 105-125 RMS at 7 Amps maximum (50-60 Hz)
1000W: 220V RMS at 7 Amps maximum (50-60 Hz)
3000W: 220V RMS at 17 Amps maximum (50-60 Hz)
Also available with 3 ϕ input.

OUTPUT VOLTAGE: Continuously adjustable from zero to maximum output voltage rating of power supply. See Model selection guide.

***VOLTAGE REGULATION:** Line: Better than ±0.005% over specified input range. Load: 600W: 0.005% for full load change. IKW & 3KW: 0.01% for full load change.

***CURRENT REGULATION:** Line: Better than ±0.005% over specified input range. Load: Better than 75uA for a 75% change of compliance voltage.

‡RIPPLE: 600, 1KW units: 0.05% 3000 Watt units: 0.1%

***TEMPERATURE COEFFICIENT:** 100ppm/°C over the range of 0 to 60°C.

***STABILITY:** 0.01%/hour. 0.03%/8 hours.

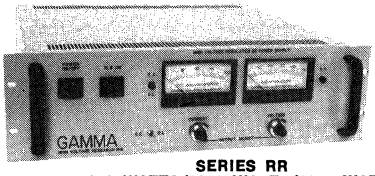
CONTROLS:
1. Power (HV ON)
2. Output Voltage (10-turn potentiometer)
3. Output Current (10-turn potentiometer)

INDICATORS:
1. Power (HV ON)
2. Output Voltage (meter ±2% of full scale)
3. Output Current (meter ±2% of full scale)
4. Mode of operation

CONNECTORS:
1. High voltage: All models are provided with 6 feet of shielded high voltage cable. The cables are fitted with bushings to mate with a re-entrant receptacle.
2. Input: 3-wire line cord.
3. Low Voltage: Rear mounted barrier terminal block for:
   a) External Interlock
   b) Voltage Programming
   c) Current Programming
   d) V/I Monitors

MODEL SELECTOR GUIDE†

OUTPUT VOLTAGE (kV)	600 WATT MODELS		1000 WATT MODELS		3000 WATT MODELS	
	Model	(mA) Rating	Model	(mA) Rating	Model	(mA) Rating
0-1.5	—	—	—	—	—	—
0-3	RR3-200	200	RR3-333	333	RR3-1000	1000
0-5	RR5-120	120	RR5-200	200	RR5-600	600
0-10	RR10-60	60	RR10-100	100	RR10-300	300
0-15	RR15-40	40	RR15-65	65	RR15-200	200
0-20	RR20-30	30	RR20-50	50	RR20-150	150
0-30	RR30-20	20	RR30-33	33	RR30-100	100
0-40	RR40-15	15	RR40-25	25	RR40-75	75
0-50	RR50-12	12	RR50-20	20	RR50-60	60
0-60	RR60-10	10	RR60-17	17	RR60-50	50
0-80	RR80-7.5	7.5	RR80-12.5	12.5	RR80-37.5	37.5
0-100	RR100-6	6	RR100-10	10	RR100-30	30
0-125	RR125-4.8	4.8	RR125-8	8	RR125-24	24
0-150	RR150-4	4	RR150-6.6	6.6	RR150-20	20
0-200	RR200-3	3	RR200-5	5	RR200-15	15
0-300	RR300-2	2	RR300-3.3	3.3	RR300-10	10
0-400	RR400-1.5	1.5	RR400-2.5	2.5	RR400-7.5	7.5



SERIES RR
600 WATTS/1000 WATTS/3000 WATTS
MODEL RR50-20P

*For voltage range from 10% to 100% of rated output. ‡For voltages 150KV and above consult factory. †Lower and higher power models are available. Consult factory.
All units are available in positive or negative polarity. Units up to 100kV are also available in reversible polarity. Add P, N or R as suffix to Model Number to indicate polarity desired.

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HIGH VOLTAGE POWER SUPPLIES MODULAR

SERIES MC

7 Models Covering the Range of 50VDC to 10,000VDC

ELECTRICAL CHARACTERISTICS:

Input Voltage: 1.75 to 12VDC
Input Current: 400mA
Output Voltage: Proportional to Input (see table)
Output Current: 3 Watts maximum (see table)
Load Regulation: 5% (½ load to full load)
Ripple: 1% p-p (typical)
Insulation Strength: 3000V Input/Output

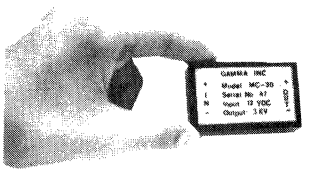
PHYSICAL CHARACTERISTICS:

Dimensions: 1.5″ x 2.5″ x 0.75″ (up to 5KV)
1.5″ x 2.5″ x 1.5″ (10KV)
Volume: 2.8 cu. in. (up to 5KV)
5.6 cu. in. (10KV)
Weight: 4 oz.
Packaging: Solid encapsulation
Terminations: 4 PC pins (.043 dia holes) up to 3KV)
3 PC pins (.043 dia holes) (5 and 10KV)

ENVIRONMENTAL CHARACTERISTICS:

Temperature Range: −20°C to +60°C

MINIATURE HIGH VOLTAGE POWER SUPPLIES



ELECTRICAL SPECIFICATIONS:

OUTPUT MODEL	OUTPUT VOLTAGE RANGE	OUTPUT POLARITY	CURRENT
MC-5	50VDC to 500VDC	Reversible	6mA
MC-15	150VDC to 1500VDC	Reversible	2mA
MC-30	300VDC to 3000VDC	Reversible	1mA
MC-50R	500VDC to 5000VDC	Reversible	200µA
MC-100P	1000VDC to 10,000VDC	Positive	100µA
MC-100N	1000VDC to 10,000VDC	Negative	100µA
* MC-100R	1000VDC to 10,000VDC	Reversible	100µA
† MC-150P	1500VDC to 15,000VDC	Positive	100µA
† MC-150N	1500VDC to 15,000VDC	Negative	100µA

*: SIZE: 4.5 x 1.437 x 1.375
†: INPUT: 18VDC

SERIES RC

7 Models Covering the range of 0-3KV to 0-30KV at 10 Watts

ELECTRICAL CHARACTERISTICS:

Input Voltage: +28VDC ±10%
Output Voltage: Programmable from zero to maximum rated voltage from either an external 5K ohm potentiometer or a zero to +10 volt low voltage ground referenced source
Output Current: 10 Watts maximum
Line Regulation: 0.01% maximum
Load Regulation: 0.01% maximum
Ripple: 0.05% maximum
Temp. Coefficient: 0.01%°C
Stability: 0.01%/8 hours
Monitor Outputs: 1) Voltage Monitor (Optional)
2) Current Monitor (Optional)
Programming:
Method 1. Resistance: External 5K ohm potentiometer
Method 2. Voltage: Zero to +10 Volts

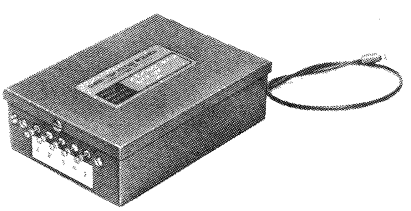
PHYSICAL CHARACTERISTICS:

Dimensions: 3½″ x 5⅛″ x 1 9/16″ (up to 15KV)
3¾″ x 6″ x 2¾″ (20 & 30KV)
Weight: 2½ lbs (up to 15KV)
3½ lbs (20 & 30KV)
Packaging: Solid encapsulation, metal case with metal inserts in base
Input Connector: Terminal strip
Output Termination: 12″ flying lead

ENVIRONMENTAL CHARACTERISTICS:

Temperature Range: 0 to 50°C

REGULATED DC/DC HIGH VOLTAGE POWER SUPPLIES



MODEL GUIDE:

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT
RC10-3	0-3KV	3.3mA
RC10-5	0-5KV	2.0mA
RC10-10	0-10KV	1.0mA
RC10-15	0-15KV	0.66mA
RC10-20	0-20KV	0.5mA
RC10-25	0-25KV	0.4mA
RC10-30	0-30KV	0.33mA

All units are available in positive or negative polarity. Add P or N as suffix to Model Number to indicate polarity desired.

SERIES UC

7 Models Covering the range of 0-3KV to 0-30K at 5 Watts

ELECTRICAL CHARACTERISTICS:

Input Voltage: +24VDC ±10%
Input Current: 400mA maximum
Output Voltage: Adjustable from zero to rated voltage by adjustment of DC input voltage
Output Current: 5 Watts maximum (see table)
Load Regulation: 20% maximum (½ load to full load)
Ripple: 0.1% per watt

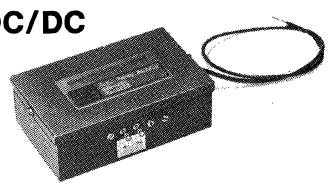
PHYSICAL CHARACTERISTICS:

Dimensions: 2¾″ x 4½″ x 1 9/16″ (up to 15KV)
3½″ x 5⅛″ x 1 9/16″ (20, 25 & 30KV)
Weight: 1½ lbs. (up to 15KV)
2½ lbs. (20, 25 & 30KV)
Packaging: Solid encapsulation, metal case with metal inserts in base
Terminations: Two terminals for DC input. 12″ flying lead for H.V. output

ENVIRONMENTAL CHARACTERISTICS:

Temperature Range: 0 to 50°C

PROPORTIONAL DC/DC HIGH VOLTAGE POWER SUPPLIES



MODEL GUIDE:

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT
UC5-3	0-3KV*	1.6mA
UC5-5	0-5KV*	1.0mA
UC5-10	0-10KV*	0.5mA
UC5-15	0-15KV	0.33mA
UC5-20	0-20KV	0.25mA
UC5-25	0-25KV	0.2mA
UC5-30	0-30KV	0.166mA

All Models available in positive or negative polarity. Add P or N as suffix to Model Number to indicate polarity desired. *3KV, 5KV and 10KV Models can be provided with reversible polarity (consult factory).

GAMMA HIGH VOLTAGE RESEARCH INC.

Designers/Manufacturers – High Voltage Power Supplies

1096 North US Hwy. #1, Ormond Beach, FL 32174 • TEL. 904-677-7070 • FAX. 904-677-3039

HIGH VOLTAGE POWER SUPPLIES MODULAR

SERIES PMT

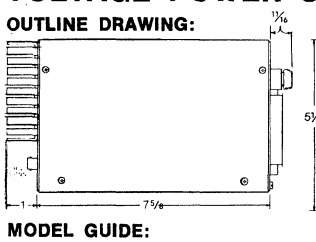
4 Models covering the range of 0-1.5KV to 0-3KV

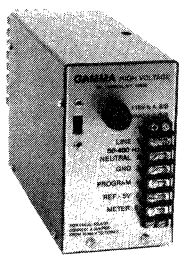
ELECTRICAL CHARACTERISTICS:

Input Voltage:	115/230 VAC ±10% 50 to 400 Hz
Output Voltage:	Continuously adjustable from zero to maximum output rating
Output Current:	See ratings of individual models
Regulation:	0.001% for ±10% line change 0.002% for NL-FL or FL-NL
Ripple:	0.001% peak-to-peak
Stability:	0.01%/hour, 0.02%/8 hours
Temp. Coefficient:	50ppm/°C over, the range of 0 to 50°C
Monitor Output:	0 to 5V/100μA for zero to maximum output voltage
Control:	Local: 20 turn potentiometer for zero to maximum output voltage Remote: Voltage (0 to −5V) or resistance for full range
Connections:	Input line, programming and metering via Terminal Block. Alternate connectors available
Size:	5½" H x 3⅛" W x 8⅝" L

PHOTOMULTIPLIER TUBE HIGH VOLTAGE POWER SUPPLIES

OUTLINE DRAWING:





MODEL GUIDE:

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT	POLARITY
PMT1.5P	0-1.5KV	10mA	Positive
PMT1.5N	0-1.5KV	10mA	Negative
PMT3P	0-3KV	5mA	Positive
PMT3N	0-3KV	5mA	Negative

SERIES XRM 10 Models covering the range of 0-1.5KV to 0-60KV up to 60 Watts

ELECTRICAL CHARACTERISTICS:

Input Voltage:	105-125 VAC 50 to 400 Hz
Output Voltage:	Continuously adjustable from zero to max output volt
Output Current:	See ratings of individual models
Voltage Regulation:	Line: ±0.005% over specified input range Load: ±0.01% for full load change
Current Regulation:	Better than ±0.005% over specified input range
Load Regulation:	Better than 50μA for a 75% change in compliance volt
Ripple:	0.05%
Temp. Coefficient:	100ppm/°C over the range of 0 to 60°C
Stability:	0.01%/hour; 0.03%/8 hours
Programming Output Voltage and Output Current:	The output voltage or output current can be remotely programmed from either an external volt source or external potentiometers from the internal reference volt. A zero to +5 source is required to full scale programming.

PHYSICAL CHARACTERISTIC:

Dimensions:	6" H x 4" x W x 10" L
Weight:	10 lbs.
Packaging:	Modular construction with high voltage section encapsulated in a silicone elastomer
Input Connector:	D-Subminiature 25 pin connector
Output Termination:	Re-entrant type bushing is standard, with mating output cable provided Customer specified output connectors can be provided

REGULATED, LINE OPERATED MODULAR HIGH VOLTAGE POWER SUPPLIES

(Non-Standard Connectors on Unit shown)

MODEL GUIDE:

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT
XRM1.5	0-1.5KV	33.0mA
XRM3	0-3KV	15.0mA
XRM5	0.5KV	10.0mA
XRM10	0-10KV	5.0mA
XRM15	0-15KV	3.5mA
XRM20	0-20KV	2.5mA
XRM30	0-30KV	2.0mA
XRM40	0-40KV	1.5mA
XRM50	0-50KV	1.0mA
XRM60	0-60KV	1.0mA

All units are available in positive or negative polarity. Add P or N as suffix to Model Number to indicate polarity desired.

HIGH VOLTAGE DIVIDER

SERIES HVD

MODEL HVD-100 SPECIFICATIONS:

Input Voltage:	100KVDC maximum
Input Impedance:	200 megohms
Output Impedance:	20,000 ohms
Output Taps:	1 volt/100KV
Temp. Coefficient:	75 ppm
Accuracy:	0.2%
Size:	17½" high (maximum). Termination 10" toroid
Output Connector:	BNC

MODEL HVD-100-S SPECIFICATIONS:

Model HVD-100-S is identical to Model HVD-100 with the exception of accuracy which is 0.1% and temperature coefficient which is 25ppm.

MODEL HVD-200 SPECIFICATIONS:

Input Voltage:	200KVDC maximum
Input Impedance:	4000 megohms
Output Impedance:	40,000 ohms
Output Taps:	2V 1 (volt/100KV)
Temp. Coefficient:	75ppm
Accuracy:	0.2%
Size:	30" high (maximum). Termination 12" toroid
Output Connector:	BNC

MODEL HVD-200-S SPECIFICATIONS:

Model HVD-200-S is identical to Model HVD-200 with the exception of accuracy which is 0.1% and temperature coefficient which is 25ppm.

HVD-100

HIGH FREQUENCY DIVIDER NEW

MODEL HFD-60

Capability of measuring pulses wtih rise time of less than 20nS at voltages to 60KV.

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TWX: 710-480-2839

GLASSMAN HV POWER SUPPLIES...better by design!

The choice of a high voltage power supply involves many factors besides the obvious ones. Of course, the supply must meet the maximum output voltage and current required for the particular application. It must provide adequate ripple suppression, static line regulation, and static load regulation. And its input voltage and frequency requirements must be considered and met. However, other factors may be of even more significance.

Safety Considerations

Safety considerations are of utmost importance. Any high voltage power supply poses a threat to operating personnel. Glassman power supplies, however, are designed to minimize the danger. They operate, not at line frequencies, but at RF. The higher frequency means that the filter capacitors used to suppress ripple are orders of magnitude smaller in value than those used in line frequency supplies. Since stored energy is equal to $E = \frac{1}{2} CV^2$, a smaller capacitor means less stored energy. In fact, the stored energy available from most Glassman supplies is well below the 4 to 5 joules required to kill a person.

Nevertheless, lethal energy may be present at higher voltages. To guard against this danger, Glassman supplies are equipped with extensive protective devices, including safety interlock circuits with intelligent latching, full panel status annunciators, and selectable restart conditions in the event of a power outage.

Efficiency, Size, and Weight

The use of RF in Glassman supplies has other advantages beyond that of safety. Higher operating frequencies mean smaller and lighter transformers, as well as smaller capacitors and inductors. This leads directly to lower weight, smaller size, and lower cost. And RF supplies are more efficient because of lower losses. This translates into cooler operation and increased reliability.

Another consequence of RF supplies, with their lower stored energy, is that the output cable and connector do not have to support large levels of energy in the event of a short circuit condition. Glassman supplies are equipped with an eight-foot, shielded, light weight coaxial output cable.

Regulation

The high frequency of an RF supply simplifies closed loop regulator design. Dynamic regulation becomes important when either the line or the load may be expected to change abruptly or when the load is sensitive to momentary deviations in the output. Glassman supplies have typical regulation response times of 1 millisecond. Both the degree of regulation and the speed of response is considerably better than line frequency-based designs.

Air Insulation

Glassman supplies are unique in that they use air insulation. Competitive supplies use vacuum encapsulated high voltage components. The use of air insulation has considerable advantages. Reduced weight is one. More importantly, air insulation leads to improved serviceability. Individual components can be replaced, if necessary, without the need to scrap an entire assembly. Air insulation also avoids the danger of delamination of the encapsulation which can lead to unseen creepage paths and catastrophic failure. Glassman high voltage components are designed with careful consideration of potential gradients, assuring corona-free operation.

For output voltages up to 125 KV, high voltage components are enclosure-mounted for protection against contamination. For voltages above 125 KV, open-stack components are used. Some consideration of atmospheric contamination is then required. However, 12 years of experience with air insulation and thousands of units in operation from deserts to coastal plains and altitudes to 10,000 feet demonstrate the reliability of air insulation.

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STANDARD POWER SUPPLIES FROM GLASSMAN

Glassman offers a broad selection of the most advanced high voltage power supplies available. Each features unbeatable performance, versatile control and protection capabilities, field-tested reliability, and significant size and weight advantages. Standard models, features, and options are summarized at right.

In addition to our broad base of standard models, we welcome the opportunity to discuss your "OEM" requirements.

Glassman High Voltage, Inc. warrants standard power supplies to be free from defects in materials and workmanship for three years from date of shipment. OEM and modified standard power supplies are warranted for one year from date of shipment. The company agrees to replace or repair any power supply that fails to peform as specified within the warranty period. Formal warranty available.

Features/Options	Series												
	MJ pg. 2	MK pg. 2	EL pg. 3	EH pg. 3	ER pg. 4	WR pg. 4	WH pg. 5	EW pg. 5	WX pg. 5	PG pg. 6	LX pg. 7	LT pg. 7	PK pg. 8	PKCP pg. 10
Remote Voltage Program	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S
Remote Voltage Monitor	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S
Remote Current Program	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S
Remote Current Monitor	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S
Voltage Adjust	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Current Adjust	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S
Shielded Output Cable	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Digital Panel Meters	N/A	N/A	O	O	O	O	O	O	O	O	O	O	S	S
Analog Panel Meters	N/A	N/A	S	S	S	S	S	S	S	S	S	S	N/A	N/A
External interlock Terminals	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S
TTL Enable/Disable	S	S	N/A	S	S	S	O	S	S	O	S	S	S	S
Zero Start Interlock	N/A	N/A	O	O	O	O	O	O	O	O	O	O	O	O
Slow Start	N/A	N/A	O	O	O	O	O	O	O	O	O	O	O	O
Current Trip	N/A	N/A	O	O	O	O	O	O	O	O	O	O	S	S

S = Standard O = Optional N/A = Not Available

Typical Specifications

Voltage Regulation:* Load, better than ±0.005% ±1 volt for full load variation; line, better than ±0.005% ±l volt.

Current Regulation:* Load, better than ±0.05% from short circuit to rated voltage at any load condition. Line, better than ±0.005% ±1 μA.

Ripple:* 0.03% rms of rated voltage at full load. Ripple voltage is proportional to load current and decreases linearly to 0.01% rms of rated voltage at no load.

Stability: 0.01% per hour after 1/2 hour warm-up. 0.05% per 8 hours.

Temperature Coefficient: 0.01%/°C.

Ambient Temperature: -20° C to +60° C, operating; -40° C to +85° C, storage.

Protection: Automatic current regulation protects the power supply against all overload conditions, including arcs and short circuits. Fuses, surge limiting resistors, and low energy components provide the ultimate protection.

Most models can be tailored to meet your precise requirements. Consult factory

* Some specifications vary on particular models. Check with the factory or refer to individual product data sheets for details.

Standard Models Voltage/Current

Output (kV)	Series; Current Rating (mA)												
	MJ pg. 2	MK pg. 2	EL pg. 3	EH pg. 3	ER pg. 4	WR pg. 4	EW pg. 5	WX pg. 5	PG pg. 6	LX pg. 7	LT pg. 7	PK pg. 8	PKCP pg. 10
1		75		100	300		600	1000					
1.5		50		65	200		400	700		1300	1300		
2		35.7		50	150		300	500		1000	1000		
3	5	25	15	33	100		200	350		660	660	1300	650
												2600	1300
5	3	15	8	20	60		120	200		400	400		
6					50					330	330	650	325
												1300	650
7							85						
8										250	250	450	225
												900	450
10	1.5	7.5	4	10	30		60	100		200	200	400	200
												800	400
12										165	165	330	165
												660	330
15	1	5	3	6	20		40	70		132	132	260	130
												520	260
20	0.7	3.7	2	5	15		30	50		100	100	200	100
												400	200
25				4			24						
30	0.4	2.5	1.5	3	10		20	35		66	66	130	65
												260	130
35		2											
40		1.8	1	2.5	7.5		15	25		50	50	100	50
												200	100
50		1.5	0.8	2	6		12	20		40	40	80	40
												160	80
60		1.2	0.6	1.5	5		10	15		33	33	65	37.5
												130	65
75					4			12				50	25
												100	50
80										25	25	50	25
												100	50
85						3.5							
100						2.5				20	20	40	20
												80	40
125						2				16	16	30	15
												60	30

Open Stack Models

100									5				
									10				
150									3			25	12.5
									6			50	25
200									2.5			18	9
									5			36	18
250									2			14	7
									4			28	14
300									1			10	5
									2			20	10
350												8	4
												16	8
400									1			6	3
												12	6
500									1			4	2
												8	4

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Series MJ — 15 Watt

FEATURES

- Premium performance at low cost.
- Multi-mode operation allows local voltage and/or current control or remote control via a 0-10 V signal or external potentiometers.
- External interlock terminals.
- TTL enable/disable.
- Overload, short circuit, and arc protection.
- AC input eliminates the need and expense of an auxiliary DC power source.

OPTIONS

Symbol	Description
100	100 volt input: rated for 90 to 110 volts RMS, 48-420 Hz
220	220 volt input: rated for 210 to 250 volts RMS, 48-420 Hz

MODELS

Positive Polarity	Negative Polarity	Output Voltage (kV)	Output Current (mA)	Case Size	Output Cable Provided
MJ3P5000	MJ3N5000	0-3	0-5	A	RG-8U
MJ5P3000	MJ5N3000	0-5	0-3	A	RG-8U
MJ10P1500	MJ10N1500	0-10	0-1.5	A	RG-8U
MJ15P1000	MJ15N1000	0-15	0-1	A	RG-8U
MJ20P700	MJ20N700	0-20	0-0.7	B	RG-8U
MJ30P400	MJ30N400	0-30	0-0.4	B	RG-8U

Case A: 3¼×5¼×11½
B: 3¼×5¼×13¾

For typical specifications see page 1.

Series MK — 75 Watt

FEATURES

- High power laboratory performance in a compact package.
- Multi-mode operation allows local voltage and/or current control or remote control via a 0-10 V signal or external potentiometers.
- External interlock terminals.
- TTL enable/disable.
- Overload, short circuit, and arc protection.
- AC power annunciator.

OPTIONS

Symbol	Description
100	100 volt input: rated for 90 to 110 volts RMS, 48-420 Hz
220	220 volt input: rated for 210 to 250 volts RMS, 48-420 Hz

MODELS

Positive Polarity	Negative Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
MK1P75L	MK1N75L	0-1	0-75	RG-59U
MK1.5P50L	MK1.5N50L	0-1.5	0-50	RG-59U
MK2P37.5L	MK2N37.5L	0-2	0-37.5	RG-59U
MK3P25L	MK3N25L	0-3	0-25	RG-59U
MK5P15L	MK5N15L	0-5	0-15	RG-59U
MK10P7.5	MK10N7.5	0-10	0-7.5	RG-8U
MK15P5	MK15N5	0-15	0-5	RG-8U
MK20P3.7	MK20N3.7	0-20	0-3.7	RG-8U
MK30P2.5	MK30N2.5	0-30	0-2.5	RG-8U
MK35P2	MK35N2	0-35	0-2	RG-8U
MK40P1.8	MK40N1.8	0-40	0-1.8	RG-8U
MK50P1.5	MK50N1.5	0-50	0-1.5	RG-8U
MK60P1.2	MK60N1.2	0-60	0-1.2	RG-8U

Case: 4¾×5 3/16×11

For typical specifications see page 1.

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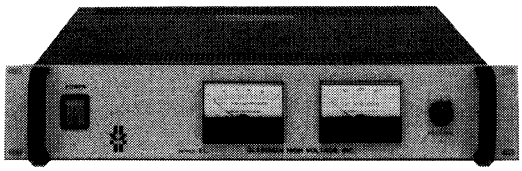
Series EL — 40/45 Watt



FEATURES

- Laboratory performance at an economical price.
- Fast transient response time. Less than 3 milliseconds for a 50% load transient.
- Ten-turn voltage control with locking vernier dial.
- Self-restoring automatic crossover from voltage regulation to current limit mode with overload.
- Overload, short circuit, and arc protection.
- 19-inch rack or bench mounting, 3½ inch high.

MODELS

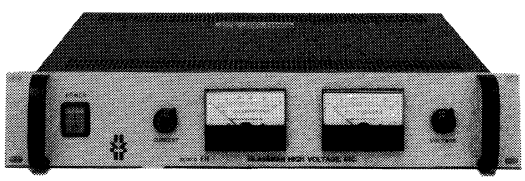
Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
EL3P15L	EL3N15L	EL3R15L	0-3	15	RG-59U
EL5P8L	EL5N8L	EL5R8L	0-5	8	RG-59U
EL10P4	EL10N4	EL10R4	0-10	4	RG-8U
EL15P3	EL15N3	EL15R3	0-15	3	RG-8U
EL20P2	EL20N2	EL20R2	0-20	2	RG-8U
EL30P1.5	EL30N1.5	EL30R1.5	0-30	1.5	RG-8U
EL40P1	EL40N1	EL40R1	0-40	1	RG-8U
EL50P0.8	EL50N0.8	EL50R0.8	0-50	0.8	RG-8U
EL60P0.6	EL60N0.6	EL60R0.6	0-60	0.6	RG-8U

For typical specifications see page 1.

OPTIONS

Symbol	Description
100	100 volt input: rated for 90 to 110 volts RMS, 48-420 Hz
220	220 volt input: rated for 210 to 250 volts RMS, 48-420 Hz

Series EH — 100 Watt



FEATURES

- Premium performance at an economical price.
- 3½ inch high, 13 lbs.
- Fast transient response. Less than 3 milliseconds for a 50% load transient.
- Ten-turn voltage and current controls with locking vernier dial.
- Constant voltage/Constant current operation.
- Remote control facilities include voltage and current program/monitor terminals, TTL high voltage enable/disable, safety interlock terminals, as well as a +10 volt reference source.

MODELS

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
EH1P100L	EH1N100L	EH1R100L	0-1	0-100	RG-59U
EH1.5P65L	EH1.5N65L	EH1.5R65L	0-1.5	0-65	RG-59U
EH2P50L	EH2N50L	EH2R50L	0-2	0-50	RG-59U
EH3P33L	EH3N33L	EH3R33L	0-3	0-33	RG-59U
EH5P20L	EH5N20L	EH5R20L	0-5	0-20	RG-59U
EH10P10	EH10N10	EH10R10	0-10	0-10	RG-8U
EH15P6	EH15N6	EH15R6	0-15	0-6	RG-8U
EH20P5	EH20N5	EH20R5	0-20	0-5	RG-8U
EH25P4	EH25N4	EH25R4	0-25	0-4	RG-8U
EH30P3	EH30N3	EH30R3	0-30	0-3	RG-8U
EH40P2.5	EN40N2.5	EH40R2.5	0-40	0-2.5	RG-8U
EH50P2	EH50N2	EH50R2	0-50	0-2	RG-8U
EH60P1.5	EH60N1.5	EH60R1.5	0-60	0-1.5	RG-8U

For typical specifications see page 1.

OPTIONS

Symbol	Description
100	100 volt input: rated for 90 to 110 volts RMS, 48-420 Hz
220	220 volt input: rated for 210 to 250 volts RMS, 48-420 Hz
DM	3½ digit LCD displays
ZR	Zero start interlock. Voltage control must be at zero before accepting an enable signal
SS	Slow start ramp of up to 30s available. Specify time
CT	Current trip

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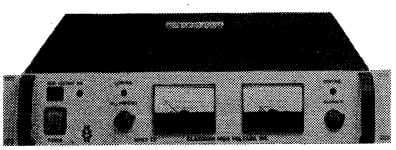
Series ER — 300 Watt



The 300 W Series ER represents a significant advance in sophisticated high voltage power supplies. Available in output voltage ranges of 0 to 2 KV through 0 to 75 KV, Series ER is only 3½ inches high and weighs a mere 18 pounds. In addition to its standard configuration with dual analog meter displays, it is available as a Series ERDM with digital meters or with a blank panel for OEM/system applications.

MODELS

Positive Polarity	Negavite Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
Reversible Polarity Only		ER1R300	0-1	0-300	RG-59U
		ER1.5R200	0-1.5	0-200	RG-59U
		ER2R150	0-2	0-150	RG-59U
		ER3R100	0-3	0-100	RG-59U
		ER5R60	0-5	0-60	RG-59U
		ER6R50	0-6	0-50	RG-58U
ER10P30	ER10N30	ER10R30	0-10	0-30	RG-8U
ER15P20	ER15N20	ER15R20	0-15	0-20	RG-8U
ER20P15	ER20N15	ER20R15	0-20	0-15	RG-8U
ER30P10	ER30N10	ER30R10	0-30	0-10	RG-8U
ER40P7.5	ER40N7.5	ER40R7.5	0-40	0-7.5	RG-8U
ER50P6	ER50N6	ER50R6	0-50	0-6	RG-8U
ER60P5	ER60N5	ER60R5	0-60	0-5	RG-8U
ER75P3	ER75N3	ER75R3	0-75	0-3	DS2124

For typical specifications see page 1.

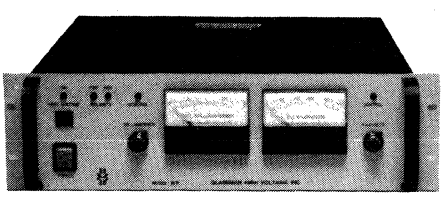
ADDITIONAL FEATURES

- Automatic crossover from voltage or current regulated mode dependent on load conditions.
- 3 ½ inch high, 18 lbs.
- Less than 3 ms response for a 50% load transient.
- Voltage and current program/monitor terminals.
- TTL HV enable/disable.
- Safety interlock terminals.
- +10 V reference source.

OPTIONS

Symbol	Description
100	100 Volt Input: rated 90 to 110 V RMS, 48-63 Hz
220	220 Volt Input: rated 200 to 264 V RMS, 48-63 Hz
400	48 to 420 Hz, available on standard model and options 100 and 220
DM	3½ digit LCD panel meters
NC	Blank front panel (power switch only)
CT	Current Trip. Power supply trips off under overload conditions
ZR	Zero start interlock. Voltage control must be at zero before accepting an enable signal
SS	Slow start ramp of up to 30s available. Specify time

Series WR — 250 Watt



The 250 W Series WR is a natural extension of Series ER, adding output voltages from 0 to 85 kV through 0 to 125 kV...in a panel height of only 5.25 inches. It also is available with analog displays, digital displays, or with a blank panel for OEM/system applications. For analog and digital versions, voltage and current control is by means of separate 10-turn potentiometers with locking vernier dials.

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
WR85P3.5	WR85N3.5	WR85R3.5	0 - 85	0 - 3.5	DS2121
WR100P2.5	WR100N2.5	WR100R2.5	0 - 100	0 - 2.5	DS2121
WR125P2	WR125N2	WR125R2	0 - 125	0 - 2	DS2121

For typical specifications see page 1.

ADDITIONAL FEATURES

- Automatic crossover from voltage or current regulated mode dependent on load conditions.
- Less than 3 ms response for a 50% load transient.
- Voltage and current program/monitor terminals.
- TTL HV enable/disable.
- Safety interlock terminals.
- +10 V reference source.

OPTIONS

Symbol	Description
100	100 Volt Input: rated 90 to 110 V RMS, 48-63 Hz
220	220 Volt Input: rated 200 to 264 V RMS, 48-63 Hz
400	48 to 420 Hz, available on standard model and options 100 and 220
DM	3½ digit LCD panel meters
NC	Blank front panel (power switch only)
CT	Current Trip. Power supply trips off under overload conditions
ZR	Zero start interlock. Voltage control must be at zero before accepting an enable signal
SS	Slow start ramp of up to 30s available. Specify time

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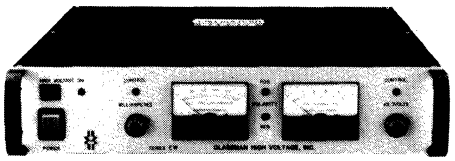
TWX: 710-480-2839

Series EW—500 Watt with Extended Current Capability



FEATURES

- Maximum current equivalent to 600 W supply for output voltages below 84% of rated.
- Low stored energy, for maximum personnel/equipment safety.
- Constant voltage/constant current operation.
- Primary contactor— prevents self-turn-on after power outage.
- Pulse width modulated off-the-line configuration results in full load efficiency bette than 85%— low internal dissipation, very high reliability.
- Remote and front panel monitoring of both DC ouput voltage and current.
- Regulation— better than 0.005%— line and load.
- 3 ½ inch high, 18 lbs.

MODELS

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
Reversible Only		EW1R600	0-1	0-600	RG-59U
		EW1.5R400	0-1.5	0-400	RG-59U
		EW2R300	0-2	0-300	RG-59U
		EW3R200	0-3	0-200	RG-59U
		EW5R120	0-5	0-120	RG-59U
EW7P85	EW7N85	EW7R85	0-7	0-85	RG-8U
EW10P60	EW10N60	EW10R60	0-10	0-60	RG-8U
EW15P40	EW15N40	EW15R40	0-15	0-40	RG-8U
EW20P30	EW20N30	EW20R30	0-20	0-30	RG-8U
EW25P24	EW25N24	EW25R24	0-25	0-24	RG-8U
EW30P20	EW30N20	EW30R20	0-30	0-20	RG-8U
EW40P15	EW40N15	EW40R15	0-40	0-15	RG-8U
EW50P12	EW50N12	EW50R12	0-50	0-12	RG-8U
EW60P10	EW60N10	EW60R10	0-60	0-10	RG-8U

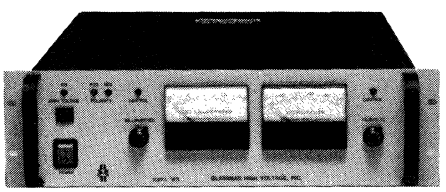
OPTIONS

Symbol	Description
220	220 Volt input: rated for 210 to 250V RMS, 50-400 Hz
100	100 Volt input: rated for 90 to 110V RMS, 50-400 Hz
400	48 to 420 Hz available on standard model and options 100 and 220
B	Bi-Polar Operation (Requires 2 power supplies)
CT	Current Trip
DM	Digital Panel Meters

Note: Product of voltage and current automatically limited to 500W maximum.

For typical specifications see page 1.

Series WX — 1000 watt



FEATURES

- Constant voltage/Constant current operation.
- Ten-turn voltage and current controls with locking vernier dial.
- Three different control panel configurations for maximum application flexibility.
- Remote control facilities include voltage and current program/monitor terminals, TTL high voltage enable/disable, safety interlock terminals, as well as a +10 volt reference source.
- Light weight, 40 pounds; **compact 5¼" panel height.**

MODELS

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable Provided
Reversible Only		WX1R1000	0-1	0-1000	RG-59U
		WX1.5R700	0-1.5	0-700	RG-59U
		WX2R500	0-2	0-500	RG-59U
		WX3R350	0-3	0-350	RG-59U
		WX5R200	0-5	0-200	RG-59U
WX10P100	WX10N100	WX10R100	0-10	0-100	RG-8U
WX15P70	WX15N70	WX15R70	0-15	0-70	RG-8U
WX20P50	WX20N50	WX20R50	0-20	0-50	RG-8U
WX30P35	WX30N35	WX30R35	0-30	0-35	RG-8U
WX40P25	WX40N25	WX40R25	0-40	0-25	RG-8U
WX50P20	WX50N20	WX50R20	0-50	0-20	RG-8U
WX60P15	WX60N15	WX60R15	0-60	0-15	RG-8U
WX75P12	WX75N12	WX75R12	0-75	0-12	DS2124

OPTIONS

Symbol	Description
DM	3½ digit LCD panel meters.
NC	Blank front panel, power switch only.
CT	Current trip. The power supply shuts off in the event of an overload.
ZR	Zero start interlock. The power supply control must be at zero prior to an enable signal being accepted.
SS	Slow start ramp of up to 30 seconds is provided. Specify time when ordering.

Ripple: 0.05% of rated voltage at full load.
Input: 198-264 V RMS, 48-63 HZ single phase, 9 A.

For typical specifications see page 1.

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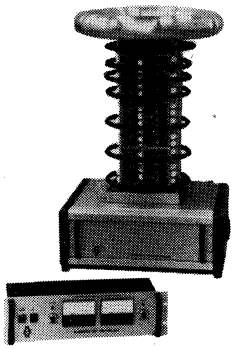
Series PG — 500/1000 Watt



FEATURES

- Adjustable current limits, output surge-limiting resistors provide additional margins of safety.
- Off-the-line configuration results in full load efficiency better than 75% — low internal dissipation, very high reliability.
- Remote and front panel monitoring and programming of both DC output voltage and current.
- Regulation better than 0.005% — line and load.
- Less than 3 msec recovery from 50% load transient.

OPTIONS

Symbol	Description
220	220 Volt input: rated for 210 to 250 volts RMS, 50-60 Hz.
100	100 Volt input: rated for 90 to 110 volts RMS, 50-60 Hz.
400	48 to 420 Hz, available on standard model and options 100 and 220.
CT	Current Trip: supply turns off when overload occurs. Manual reset required to return to normal operation.
DM	4½-digit LED displays for both voltages and current readouts.
TTL	TTL compatible "enable" line.

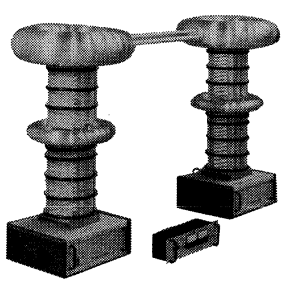
For typical specifications see page 1.

MODELS

Open stack models are supplied with cabinet mounted stack and driver, and remote control panel. Driver mounted controls are optional.

Positive Polarity Model	Negative Polarity Model	Reversible Polarity Model	Output Voltage (kV)	Output Current (mA)	Ripple RMS (%)	Panel Height (inches)	Stack Size (LxWxH) (inches)
PG100P5	PG100N5	PG100R5	0-100	0-5	0.1	5¼	12x12x14½
PG100P10	PG100N10	PG100R10	0-100	0-10	0.2	5¼	12x12x14½
PG150P3	PG150N3	PG150R3	0-150	0-3	0.1	5¼	12x12x21½
PG150P6	PG150N6	PG150R6	0-150	0-6	0.2	5¼	12x12x21½
PG200P2.5	PG200N2.5	PG200R2.5	0-200	0-2.5	0.1	5¼	12x12x26½
PG200P5	PG200N5	PG200R5	0-200	0-5	0.2	5¼	12x12x26½
PG250P1	PG250N1	PG250R1	0-250	0-1	0.1	5¼	12x12x32¼
PG250P2	PG250N2	PG250R2	0-250	0-2	0.2	5¼	12x12x32¼
PG300P1	PG300N1	PG300R1	0-300	0-1	0.2	5¼	12x12x42⅝
PG400P1	PG400N1	PG400R1	0-400	0-1	0.2	5¼	12x12x51
PG500P1	PG500N1	PG500R1	0-500	0-1	0.2	5¼	12x12x65¼

Series PG-LR — Open Stack Models With Low Ripple



SPECIFICATIONS

Input:
208 VRMS 50-60 Hz; 3 phase. Less than 5 amperes.

Voltage Regulation:
Better than ±0.005% ±1V line and load.

Current Regulation:
Load, better than 100 microamperes from short circuit to rated voltage at any load condition.
Line, better than ±0.005% ±1μA.

Controls:
Complete remote control panel, power on/off high voltage on switches, voltage and current meters, ten turn voltage and current controls with active mode indicators, 20′ interconnection cable.

OPTIONS

Symbol	Description
CT	Current Trip: supply turns off when overload occurs. Manual reset required to return to normal operation.
TTL	TTL compatible "enable" line.
DM	4½-digit LED displays for both voltage and current readouts.

MODELS

Positive Polarity	Negative Polarity	Output Voltage (kV)	Output Current (mA)	Ripple Volts P-P	
				Typical	Maximum
PG100P2.5-LR	PG100N2.5-LR	0-100	2.5	2	4½
PG100P5-LR	PG100N5-LR	0-100	5	4	7
PG150P2-LR	PG150N2-LR	0-150	2	3	4¾
PG150P3-LR	PG150N3-DR	0-150	3	6	9
PG200P1-LR	PG200N1-LR	0-200	1	3½	5
PG200P2-LR	PG200N2-LR	0-200	2	7	10
PG250P1-LR	PG250N1-LR	0-250	1	4¼	6¼
PG250P2-LR	PG250N2-LR	0-250	2	8½	12½
PG300P1-LR	PG300N1-LR	0-300	1	5	7½
PG300P2-LR	PG300N2-LR	0-300	2	10	15
PG400P1-LR	PG400N1-LR	0-400	1	7	10

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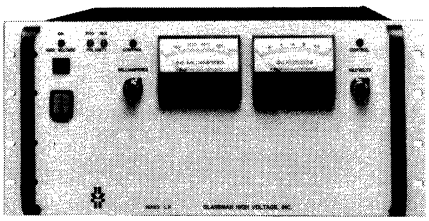
Series LX — 1000 Watt



FEATURES

- Extended current equivalent to a constant power 2000 W supply for output voltages below 50% of rated.
- Air insulation reduces total weight and allows for easy serviceability.
- Ripple is less than 0.03% of rated voltage + 1V at full load.
- Voltage regulation better than 0.005% for allowable line and load variations.
- As standard, all LX models provide output voltage and current program/monitor terminals, TTL high voltage enable/disable, safety interlock terminals, and a +10 V reference source.
- Panel height only 8.75 inches. Weight is less than 47 pounds.

MODELS

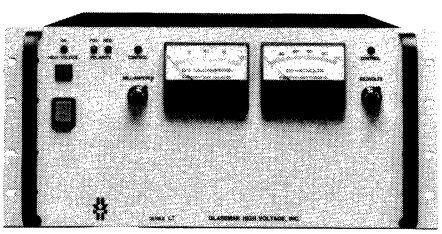
Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable	Panel Height (in)
Reversible only		LX1.5R1300	0-1.5	0-1300	RG-59U	8.75
		LX2R1000	0-2	0-1000	RG-59U	8.75
		LX3R660	0-3	0-660	RG-59U	8.75
		LX5R400	0-5	0-400	RG-59U	8.75
		LX6R330	0-6	0-330	RG-58U	8.75
LX8P250	LX8N250	LX8R250	0-8	0-250	RG-8U	8.75
LX10P200	LX10N200	LX10R200	0-10	0-200	RG-8U	8.75
LX12P165	LX12N165	LX12R165	0-12	0-165	RG-8U	8.75
LX15P132	LX15N132	LX15R132	0-15	0-132	RG-8U	8.75
LX20P100	LX20N100	LX20R100	0-20	0-100	RG-8U	8.75
LX30P66	LX30N66	LX30R66	0-30	0-66	RG-8U	8.75
LX40P500	LX40N50	LX40R50	0-40	0-50	RG-8U	8.75
LX50P40	LX50N40	LX50R40	0-50	0-40	RG-8U	8.75
LX60P33	LX60N33	LX60R33	0-60	0-33	RG-8U	8.75
LX80P25	LX80N25	LX80R25	0-80	0-25	DS2121	8.75
LX100P20	LX100N20	LX100R20	0-100	0-20	DS2121	8.75
LX125P16	LX125N16	LX125R16	0-125	0-16	DS2121	8.75

OPTIONS

Symbol	Description
100	90-116 V input, 48-63 Hz. NEMA 5-15 plug.
200	180-232 V input, 48-63 Hz. NEMA 6-15 plug.
DM	3½ digit LCD panel meters.
NC	Blank front panel, power switch only.
CT	Current trip. Power supply trips off under overload condition. This option has a rear panel switch that selects either "trip" operation or normal current limiting of an overload.
ZR	Zero start interlock. Voltage control, local or remote, must be at zero before accepting an enable signal.
SS	Slow start ramp. Specify standard times of 1, 2, 3, 5, 10, 15, 20 or 30 s ±20%
5VC	0-5V voltage and current program/monitor.

Note: Product of voltage and current automatically limited to 1000 W maximum.

Series LT — 2000 Watt



FEATURES

- Off-the-line pulse-width modulation provides high efficiency and a reduced parts count for reliability.
- Air insulation reduces total weight and allows for easy serviceability.
- Automatic crossover from constant-voltage to constant-current regulation protects against overloads, arcs, and short circuits.
- Ripple is less than 0.03% of rated voltage + 1V at full load.
- Voltage regulation better than 0.005% for allowable line and load variations.
- As standard, all LT models provide output voltage and current program/monitor terminals, TTL high voltage enable/disable, safety interlock terminals, and a +10 V reference source.
- Panel height only 8.75 inches. Weight is less than 47 pounds.

MODELS

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Output Cable	Panel Height (in)
Reversible only		LT1.5R1300	0-1.5	0-1300	RG-59U	8.75
		LT2R1000	0-2	0-1000	RG-59U	8.75
		LT3R660	0-3	0-660	RG-59U	8.75
		LT5R400	0-5	0-400	RG-59U	8.75
		LT6R330	0-6	0-330	RG-58U	8.75
LT8P250	LT8N250	LT8R250	0-8	0-250	RG-8U	8.75
LT10P200	LT10N200	LT10R200	0-10	0-200	RG-8U	8.75
LT12P165	LT12N165	LT12R165	1-12	0-165	RG-8U	8.75
LT15P132	LT15N132	LT15R132	0-15	0-132	RG-8U	8.75
LT20P100	LT20N100	LT20R100	0-20	0-100	RG-8U	8.75
LT30P66	LT30N66	LT30R66	0-30	0-66	RG-8U	8.75
LT40P500	LT40N50	LT40R50	0-40	0-50	RG-8U	8.75
LT50P40	LT50N40	LT50R40	0-50	0-40	RG-8U	8.75
LT60P33	LT60N33	LT60R33	0-60	0-33	RG-8U	8.75
LT80P25	LT80N25	LT80R25	0-80	0-25	DS2121	8.75
LT100P20	LT100N20	LT100R20	0-100	0-20	DS2121	8.75
LT125P16	LT125N16	LT125R16	0-125	0-16	DS2121	8.75

OPTIONS

Symbol	Description
DM	3½ digit LCD panel meters.
NC	Blank front panel, power switch only.
CT	Current trip. Power supply trips off under overload condition. This option has a rear panel switch that selects either "trip" operation or normal current limiting of an overload.
ZR	Zero start interlock. Voltage control, local or remote, must be at zero before accepting an enable signal.
SS	Slow start ramp. Specify standard times of 1, 2, 3, 5, 10, 15, 20 or 30 s ±20%
5VC	0-5V voltage and current program/monitor.

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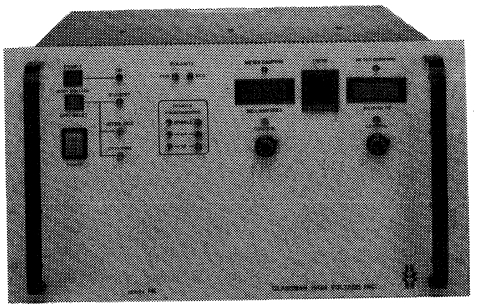
Series PK — 4/8 Kilowatt (208V 3-phase input)



The new Series PK features unprecedented 4 or 8 KW performance in a choice of models providing output voltages to 500 KV. Each model offers significant savings in size and weight over competitive units, as well as tighter regulation, improved stability, and lower temperature coefficients.

Output voltage and current are displayed on separate LCD digital readouts with selectable damping. A dual bargraph provides an additional "analog" indication of rapidly changing output levels.

All Series PK models provide extensive remote programming capabilities with front panel annunciators displaying remote activity. Both voltage and current levels can be controlled by external analog signals and an external digital signal can activate high voltage enable.

ADDITIONAL FEATURES

- Front panel interlock indicator shows a customer interlock "is" or "was" open. Output voltage is disabled and cannot be enabled until the open interlock is corrected and the system reset.
- Front panel external indicator shows an external disable signal "is" or "was" present. The external fault can be latching or non-latching at the user's discretion. When latched, the system must be reset to enable the high voltage. When unlatched, the voltage will re-enable as soon as the external signal is removed.
- Front panel standby indicator shows the system is ready for high voltage enable. A monitoring system will defeat a standby indication if the AC line voltage is too low, internal bias voltage is missing, a current trip fault occurred, or if an external disable or open interlock signal is or was present.
- A current limiting mode is standard. The user may select instead a soft current trip with 500 milliseconds delay. A hard trip also is available on request.
- A rear panel connector accepts an external trip signal of 5 volts. Operation can be user selected as latching or non-latching.
- In the event of a power outage, the system can be configured to automatically restart or to shut down until a reset is performed.

MODELS, 4 KW FULLY ENCLOSED

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height (in.)
Reversible Polarity Only		PK3R1300	0-3	0-1300	10½
		PK6R650	0-6	0-650	10½
PK8P450	PK8N450	PK8R450	0-8	0-450	10½
PK10P400	PK10N400	PK10R400	0-10	0-400	10½
PK15P260	PK15N260	PK15R260	0-15	0-260	10½
PK20P200	PK20N200	PK20R200	0-20	0-200	10½
PK30P130	PK30N130	PK30R130	0-30	0-130	10½
PK40P100	PK40N100	PK40R100	0-40	0-100	10½
PK50P80	PK50N80	PK50R80	0-50	0-80	10½
PK60P65	PK60N65	PK60R65	0-60	0-65	10½
PK75P50	PK75N50	PK75R50	0-75	0-50	10½
PK80P50	PK80N50	PK80R50	0-80	0-50	15¾
PK100P40	PK100N40	PK100R40	0-100	0-40	15¾
PK125P30	PK125N30	PK125R30	0-125	0-30	15¾

OPTIONS, 4 KW AND 8 KW

Symbol	Description
D	Differential control interface for remote I/O signals provides ± 3V DC common mode rejection.
LA	Low active Enable and External inputs, low active digital monitor outputs.
ZR	Set-to-zero interlock, requires front panel KV control or remote input to be set to zero before HV enable.
LR	Low output ripple version.
SS	Slow start version.

4 KW OPEN STACK

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height (in.)	Stack Size (L x W x H) in.
PK150P25	PK150N25	PK150R25	0-150	0-25	10½	12 x 12 x 21½
PK200P18	PK200N18	PK200R18	0-200	0-18	10½	12 x 12 x 26½
PK250P14	PK250N14	PK250R14	0-250	0-14	10½	12 x 12 x 32¼
PK300P10	PK300N10	PK300R10	0-300	0-10	10½	12 x 12 x 42⅝
PK350P8	PK350N8	PK350R8	0-350	0-8	10½	12 x 12 x 51
PK400P6	PK400N6	PK400R6	0-400	0-6	10½	12 x 12 x 51
PK500P4	PK500N4	PK500R4	0-500	0-4	10½	12 x 12 x 65¼

Net Weight: Models to 75 KV, 62 lbs.
Models from 80 to 125 KV, 85 lbs.
Models from 150 to 500 KV, 125 lbs. and up

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Series PK — 4/8 Kilowatt

MODELS, 8 KW*
FULLY ENCLOSED

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height (in.)
Reversible Polarity Only		PK3R2600	0-3	0-2600	21
		PK6R1300	0-6	0-1300	21
PK8P900	PK8N900	PK8R900	0-8	0-900	21
PK10P800	PK10N800	PK10R800	0-10	0-800	21
PK15P520	PK15N520	PK15R520	0-15	0-520	21
PK20P400	PK20N400	PK20R400	0-20	0-400	21
PK30P260	PK30N260	PK30R260	0-30	0-260	21
PK40P200	PK40N200	PK40R200	0-40	0-200	21
PK50P160	PK50N160	PK50R160	0-50	0-160	21
PK60P130	PK60N130	PK60R130	0-60	0-130	21
PK75P100	PK75N100	PK75R100	0-75	0-100	21
PK80P100	PK80N100	PK80R100	0-80	0-100	31½
PK100P80	PK100N80	PK100R80	0-100	0-80	31½
PK125P60	PK125N60	PK125R60	0-125	0-60	31½

OPEN STACK

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height (in.)	Stack Size (L x W x H) in.
PK150P50	PK150N50	PK150R50	0-150	0-50	21	12 x 12 x 21½
PK200P36	PK200N36	PK200R36	0-200	0-36	21	12 x 12 x 26½
PK250P28	PK250N28	PK250R28	0-250	0-28	21	12 x 12 x 32¼
PK300P20	PK300N20	PK300R20	0-300	0-20	21	12 x 12 x 42⅝
PK350P16	PK350N16	PK350R16	0-350	0-16	21	12 x 12 x 51
PK400P12	PK400N12	PK400R12	0-400	0-12	21	12 x 12 x 51
PK500P8	PK500N8	PK500R8	0-500	0-8	21	12 x 12 x 65¼

*Models up to 15 KW available, consult factory.

Net Weight: Models to 75 KV, 125 lbs.
Models from 80 to 125 KV, 170 lbs.
Models from 150 to 500 KV, 200 lbs. and up

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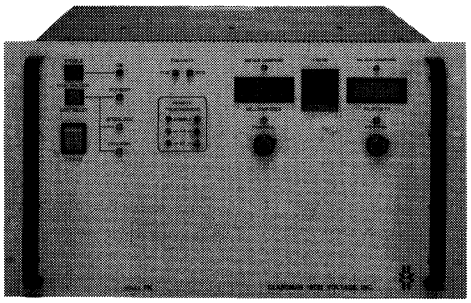
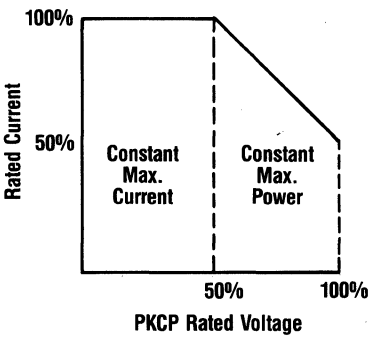
Series PKCP — 2/4 Kilowatt (220V single-phase input)



The new Series PKCP has all the performance features, operating controls, displays, and safety facilities of the Series PK. The PKCP, where CP denotes Constant Power, differs in that the output power is reduced to a choice of 2 KW or 4 KW. Output voltage ranges are the same as PK: 0 to 3 KV through 0 to 500 KV. However, from 50% to 100% of rated voltage the maximum available output current is linearly reduced providing, in effect, a region of constant power.



As the result of reduced power, PKCP does not require a 208V three-phase input supply. Instead, it operates with a 220V single-phase supply while still developing the same range of output voltages as the PK.

MODELS, 2 KW FULLY ENCLOSED

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height (in.)
Reversible Polarity Only		PKCP3R	0-3/1-5	0-650/1300	10½
		PKCP6R	0-6/3	0-325/650	10½
PKCP8P	PKCP8N	PKCP8R	0-8/4	0-225/450	10½
PKCP10P	PKCP10N	PKCP10R	0-10/5	0-200/400	10½
PKCP15P	PKCP15N	PKCP15R	0-15/7.5	0-130/260	10½
PKCP20P	PKCP20N	PKCP20R	0-20/10	0-100/200	10½
PKCP30P	PKCP30N	PKCP30R	0-30/15	0-65/130	10½
PKCP40P	PKCP40N	PKCP40R	0-40/20	0-50/100	10½
PKCP50P	PKCP50N	PKCP50R	0-50/25	0-40/80	10½
PKCP60P	PKCP60N	PKCP60R	0-60/30	0-37.5/75	10½
PKCP75P	PKCP75N	PKCP75R	0-75/37.5	0-25/50	10½
PKCP80P	PKCP80N	PKCP80R	0-80/40	0-25/50	10¾
PKCP100P	PKCP100N	PKCP100R	0-100/50	0-20/40	10¾
PKCP125P	PKCP125N	PKCP125R	0-125/62.5	0-15/30	10¾

2 KW OPEN STACK

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height	Stack Size (L x W x H) in.
PKCP150P	PKCP150N	PKCP150R	0-150/75	0-12.5/25	10½	12 x 12 x 21½
PKCP200P	PKCP200N	PKCP200R	0-200/100	0-9/18	10½	12 x 12 x 26½
PKCP250P	PKCP250N	PKCP250R	0-250/125	0-7/14	10½	12 x 12 x 32¼
PKCP300P	PKCP300N	PKCP300R	0-300/150	0-5/10	10½	12 x 12 x 42⅝
PKCP350P	PKCP350N	PKCP350R	0-350/175	0-4/8	10½	12 x 12 x 51
PKCP400P	PKCP400N	PKCP400R	0-400/200	0-3/6	10½	12 x 12 x 51
PKCP500P	PKCP500N	PKCP500R	0-500/250	0-2/4	10½	12 x 12 x 65¼

Net Weight: Models to 75 KV, 62 lbs.
Models from 80 to 125 KV, 85 lbs.
Models from 150 to 500 KV, 125 lbs. and up

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TWX: 710-480-2839

MODELS, 4 KW FULLY ENCLOSED

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height (in.)
Reversible Polarity Only		PKCP3R	0-3/1.5	0-1300/2600	21½
		PKCP6R	0-6/3	0-650/1300	21
PKCP8P	PKCP8N	PKCP8R	0-8/4	0-450/900	21
PKCP10P	PKCP10N	PKCP10R	0-10/5	0-400/800	21
PKCP15P	PKCP15N	PKCP15R	0-15/7.5	0-260/520	21
PKCP20P	PKCP20N	PKCP20R	0-20/10	0-200/400	21
PKCP30P	PKCP30N	PKCP30R	0-30/15	0-130/260	21
PKCP40P	PKCP40N	PKCP40R	0-40/20	0-100/200	21
PKCP50P	PKCP50N	PKCP50R	0-50/25	0-80/160	21
PKCP60P	PKCP60N	PKCP60R	0-60/30	0-65/130	21
PKCP75P	PKCP75N	PKCP75R	0-75/37.5	0-50/100	21
PKCP80P	PKCP80N	PKCP80R	0-80/40	0-50/100	31½
PKCP100P	PKCP100N	PKCP100R	0-100/50	0-40/80	31½
PKCP125P	PKCP125N	PKCP125R	0-125/62.5	0-30/60	31½

4 KW OPEN STACK

Positive Polarity	Negative Polarity	Reversible Polarity	Output Voltage (kV)	Output Current (mA)	Panel Height	Stack Size (L x W x H) in.
PKCP150P	PKCP150N	PKCP150R	0-150/75	0-25/50	21	12 x 12 x 21½
PKCP200P	PKCP200N	PKCP200R	0-200/100	0-18/36	21	12 x 12 x 26½
PKCP250P	PKCP250N	PKCP250R	0-250/125	0-14/28	21	12 x 12 x 32¼
PKCP300P	PKCP300N	PKCP300R	0-300/150	0-10/20	21	12 x 12 x 42⅝
PKCP350P	PKCP300N	PKCP300R	0-350/175	0-8/16	21	12 x 12 x 51
PKCP400P	PKCP400N	PKCP400R	0-400/200	0-6/12	21	12 x 12 x 51
PKCP500P	PKCP500N	PKCP500R	0-500/250	0-4/8	21	12 x 12 x 65¼

Net Weight: Models to 75 KV, 125 lbs.
Models from 80 to 125 KV, 170 lbs.
Models from 150 to 500 KV, 200 lbs. and up

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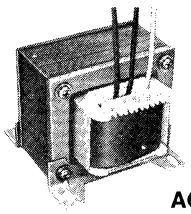

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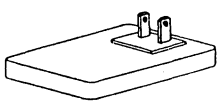
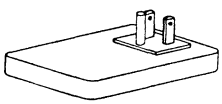
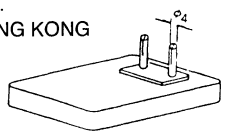
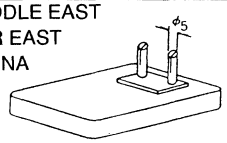
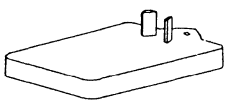
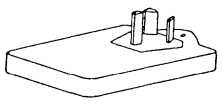
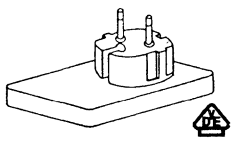
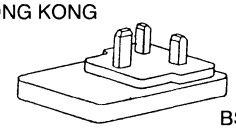
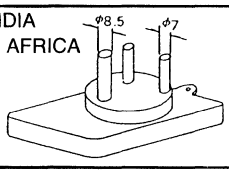
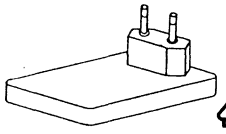
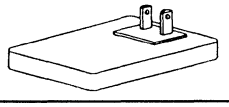
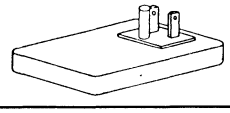
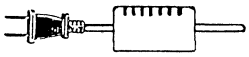
N. AMERICAN 	N. AMERICAN 	U.K. HONG KONG 	MIDDLE EAST FAR EAST CHINA 
AUSTRALIA/NEW ZEALAND 	AUSTRALIA/NEW ZEALAND 	EUROPEAN "SCHUKO" (S)(D)(N)(F) 	UNITED KINDOM HONG KONG  BSI
INDIA S. AFRICA 	EUROPEAN "SCHUKO" (S)(D)(N)(F) 	JAPAN MITI 	JAPAN MITI 
 ☐ SPECIFY INLET/OUTLET ☐ SPECIFY INPUT/OUTPUT CABLE	ISRAEL	POWER TRANSFORMERS ☐ VDE 0550 ☐ UL ☐ CSA	☐ IEC 380/435/950 ☐ IEC 601/NATIONAL ST. ☐ VDE 0551 ☐ IEC 65/335/338 ☐ UL ☐ CSA ☐ TUV GS ☐ VDE GS

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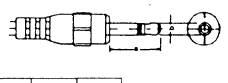

TYPE	a	b
OP-01	.0453	0.098
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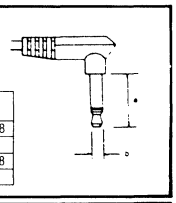
OP-02	0.571	0.138
	14.5	3.5



TYPE	a	b
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OP-04	0.571	0.138
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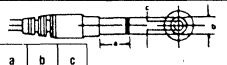
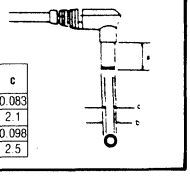


TYPE	a	b	c
OP-05	0472	0.197	0.079
	12.0	5.0	2.0
OP-06	0.472	0.197	0.098
	12.0	5.0	2.5
OP-07-1	0.472	0.217	0.098
	12.0	5.5	2.5
OP-07-2	12.0	5.5	2.1



TYPE	a	b	c
OP-08	0472	0.197	0.083
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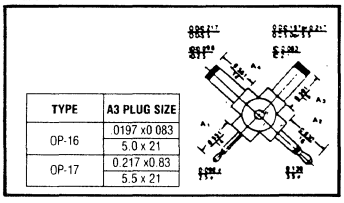
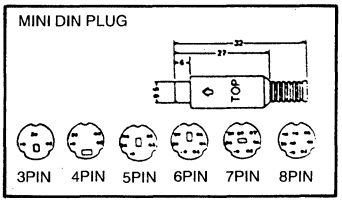
OP-09	0.453	0.217	0.098
	11.5	5.5	2.5



TYPE	A3 PLUG SIZE
OP-16	0197 x0 083
	5.0 x 21
OP-17	0.217 x0.83
	5.5 x 21

MINI DIN PLUG



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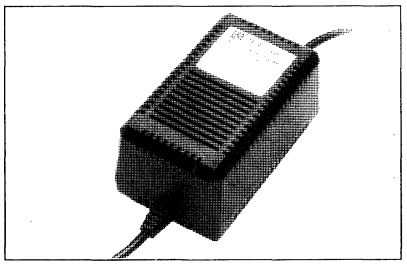

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- External Floppy Drives
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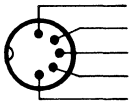
- Modems
- Digitizers

OUTPUT SPECIFICATIONS

PRODUCT NO.	OUTPUT VOLTAGE	LOAD		
		MIN.	RATED	MAX.*
PS-303	5.0V DC 12.0V DC – 12.0V DC	0.5A 0.0A 0.0A	3.00A 1.00A 0.30A	4.00A 2.00A 0.50A
PS-303-2	5.0V DC 12.0V DC – 12.0V DC	0.6A 0.3A 0.0A	3.00A 1.80A 0.30A	5.00A 2.00A 0.50A
PS-1225A	12.0V DC	0.3A	2.50A	—

*Please consult GPE



PIN ASSIGNMENT	
3	+5V
5	+12V
2	GND
4	– 12V
1	GND
SHELL	GND

Power Supplies for Continental Europe

PRODUCT NO.	OUTPUT VOLTAGE REGULATED	LOAD
ML-6022-2	5.0V DC 12.0V DC – 12.0V DC	1.00A 0.20A 0.20A
PD-5015ARE	5.0V DC	1.50A

PRODUCT NO.	OUTPUT VOLTAGE UNREGULATED	LOAD
PD6230E	6.2 VDC	0.30A
PD9500E	9.0 VDC	0.50A
PD9010AE	9.0 VDC	1.00A
PD1250E	12.0 VDC	0.50A
PD1210AE	12.0 VDC	1.00A
PD1510AE	15.0 VDC	1.00A
PA-4510E	4.5 VAC	0.10A
PA-9010E	9.0 VAC	0.10A
PA-2440E	24.0 VAC	0.40A

Battery Chargers

Fast charger for NICD battery pack**
117VAC Input

PRODUCT NO.	OUTPUT VOLTAGE	CURRENT
PC-7215A	7.2 VDC	1.5A
PC-7215A2	7.2 VDC	1.5A 2-modes
PC-9615A	9.6 VDC	1.5A
PC-9615A2	9.6 VDC	1.5A 2-modes

**Custom-made orders for other types of battery chargers are available upon request.

220 VAC INPUT

PRODUCT NO.	OUTPUT VOLTAGE	CURRENT
PD-7216AE	7.2 VDC	1.6A
PC-7216AE2	7.2 VDC	1.6A 2-modes
PC-8712AE	8.7 VDC	1.2A
PC-9618AE	9.6 VDC	1.8A
PC-9618AE2	9.6 VDC	1.8A 2-modes

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560 SOUTH MELROSE STREET • PLACENTIA, CA 92670
PHONE: (714) 993-6970 • FAX: (714) 993-6023

Linear Regulated External (Wall Plug-In & Desk-Top) Power Supplies

- **Input Voltage:** 120VAC ± 10%, 60Hz
- **Input Connection:** (1) Wall Plug-In—2 prong or 3-prong (2) Desk-Top—6 FT cord with 2-prong or 3-prong plug
- **Line Regulation:** ± 3% Max.
- **Load Regulation:** ± 5% Max.
- **Storage Temperature:** 20°C ~ + 85°C
- **Operating Temperature:** 0°C ~ + 50°C
- **Safety Agency:** Meet or exceed UL1012 & CSA 22.2 standards, see table below for individual approvals.
- **Housing:** Black impact-resistant thermoplastic, see table below for types and sizes.
- **Outputs:** See table below
- **Applications:** Computer, data communication, telecommunication, industrial controls, battery chargers, consumer products.
- **Output Tolerance:** ± 5% full load 120V input
- **Output Connection:** (1) Single output—PL01 ~ PL-06 (2) Multiple outputs—PL08 ~ PL10
- **Ripple & Noise:** 50 mV p-p Maximum
- **Transient Response:** 50% ~ 100% load change, recovery time 500 µS, overshoot 2% Max.
- **Storage Humidity:** 10 ~ 90% RH, non-condensing
- **Operating Humidity:** 10-75% RH, non-condensing
- **UL/CSA Listed:** • (Wall Plug-In) ⊙ (Desk-Top)

PRODUCT NO.	OUTPUTS						CASE TYPE or SIZE IN INCH (L x W x H)	APPROVAL	
	#1		#2		#3			UL	CSA
	VDC	A	VDC	A	VDC	A			
PD-5800R	5	0.8					3.88 x 2.52 x 2.34	•	•
PD-5010AR	5	1.0					N	⊙	⊙
PD-5015AR	5	1.5					K	⊙	
PD-5020AR	5	2.0					K	⊙	⊙
PD-6010AR	6	1.0					3.80 x 2.61 x 2.05	⊙	⊙
PD-8200	8	0.2	-8	0.2			EI-57A	•	
PD-9400R	9	0.4					EI-41A, EI-41D	•	•
PD-9500R	9	0.5					EI-41D	•	•
PD-9800R	9	0.8					EI-48D	•	•
PD-9010AR	9	1.0					EI-48D	•	
PD-1240R	12	0.4					EI-41D		•
PD-1210AR	12	1.0					EI-48D, 4.75 x 3.06 x 2.20	⊙	⊙
PD-1212AR	12	1.2					EI-57A	•	⊙
ML-5822	5	0.8	12	0.1	-12	0.1	M	•	⊙
ML-6022-1	5	1.0	12	0.2	-12	0.2	K	⊙	⊙
ML-6522	5	1.5	12	0.2	-12	0.2	K	⊙	⊙
ML-6023-1	5	1.0	12	0.3	-12	0.3	K	⊙	
ML-7022	5	2.0	12	0.2	-12	0.2	K	⊙	⊙
DT-1230F			12	0.2	-12	0.2	4.0 x 2.52 x 1.77	•	•
DW-1518F			15	0.18	-15	0.18	3.88 x 2.52 x 2.32	•	•
DT-6055	5	1.0	15	0.5			4.75 x 3.06 x 2.20	•	•
DT-6043	5	1.0	24	0.3			4.75 x 3.06 x 2.20	⊙	⊙

Plug-In AC/DC Unregulated Power Supplies

- **Input Voltage:** 120VAC ± 10%, 60Hz
- **Output Power:** See table below (custom spec. available)
- **Operating Temperature:** 0°C-40°C (rated for continuous duty)
- **AC Dielectric Strength:** 1500VRms 60Hz for one minute between primary and secondary
- **Humidity:** 10% to 90% RH, non-condensing
- **Input Plug:** 2-Prong (3-Prong optional available), Desk-Top models with 6 FT cords
- **Output Connection:** 6 FT cord. Screw terminals available on some models
- **Housing:** Black impact-resistant thermoplastic (case type may vary depending on availability)
- **Application:** Battery chargers, consumer products, data communication equipment, computer peripherals

PRODUCT NO.	OUTPUT		CASE SIZE	APPROVAL	
	VDC	MA		UL	CSA
PD-6030	6	30	2		✓
PD-6100	6	100	2	✓	✓
PD-6200	6	200	3	✓	✓
PD-6300	6	300	3	✓	✓
PD-6400	6	400	3	✓	✓
PD-6500	6	500	3	✓	✓
PD-6600	6	600	3	✓	✓
PD-6700	6	700	3	✓	✓
PD-6800	6	800	3	✓	✓
PD-6900	6	900	4	✓	✓
PD-6010A	6	1000	4	✓	✓
PD-6011A	6	1100	4	✓	
PD-9030	9	30	2		✓
PD-9050	9	50	2	✓	✓
PD-9100	9	100	2	✓	✓
PD-9120	9	120	2	✓	
PD-9200	9	200	2	✓	✓
PD-9300	9	300	2	✓	✓
PD-9400	9	400	3	✓	✓
PD-9500	9	500	3	✓	✓
PD-9600	9	600	3	✓	✓
PD-9700	9	700	4	✓	✓
PD-9800	9	800	4	✓	✓
PD-9900	9	900	4	✓	✓
PD-9010A	9	1000	4	✓	✓
PD-9011A	9	1100	4	✓	✓
PD-1205	12	50	2		✓
PD-1210	12	100	2	✓	✓

PRODUCT NO.	OUTPUT		CASE SIZE	APPROVAL	
	VDC	MA		UL	CSA
PD-1215	12	150	2	✓	✓
PD-1220	12	200	2	✓	✓
PD-1230	12	300	3	✓	✓
PD-1235	12	350	3	✓	✓
PD-1240	12	400	3	✓	✓
PD-1245	12	450	3	✓	
PD-1250	12	500	3	✓	✓
PD-1260	12	600	4	✓	✓
PD-1270	12	700	4	✓	✓
PD-1280	12	800	4	✓	✓
PD-1290	12	900	4	✓	
PD-1210A	12	1000	4	✓	✓
PD-1211A	12	1100	4	✓	
PD-1212A	12	1200	5		
PD-1220A	12	2000	5		
PD-1510	15	100	2	✓	
PD-1515	15	150	3		✓
PD-1520	15	200	3	✓	✓
PD-1525	15	250	3	✓	✓
PD-1530	15	300	3	✓	✓
PD-1535	15	350	3	✓	✓
PD-1540	15	400	3	✓	✓
PD-1550	15	500	4	✓	✓
PD-1560	15	600	4	✓	✓
PD-1570	15	700	4	✓	✓
PD-1580	15	800	4	✓	
PD-1590	15	900	4	✓	
PD-1510A	15	1000	5		

PRODUCT NO.	OUTPUT		CASE SIZE	APPROVAL	
	VDC	MA		UL	CSA
PD-1605	16	50	2		✓
PD-1610	16	100	2	✓	✓
PD-1615	16	150	3		✓
PD-1620	16	200	3		✓
PD-1625	16	250	3	✓	✓
PD-1630	16	300	3	✓	✓
PD-1635	16	350	3	✓	✓
PD-1640	16	400		✓	✓
PD-1645	16	450	4	✓	✓
PD-1650	16	500	4	✓	✓
PD-1655	16	550	4	✓	✓
PD-1660	16	600	5	✓	
PD-1670	16	700	4	✓	
PD-1680	16	800	4	✓	
PD-1690	16	900	4	✓	
PD-1610A	16	1000	5		
PD-2410	24	100	3	✓	✓
PD-2415	24	150	3		✓
PD-2420	24	200	3	✓	✓
PD-2425	24	250	3	✓	✓
PD-2430	24	300	4	✓	✓
PD-2435	24	350	4		✓
PD-2440	24	400	4	✓	
PD-2450	24	500	4	✓	
PD-2460	24	600	4	✓	
PD-2470	24	700	5		
PD-2410A	24	1000	5		

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE.

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

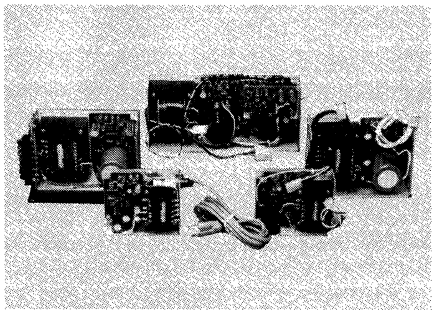
Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
Encapsulation, Miniglossary **C**•1126
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **C**•1601
Fiber Optics, Miniglossary **B**•1224
Fiber Optics, Product Selection Guide **B**•1214
Filters, Power, Product Selection Guide **A**•1609
Filters, Signal, Product Selection Guide **A**•1651
Instruments, Test & Measuring, Product Selection Guide **D**•1207
Interconnection Systems, Product Selection Guide **C**•1678
Keyboards & Keypads, Product Selection Guide **B**•1794
Lamps, Lights, & Indicators, Product Selection Guide **B**•1135
Logofinder & Trademark Directories **C**•901
Microwave Components, Product Selection Guide **A**•1746
Military Qualified Products List **B**•1002
Motors, Drives, & Rotating Components, Product Selection Guide **B**•1233
Opto Semiconductors, Miniglossary **B**•1334
Oscilloscopes, Product Selection Guide **D**•1406
Panel Hardware, Product Selection Guide **C**•1582
Panel Meters, Analog & Digital, Product Selection Guide **D**•1340
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **A**•2013
Power Supplies, Miniglossary **D**•1522, **D**•2184
Power Supplies, AC, Product Selection Guide **D**•2146
Power Supplies, DC, Product Selection Guide **D**•1501
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **B**•1347
Relay Contact Forms **B**•1550
Relays, Electromechanical, Miniglossary **B**•1449
Relays, Product Selection Guide **B**•1397
Resistor Color Codes **A**•1924
Resistors, Product Selection Guide **A**•1835
Servo Components, Miniglossary **B**•1270, **D**•2244
SI Units, Basic Guide To, **A**•2080, **B**•1666, **C**•1362, **D**•2246
Solenoids, Product Selection Guide **B**•1614
Switches, Product Selection Guide **B**•1639
Symbols—International Authorities **A**•1139, **B**•1024, **C**•1156, **D**•1090
Thermal Components, Product Selection Guide **B**•1831
Thermal Conductivity of Dielectrics at Room Temperature **C**•1709
Thyristors/High Power Diodes, Miniglossary **A**•1728, **A**•2084
Timers, Miniglossary **B**•1409, **D**•1149
Trademark & Logofinder Directories **C**•901
Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

INTERNATIONAL POWER
DC POWER SUPPLIES

A Worldwide Standard of Reliability

International Power • 355 N. Lantana, Suite 710, Camarillo, CA 93010, (805) 987-7900 • FAX 805-388-2686

DC Power Supplies



Description:

The International Power open frame series are a high reliability line of power supplies designed to operate over the wide range of A.C. power sources found worldwide. This feature simplifies your inventory and service consideration by allowing the use of one standard power supply regardless of destination.

These models are designed to meet many domestic and European regulatory agency requirements. If you plan to distribute your products worldwide, obtaining necessary agency approvals can be greatly simplified by specifying the International Power open frame series.

Features:

- VDE transformer construction
- 100/120/220/230-240 VAC input
- OVP on 5 volt outputs
- ±.05% regulation
- Remote sense on most outputs
- Industry standard case size
- Full rated to 50°C
- Foldback/current limit
- Made in the USA
- Two hour burn-in
- Two-year warranty
- U.L. recognized - File #E84242
- C.S.A. Certified - File #LR52143
- Chassis notched for A.C. input
- Input accepts .110 x .032 fast-on or solder connection

Specifications:

A.C. Input	100/120/220/230-240 VAC +10% −13% 47-63 Hz. See chassis A.C. connection table for jumper and line fusing requirements. Derate output current 10% for 50 Hz operation. Tolerance for 230-240 volt operation is +15% −10%.
D.C. Output:	See voltage current rating chart. Adjustment range ±5% minimum.
Line Regulation:	±.05% for a 10% line change.
Load Regulation:	±.05% for a 50% load change.
Transient Response:	50 μseconds for 50% load change.
Output Ripple:	2 volt to 15 volt units: 5.0 mV PK-PK maximum. 24 volt to 250 volt units: .02% PK-PK maximum.
Short Circuit and Overload Protection:	Automatic current limit/foldback.
Overvoltage Protection:	Build-in on all 5 volt outputs. Set at 6.2 ±.4 volts. Other outputs use overvoltage protection modules.
Remote Sensing:	Provided on most models, see voltage/current rating chart. Open sense lead protection built-in.
Efficiency: (Typical)	5 volt unit: 45%. 12 and 15 volt units: 55%. 24 through 250 volt units: 60%.
Stability:	±.3% for 24-hour period after 1 hour warm up.
Temperature Rating:	0°C to 50°C full rated, derated linearly to 40% at 70°C.
Temperature Coefficient:	±.3% maximum.
Vibration:	Per MIL-STD-810D, Method 514.3, Category 1, Procedure I.
Shock:	Per MIL-STD-810D, Method 516.3, Procedure III.

Value Added Services

International Power offers a variety of value added services for standard catalog models, examples of which are, but not limited to, installation of AC and DC harnesses, line cords, fuse holders, terminal blocks, PEM hardware, chassis modifications and output voltage/current modifications. This service is available for small quantities as well as for production quantities. Please contact your local factory representative, distributor, or the factory direct for quotations and availability of services.

DC Power Supplies

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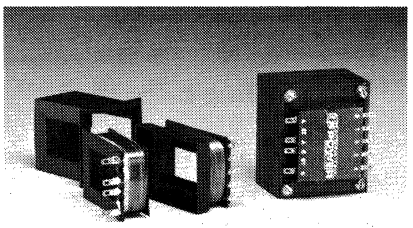

Transformers

International Power, open frame series transformers feature separate, fully enclosed, primary and secondary coils. Meets safety requirements of VDE, UL, CSA, BPO, IEC, CEE, and ECMA.

Summary of Regulatory Safety Agency Specifications

The following regulatory agency specifications have gained acceptance throughout the electronics industry as the most important to comply with when designing products for worldwide distribution. The International Power open frame series meets or exceeds the creepage distance, leakage current and dielectric withstand test requirements of these specifications.

UL **UNDERWRITERS LABORATORIES, INC.**

UL 1012 - Power Supplies
This specification covers the safety requirements for commercial and industrial power supplies.

UL 478 - Electronic Data Processing Units and Systems
This specification covers electrically operated machine units that, separately of assembles in systems, electronically,accumulate, process and store data.

CSA **CANADIAN STANDARDS ASSOCIATION**

CSA 22.2, No. 220-1986 - Office Machines
This standard applies to office machines such as dictating machines, calculators, cash registers, duplicators, photocopiers, etc.

CSA 22.2, No. 154-1975 - Data Processing Equipment
This standard applies to equipment designed to prepare, store, process, transmit, or display data. All International Series power supplies are CSA certified.

VDE **VERBAND DEUTSCHER ELECTROTECHNIKER**

VDE 0730 Part 2P - Business Machines
This specification covers business machines used in office environments. Safety requirements are similar to IEC 380.

VDE 0804/3.77 - Telecommunications and Electronic Data Processing Equipment
This specification was the basis for IEC 435 and therefore contains similar safety requirements.

VDE 0806/11.81
This standard adopts IEC 380 as a German National Standard. It is essentially the same as IEC 380.

Please note the VDE certification is not mandatory for marketing products in Germany. However, equipment must be designed and built to meet the applicable VDE specifications. Equipment found not in compliance may be banned from sale in Germany.

BPO **BRITISH POST OFFICE TECHNICAL GUIDE No. 26**
Details the electrical protection requirements to which privately owned and maintained equipment must conform if supplied for attachment to post office maintained property.

ECMA **EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION**

ECMA-57 - Safety Requirements for Data Processing Equipment
This standard applies to data processing equipment and associated electronic units, data preparation equipment and data terminal equipment. Safety requirements are essentially the same as IEC 435.

CEE **INTERNATIONAL COMMISSION ON RULES FOR THE APPROVAL OF ELECTRICAL EQUIPMENT**

CEE 10, Part 2P - Specification For Business Machines
This specification specifically covers office business machines. Safety requirements are similar to IEC 380 and VDE 0730 Part 2P.

IEC **INTERNATIONAL ELECTRO-TECHNICAL COMMISSION**

IEC 380 - Safety of Electrically Energized Office Machines
This specification is similar to IEC 435 but pertains specifically to office machines designed to be used in offices or similar locations. Such equipment as typewriters, duplicators and calculators are covered by IEC 380.

IEC 435 - Safety of Data Processing Equipment
This specification covers data processing equipment and associated electronic units, data preparation and data communication terminal equipment in office environments.

Voltage/Current Rating Chart

SINGLE OUTPUT MODELS

MODEL	VOLTAGE/ CURRENT	CASE SIZE	PRICE 10-24
2 VOLTS			
IHB2-3	2V @ 3A*	B	$ 34.68
IHC2-6	2V @ 6A*	C	54.62
IHD2-12	2V @ 12A*	D	84.78
IHE2-18	2V @ 18A*	E	113.95
5 VOLTS			
IHA5-1.2/OVP	5V @ 1.2A**	A	26.50
IHA5-1.5/OVP	5V @ 1.5A	B	27.88
IHB5-3/OVP	5V @ 3A*	B	32.77
IHC5-6/OVP	5V @ 6A*	C	54.62
IHN5-9/OVP	5V @ 9A*	N	74.59
IHD5-12/OVP	5V @ 12A*	D	84.78
IHE5-18/OVP	5V @ 18A*	E	113.95
IF5-25/OVP	5V @ 25A*	F	154.37
IG5-35/OVP	5V @ 35A*	F	194.28
ICP197	5V @ 50A*	F	229.42
12 VOLTS			
IHA15-0.5	12V @ 0.5A**	A	26.50
IHA15-0.9	12V @ 0.9A	B	27.88
IHB12-1.7	12V @ 1.7A*	B	32.77
IHC12-3.4	12V @ 3.4A*	C	49.87
IHN12-5.1	12V @ 5.1A*	N	69.82
IHD12-6.8	12V @ 6.8A*	D	79.75
IHE12-10.2	12V @ 10.2A*	E	109.72
IF15-15	12V @ 16A*	F	154.37
15 VOLTS			
IHA15-0.5	15V @ 0.5A	A	26.50
IHA15-0.9	15V @ 0.9A	B	27.88
IHB15-1.5	15V @ 1.5A*	B	32.77
IHC15-3	15V @ 3A*	C	49.87
IHN15-4.5	15V @ 4.5A*	N	69.82
IHD15-6	15V @ 6A*	D	79.75
IHE15-9	15V @ 9A*	E	109.72
IF15-15	15V @ 15A*	F	154.37

SINGLE OUTPUT MODELS

MODEL	VOLTAGE/ CURRENT	CASE SIZE	PRICE 10-24
24 VOLTS			
IHA24-0.5	24V @ 0.5A	B	27.88
IHB24-1.2	24V @ 1.2A*	B	32.77
IHC24-2.4	24V @ 2.4A*	C	49.87
IHN24-3.6	24V @ 3.6A*	N	69.82
IHD24-4.8	24V @ 4.8A*	D	79.75
IHE24-7.2	24V @ 7.2A*	E	109.72
IF24-12	24V @ 12A*	F	154.37
28 VOLTS			
IHA24-0.5	28V @ 0.5A	B	27.88
IHB28-1	28V @ 1.0A*	B	32.77
IHC28-2	28V @ 2.0A*	C	49.87
IHN28-3	28V @ 3.0A*	N	69.82
IHD28-4	28V @ 4.0A*	D	79.75
IHE28-6	28V @ 6.0A*	E	109.72
IF24-12	28V @ 10A*	F	154.37
48 VOLTS			
IHB48-0.5	48V @ 0.5A	B	34.68
IHB48-0.5-105	48V @ .75A		36.95
IHC48-1	48V @ 1.0A	C	54.62
IHC48-1-105	48V @ 1.5A		56.95
IHD48-3	48V @ 3.0A*	D	84.78
IHE48-4	48V @ 4.0A*	E	109.72
IF48-8	48V @ 8.0A**	F	194.50
135-265 VOLTS			
IHB155-0.12	135-170V @ .12A	B	39.85
IHB200-0.12	175-210V @ .12A	B	39.85
IHB250-0.1	215-265V @ .10A	B	39.85

* Remote Sense Provided
**Not International Series

DC Power Supplies

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Voltage/Current Rating Chart

DUAL OUTPUT MODELS				
MODEL	**OUTPUT #1**	**OUTPUT #2**	**CASE SIZE**	**PRICE 10-24**
±5 VOLTS				
IHAA5-1.5/OVP	5V @ 1.5A	−5V @ 1.5A	AA	49.87
IHBB5-3/OVP	5V @ 3A	−5V @ 3A	BB	64.83
IHCC5-6/OVP	5V @ 6A*	−5V @ 6A	CC	96.66
±12 VOLTS				
IHAD12-0.4	12V @ 0.4A	−12V @ 0.4A	B	36.80
±15 VOLTS				
IHAD15-0.4	15V @ 0.4A	−15V @ 0.4A	B	36.80
±12 TO 15 VOLTS				
IHAA15-0.8	12V @ 1A OR 15V @ 0.8A*	−12V @ 1A OR −15V @ 0.8A*	AA	42.75
IHBB15-1.5	12V @ 1.7A OR 15V @ 1.5A*	−12V @ 1.7A OR −15V @ 1.5A*	BB	54.62
IHCC15-3	12V @ 3.4A OR 15V @ 3.0A*	−12V @ 3.4A OR −15V @ 3.0A*	CC	87.87
IHDD15-5	12-15V @ 5A*	−12-15V @ 5A*	E	129.68
±18 TO 24 VOLTS				
IHAA24-0.6	18-20V @ 0.4A OR 24V @ 0.6A	−18-20V @ 0.4A OR −24V @ 0.6A	AA	42.75
IHBB24-1.2	18-20V @ 0.9A OR 24V @ 1.2A	−18-20V @ 0.9A OR +24V @ 1.2A	BB	54.62
IHCC24-2.4	18-20V @ 1.8A* OR 24V @ 2.4A*	−18-20V @ 1.8A* OR −24V @ 2.4A*	CC	87.87
5 VOLTS AND 12-15 VOLTS ISOLATED OUTPUTS				
IHAA512	5V @ 2A ‡	12-15V @ 0.5A	AA	49.87
IHBB512	5V @ 3A ‡*	12-15V @ 1.2A	BB	59.80
IHCC512	5V @ 6A ‡*	12-15V @ 2.5A*	CC	94.52

*Remote Sense
‡Over Voltage Protection Provided

Voltage/Current Rating Chart

TRIPLE OUTPUT MODELS					
MODEL	**OUTPUT #1**	**OUTPUT #2**	**OUTPUT #3**	**CASE SIZE**	**PRICE 10-24**
IHTAA-16W	5V @ 2A ‡	12-15V @ 0.4A	−12-15V @ 0.4A OR −5V @ 0.4A	AA	54.86
IHBAA-40W	5V @ 3A* ‡	12V @ 1A OR 15V @ 0.8A	−12V @ 1A OR* −15V @ 0.8A OR −5V @ 0.4A	BAA	75.76
IHCAA-60W	5V @ 6A* ‡	12V-15V @ 1A	−12V-15V @ 1A OR −5V @ 0.4A	D	89.77
IHCBB-75W	5V @ 6A* ‡	12V @ 1.7A OR 15V @ 1.5A*	−12V @ 1.7A OR −15V @ 1.5A OR* −5V @ 0.7A	CBB	99.70
IHBCC-512	5V @ 3A ‡	12V @ 3.4A OR 15V @ 3A	−12V @ 3.4A OR −15V @ 3A	CC	99.70
IHBCC-524	5V @ 3A	18-20V @ 1.8A OR 24V @ 2.4A	−18-20V @ 1.8A OR −24V @ 2.4A	CC	99.70
ICP131	5V @ 8A* ‡	12V @ 1.7A OR 15V @ 1.5A*	−12V @ 1.7A OR −15V @ 1.5A OR* −5V @ 0.7A	131	119.65
IHDBB-105W	5V @ 12A* ‡	12V @ 1.7A OR 15V @ 1.5A*	−12V @ 1.7A OR −15V @ 1.5A OR* −5V @ 0.7A	DBB	134.42
IHDCC-150W	5V @ 12A* ‡	12V @ 3.4A OR 15V @ 3A*	−12V @ 3.4A OR −15V @ 3A OR −5V @ 0.7A*	DCC	154.37
IOVP-12					7.55
IOVP-24					14.20
IAR5-.6/OVP	The IAR5 will provide a −5V regulated output from any −7V to −30V filtered D.C. source				10.91

OVP SELECTION GUIDE		
MODEL	**CASE SIZE**	**OVP MODULES REQUIRED**
SINGLE OUTPUT	B,C,N,D	(1) OVP-12
	E, F	(1) OVP-24
DUAL OUTPUT	AA,BB,CC	(1) OVP-12 PROTECTS BOTH OUTPUTS. OVP BUILT-IN ON 5V OUTPUTS.
	E	(1) OVP-24 PROTECTS BOTH OUTPUTS.
TRIPLE OUTPUT	AA,BAA,D CBB,131 DBB	(1) OVP-12 PROTECTS BOTH 9V THRU 15V OUTPUTS. OVP BUILT-IN ON MAIN 5V OUTPUTS.
DISK DRIVE MODELS	N,BAA CBB, 131	(1) OVP-12 PROTECTS ANY OUTPUT NOT PROVIDED WITH BUILT-IN OVP

*Remote Sense
‡Over Voltage Protection Provided

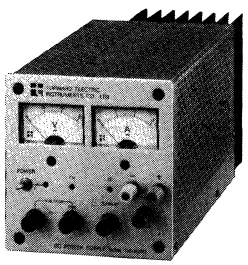
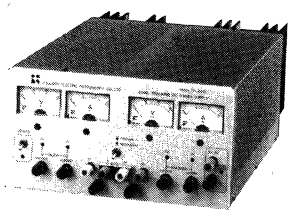
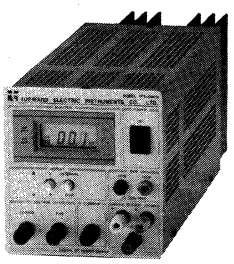
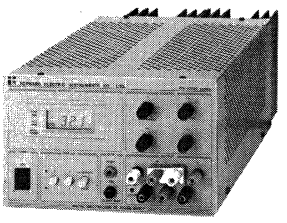
Voltage/Current Rating Chart

DISK DRIVES						
MODEL	**OUTPUT #1**	**OUTPUT #2**	**OUTPUT #3**	**OUTPUT #4**	**CASE SIZE**	**PRICE 10-24**
5¼" FLOPPY DISK DRIVES						
ICP340	5V @ 0.5A 0.7A PK‡	12V @ 0.9A/ 1.8A PK			CP340	$ 44.88
ICP323	5V @ 3A ‡*	12V @ 4A			N	79.75
8" FLOPPY DISK DRIVES						
ICP205	5V @ 1A ‡	−5V @ 0.5A ‡*	24V @ 1.5A/ 1.7A PK		BAA	75.76
ICP206	5V @ 2.5A ‡*	−5V @ 0.5A ‡*	24V @ 3A/ 3.4A PK*		CBB	99.70
ICP162	5V @ 3A ‡*	−5V @ 0.6A ‡*	24V @ 5A/ 6A PK*		131	129.67
RIGID-DISK DRIVES						
ICP510	5V @ 6A ‡	12V @ 2.5A/ 7.5A PK			CP510	79.56
ICP379	5V @ 6A ‡*	−5V @ 1.2A or −12V @ 1.2A	24V @ 3.5A/ 8A PK*		131	129.67
ICP384	5V @ 9A ‡*	−5V @ 1.2A or −12V @ 1.2A	24V @ 2A/ 8A PK*		131	129.67
ICP503	5V @ 6A ‡	12V @ 1A	−12V @ 1A	24V @ 2.5A/ 4A PK	131	129.67

*Remote Sense
‡Over Voltage Protection Provided

HauMan, Inc.
2031 RINGWOOD AVE., SAN JOSE, CA 95131 • (408) 434-0888 • FAX: 408-434-9832

LABORATORY DC POWER SUPPLIES—TPS2000/4000 SERIES

TPS-2000	TPS-4000	TPS-2000D	TPS-4000D
			

FEATURES FOR ALL MODELS

- Constant Voltage. Constant Current Mode Operation
- Short Circuit Protection Standard
- Compact aluminum case for excellent heat dissipation
- Built in separate Voltage and Current meters for analog models
- 3½ digit auto Ranging Panel Meters for Voltage or Current display in digital models
- Single, Dual, Triple Models available
- Fully Variable Voltage and current set point control
- Excellent Ripple and Noise, Line/Load Regulations
- Unsurpassed Price/Performance Ratio
- Immediate Delivery

SPECIFICATIONS FOR ALL MODELS

	TPS-2000 SERIES	TPS-4000 SERIES
Ripple & Noise	CV 0.5mVms or 4mVp-p CC 0.5mArms or 4mAp-p	
Line Regulation	CV 0.02% + 2mV CC 0.02% + 250μA	
Load Regulation	CV 0.02% + 2mV CC 0.02% + 500μA	
Output Impedance	5mΩ + 2μH	
Tracking Error— Dual Output Model Only		±(0.2% + 5mV)
5V/3A Output— Triple Output Model Only Output Voltage Output Current Ripple & Noise Regulation		 5V + 5% (Fixed) 3A (Max.) <2mVms 0.1% + 5mV
Dimension Weight	125(W)×140(H)×300(D)mm 4.1Kg(TPS-2303)	250(W)×140(H)×363(D)mm 8.9Kg(TPS-4303)
Power	115V/230V ± 10%, 50/60Hz	
Accessory	ACS-002×1, Banana-Clip	ACS-002×2, Banana-Clip

SPECIFICATIONS FOR MODEL 2000D/4000D ONLY

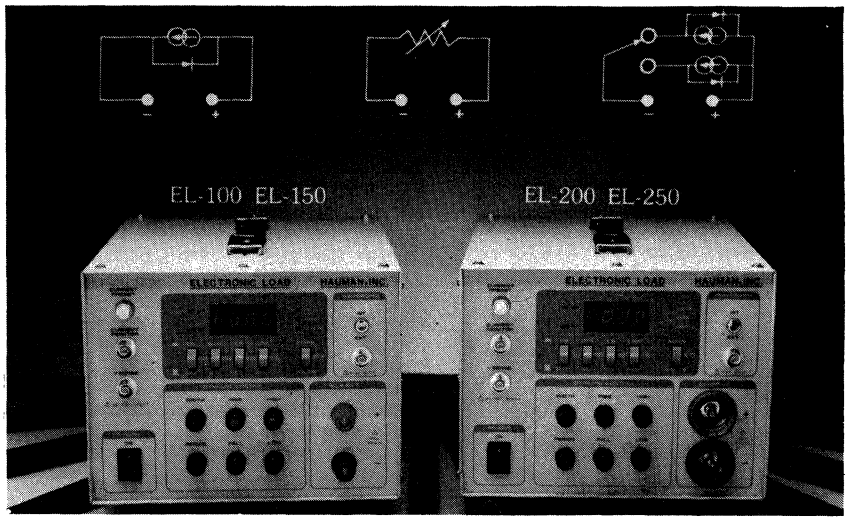
	TPS-2000D SERIES	TPS-4000D SERIES
Display	3½ LCD display with unit indicator	
Output Voltage Monitor	199.9mV, 1.999V, 19.99V, 199.9V 4 Auto-Ranges	
Output Current Monitor	19.99A	
DVM	±199.9mV, ±1.999V, ±19.99V, ±199.9V 4 Auto-Ranges	
Accuracy	±(0.2% + 2d)	

ORDERING INFORMATION

	PART #	DESCRIPTION	PRICE	PART #	DESCRIPTION	PRICE
ANALOG	1810	0-18V/0-10A DC POWER SUPPLY	395.00	2601	0-60V/0-1A DC POWER SUPPLY	260.00
	2203	0-20V/0-3A DC POWER SUPPLY	255.00	2603	0-60V/0-3A DC POWER SUPPLY	440.00
	2302	0-30V/0-2A DC POWER SUPPLY	255.00	4302	0-30V/0-2A x 2, 5V/3A TRIPLE OUTPUT SUPPLY	440.00
	2303	0-30V/0-3A DC POWER SUPPLY	275.00	4303	0-30V/0-3A x 2, 5V/3A TRIPLE OUTPUT SUPPLY	520.00
	2306	0-30V/0-6A DC POWER SUPPLY	430.00	4306	0-30V/0-6A x 2, DUAL OUTPUTS POWER SUPPLY	760.00
	23010	0-30V/0-10A DC POWER SUPPLY	690.00	4603	0-60V-3A x 2, DUAL OUTPUTS POWER SUPPLY	760.00
DIGITAL	2302D	0-30V/0-2A DIGITAL DC POWER SUPPLY	300.00	4302D	0-30V/0-2A x2, 5V/3A TRIPLE DIGITAL	495.00
	2303D	0-30V/0-3A DIGITAL DC POWER SUPPLY	340.00	4303D	0-30V/0-3A x2, 5V/3A TRIPLE DIGITAL	575.00

HauMan, Inc.
2031 RINGWOOD AVE., SAN JOSE, CA 95131 • (408) 434-0888 • FAX: 408-434-9832

MULTI-FUNCTION, STATE-OF-THE-ART ELECTRONIC LOADS 100W, 150W, 200W, 250W MODELS



FEATURES

- Static and dynamic loading operation.
- Constant resistance (CR) and constant current (CC) modes.
- Presetable dynamic current waveform with independent control of rise and fall time, pulse width and period high and low current levels.
- 3½ digit LED voltage and current display.
- 0-5V proportional current waveform monitor.
- Optional digital I/O control interface.
- External, arbitrary waveform input (2A/μS slew rate maximum, DC-20 KHz).
- Remote voltage sensing capability.
- Protections against over-power, over-current, over-voltage, over-temperature, and reverse polarity.
- Multiple units parallelable to increase power/current capacity.
- Advanced power MOSFET design.
- Bench use or rack mount.
- Optional GPIB control with Talk/Listen capability.

APPLICATIONS:

- Power supply testing.
- Burn-in testing.
- Battery testing.
- Coil testing.
- Relay testing.
- Power resistor.
- Constant current source.
- DC switch.
- Fuse testing.
- Motor testing.

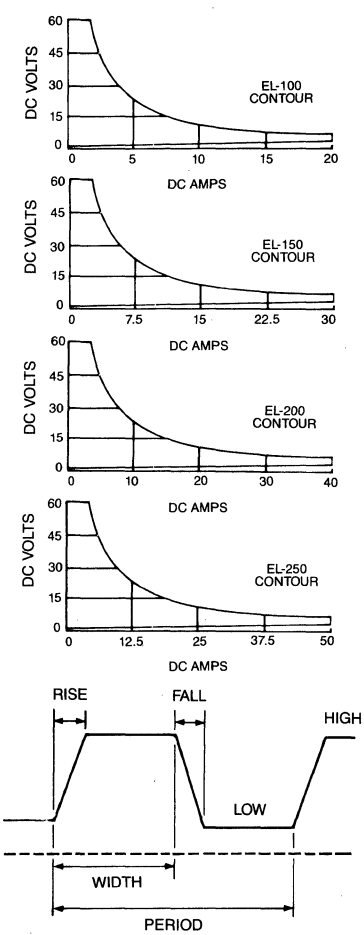
SPECIFICATIONS

Model	EL-100	EL-150	EL-200	EL-250
PRICE	$895	$960	$1030	$1095
Power (Watt)	100W	150W	200W	250W
Voltage (Volt)	3-60V			
Current (Ampere)	0-20A	0-30A	0-40A	0-50A
CONSTANT RESISTANCE (CR)				
Range (Siemens)	1mS-4S	1.5mS-5S	2mS-6S	2.5mS-8S
Resolution	1mS	1.5mS	2mS	2.5mS
CONSTANT CURRENT (CC)				
Range (Ampere)	0-20A	0-30A	0-40A	0-50A
Resolution	10mA	10mA	15mA	15mA
DYNAMIC WAVEFORM				
Period (milli-seconds)	0.2-20mS			
Width	0.1-10mS			
Rise/Fall Time	0.03-3mS			
PROTECTION CIRCUITS				
Over-power (Watt)	105W	158W	210W	263W
Over-voltage (Volt)	63V			
Over-current (Ampere)	21A	32A	42A	53A
Over-temperature	95°C			
OTHER FUNCTIONS				
Remote voltage sensing	Voltage compensation for ohmic drop of input conductors			
External waveform input	0-5VDC F.S., DC-20KHz, input impedance 10K Ohms			
Current monitor output	4A/V	6A/V	8A/V	10A/V
Parallel operation	0-5VDC control signal			
FRONT PANEL DISPLAY	3½ digits auto-range			
Voltage	0.1% reading ± 1 LSD			
Current	0.5% reading ± 1 LSD			
GENERAL				
Operating condition	0-40°C, 85% relative humidity maximum			
Cooling	Fan cooled			
AC input	110/220V ± 10%, 50/60Hz, Factory set			
Dimensions	8"W × 6"H × 13"D			
Weight	Approximately 15 Lbs			

OPTIONS

- Rack mounting kit for 1 unit—Part no. RMK1
- Rack mounting kit for 2 units—Part no. RMK2
- digital I/O interface card—Part no. DA4000B

OPERATING AREA



PERIOD: Time interval between the leading edge of consecutive pulses
WIDTH: From leading edge start to trailing edge start.
RISE/FALL: Time interval between the 10% and 90% amplitude point on the leading/trailing edge.
HIGH/LOW: Current waveform amplitude high/low level.

HC: The New Standard for Reliability and Efficiency in High Power Switchers

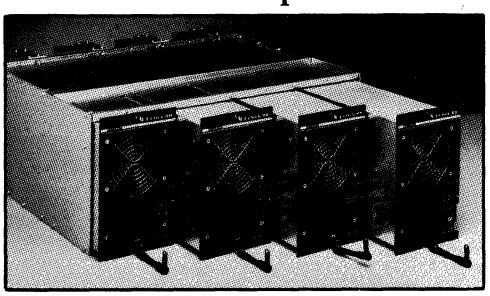
Hi-Rel Power MOSFET Design With Unique Current Mode Control Guarantees Minimum 250,000 Hour MTBF

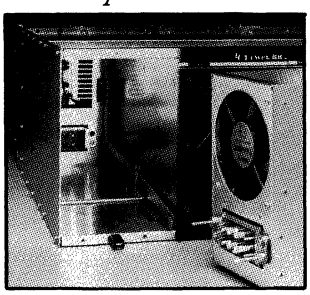
This new concept in high power switcher design sets new standards for high performance and operating life.

HC switch-mode supplies incorporate new technology that delivers maximum power from the smallest possible package. Choose from 500 to 4000 watts, with one to five outputs; in standards or custom designs.

This thoroughly proven line allows instantaneous rejection of input voltage transients and absolute current sharing of parallel outputs, while assuring transient response to large step load changes in **less than 50 microseconds.** Single Pole loop compensation yields greater stability with tighter regulation, and 120 Hz ripple is eliminated entirely!

NEW! HC "Hot Swap" Redundant Power Systems





This unique concept allows power supplies to be replaced by untrained personnel while your system is in operation. Hot Swap eliminates any possibility of wiring errors, and is ideal for applications in fault-tolerant systems. Select any standard power supplies listed on this page, then call us for a technical consultation.

Specifications

INPUT SPECIFICATIONS

AC Input Ranges: 90-132 VAC, 180-264 VAC, 47-440 Hz, single or three phase.
Optional: 180-264 VAC, three phase.
DC Input Range: 42-58 VDC, 21-28 VDC optional. Other DC inputs available on special order.
Line Transient: Meets IEE 472.
Line Filtering: Optional filter complies with FCC Docket 20780, Level A, and VDE 0871, Level A.

OUTPUT SPECIFICATIONS

Voltage Adjust Range: ±10%.
Load Regulation: 0.2%.
Cross Regulation: 0.1% maximum.
Ripple & Noise: 1% or 50 mV, whichever is greater.
Rapid Transient Response: <50 μsec.
Output Polarity: All outputs are floating.
Minimum Load: No minimum loading is required on any output.

LOGIC AND CONTROL

Remote Sense.
Remote Margin.
AC Power Fail Warning.
Current Sharing.
Current Monitor.
DC- OK.

PROTECTION

Over Voltage Protection.
Over Current.
Thermal Shutdown.
Reverse Polarity.

HC Switcher Selection Guide—500 to 4000 Watts, 1 to 5 Outputs.

SINGLE

	HC50 500W	HC75 750W	HC10 1000W	HC15 1500W	HC18 1800W
V1	2V, 120A 5V, 100A 12V, 42A 15V, 34A 18V, 28A 24V, 21A 28V, 18A 36V, 14A 48V, 11A	2V, 175A 5V, 150A 12V, 63A 15V, 50A 18V, 42A 24V, 31A 28V, 27A 36V, 21A 48V, 16A	2V, 230A 5V, 200A 12V, 83A 15V, 67A 18V, 56A 24V, 42A 28V, 36A 36V, 28A 48V, 21A	2V, 340A 5V, 300A 12V, 125A 15V, 100A 18V, 83A 24V, 63A 28V, 54A 36V, 42A 48V, 31A	2V, 360A 5V, 360A 12V, 150A 15V, 120A 18V, 100A 24V, 75A 28V, 65A 36V, 50A 48V, 38A

DUAL

	HC50 500W	HC75 750W	HC10 1000W	HC12 1250W	HC15 1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 15A 5V, 15A 12V, 15A 15V, 10A 24V, 10A	2V, 50A 5V, 50A 12V, 33A 15V, 27A 24V, 17A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A

TRIPLE

	HC50 500W	HC75 750W	HC10 1000W	HC12 1250W	HC15 1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2*	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 15A 5V, 15A 12V, 15A 15V, 10A 24V, 10A	2V, 20A 5V, 20A 12V, 15A 15V, 15A 24V, 10A	2V, 50A 5V, 50A 12V, 35A 15V, 28A 24V, 18A	2V, 50A 5V, 50A 12V, 35A 15V, 28A 24V, 18A
V3	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A

Total output power is limited to power rating shown. Combined loading for V2 thru V5 not to exceed 600 watts.

HI-POWER SINGLE

	HC20 2000W	HC30 3000W	HC40 4000W
V1	2V, 400A 5V, 400A 12V, 167A 15V, 134A **18V, 111A** 24V, 84A 28V, 72A 36V, 56A 48V, 42A	2V, 600A 5V, 600A 12V, 250A 15V, 200A **18V, 166A** 24V, 125A 28V, 107A 36V, 83A 48V, 63A	2V, 800A 5V, 800A 12V, 333A 15V, 267A **18V, 222A** 24V, 167A 28V, 143A 36V, 111A 48V, 84A

HI-POWER DUAL

	HC30 3000W	HC40 4000W
V1 AND V2	2V, 300A 5V, 300A 12V, 125A 15V, 100A 18V, 83A 24V, 63A 28V, 54A 36V, 42A 48V, 31A	2V, 400A 5V, 400A 12V, 167A 15V, 134A 18V, 111A 24V, 84A 28V, 72A 36V, 56A 48V, 42A

NOTE: DC Input Models are available up to 1000 watts. Contact factory for details.

QUAD/PENTA

	HC50 500W	HC75 750W	HC10 1000W	HC12 1250W	HC15 1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2*	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 15A 5V, 15A 12V, 15A 15V, 10A 24V, 10A	2V, 20A 5V, 20A 12V, 15A 15V, 15A 24V, 12A	2V, 50A 5V, 50A 12V, 35A 15V, 28A 24V, 18A	2V, 50A 5V, 50A 12V, 35A 15V, 28A 24V, 18A
V3	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A
V4	2V, 3A 5V, 3A 12V, 3A 15V, 2A 24V, 2A	2V, 3A 5V, 3A 12V, 3A 15V, 2A 24V, 2A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A
V5	12V, 5A/8A† 24V, 5A/8A†	12V, 7A/10A† 24V, 7A/10A†	12V, 8A/12A† 24V, 8A/12A†	Contact Factory	Contact Factory

*Higher current ratings available for V2 on HC12 and HC15. Contact factory.
†Peak output for 30 seconds

Ask About MG Series Quasi-MIL Power Supplies and HC Custom Rack Assemblies.

HC Power, inc.
17032 Armstrong Avenue, Irvine, CA 92714-5716
TEL: 714 261-2114 FAX: 714 261-6584

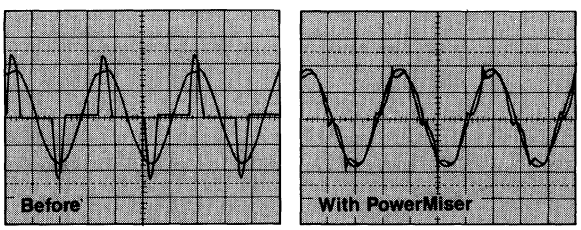
Introducing PowerMiser: The Patented, New Breakthrough in Power Factor Correction

Cuts AC Input Requirements by 30%; Reduces Harmonic Distortion To Meet DOD-STD-1399, Section 300.

Available for power levels from 500 through 4000 watts, this patented new concept in power factor correction assures safe and reliable operation of computers and business equipment while reducing AC input requirements. This unique device also attenuates AC line harmonics induced by switching supplies and prevents overloading of neutral conductors and transformers in major electrical/electronic installations.

This cost effective technology breakthrough permits operation of a 1000 watt switch-mode power supply from a 115 VAC, 15 Amp outlet, without exceeding the 12 Amp limit imposed by UL regulations.

Eliminate Troublesome Harmonic Line Distortion Induced by Switching Power Supplies. PowerMiser Converts Current Pulse to Modified Sine Wave.



PowerMiser Selector

Select Maximum Power and Case Configuration

Output (1)	Case Size	Optional (3) Filter	Input Voltage	Output Power Code	Input Term.	Output Term.
500 W	A	Yes	1, 2, or 4	0	1 (2)	1
500 W	B	—	1, 2, or 4	0	1	1
500 W	D	Yes	1	0	2	3
1000 W	A	Yes	1, 2, or 4	1	1 (2)	1
1000 W	B	—	1, 2, or 4	1	1	1
1500 W	A	Yes	1, 2, or 4	9	1 (2)	1
1500 W	B	—	2	9	1	1
2000 W	A	—	2	2	1	1
2000 W	B	—	2	2	1	1
2000 W	E	—	1	2	4	4
3000 W	E	—	2	3	4	4
3000 W	F	—	2	3	4	4
4000 W	E	—	2	4	4	4
4000 W	F	—	2	4	4	4

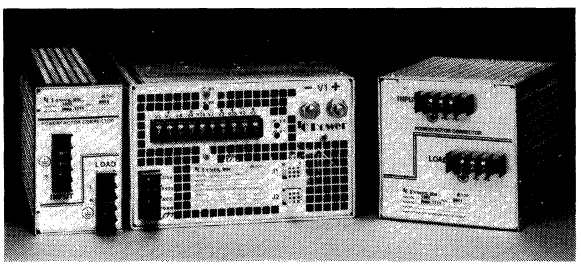
(1) Specify a power rating equal to the maximum output power of your power supply. More than one power supply can be connected to the PowerMiser if the combined output power does not exceed the rating of the PowerMiser.
(2) The input terminals will be studs, Code 5, if the optional AC line filter is ordered.
(3) Optional filter not available on units with strappable inputs.

Specifications

AC Input Voltage Ranges:
90-132 VAC, 47-63 Hz, Single Phase
180-264 VAC, 47-63 Hz, Single Phase

Output Power Ranges:
500 W, 1000 W, 1500 W, 2000 W, 3000 W, 4000 W.
Specify power rating equal to the driven power supply or supplies.

Optimum Operating Range: 50 to 100% of the full rated power. Operation below 50% of rating will simply result in a slight degradation of the power factor.



Power Factor: .98
Conversion Efficiency: 98%
Harmonic Current Attenuation: Complies with DOD-STD-1399 for Section 300A, Type 1 Power, Under 1 KVA.
Line Filtering: Optional filter complies with Level B of FCC Docket 20780 and VDE 0871.
Inductive Loading: The PowerMiser has been specifically designed to work with capacitive input power supplies. However, up to 10% of the total load may be inductive loads such as fans or motors.
"X" Caps: The "X" caps in the input filters of the driven power supplies should not exceed .01 mfd per watt.
Protection: External fuse or circuit breaker required
Operating Temperature: 0°C-70°C full power to 50°C, derate to 60% at 70°C.
Storage Temperature: −55°C To +85°C, with maximum of 95% relative humidity.
Cooling: Case E and Case F have forced air cooling. All other cases are convection cooled.
Safety: Meets UL 478, CSA C22.2 #220, and IEC 950. Check factory for status of approvals
Precautions:
Lead length between PowerMiser and Power Supply should not exceed 8 feet.
AC Power should be turned off before disconnecting load.
The PowerMiser is an AC in/AC out device which operates at line frequency. Not recommended for mounting within 24″ of equipment sensitive to 60 Hz radiation.

NOTES:
(1) Performance with products manufactured by other than HC POWER cannot be guaranteed.
(2) Specifications subject to change without notice.

Ordering Information

PM [ ][ ] − [ ][ ][ ][ ]

CASE SIZE
A = 3.375x5x11.25
B = 5x5x5.75
D = 5x5x8.25
E = 5x5x11.25
F = 4x5x14

OPTION CODE
X = None
B = B Level Filter

INPUT VOLTAGE
1 = 115 VAC
2 = 230 VAC
4 = 115/230

INPUT TERMINATION
1 = Barrier Strip
2 = IEC Connector
4 = Terminal Block
5 = Studs

OUTPUT TERMINATION
1 = Barrier Strip
3 = Duplex Outlet
4 = Terminal Block

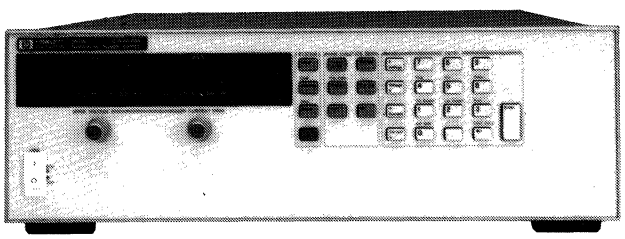
POWER RATINGS
0 = 500 W 2 = 2000 W
1 = 1000 W 3 = 3000 W
9 = 1500 W 4 = 4000 W

HC Power, inc.
17032 Armstrong Avenue, Irvine, CA 92714-5716
TEL: 714 261-2114 FAX: 714 261-6584

Dedicated to the Design and Manufacture of High Quality Switchers

HEWLETT PACKARD

For Performance and Selection... Hewlett-Packard DC Power Supplies and Electronic Loads



HP 6671A HP-IB

HP's "One-Box" Solution Power Supplies

Hewlett-Packard's approach to designing power supplies for computer-controlled applications is to design everything related to the power supply into one box. This includes HP-IB (IEEE-488) voltage and current programmers, voltage and current readback, load protection circuits, SRQ interrupts, status readback, and relay control. The benefits of this approach are:

- Ease-of-integration
- Ease-of-use
- Reliability
- Fully specified performance
- Reduced system cost
- Protection for the DUT

Multiple-Output System Power Supplies

Power (Watts)	Volts	Amps	Number of outputs per HP Model number 6621A	6622A	6623A	6624A	6627A
40	20	5*	-	-	1	2	-
40	50	2*	-	-	1	2	4
80	20	10*	2	-	1	-	-
80	50	4*	-	2	-	-	-

Precision Models

Power (Watts)	Volts	Amps	Number of outputs per HP Model number 6625A	6626A	6628A	6629A
25	7	500 mA*	1	2	-	-
50	16	1*	1	2	2	4

* Dual-range output

Modular Power System

HP 66000 MPS Mainframe - 8 slots

DC Power Modules

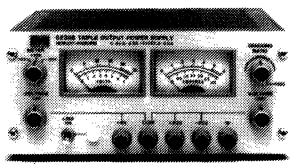
Power (Watts)	Volts	Amps	HP Model Number
0-128	0-8	0-16	66101A
0-150	0-20	0-7.5	66102A
0-150	0-35	0-4.3	66103A

Single-Output System Power Supplies

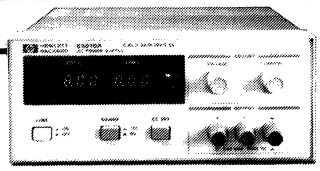
Power (Watts)	Volts	Amps	HP Model Number
0-100	0-20	0-5	6632A
	0-50	0-2	6633A
	0-100	0-1	6634A
0-200	0-8	0-20	6641A
	0-20	0-10	6642A
	0-20	0-30**	6033A
	0-35	0-6	6643A
	0-60	0-3.5	6644A
	0-60	0-10**	6038A
	0-120	0-1.5	6645A
0-500	0-8	0-50	6651A
	0-20	0-25	6652A
	0-35	0-15	6653A
	0-60	0-9	6654A
	0-120	0-4	6655A
0-1000	0-20	0-120**	6031A
	0-60	0-50**	6032A
	0-200	0-17**	6030A
	0-500	0-5**	6035A
0-2000	0-8	0-220	6671A
	0-20	0-100	6672A
	0-35	0-60	6673A
	0-60	0-35	6674A
	0-120	0-18	6675A

**Autoranging output

General-Purpose Bench Power Supplies



HP 6236B, 6237B



HP E3610A, E3611A, E3612A

	Range 1	Range 2	HP Model	Price*
Single Output	8 V, 3 A	15 V, 2 A	E3610A	$300
	20 V, 1.5 A	35 V, 0.85 A	E3611A	$300
	60 V, 0.5 A	120 V, 0.25 A	E3612A	$300
	Volts	**Amps**	**HP Model**	**Price***
Dual Output	0-25	0-0.2	6234A	$640
	0-25	0-0.2		
Triple Output	0-6	0-1	6235A	$700
	0 to ±18	0-0.2		
	0-6	0-2.5	6236B	$930
	0 to ±20	0-0.5		
	0-18	0-1	6237B	$930
	0 to ±20	0-0.5		

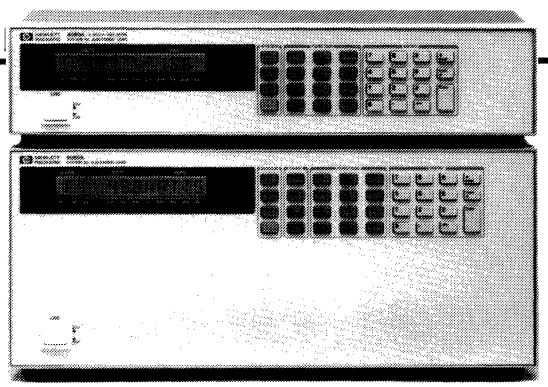
*Prices subject to change.

These popular low-cost bench supplies are designed for general laboratory use. All models feature short-circuit protection and CV and CC operation.

For same day shipment call HP Direct at 1-800-538-8787 to place your order, and it will be shipped within 24 hours.

For details on HP's full range of power supplies from 10 to 11,000 watts, request the HP DC Power Supply Catalog described below.

Electronic Loads

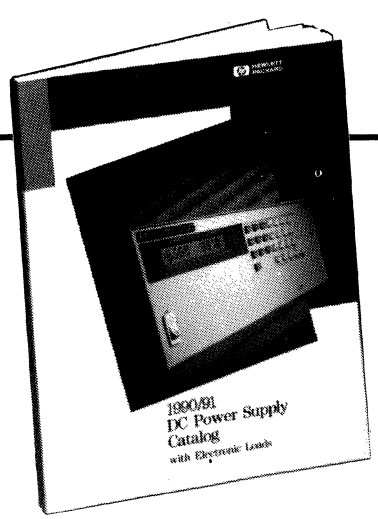


HP 6060B
HP 6050B

HP-IB

	Watts	Amps	Volts	HP Model
Stand-Alone Units	250	0-30	3-240	6063B
	300	0-60	3-60	6060B
Mainframes	600 (2 slots)			6051B
	1800 (6 slots)			6050B
Mainframe Modules	150	0-30	3-60	60501B
	250	0-30	3-240	60503B
	300	0-60	3-60	60502B
	600 (2 slots)	0-120	3-60	60504B

- Ideal for testing dc power supplies, batteries and power components
- Constant current, constant voltage, and constant resistance modes
- Built-in transient generator
- "One-Box" Solution with full HP-IB control and readback
- Front panel control
- High reliability



To Find Out More . . .

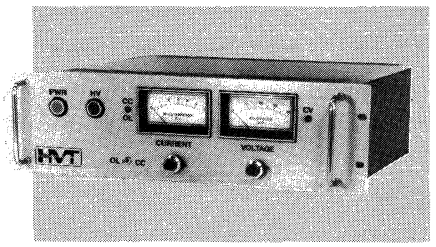
Call 1-800-752-0900 Ext. 2130 and ask for Hewlett-Packard's DC Power Supply Catalog. This handy reference catalog provides detailed specifications for HP's complete range of dc power supplies and electronic loads.

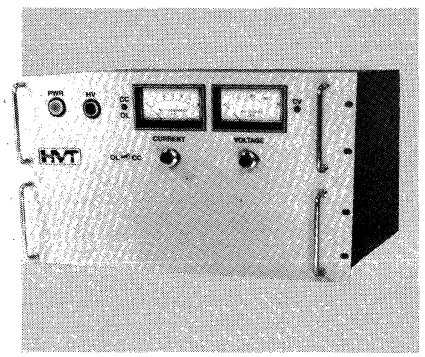
- Over 90 models to choose from
- Convenient reference format
- Application information

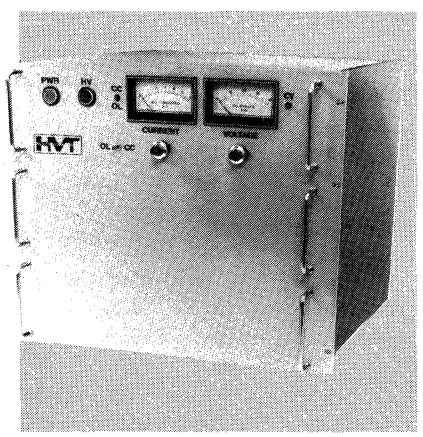
HEWLETT PACKARD

HIGH VOLTAGE TECHNOLOGY, INC.

HIGH VOLTAGE REGULATED DC POWER SUPPLIES







FEATURES:

- Light weight, compact
- Low stored energy
- True Current and Voltage monitor
- Programmable Output Voltage & Current
- CC/CV Automatic Crossover
- Overload, Arc-over & Short Circuit Protection
- Efficiency is typically better than 75%
- External Polarity Reversal
- External Interlock/Output Inhibit
- Remote Voltage & Current Monitoring

DESIGN CONCEPT

High Voltage Technology LS Series incorporates high efficiency switch mode technology. The DC unregulated bus is switched at a frequency greater than 20KHZ rate by means of a power switch. All control and monitoring functions are isolated from the power line.

Ferrite Core high voltage transformer is used to perform the necessary step-up to power the high voltage multiplier.

Voltage or Current Regulation is achieved by independent high gain wide band width feedback networks, thus achieving excellent dynamic power supply regulation. A control signal is generated by a comparison between the sampled output voltage or output current with a temperature stabilized reference voltage. This signal controls the output of the pulse width modulator, allowing the output voltage to be maintained to better than 0.005%.

Constant Voltage/Constant Current Automatic Crossover operation is achieved by means of a gating function.

SPECIFICATIONS:

Output Voltage:
Adjustable from zero to maximum rated output voltage.

Output Current:
Adjustable from 10% to 100% rated output current.

Voltage Regulation:
Line: ±0.005% over specified input range.
Load: ±0.005% for full load change.

Current Regulation:
Line: ±0.005% over specified input range.
Load: ±Better than 100μA from 10% to rated output voltage.

Ripple:
60 & 150 Watt units: 0.02% RMS 3KW units: 0.15%
300, 600 & 1KW units: 0.05% RMS

Temperature Coefficient:
100PPM/°C over the range of 0 to 60°C (for voltage range from 10% to 100% of rated output).

Stability:
0.01%/hour; 0.03%/8 hours: for voltage range from 10% to 100% of rated output.

Input Voltage:
AC input voltage ± 10% all units

71 ALEXANDER STREET, YONKERS, NEW YORK 10701 (914) 423-6636 FAX (914) 968-0347

HIGH VOLTAGE TECHNOLOGY, INC.

HIGH VOLTAGE REGULATED DC POWER SUPPLIES

MODEL SELECTION GUIDE

MODELS KV	60 WATT mA	150 WATT mA	300 WATT mA	600 WATT mA	1000 WATT mA	3000 WATT mA
LS1.5	40	100	200	400	666	2000
LS3	20	50	100	200	333	1000
LS5	12	30	60	120	200	600
LS10	6	15	30	60	100	300
LS15	4	10	20	40	65	200
LS20	3	7.5	15	30	50	150
LS30	2	5	10	20	33	100
LS40	1.5	3.75	7.5	15	25	75
LS50	1.25	3	6	12	20	60
LS60	1	2.5	5	10	17	50
LS80	0.75	1.8	3.75	7.5	12.5	37.5
LS100	0.6	1.5	3	6	10	30
LS125	0.5	1.2	2.5	4.8	8	24
LS150	NA	1	2	4	6.6	20
LS200	NA	0.75	1.5	3	5	15
LS300	NA	0.5	1	2	3.3	10
LS400	NA	0.375	0.75	1.5	2.5	7.5

*ADD Prefix P = Positive N = Negative R = Reversible NA = Not Available

Part Number Example:
for Model + 10KV @ 6MA

LS10-6P ___ – ___
Input Voltage ___| |___ OPTION (list all Options)

CODE	INPUT VOLTAGE	MODELS					
		60W	150W	300W	600W	1KW	3KW
#1	100VAC	*	*	*	*	*	NA
#2	115VAC	ST	ST	ST	ST	*	NA
#3	200VAC	*	*	*	*	*	*
#4	220VAC	*	*	*	*	ST	ST
#5	208VAC 3ϕ	NA	NA	NA	NA	OP	OP

*Available at no extra cost ST = Standard OP = Option-extra cost (consult factory) NA = Not Available

OPTIONS

#1 (ZVR) Zero Voltage Reset:
Output Voltage program must be set to zero before high voltage can be programmed.

#2 (OVR) Overvoltage Reset:
Power supply will shut down when output voltage exceeds preset setting (adjustable from 10% to 110% of maximum rated voltage).

#3 (DPM) Digital Panel Meter:
3½ digit meter for Voltage and Current. 4½ digit meters available, consult factory.

#4 (TTL):
Compatible "enable" line.

#5 (RCP) Remote Control Panel:
Power supply can be controlled up to 100 feet away from drive unit and high voltage assembly.

#6 (MOD) SPECIAL MODIFICATION:
Any non standard option or modification consult factory.

#7 IEEE-488 or RS232C INTERFACE.

71 ALEXANDER STREET, YONKERS, NEW YORK 10701 (914) 423-6636 FAX (914) 968-0347

HIGH VOLTAGE TECHNOLOGY, INC.

HIGH VOLTAGE REGULATED DC POWER SUPPLIES

SERIES VPM100

7 Models Ranging from 3KV to 30KV @ 10 Watts

FEATURES:

- Voltage Programmable
- Excellent Dynamic Regulation
- Arc-Over Protected
- Compact/Fully Encapsulated

MODELS AVAILABLE:

- AC Input 115/220VAC 48–400Hz
- Output Voltage Range 250VDC to 50KVDC
- Output Power 1 Watt to 100 Watts
- Consult Factory

MODEL GUIDE

MODEL	VOLTAGE	CURRENT
VPM103	0–3KV	3.3MA
VPM105	0–5KV	2.0MA
VPM110	0–10KV	1.0MA
VPM115	0–15KV	0.66MA
VPM120	0–20KV	0.5MA
VPM125	0–25KV	0.4MA
VPM130	0–30KV	0.33MA

Units available in Positive or Negative polarity. Add P or N suffix to Model Number

ELECTRICAL SPECIFICATIONS

Input Voltage:
+24VDC ±10%

Output Voltage:
Programmable from zero to maximum rated output voltage from an external 5K Potentiometer or 0 to 10V low voltage ground reference source.

Output Current:
10 Watts Maximum

Line Regulation:
±0.01% Maximum

Load Regulation:
0.01% Maximum

Ripple:
0.05% RMS

Monitor Output:
Voltage Monitor } Both are
Current Monitor } Optional

ENVIRONMENTAL CHARACTERISTICS

	OPERATING	STORAGE
Temperature Range:	0 to 70°C	125°C
Temperature Coefficient:	0.01%/°C	
Stability:	0.01%/8 Hours	

MECHANICAL SPECIFICATIONS

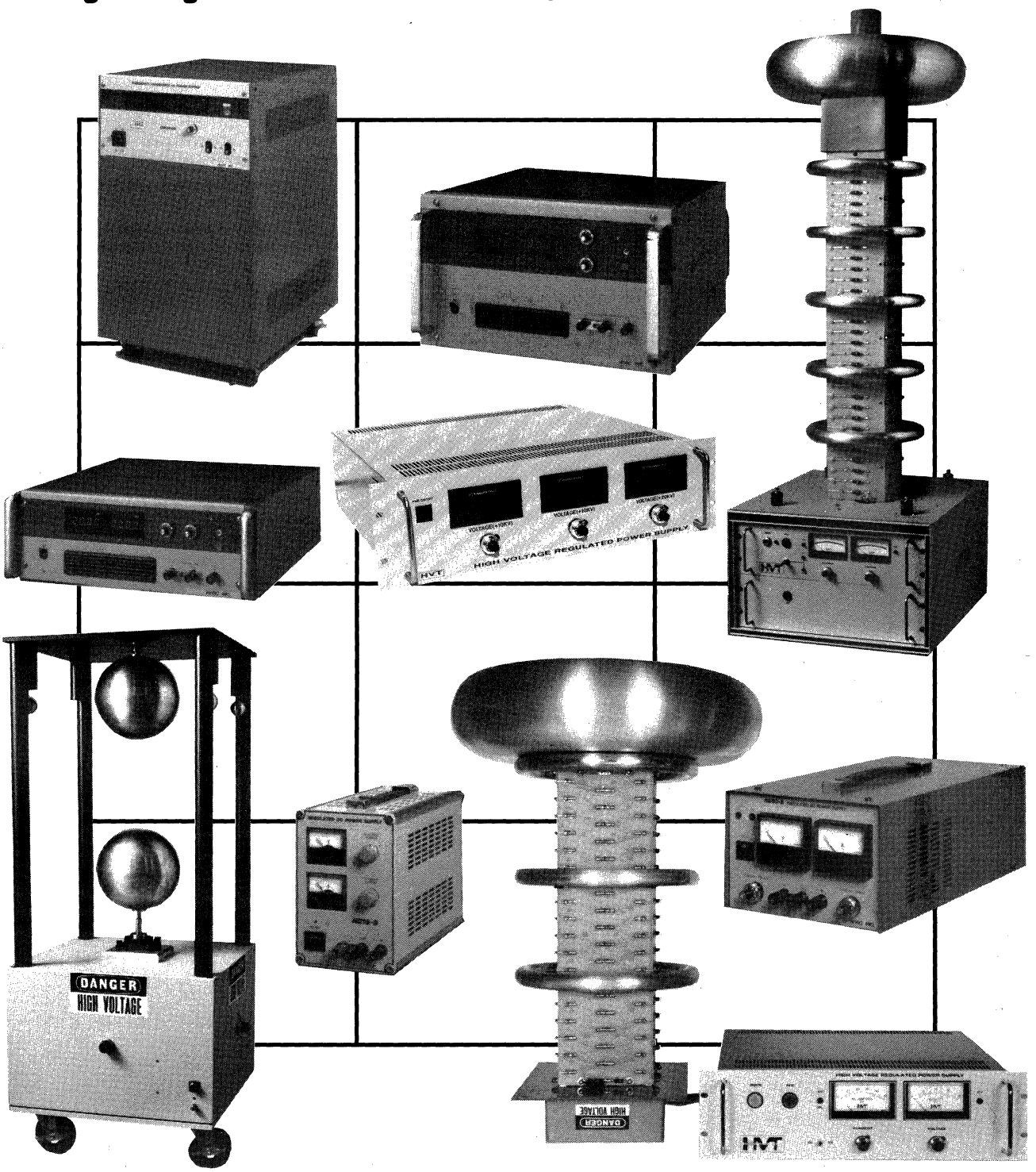
PACKING:
Silicon Rubber Encapsulant
Die Cast Aluminum Case

OUTPUT TERMINATION:
12" Flying lead silicon rubber. Longer lead optional at no extra cost.

71 ALEXANDER STREET, YONKERS, NEW YORK 10701 (914) 423-6636 FAX (914) 968-0347

CUSTOM DESIGN POWER SUPPLIES

Voltage Range 8 Volts to 600 KVDC / Power Level 1 Watt to 20KW



HVT
71 ALEXANDER STREET, YONKERS, NEW YORK 10701
(914) 423-6636 FAX (914) 968-0347

30 YEARS OF SERVICE

Hipotronics®

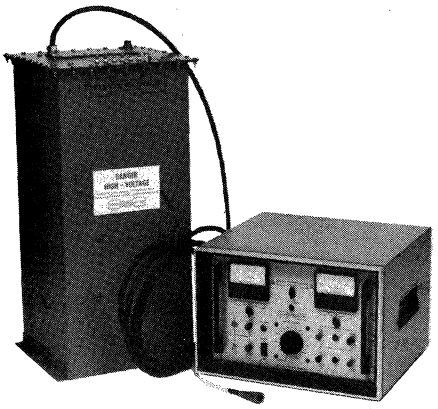
1KV TO 1 MEGAVOLT, 1KW TO 1 MEGAWATT HIGH VOLTAGE DC POWER SUPPLIES

Hipotronics manufactures a complete line of High Voltage Power Supplies with continuously adjustable output voltages for Electrostatic Systems, Accelerators, Lasers, High Voltage Power Sources, X-Ray Systems, Precipitators, DC Transmission Line Components and more.

Modified units can be supplied with thyristor regulators for capacitor changing applications as well as crowbar circuits, high energy discharge solenoids, line regulators, special control functions, and special packaging.

Standard Features
(provided with all units)

- Output connected triple range voltage meter.
- Triple range current meter in return leg of HV circuit.
- Reversible polarity.
- Rated current available from zero to rated voltage.
- Solid state rectifiers.
- Continuously variable output voltage from zero to maximum.
- HV on and off pushbuttons.
- Meter recalibration potentiometers.



Typical DC Power Supply

Quality Products

These units are designed and manufactured with the highest quality components. They are available with fully instrumented control consoles or without controls for use in OEM equipment.

All critical components—transformers, capacitors, rectifier assemblies, tanks, etc., are designed and manufactured by Hipotronics so that superior quality and on-time delivery schedules can be assured.

Model No.	Voltage (kV)	Current (mA)	Output	Input
801-1A	1	1 Amp	1 KILOWATT	115 VOLT, 50/60 Hz, SINGLE PHASE
803-330	3	330		
805-200	5	200		
810-100	10	100		
820-50	20	50		
825-40	25	40		
830-33	30	33		
850-20	50	20		
860-16	60	16		
875-13	75	13		
8100-10	100	10		
8120-8	120	8		
8150-6.5	150	6.5		
8200-5	200	5		
801-1.5A	1	1.5 Amp	1.5 KILOWATT	
803-500	3	500		
805-300	5	300		
810-150	10	150		
825-60	25	60		
830-50	30	50		
850-30	50	30		
875-20	75	20		
8100-15	100	15		
8120-12.5	120	12.5		
8150-10	150	10		
8200-7.5	200	7.5		
801-2.5A	1	2.5 Amp	2.5 KILOWATT	
803-830	3	830		
805-500	5	500		
810-250	10	250		
825-100	25	100		
850-50	50	50		
875-33	75	33		
8100-25	100	25		
8120-20	120	20		
8150-16	150	16		
8200-12.5	200	12.5		
8250-10	250	10		
8300-8	300	8		

Model No.	Voltage (kV)	Current (mA)	Output	Input	
801-5A	1	5 Amp	5 KILOWATT	3φ	208/230V
803-1.6A	3	1.66 Amp			
805-1A	5	1 Amp			
810-500	10	500			
825-200*	25	200		1φ	
850-100*	50	100			
875-67*	75	67			
8100-50*	100	50			
8120-41.5*	120	41.5			
8150-33.3*	150	33.3			
8200-25*	200	25			
8250-20*	250	20			
8300-16.6*	300	16.6			
801-10A	1	10 Amp	10 KILOWATT	3φ	
803-3300	3	3.3 Amp			
805-2000	5	2 Amp			
810-1000	10	1 Amp			
825-400	25	400			
850-200*	50	200		1φ	480V
875-130*	75	130			
8100-100*	100	100			
8120-80*	120	80			
8150-65*	150	65			
8200-50*	200	50			
8250-40*	250	40			
8300-33*	300	33			

STANDARD SPECIFICATIONS
THREE PHASE INPUT

Ripple — 5% rms (1% optional)
Regulation — 10% NL/FL

SINGLE PHASE INPUT

Ripple — 2% rms
Regulation — 15%-18% NL/FL

Model No.	Voltage (kV)	Current (mA)	Output	Input	
801-15A	1	15 Amp	15 KILOWATT	3φ	480V
803-5A	3	5 Amp			
805-3A	5	3 Amp			
810-1.5A	10	1.5 Amp			
825-600	25	600			
850-300	50	300		1φ	
875-200*	75	200			
8100-150*	100	150			
8120-125*	120	125			
8150-100*	150	100			
8200-75*	200	75			
8250-60*	250	60			
8300-50*	300	50			
801-25A	1	25 Amp	25 KILOWATT	3φ	
803-8.8A	3	8.8 Amp			
805-5A	5	5 Amp			
810-2.5A	10	2.5 Amp			
825-1A	25	1 Amp			
850-500	50	500			
875-335	75	335			
8100-250	100	250			
8120-200	120	200			
8150-170	150	170			
8200-125&	200	125		1φ	
8300-80*	300	80			
801-50A	1	50 Amp	50 KILOWATT	3φ	
803-16.6A	3	16.6 Amp			
805-10A	5	10 Amp			
810-5A	10	5 Amp			
825-2A	25	2 Amp			
850-1A	50	1 Amp			
875-670	75	670			
8100-500	100	500			
8120-420	120	420			
8150-335	150	335			
8200-250*	200	250		1φ	
8300-165*	300	165			

HIPOTRONICS, INC. ■ ROUTE 22, BREWSTER, NY 10509 ■ PHONE: (914) 279-8091 ■ TWX: (710) 574-2420 HIPO BRWS NY ■ FAX: (914) 279-2467

30 YEARS OF SERVICE

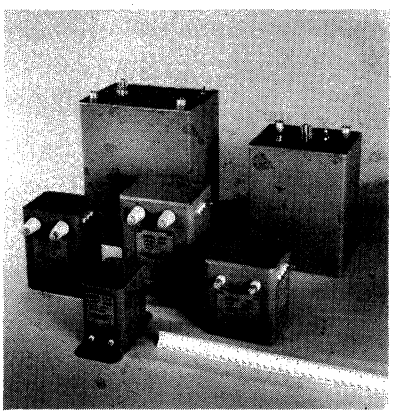
Hipotronics®

HV DC POWER SUPPLIES

Some of the High Voltage dc Power Supplies Hipotronics has manufactured during the past 25 years are illustrated on these pages. Call with your application and for other power products see our pages under transformers and ac Power Supplies.

Power Packs:

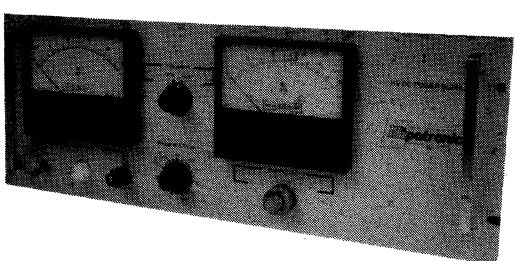
Manufactured with all components rated at well above designated operating level and pre-assembly Hipot tested at 1.5 operating voltage. Power Packs are available from 2.5 kV to 150 kV. Input voltage 115/220V.



Model No.	Output KV	MA
2.5B	2.5	5
2.5C	2.5	10
5B	5	5
7.5C	7.5	10
10B	10	5
10C	10	10
15C	15	10
20B	20	5
30B	30	5
30C	30	10
40A	40	2.0
50B	50	5
60A	60	2.0
100B	100	5
100C	100	10
150B	150	5

Metered Power Packs with simplified controls:

Provide complete output metering and overload protection system in a unit suitable for mounting in standard 19″ relay racks. Current limited to 5 mA.



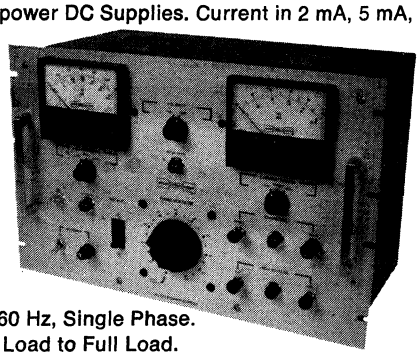
SPECIFICATIONS:

INPUT: 125 Volts (Output Voltages & Current — Stated for Nominal 117 Volt Input)
Regulation: 10% to 15% No Load to Full Load.
Ripple: 0.5% RMS per Milliampere Output.

Model No.	Output (kV)	Current (mA)	Ripple (%rms/mA)	Polarity	KV Meter Range (kV)	Current Meter Range (mA)
R2B	0- 2	5	0.5	Reversible	0- 2.5	0-5
R5B	0- 5	5	0.5	Reversible	0- 6	0-5
R10B	0-10	5	0.5	Reversible	0-12	0-5
R15B	0-15	5	0.5	Reversible	0-15	0-5
R20B	0-20	5	0.5	Reversible	0-25	0-5
R30B	0-30	5	0.5	Reversible	0-30	0-5
R50B	0-50	5	0.5	Reversible	0-50	0-5
R60A	0-60	2.0	0.5	Reversible	0-60	0-2.0

Power Packs with deluxe controls:

Provided with many safety and control features previously found only in higher power DC Supplies. Current in 2 mA, 5 mA, and 10 mA.



SPECIFICATIONS:

Input: 115 Volts, 50/60 Hz, Single Phase.
Regulation: 15% No Load to Full Load.
Ripple: 0.5% RMS Per Millampere Output.
HV Output: 20 Foot Shielded Cable.
Polarity: Reversible

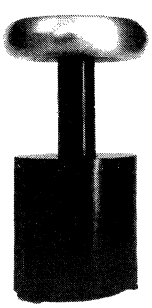
Model No.	Max. kV	mA	kV Meter Ranges	mA Meter Ranges
82.5B	2.5	5	0-.5/1/2.5	0-1/2.5/5
82.5C	2.5	10	0-.5/1/2.5	0-2.5/5/10
85B	5	5	0-1/2.5/5	0-1/2.5/5
87.5C	7.5	10	0-1.5/3.75/7.5	0-2.5/5/10
810B	10	5	0-2.5/5/10	0-1/2.5/5
810C	10	10	0-2.5/5/10	0-2.5/5/10
815B	15	5	0-3.75/7.5/15	0-1/2.5/5
815C	15	10	0-3.75/7.5/15	0-2.5/5/10
820B	20	5	0-4/8/20	0-1/2.5/5
830C	30	10	0-6/12/30	0-2.5/5/10
830B	30	5	0-6/12/30	0-1/2.5/5
840A	40	2	0-8/20/40	0-.4/.8/2
850B	50	5	0-10/25/50	0-1/2.5/5
860A	60	2	0-12/30/60	0-.4/.8/2

Isolation Transformers:

Operate in Oil, Gas and Air (Rated in Air) for use in Laser, Accelerator & Laboratory Power Supplies and for insulation, Cable, Hipot and Corona Testing.

Model	IT100
DC Insulation	100 kV
Input/Output Voltage	115:115V, 50/60 Hz or 220:220V, 50/60 Hz Single Phase
KVA	1 kVA

Higher voltages and kVA are also available. Call our Sales Department.



For More Isolation Transformer Information See Page A•2233 in Vol. A— Section 5600—Transformers

Our High Voltage Test Equipment And Voltage Regulators Appear within This Section D.

HIPOTRONICS, INC. ▪ ROUTE 22, BREWSTER, NY 10509 ▪ PHONE: (914) 279-8091 ▪ TWX: (710) 574-2420 HIPO BRWS NY ▪ FAX: (914) 279-2467

EEM MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

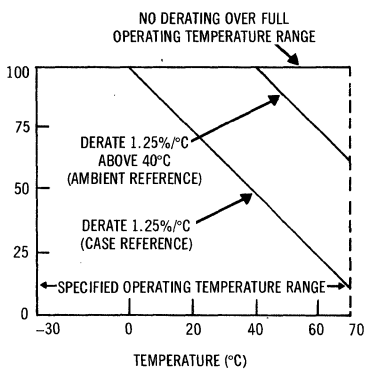


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

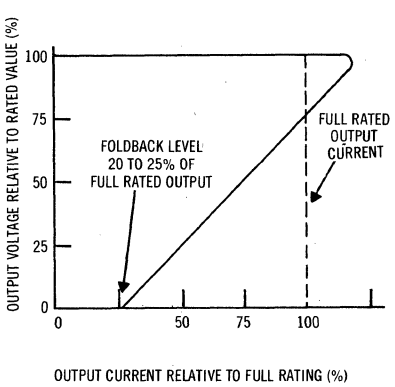


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

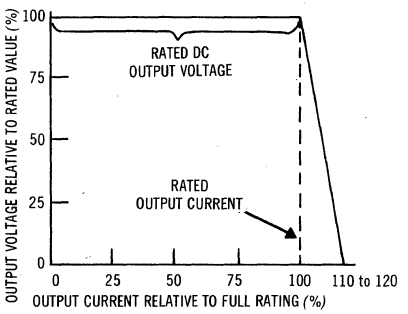


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

HITRAN

Key source for reliable magnetic components, power supplies and control systems for over 40 years.

DC POWER SYSTEMS DC BATTERY CHARGERS

Also see our catalog pages under AC POWER SUPPLIES and TRANSFORMERS.

AT10 SERIES STATIONARY FLOAT BATTERY CHARGERS

AT10 series charger/rectifiers are self contained, constant potential, DC power supplies designed for floating and charging stationary batteries and/or supplying power to utility, communication and industrial type loads.

***AT** means **Advanced Technology** microprocessor control.*

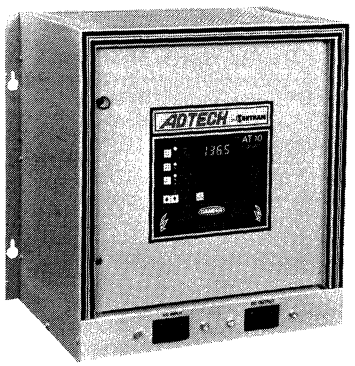
Design Features:

- *Modular Construction* — Rectifier, microprocessor control, input/output, power transformer, filter and alarm assemblies are all modular and easily replaceable.
- *Long Life* — All units are engineered for 30 years life with a MTBF of 60,000 hours (6.85 years).
- *Field Serviceable* — For fast service, enclosure and instrument panel are easily removable without disturbing chassis or installed conduit. Schematic and diagnostic information plates are mounted right on enclosure. Modular construction results in an MTTR of less than 60 minutes.
- *Installation and Field Adjustment* — Units are easily wall mounted. Control, alarm and operating level set points are adjusted digitally from the front panel while on-line, without the need to vary loads or external conditions.

Specifications

Input

- Voltage: 120/208/240 Volts +10%, −12%, single phase, 60 Hz ±5%
- Power Factor: 0.80 pf at full load
- Efficiency: 85% minimum at 50-100% load



Output

- Voltage Ratings: 12, 24, 48 or 130Vdc nominal
- Current Ratings: 6, 12, 16, 20 or 25Adc
- Voltage Regulation: ±0.25% for line, load and temperature variations
- Current Limited: 110% of rated output current
- Continuous Rating: 110% output at max equalize volts and 0-50°C
- Electrical Noise: 30mVrms/32dBrnC weighted max on filtered units
- Surge Withstand Capability (SWC): per IEEE-472/ANSI C37.90a

Standard Accessories & Features

- Digital LED display meter for Vdc, Adc, timer hours and alarm levels
- AC input and DC output circuit breakers
- 0-255 hour manual float/equalize timer and selector switch
- 0-255 hour line failure auto-equalize timer
- Local or remote voltage sense
- High DC voltage shutdown
- Open control loop shutdown
- Reverse polarity start inhibit
- MOV surge suppressors
- Switchboard wire, UL VW-1

Optional Accessories

- Alarm assembly with local LEDs and alarm relay contacts for AC fail, DC fail, High Vdc, Low Vdc, (+) ground, (−) ground
- High AIC circuit breakers
- Input lightning arrester
- Output filter for 30mVrms ripple
- Temperature compensation w/probe
- Fungus proofing (Tropicalization)
- Floor or rack mounting
- Drip shield
- NEMA 4 or NEMA 12 enclosures

Enclosure Sizes (inches)

- 12V-6, 25A; 24V-6; 25A; 48V-6, 12A; 130V-6A models: 15.25H x 16W x 10D
- 48V-16, 25A; 130V-12, 25A models: 17.63H x 19.25W x 12.5D

SCR/SCRF SERIES STATIONARY FLOAT BATTERY CHARGERS

Industrial float type chargers, designed to automatically control charging rates for a wide variety of battery types. Filtered and unfiltered 600V class input. Single phase and three phase. 47 to 63 Hz. Outputs range from 12 to 260V at 6 to 600Adc.

***SCR/SCRF Series** constant voltage chargers are automatically controlled by solid state integrated circuitry.*

Performance

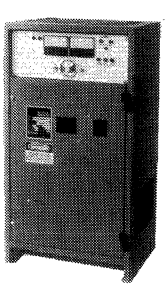
- Full rated output for both continuous and intermittant loads.
- Electronic current limiting at 110% of rated output.

Regulation.

- Continous taper charging as required.
- ± ½% Load Regulation of DC voltages from no load to full load.
- ± ½% of DC voltage setting maintained with input line variations of ±10% voltage, and/or ±5% frequency.
- ±1% Output Regulation maintained against the combined variations of line, load and temperature.

Design Features

- No adjustment taps required.
- Lockable float/equalize controls on recessed front panel.
- Enclosures wall, floor or rack mountable.



SCR/SCRF Series Battery Charger

AC Input Voltage

120, 220, 240, 480 single phase, 47-63Hz and 208, 240, 380, 416, 480 three phase, 47-63Hz.

DC Output Ratings

6-600 Adc at 12, 24, 48, 130 or 260 Vdc, nominal.

Standard Accessories

- DC Ammeter and Voltmeter.
- Potentiometers for float and equalize charge adjustments.
- AC input circuit breaker.
- Dual fused DC output.
- Front panel switch to change from float to equalize charging rate.
- Internal connection blocks for AC input, DC output and optional accessories.
- Protection diode to prevent damage due to improper connection of battery cables.

Optional Accessories

- DC circuit breaker to replace standard fusing.
- Equalize timer, 0-72 hour.
- Ground detection alarm relays and lights.
- HI & LO Vdc alarm relays and lights.
- Charger failure alarm relay and lights.
- Output filtering as required, 30mV RMS or less as charger or eliminator.
- And many more.

Designs and specifications subject to change without notice.

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SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

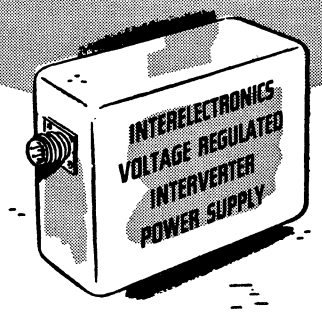
United States Underwriters Laboratories Inc. Recognized Component Mark

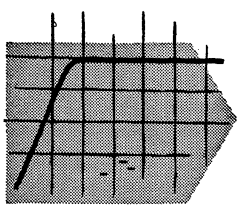
United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

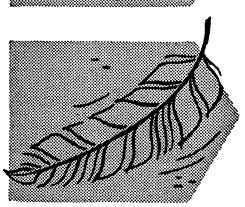
Yugoslavia Federal Institute of Standardization

PROVEN RELIABILITY—
DC-DC, DC-AC, SOLID-STATE POWER INVERTERS
over 260,000 logged hours— voltage-regulated, frequency-controlled, for missile, telemeter, ground-support, 135°C all-silicon units available now—



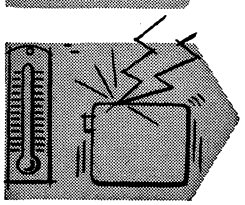


Interelectronics all-silicon thyratron-like gating elements and cubic-grain toroidal magnetic components convert DC to any desired number of AC or DC outputs from 1 to 10,000 watts.



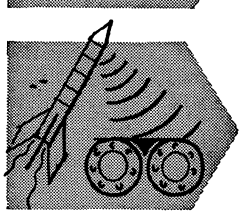
Ultra-reliable in operation (over 260,000 logged hours), no moving parts, unharmed by shorting output or reversing input polarity. High conversion efficiency (to 92%, including voltage regulation by Interelectronics patented reflex high-efficiency magnetic amplifier circuitry).

Wide input voltage range (1 to 250 volts DC). Wide input voltage regulation (output voltage maintained with variations up to 50% in input voltage).

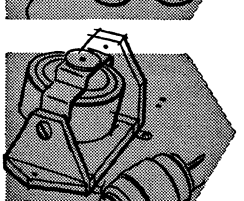


Light weight (to 6 watts/oz.), compact (to 8 watts/cu. in.), low ripple (to 0.01 mv. p-p), excellent voltage regulation (to 0.1%), precise frequency control (to 0.2%) with Interelectronics extreme environment magnetostrictive standards or to 0.0001% with fork or piezoelectric standards.

Complies with MIL specs. for shock (100G 11 misc.), acceleration (100G 15 min.), vibration (100G 5 to 5,000 cps.), temperature (to 150 degrees C), RF noise (I-26600).



AC single and polyphase units supply sine waveform output (to 2% harmonics), will deliver up to ten times rated line current into a short circuit to actuate MIL type magnetic circuit breakers or fuses, will start gyros and motors with starting current surges up to ten times normal operating line current.



Now in use in major missiles, powering telemeter transmitters, radar beacons, electronic equipment. Single and polyphase units now power airborne and marine missile gyros, synchros, servos, magnetic amplifiers.

Interelectronics—first and most experienced in the solid-state power supply field produces its own all-silicon solid-state gating elements, all high flux density magnetic components, high temperature ultra-reliable film capacitors and components, has complete facilities and know how—has designed and delivered more working KVA than any other firm!

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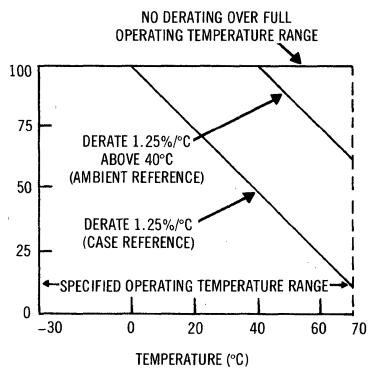

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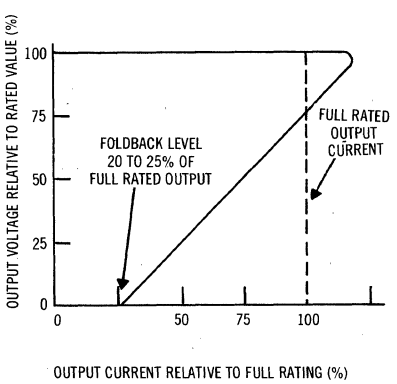

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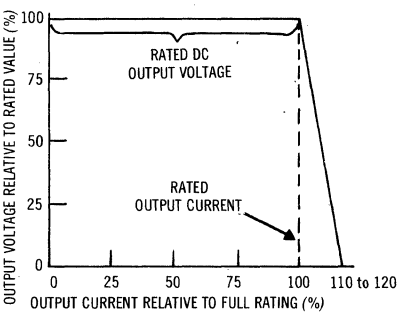

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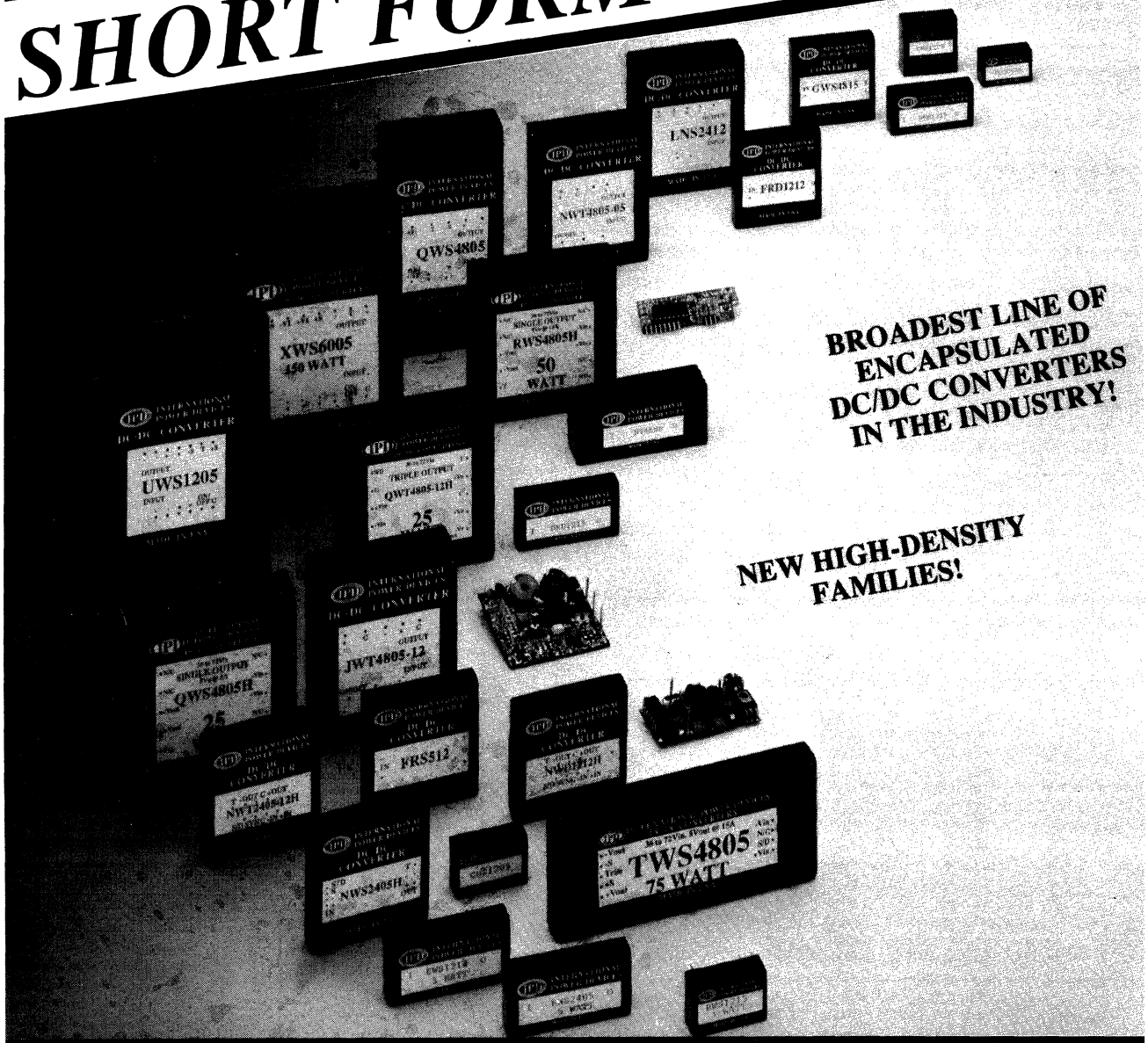
IPD

INTERNATIONAL POWER DEVICES'

SHORT FORM CATALOG



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NEW HIGH-DENSITY FAMILIES!

0.5 TO 500 WATT STANDARD, MODIFIED AND CUSTOM

DC/DC CONVERTERS

INTERNATIONAL POWER DEVICES, INC.

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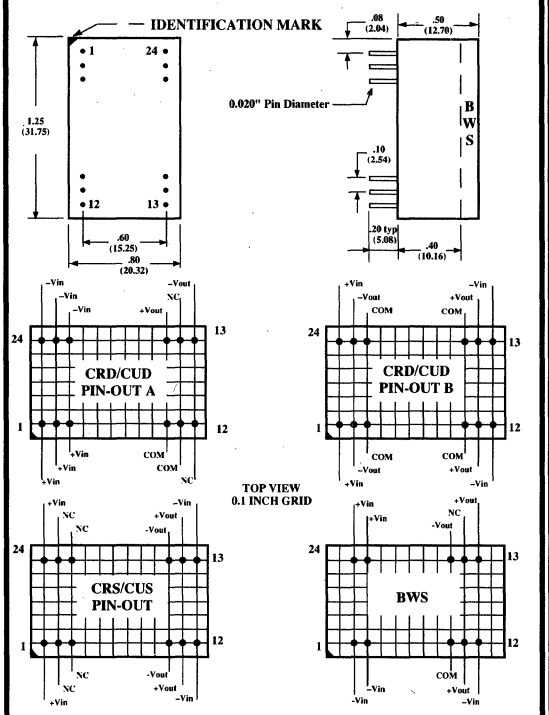
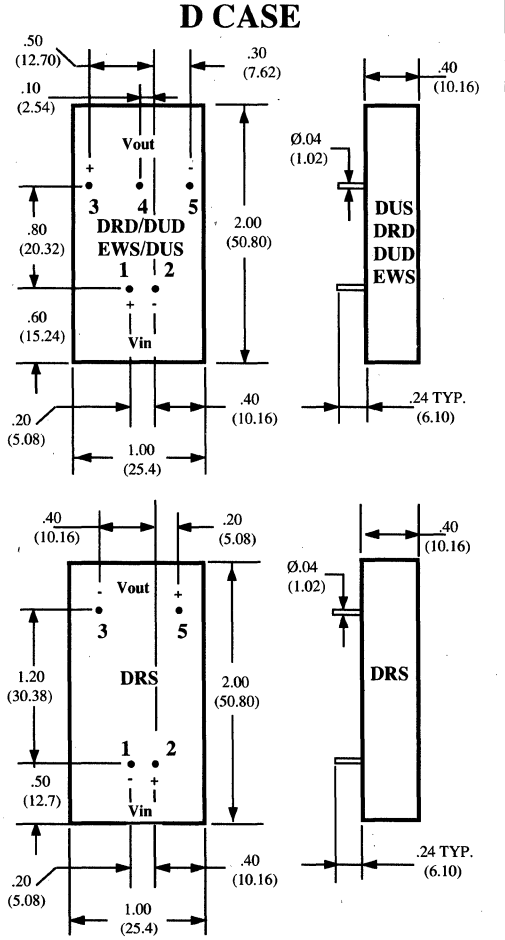
DESCRIPTION	Vin	Vout/Vin	EFF	CASE	MODEL
TO 1 WATT, REGULATED DUAL OUT	4.65-5.5	±12V/±40mA	50%	C	CRD512
	4.65-5.5	±15V/±33mA	50%	C	CRD515
	10.9-13.2	±12V/±40mA	50%	C	CRD1212
	10.9-13.2	±15V/±33mA	50%	C	CRD1215
TO 1 WATT, REGULATED SINGLE OUT	4.65-5.5	5V/100mA	32%	C	CRS505
	4.65-5.5	12V/80mA	46%	C	CRS512
	4.65-5.5	15V/65mA	53%	C	CRS515
	10.9-13.2	5V/100mA	34%	C	CRS1205
	10.9-13.2	12V/80mA	50%	C	CRS1212
	10.9-13.2	15V/65mA	53%	C	CRS1215
1 WATT, UNREGULATED DUAL OUT	4.5-5.5	±12V/±62mA	73%	C	CUD512
	4.5-5.5	±15V/±50mA	73%	C	CUD515
	10.8-13.2	±12V/±62mA	75%	C	CUD1212
	10.8-13.2	±15V/±50mA	75%	C	CUD1215
TO 2 WATT, UNREGULATED SINGLE OUT	4.5-5.5	5V/220mA	60%	C	CUS505
	4.5-5.5	9V/150mA	64%	C	CUS509
	4.5-5.5	12V/125mA	70%	C	CUS512
	4.5-5.5	15V/100mA	72%	C	CUS515
	10.8-13.2	5V/220mA	64%	C	CUS1205
	10.8-13.2	9V/150mA	72%	C	CUS1209
	10.8-13.2	12V/125mA	78%	C	CUS1212
	10.8-13.2	15V/100mA	73%	C	CUS1215
2 WATT, 2,500V Isolation, REGULATED SINGLE OUT	4.65-5.5	9V/250mA	45%	CH	CHS509
	4.65-5.5	12V/200mA	45%	CH	CHS512
	10.9-13.2	9V/250mA	50%	CH	CHS1209
	10.9-13.2	12V/200mA	50%	CH	CHS1212
NEW !!! 3 WATT, HIGH DENSITY, WIDE INPUT REGULATED SINGLE OUT	9-18	5V/500mA	73%	BWS	BWS1205
	9-18	12V/250mA	79%	BWS	BWS1212
	18-36	5V/500mA	73%	BWS	BWS2405
	18-36	12V/250mA	79%	BWS	BWS2412
	36-72	5V/500mA	79%	BWS	BWS4805
	36-72	12V/250mA	79%	BWS	BWS4812
2 WATT, REGULATED DUAL OUT	4.65-5.5	±12V/±80mA	60%	D	DRD512
	4.65-5.5	±15V/±65mA	64%	D	DRD515
	10.9-13.2	±12V/±80mA	60%	D	DRD1212
	10.9-13.2	±15V/±65mA	60%	D	DRD1215
	21.6-26.4	±12V/±80mA	59%	D	DRD2412
	21.6-26.4	±15V/±65mA	63%	D	DRD2415
	25.2-30.8	±12V/±80mA	62%	D	DRD2812
	25.2-30.8	±15V/±65mA	63%	D	DRD2815
	43.2-52.8	±12V/±80mA	50%	D	DRD4812
	43.2-52.8	±15V/±65mA	50%	D	DRD4815
TO 2 WATT, REGULATED SINGLE OUT	4.65-5.5	5V/250mA	43%	D	DRS505
	4.65-5.5	12V/250mA	57%	D	DRS512
	4.65-5.5	15V/250mA	58%	D	DRS515
	10.9-13.2	5V/250mA	43%	D	DRS1205
	10.9-13.2	12V/250mA	57%	D	DRS1212
	10.9-13.2	15V/250mA	60%	D	DRS1215
	21.6-26.4	5V/250mA	45%	D	DRS2405
	21.6-26.4	12V/250mA	50%	D	DRS2412
	21.6-26.4	15V/250mA	60%	D	DRS2415
	25.2-30.8	5V/250mA	45%	D	DRS2805
	25.2-30.8	12V/250mA	50%	D	DRS2812
	25.2-30.8	15V/250mA	55%	D	DRS2815
	43.2-52.8	5V/250mA	40%	D	DRS4805
	43.2-52.8	12V/250mA	50%	D	DRS4812
	43.2-52.8	15V/250mA	55%	D	DRS4815
TO 6 WATT, UNREGULATED DUAL OUT	4.65-5.5	±12V/250mA	80%	D	DUD512
	4.65-5.5	±15V/200mA	80%	D	DUD515
	4.65-5.5	±18V/165mA	79%	D	DUD518
	10.9-13.2	±12V/250mA	80%	D	DUD1212
	10.9-13.2	±15V/200mA	81%	D	DUD1215
	10.9-13.2	±18V/165mA	79%	D	DUD1218
TO 6 WATT, UNREGULATED SINGLE OUT	4.65-5.5	5V/1000mA	76%	D	DUS505
	4.65-5.5	12V/500mA	80%	D	DUS512
	10.9-13.2	5V/1000mA	79%	D	DUS1205
	10.9-13.2	12V/500mA	85%	D	DUS1212
	21.6-26.4	5V/1000mA	80%	D	DUS2405
	25.2-30.8	5V/1000mA	80%	D	DUS2805
	43.2-52.8	5V/1000mA	79%	D	DUS4805

C CASE



D CASE



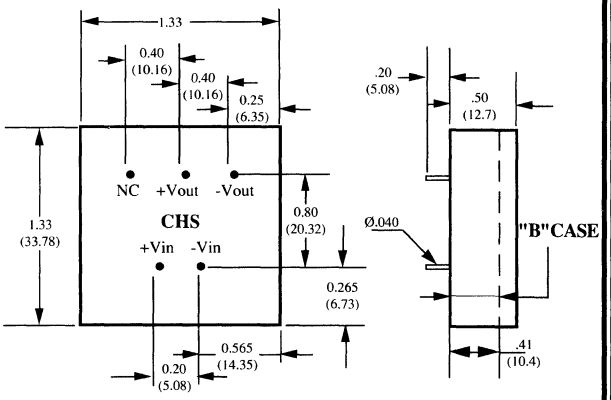
INTERNATIONAL POWER DEVICES, INC.

155 North Beacon St., Brighton, MA 02135 • Phone: (617)782-3331 • Fax: (617)782-7416

Description	Vin	Vout/Iout	EFF	CASE	MODEL
NEW !!! 5 WATT, High Density, Wide Input, Single Out	18-36	5V/1000mA	75%	D	EWS2405
	18-36	12V/500mA	80%	D	EWS2412
	36-72	5V/1000mA	78%	D	EWS4805
	36-72	12V/500mA	80%	D	EWS4812
5 WATT, REGULATED DUAL OUT	4.65-5.5	±12V/±230mA	65%	F	FRD512
	4.65-5.5	±15V/±190mA	66%	F	FRD515
	10.9-13.2	±12V/±230mA	66%	F	FRD1212
	10.9-13.2	±15V/±190mA	66%	F	FRD1215
	21.6-26.4	±12V/±230mA	66%	F	FRD2412
	21.6-26.4	±15V/±190mA	65%	F	FRD2415
	25.2-30.8	±12V/±230mA	65%	F	FRD2812
	25.2-30.8	±15V/±190mA	65%	F	FRD2815
	43.2-52.8	±12V/±230mA	65%	F	FRD4812
	43.2-52.8	±15V/±190mA	66%	F	FRD4815
5 WATT, REGULATED SINGLE OUT	4.65-5.5	5V/1000mA	64%	F	FRS505
	4.65-5.5	12V/470mA	71%	F	FRS512
	4.65-5.5	15V/400mA	70%	F	FRS515
	10.9-13.2	5V/1000mA	61%	F	FRS1205
	10.9-13.2	12V/470mA	68%	F	FRS1212
	10.9-13.2	15V/400mA	67%	F	FRS1215
	21.6-26.4	5V/1000mA	59%	F	FRS2405
	21.6-26.4	12V/470mA	66%	F	FRS2412
	21.6-26.4	15V/400mA	69%	F	FRS2415
	25.2-30.8	5V/1000mA	66%	F	FRS2805
	25.2-30.8	12V/470mA	74%	F	FRS2812
	25.2-30.8	15V/400mA	66%	F	FRS2815
	43.2-52.8	5V/1000mA	68%	F	FRS4805
	43.2-52.8	12V/470mA	65%	F	FRS4812
	43.2-52.8	15V/400mA	69%	F	FRS4815
TO 10 WATT, UNREGU-LATED DUAL OUT	4.65-5.5	±5V/±750mA	80%	F	FUD505
	4.65-5.5	±12V/±415mA	80%	F	FUD512
	4.65-5.5	±15V/±330mA	80%	F	FUD515
	4.65-5.5	±18V/±300mA	80%	F	FUD518
	10.9-13.2	±5V/±750mA	80%	F	FUD1205
	10.9-13.2	±12V/±415mA	88%	F	FUD1212
	10.9-13.2	±15V/±330mA	88%	F	FUD1215
	43.2-52.8	±5V/±750mA	80%	F	FUD4805
TO 10 WATT, UNREGU-LATED SINGLE OUT	4.65-5.5	5V/1500mA	80%	F	FUS505
	4.65-5.5	12V/830mA	84%	F	FUS512
	4.65-5.5	15V/670mA	84%	F	FUS515
	10.9-13.2	5V/1500mA	80%	F	FUS1205
	10.9-13.2	12V/830mA	84%	F	FUS1212
	21.6-26.4	5V/1500mA	83%	F	FUS2405
	43.2-52.8	5V/1500mA	79%	F	FUS4805
5 WATT, WIDE INPUT REGULATED SINGLE OUT	9-18	5V/1000mA	78%	F	GWS1205
	9-18	12V/420mA	78%	F	GWS1212
	9-18	15V/335mA	78%	F	GWS1215
	18-36	5V/1000mA	72%	F	GWS2405
	18-36	12V/420mA	75%	F	GWS2412
	18-36	15V/335mA	77%	F	GWS2415
	36-72	5V/1000mA	75%	F	GWS4805
	36-72	12V/420mA	73%	F	GWS4812
	36-72	15V/335mA	73%	F	GWS4815
TO 10 WATT, Non-Isolated, SINGLE OUT	8-32	5V/1500mA	75%	F	HNS1205
	16-32	12V/700mA	83%	F	HNS2412
	19-32	15V/600mA	85%	F	HNS2415
NEW !!! 8.5 WATT, ULTRA-WIDE INPUT, REGULATED TRIPLE OUT	9-36	+5V/±12V @ +800/±185mA	78%	N	JWT2405-12
	9-36	+5V/±15V @ +800/±150mA	78%	N	JWT2405-15
	18-72	+5V/±12V @ +800/±185mA	78%	N	JWT4805-12
	18-72	+5V/±15V @ +800/±150mA	78%	N	JWT4805-15
20/45 WATT, Non-Isolated, ULTRA-WIDE INPUT, REGULATED SINGLE OUT	9-40	5V/4000mA	78%	N	LNS1205
	9-40	5V/4000mA	78%	N	LNS1205S*
	16-40	12V/3000mA	85%	N	LNS2412
	16-40	12V/3000mA	85%	N	LNS2412S*
	19-40	15V/3000mA	87%	N	LNS2415
	19-40	15V/3000mA	87%	N	LNS2415S*

*PROVIDES REMOTE CONTROL INPUT

CH CASE



COMMON SPECIFICATIONS:

All Specifications Typical @ +25°C, Nominal Line, and Full Load Unless Otherwise Specified.

Input Filter ..... **Π (Pi) Filter**

Isolation Voltage ..... **500VDC, min. (Except Non-Isolated HNS, LNS and QNS Series, and CHS Series (2,500 VDC, min.)).**

Operating Temperature Range: ..... **-25°Cto +71°C**

Storage Temperature Range: ..... **-40°C to +125°C**

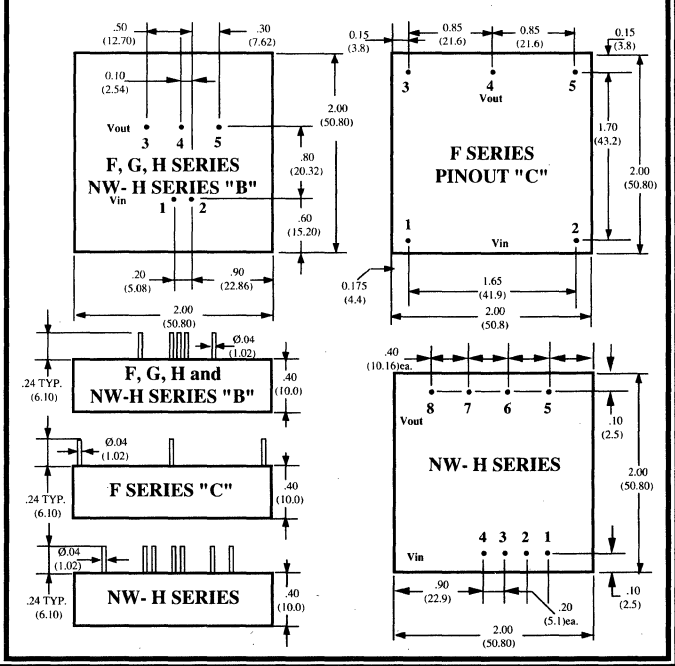
Cooling ..... **Free Air Convection**

EMI/RFI ..... **Six-Sided Continuous Metal Case, (Except C Series and Some D and F Series)**

Case Material ..... **Phenolic for C Series and Some D and F Series, Otherwise Black Painted Copper, or Anodized Aluminum with Non-conductive Base.**

Accessories: .. **Mating Sockets and Heat Sinks Available for Most Models**

F CASE

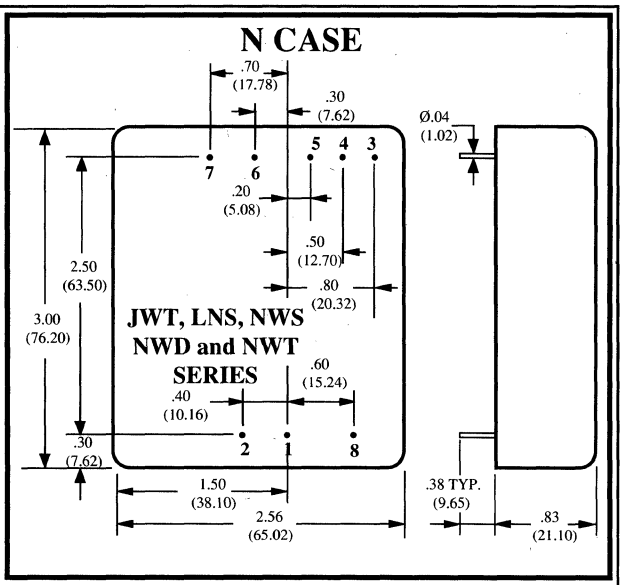


INTERNATIONAL POWER DEVICES, INC.

155 North Beacon St., Brighton, MA 02135 • Phone: (617)782-3331 • Fax: (617)782-7416

Description	Vin	Vout/Iout	EFF	Case	MODEL
15 WATT, REGULATED DUAL OUT	9-18	±5V/±1500mA	78%	N	NWD1205
	9-18	±12V/±625mA	78%	N	NWD1212
	9-18	±15V/±500mA	80%	N	NWD1215
	18-36	±5V/±1500mA	78%	N	NWD2405
	18-36	±12V/±625mA	78%	N	NWD2412
	18-36	±15V/±500mA	80%	N	NWD2415
	36-72	±5V/±1500mA	78%	N	NWD4805
	36-72	±12V/±625mA	78%	N	NWD4812
	36-72	±15V/±500mA	80%	N	NWD4815
NEW !!! 15 WATT High Density WIDE INPUT REGULATED DUAL OUT	9-18	±5V/±1500mA	79%	F	NWD1205H
	9-18	±12V/±625mA	80%	F	NWD1212H
	9-18	±15V/±500mA	81%	F	NWD1215H
	18-36	±5V/±1500mA	80%	F	NWD2405H
	18-36	±12V/±625mA	82%	F	NWD2412H
	18-36	±15V/±500mA	82%	F	NWD2415H
	36-72	±5V/±1500mA	80%	F	NWD4805H
	36-72	±12V/±625mA	82%	F	NWD4812H
	36-72	±15V/±500mA	82%	F	NWD4815H
15 WATT, REGULATED SINGLE OUT	9-18	5V/3000mA	76%	N	NWS1205
	9-18	12V/3000mA	78%	N	NWS1212
	9-18	15V/3000mA	80%	N	NWS1215
	18-36	5V/3000mA	77%	N	NWS2405
	18-36	12V/3000mA	80%	N	NWS2412
	18-36	15V/3000mA	82%	N	NWS2415
	36-72	5V/3000mA	78%	N	NWS4805
	36-72	12V/3000mA	80%	N	NWS4812
	36-72	15V/3000mA	82%	N	NWS4815
NEW !!! 15 WATT High Density WIDE INPUT REGULATED SINGLE OUT	9-18	5V/3000mA	80%	F	NWS1205H
	9-18	12V/1250mA	81%	F	NWS1212H
	9-18	15V/1000mA	82%	F	NWS1215H
	18-36	5V/3000mA	80%	F	NWS2405H
	18-36	12V/1250mA	82%	F	NWS2412H
	18-36	15V/1000mA	82%	F	NWS2415H
	36-72	5V/3000mA	80%	F	NWS4805H
	36-72	12V/1250mA	82%	F	NWS4812H
	36-72	15V/1000mA	82%	F	NWS4815H
15 WATT, REGULATED TRIPLE OUT	9-18	+5/±12V@ +1.5/±0.31A	78%	N	NWT1205-12
	9-18	+5/±15V @ +1.5/±0.25A	78%	N	NWT1205-15
	9-18	+12/-5/+5V @ +0.31/-0.5/+1.5A	78%	N	NWT1212-05
	18-36	+5/±12V @ +1.5/±0.31A	80%	N	NWT2405-12
	18-36	+5/±15V @ +1.5/±0.25A	80%	N	NWT2405-15
	18-36	+12/-5/+5V @ +0.31/-0.5/+1.5A	80%	N	NWT2412-05
	36-72	+5/±12V@ +1.5/±0.31A	82%	N	NWT4805-12
	36-72	+5/±15V @ +1.5/±0.25A	82%	N	NWT4805-15
	36-72	+12/-5/+5V @ +0.31/-0.5/+1.5A	82%	N	NWT4812-05
NEW !!! 15 WATT High Density WIDE INPUT REGULATED TRIPLE OUT	9-18	+5/±12V@ +1.5/±0.31A	78%	F	NWT1205-12H
	9-18	+5/±15V @ +1.5/±0.25A	78%	F	NWT1205-15H
	9-18	+12/-5/+5V @ +0.31/-0.5/+1.5A	78%	F	NWT1212-05H
	18-36	+5/±12V @ +1.5/±0.31A	80%	F	NWT2405-12H
	18-36	+5/±15V @ +1.5/±0.25A	80%	F	NWT2405-15H
	18-36	+12/-5/+5V @ +0.31/-0.5/+1.5A	80%	F	NWT2412-05H
	36-72	+5/±12V@ +1.5/±0.31A	82%	F	NWT4805-12H
	36-72	+5/±15V @ +1.5/±0.25A	82%	F	NWT4805-15H
	36-72	+12/-5/+5V @ +0.31/-0.5/+1.5A	82%	F	NWT4812-05H

N CASE



COMMON SPECIFICATIONS:

All Specifications Typical @ +25°C, Nominal Line, and Full Load Unless Otherwise Specified.

Input Filter ..... Π (Pi) Filter

Isolation Voltage ..... 500VDC, min.
(Except Non-Isolated HNS, LNS and QNS Series and CHS Series (2,500 VDC, min.)).

Operating Temperature Range: ..... -25°Cto +71°C

Storage Temperature Range:..... -40°C to +125°C

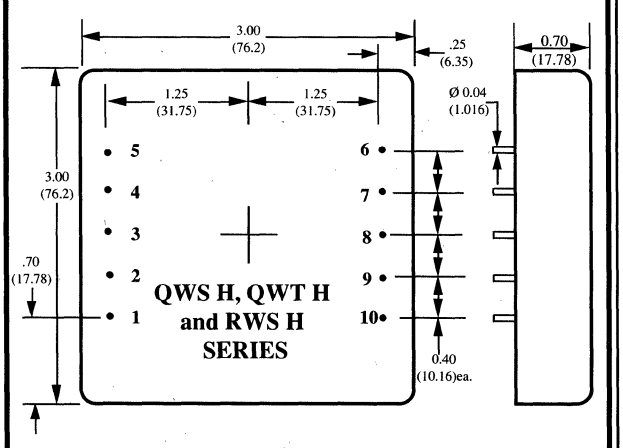
Cooling ..... Free Air Convection

EMI/RFI ..... Six-Sided Continuous Metal Case, (Except C Series and Some D and F Series)

Case Material ..... Phenolic for C Series and Some D and F Series, Otherwise Black Painted Copper, or Anodized Aluminum with Non-conductive Base.

Accessories: .. Mating Sockets and Heat Sinks Available for Most Models

P CASE



INTERNATIONAL POWER DEVICES, INC.

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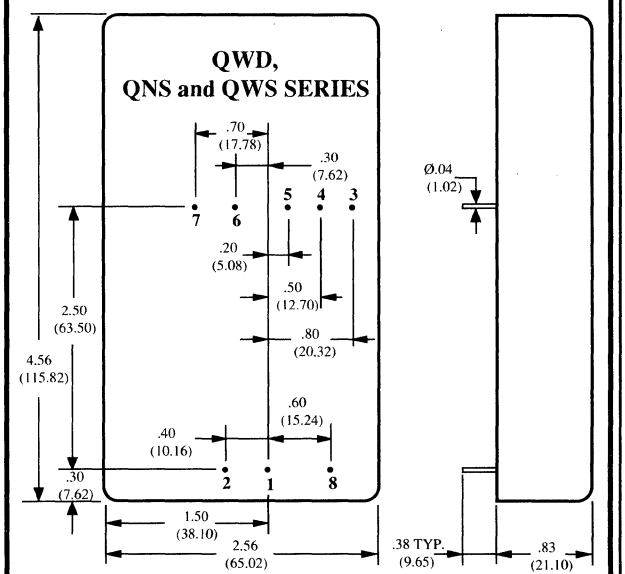
Description	Vin	Vout/Iout	EFF	Case	MODEL
40 WATT, Non-Isolated SINGLE OUT	7-26	5V/8000mA	85%	Q	QNS705
	8-40	5V/8000mA	85%	Q	QNS1205
TO 30 WATT, REGULATED DUAL OUT	9-18	±5V/±2500mA	76%	Q	QWD1205
	9-18	±12V/±1250mA	78%	Q	QWD1212
	9-18	±15V/±1000mA	78%	Q	QWD1215
	18-36	±5V/±2500mA	78%	Q	QWD2405
	18-36	±12V/±1250mA	80%	Q	QWD2412
	18-36	±15V/±1000mA	80%	Q	QWD2415
	36-72	±5V/±2500mA	78%	Q	QWD4805
	36-72	±12V/±1250mA	84%	Q	QWD4812
	36-72	±15V/±1000mA	84%	Q	QWD4815
25 WATT, ULTRA-WIDE, REGULATED SINGLE OUT	9-36	5V/5000mA	80%	Q	QWS2405
	9-36	12V/2500mA	83%	Q	QWS2412
	9-36	15V/2000mA	83%	Q	QWS2415
	20-72	5V/5000mA	80%	Q	QWS4805
	20-72	12V/2500mA	84%	Q	QWS4812
	20-72	15V/2000mA	84%	Q	QWS4815
NEW !!! 25 WATT High Density WIDE INPUT REGULATED SINGLE OUT	9-18	5V/5000mA	80%	P	QWS1205H
	9-18	12V/2500mA	82%	P	QWS1212H
	9-18	15V/2000mA	82%	P	QWS1215H
	18-36	5V/5000mA	82%	P	QWS2405H
	18-36	12V/2500mA	83%	P	QWS2412H
	18-36	15V/2000mA	83%	P	QWS2415H
	36-72	5V/5000mA	83%	P	QWS4805H
	36-72	12V/2500mA	84%	P	QWS4812H
	36-72	15V/2000mA	84%	P	QWS4815H
NEW !!! 25 WATT High Density WIDE INPUT REGULATED TRIPLE OUT	10-20	+5V/±12V @ 3.8/±0.25A	79%	P	QWT1205-12H
	10-20	+5/±15V @ 3.1/±0.31A	84%	P	QWT1205-15H
	18-36	+5V/±12V @ 3.8/±0.25A	84%	P	QWT2405-12H
	18-36	+5/±15V @ 3.1/±0.31A	84%	P	QWT2405-15H
	36-72	+5V/±12V @ 3.8/±0.25A	84%	P	QWT4805-12H
	36-72	+5/±15V @ 3.1/±0.31A	84%	P	QWT4805-15H
50 WATT, REGULATED SINGLE OUT	10-20	5V/10.0A	80%	U	RWS1205
	10-20	12V/5.0A	82%	U	RWS1212
	10-20	15V4.0A	82%	U	RWS1215
	18-36	5V/10.0A	79%	U	RWS2405
	18-36	12V/5.0A	83%	U	RWS2412
	18-36	15V/4.0A	83%	U	RWS2415
NEW !!! FILE # E 132494	36-72	5V/10.0A	80%	U	RWS4805
	36-72	12V/5.0A	84%	U	RWS4812
	36-72	15V/4.0A	84%	U	RWS4815
	20-60	5V/10.0A	80%	U	RWS6005
	20-60	12V/5.0A	82%	U	RWS6012
	20-60	15V/4.0A	82%	U	RWS6015
NEW !!! 50 WATT High Density WIDE INPUT REGULATED SINGLE OUT	10-20	5V/10.0A	80%	P	RWS1205H
	10-20	12V/5.0A	82%	P	RWS1212H
	10-20	15V4.0A	82%	P	RWS1215H
	18-36	5V/10.0A	79%	P	RWS2405H
	18-36	12V/5.0A	83%	P	RWS2412H
	18-36	15V/4.0A	83%	P	RWS2415H
	36-72	5V/10.0A	80%	P	RWS4805H
	36-72	12V/5.0A	84%	P	RWS4812H
	36-72	15V/4.0A	84%	P	RWS4815H
	20-60	5V/10.0A	80%	P	RWS6005H
	20-60	12V/5.0A	82%	P	RWS6012H
	20-60	15V/4.0A	82%	P	RWS6015H
TO 60 WATT, REGULATED DUAL OUT	9-18	±5V/±5.0A	80%	U	RWD1205
	9-18	±12V/±2.5A	82%	U	RWD1212
	9-18	±15V/±2.0A	82%	U	RWD1215
	9-18	12/5V @ 2.5/5.0A	82%	U	RWD1205-12
	18-36	±5V/±5.0A	81%	U	RWD2405
	18-36	±12V/±2.5A	83%	U	RWD2412
	18-36	±15V/±2.0A	82%	U	RWD2415
	18-36	12/5V @ 2.5/5.0A	82%	U	RWD2405-12
	36-72	±5V/±5.0A	82%	U	RWD4805
	36-72	±12V/±2.5A	84%	U	RWD4812
	36-72	±15V/±2.0A	84%	U	RWD4815
	36-72	12/5V @ 2.5/5.0A	82%	U	RWD4805-12

Q CASE



COMMON SPECIFICATIONS:

All Specifications Typical @ +25°C, Nominal Line, and Full Load Unless Otherwise Specified.

Input Filter ..... Π (Pi) Filter

Isolation Voltage ..... 500VDC, min.
(Except Non-Isolated HNS, LNS and QNS Series and CHS Series (2,500 VDC, min.)).

Operating Temperature Range: ..... -25°Cto +71°C

Storage Temperature Range:..... -40°C to +125°C

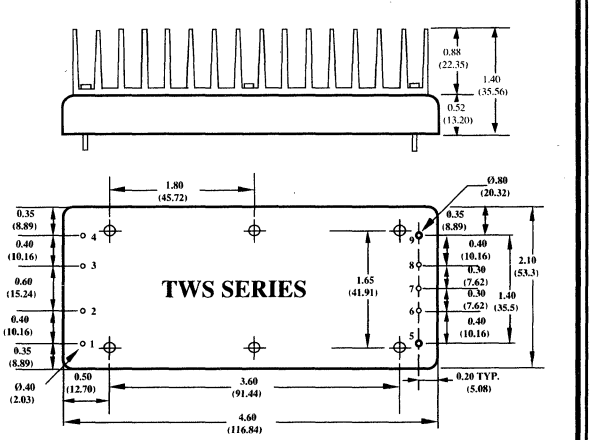
Cooling ..... Free Air Convection

EMI/RFI ..... Six-Sided Continuous Metal Case, (Except C Series and Some D and F Series)

Case Material ..... Phenolic for C Series and Some D and F Series, Otherwise Black Painted Copper, or Anodized Aluminum with Non-conductive Base.

Accessories: .. Mating Sockets and Heat Sinks Available for Most Models

T CASE



INTERNATIONAL POWER DEVICES, INC.

155 North Beacon St., Brighton, MA 02135 • Phone: (617)782-3331 • Fax: (617)782-7416

Description	Vin	Vout/Iout	EFF	Case	MODEL
60 WATT, Regulated TRIPLE OUT	9-18	+5/±12 V @ +5/±1.25A	80%	U	RWT1205-12
	9-18	+5/±15V @ +5/±1A	80%	U	RWT1205-15
	9-18	+12/±5V @ +2.5/±2.5A	81%	U	RWT1212-05
	9-18	+15/±5V @ +2/±2.5A	81%	U	RWT1215-05
	18-36	+5/±12V @ +5/±1.25A	81%	U	RWT2405-12
	18-36	+5/±15V @ +5/±1A	81%	U	RWT2405-15
	18-36	+12/±5V @ +2.5/±2.5A	82%	U	RWT2412-05
	18-36	+15/±5V @ +2/±2.5A	82%	U	RWT2415-05
	36-72	+5/±12V @ +5/±1.25A	82%	U	RWT4805-12
	36-72	+5/±15V @ +5/±1A	82%	U	RWT4805-15
	36-72	+12/±5V @ +2.5/±2.5A	83%	U	RWT4812-05
	36-72	+15/±5V @ +2/±2.5A	83%	U	RWT4815-05
NEW !!! 75 WATT High Density WIDE INPUT REGULATED SINGLE OUT	10-20	5V/10A	80%	T	TWS1205
	10-20	12V/4.1A	81%	T	TWS1212
	10-20	15V/3.3A	82%	T	TWS1215
	10-20	24V/2.1A	84%	T	TWS1224
	18-36	5V/15A	82%	T	TWS2405
	18-36	12V/8.3A	84%	T	TWS2412
	18-36	15V/6.6A	86%	T	TWS2415
	18-36	24V/4.1A	87%	T	TWS2424
	36-72	5V/15A	82%	T	TWS4805
	36-72	12V/8.3A	84%	T	TWS4812
	36-72	15V/6.6A	86%	T	TWS4815
	36-72	24V/4.1A	88%	T	TWS4824
TO 120 WATT, Regulated SINGLE OUT NEW !!! FILE # E 132494	10-30	5V/15.0A	77%	U	UWS1205
	10-30	12V/7.0A	82%	U	UWS1212
	10-30	15V/6.0A	82%	U	UWS1215
	10-30	24V/3.75A	82%	U	UWS1224
	18-36	5V/20.0A	80%	U	UWS2405
	18-36	12V/10.0A	82%	U	UWS2412
	18-36	15V/8.0A	82%	U	UWS2415
	36-72	5V/20.0A	80%	U	UWS4805
	36-72	12V/10.0A	83%	U	UWS4812
	36-72	15V/8.0A	83%	U	UWS4815
	20-60	5V/20.0A	80%	U	UWS6005
	20-60	12V/10.0A	83%	U	UWS6012
	20-60	15V/8.0A	83%	U	UWS6015
100 WATT, Regulated DUAL OUT	18-36	±5V/±10.0A	81%	U	UWD2405
	18-36	±12V/±4.1A	83%	U	UWD2412
	18-36	±15V/±3.3A	82%	U	UWD2415
	18-36	12/5V@±4.1/10.0A	82%	U	UWD2405-12
	18-36	15/5V@3.2/10.0A	82%	U	UWD2405-15
	36-72	±5V/±10.0A	81%	U	UWD4805
	36-72	±12V/±4.1A	83%	U	UWD4812
	36-72	±15V/±3.3A	82%	U	UWD4815
	36-72	12/5V@4.1/10.0A	82%	U	UWD4805-12
	36-72	15/5V@3.2/10.0A	82%	U	UWD4805-15
100 WATT, Regulated TRIPLE OUT	18-36	+5/±12V @ +10.0/±2.0A	82%	U	UWT2405-12
	18-36	+5/±15V @ +10.0/±1.6A	82%	U	UWT2405-15
	36-72	+5/±12V @ +10.0/±2.0A	82%	U	UWT4805-12
	36-72	+5/±15V @ +10.0/±1.6A	82%	U	UWT4805-15
NEW !!! 150 WATT WIDE INPUT REGULATED SINGLE OUT	10-20	5V/20A	79%	U	XWS1205
	10-20	12V/8.3A	81%	U	XWS1212
	10-20	15V/6.6A	82%	U	XWS1215
	10-20	24V/5A	84%	U	XWS1224
	18-36	5V/30A	84%	U	XWS2405
	18-36	12V/15A	85%	U	XWS2412
	18-36	15V/12A	85%	U	XWS2415
	18-36	24V/8.3A	85%	U	XWS2424
	36-72	5V/30A	84%	U	XWS4805
	36-72	12V/15A	85%	U	XWS4812
	36-72	15V/12A	85%	U	XWS4815
	36-72	24V/8.3A	85%	U	XWS4824
	20-60	5V/30A	84%	U	XWS6005
	20-60	12V/15A	85%	U	XWS6012
	20-60	15V/12A	85%	U	XWS6015
	20-60	24V/8.3	85%	U	XWS6024

COMMON SPECIFICATIONS:

All Specifications Typical @ +25°C, Nominal Line, and Full Load Unless Otherwise Specified.

Input Filter ..... **Π (Pi) Filter**

Isolation Voltage ..... **500VDC, min.**
(Except Non-Isolated HNS, LNS and QNS Series and CHS Series (2,500 VDC, min.)).

Operating Temperature Range: ..... **-25°Cto +71°C**

Storage Temperature Range:..... **-40°C to +125°C**

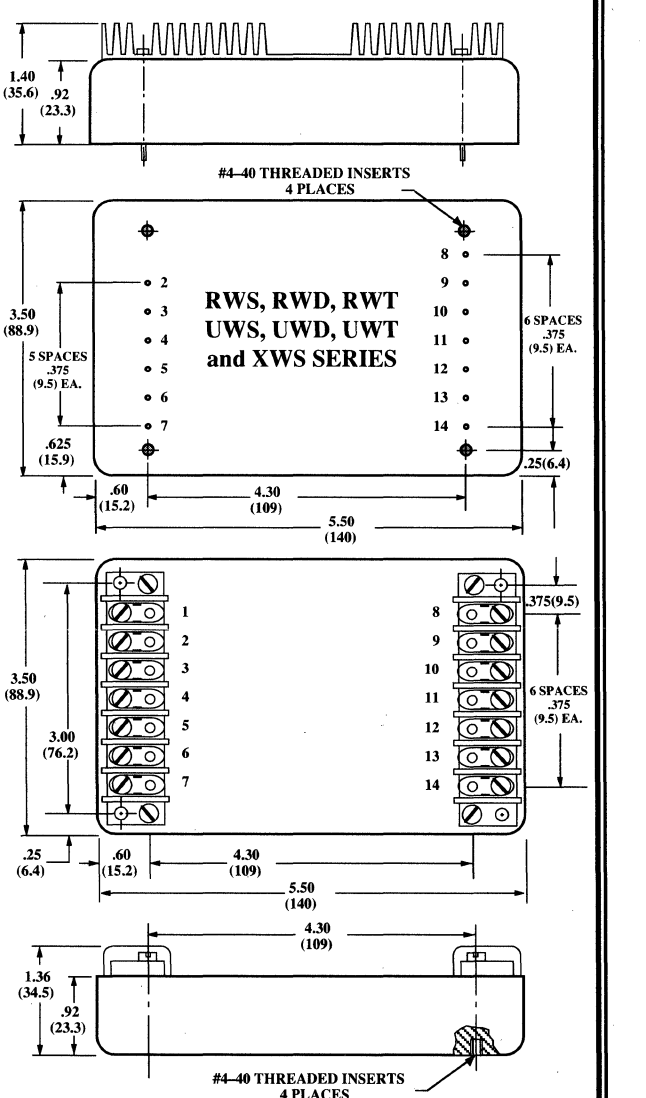
Cooling ..... **Free Air Convection**

EMI/RFI ..... **Six-Sided Continuous Metal Case, (Except C Series and Some D and F Series)**

Case Material ..... **Phenolic for C Series and Some D and F Series, Otherwise Black Painted Copper, or Anodized Aluminum with Non-conductive Base.**

Accessories: .. **Mating Sockets and Heat Sinks Available for Most Models.**

U CASE



PIN	DRD/DUD FRD/FUD EWS NWD-H PINOUT "B"	DRS	DUS/FRS FUS	GWS NWS-H PINOUT "B"	HNS	JWT	LNS/LKS/NWS	NWS-H	NWD-H	NWD	NWT-H	NWT	QWS-H RWS-H	QWS	QWD	QWT-H	TWS	RWS/UWS/XWS	RWD/UWD	RWT/UWT	PIN
1	INPUT +	INPUT -	INPUT +	INPUT +	INPUT +	INPUT +	INPUT +	REMOTE ON/OFF	REMOTE ON/OFF	INPUT +	SHUT DOWN	INPUT +	SHUT DOWN	INPUT +	INPUT +	SHUT DOWN	INPUT+	NO PIN	NO PIN	NO PIN	1
2	INPUT -	INPUT +	INPUT -	INPUT -	COMMON IN	INPUT -	INPUT -	SYNC	SYNC	INPUT -	SYNC	INPUT -	NO PIN	INPUT -	INPUT -	CASE	SHUT DOWN	INPUT -	INPUT -	INPUT -	2
3	OUTPUT +	OUTPUT -	OUTPUT +	OUTPUT +	OUTPUT +	OUTPUT 2 +	SENSE OUT +	INPUT -	INPUT -	OUTPUT 1 +	INPUT -	OUTPUT 2 +	INPUT -	SENSE +	OUTPUT 1 +	INPUT +	N/C	INPUT -	INPUT -	INPUT -	3
4	COMMON	NO PIN	NOPIN	TRIM	TRIM	COMMON	TRIM	INPUT +	INPUT +	COMMON 1 & 2	INPUT +	COMMON	INPUT +	TRIM	COMMON 1 & 2	INPUT -	INPUT-	INPUT +	INPUT +	INPUT +	4
5	OUTPUT -	OUTPUT +	OUTPUT -	OUTPUT -	COMMON OUT	OUTPUT 3 -	SENSE OUT -	TRIM	TRIM	OUTPUT 2 -	AUX OUTPUT -	OUTPUT 3 -	NO PIN	SENSE -	OUTPUT 2 -	NO CONNECTION	OUTPUT+	INPUT +	INPUT +	INPUT +	5
6						OUTPUT 1 +	OUTPUT +	OUTPUT -	OUTPUT -	NO PIN	COMMON ±	OUTPUT 1 +	NO PIN	OUTPUT +	NO PIN	OUTPUT 3 -	SENSE+	SHUT DOWN	SHUT DOWN	SHUT DOWN	6
7						COMMON	OUTPUT -	OUTPUT +	COMMON	NO PIN	OUTPUT +5V	NO PIN	NO PIN	OUTPUT -	NO PIN	OUTPUT 2 +	TRIM	CASE	CASE	CASE	7
8						SHUT DOWN	ON/OFF OR NO PIN	NO PIN	OUTPUT +	SHUT DOWN	AUX OUTPUT +	SHUT DOWN	OUTPUT -	SHUT DOWN	SHUT DOWN	COMMON	SENSE-	OUTPUT -	SENSE 1 -	SENSE 1 -	8
9													OUTPUT +			OUTPUT +5V	OUTPUT-	OUTPUT -	OUTPUT 1 -	OUTPUT 1 -	9
10													TRIM			OUTPUT TRIM		OUTPUT +	OUTPUT 1 +	OUTPUT 1 +	10
11																		OUTPUT +	SENSE 1 +	SENSE 1 +	11
12																		SENSE -	OUTPUT 2 -	OUTPUT 2 -	12
13																		TRIM	TRIM	COMMOM 2&3	13
14																		SENSE +	OUTPUT 2 +	OUTPUT 2 +	14

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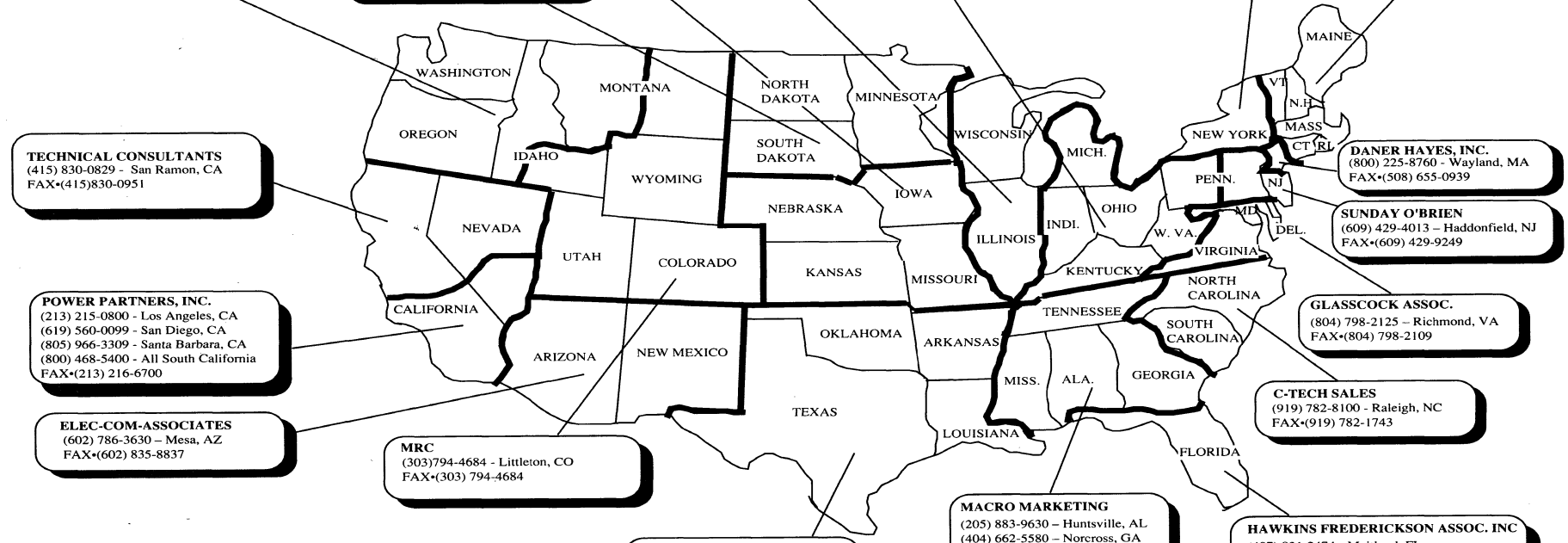

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COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

International Power Sources, Inc.

DC/DC Converters

½ Watt to 650 Watts

Switching Power Supplies

15 to 650 Watts

½ Watt–2 Watt Epoxy Encapsulated DC/DC Converters

- 5, 12, 24 and 48 VDC Inputs
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- 500 VDC Isolation
- 0.12 in² board space
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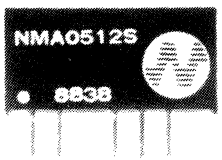
- 22 Watts per in³



Output Voltage	Output Current	Part Number			
		5VDC Input	12VDC Input	24VDC Input	48VDC Input
±5VDC	±100mA	NMA0505	NMA1205	NMA2405	NMA4805
±12VDC	±40mA	NMA0512	NMA1212	NMA2412	NMA4812
±15VDC	±30mA	NMA0515	NMA1215	NMA2415	NMA4815

Output Voltage	Output Currents	Part Numbers	
		5VDC Input	12VDC Input
5VDC	160mA	NME0505	NME1205
12VDC	84mA	NME0512	NME1212
15VDC	67mA	NME0515	NME1215

Output Voltage	Output Currents	Part Numbers	
		5VDC Input	12VDC Input
±5VDC	±200mA	NMH0505	NMH1205
±9VDC	±110mA	NMH0509	NMH1209
±12VDC	±85mA	NMH0512	NMH1212
±15VDC	±65mA	NMH0515	NMH1215

Add suffix "S" for single-in-line package, suffix "D" for dual-in-line package.

NEW! NMF Series for Flash Memory Programming

- Remote Flash Programming
- 0.18 in² Board Space
- Fully Regulated Outputs

Output Voltage	Output Currents	Part Numbers	
		5 VDC Input	12 VDC Input
5 VDC	100mA	NMF0505S	NMF1205S
9 VDC	55mA	NMF0509S	NMF1209S
12 VDC	40mA	NMF0512S	NMF1212S
12.75 VDC	40mA	NMF0513S	—
15 VDC	33mA	NMF0515S	NMF1215S

1.5–6.0 Watt DC/DC Converters

- 5, 12, 24, 28 and 48 VDC Inputs
- Industry Standard Pinouts
- 500 VDC Isolation
- Input π Filters
- Fully Regulated Outputs
- Low Cost

BA SERIES

Output Voltage	Output Current	Input Voltage				
		5 VDC	12 VDC	24 VDC	28 VDC	48 VDC
5 VDC	300 mA	BA101	BA201	BA301	BA401	BA501
12 VDC	125 mA	BA102	BA202	BA302	BA402	BA502
15 VDC	100 mA	BA103	BA203	BA303	BA403	BA503
±12 VDC	±60 mA	BA104	BA204	BA304	BA404	BA504
±15 VDC	±50 mA	BA105	BA205	BA305	BA405	BA505

BC SERIES

Output Voltage	Output Current	Input Voltage				
		5 VDC	12 VDC	24 VDC	28 VDC	48 VDC
5 VDC	1.00A	BC101	BC201	BC301	BC401	BC501
12 VDC	0.47A	BC102	BC202	BC302	BC402	BC502
15 VDC	0.40A	BC103	BC203	BC303	BC403	BC503
±12 VDC	±0.23A	BC104	BC204	BC304	BC404	BC504
±15 VDC	±0.19A	BC105	BC205	BC305	BC405	BC505

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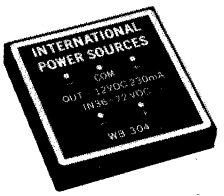
International Power Sources, Inc.

NEW! WA/WB/WC Series
3/5/15 Watt DC/DC Converters

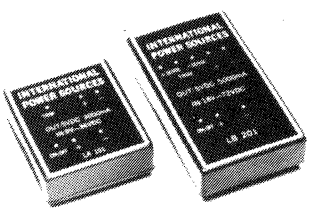


- 2:1 Input Range
- Isolated Outputs
- Efficiency to 80%
- 100 kHz Switching Frequency
- WA—24 Pin DIL Package
- Input π Filter
- Fully Regulated Ouputs
- Industry Standard Pinouts
- PCB Mountable
- WB/WC—2.0″×2.0″×.4″ Package

Model Number	Input Voltage	Output Voltage	Output Current	Input Current		%
				No Load	Full Load	Eff
WA201	18–36 VDC	5 VDC	500 mA	5 mA	134 mA	78
WA202	18–36 VDC	12 VDC	250 mA	5 mA	151 mA	83
WA203	18–36 VDC	15 VDC	200 mA	5 mA	151 mA	83
WA206	18–36 VDC	± 5 VDC	±250 mA	5 mA	132 mA	79
WA204	18–36 VDC	±12 VDC	±125 mA	5 mA	152 mA	82
WA205	18–36 VDC	±15 VDC	±100 mA	5 mA	152 mA	82
WA301	36–72 VDC	5 VDC	500 mA	5 mA	66 mA	79
WA302	36–72 VDC	12 VDC	250 mA	5 mA	75 mA	84
WA303	36–72 VDC	15 VDC	200 mA	5 mA	75 mA	84
WA306	36–72 VDC	± 5 VDC	±250 mA	5 mA	65 mA	80
WA304	36–72 VDC	±12 VDC	±125 mA	5 mA	75 mA	84
WA305	36–72 VDC	±15 VDC	±100 mA	5 mA	75 mA	84

Input Voltage	Output Voltage	WB Series		WC Series	
		Output Current	Model Number	Output Current	Model Number
9-18 VDC	5 VDC	1000 mA	WB101	—	—
9-18 VDC	12 VDC	470 mA	WB102	—	—
9-18 VDC	15 VDC	400 mA	WB103	—	—
9-18 VDC	±12 VDC	±230 mA	WB104	—	—
9-18 VDC	±15 VDC	±190 mA	WB105	—	—
18-36 VDC	5 VDC	1000 mA	WB201	3000 mA	WC201
18-36 VDC	12 VDC	470 mA	WB202	1250 mA	WC202
18-36 VDC	15 VDC	400 mA	WB203	1000 mA	WC203
18-36 VDC	±12 VDC	±230 mA	WB204	±625 mA	WC204
18-36 VDC	±15 VDC	±190 mA	WB205	±500 mA	WC205
36-72 VDC	5 VDC	1000 mA	WB301	3000 mA	WC301
36-72 VDC	12 VDC	470 mA	WB302	1250 mA	WC302
36-72 VDC	15 VDC	400 mA	WB303	1000 mA	WC303
36-72 VDC	±12 VDC	±230 mA	WB304	±625 mA	WC304
36-72 VDC	±15 VDC	±190 mA	WB305	±500 mA	WC305

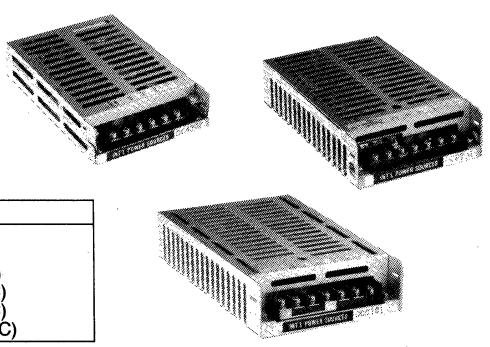
LA/LB Series
15–30 Watt DC/DC Converters



- 4:1 Input Range
- PCB Mountable
- Efficiency to 86%
- Industry Standard Pinouts
- 500 VDC Isolation
- Remote Sense/Disable

15–150 Watt AC/DC Power Supplies and DC/DC Converters

- Single, Dual, and Triple Outputs
- Compact Size/Light Weight
- 500 VDC Input/Output Isolation
- High Efficiency—80kHz Switcher
- Low Cost
- Fully Enclosed
- 8 Input Ranges
- No Minimum Load
- Same Size AC or DC Input



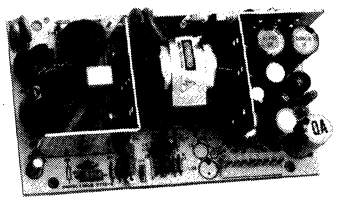
Series	Output Power
ACA/DCA	15 Watts
ACB/DCB	25 Watts
ACC/DCC	50 Watts
ACE/DCE	100 Watts
ACF/DCF	150 Watts

Input Voltage Ranges
90–132 VAC
180–264 VAC
12 volt nominal (9–16 VDC)
24 volt nominal (19–32 VDC)
48 volt nominal (38–63 VDC)
110 volt nominal (85–140 VDC)

International Power Sources. • 200 Butterfield Drive • Ashland, Massachusetts 01721
• TEL: 508/881-7434 • FAX: 508/879-8669

International Power Sources, Inc.

PU/PX Series— Low Cost Switching Power Supplies



- Universal Inputs 85–264 Vac
- UL 1950, CSA & TUV Approved
- 100% Burn-In, 40,000 Hrs MTBF Fully Tested
- Open Frame, L-Bracket & Enclosed Versions
- OVP & Short Circuit Protection
- 3″×5″, 3.5″×6″, 5″×11″ Outlines

Power	Model	Input	Output						
			+5V	+12V	−12V	+24V	−5V	+15V	−15V
40W	PU40-25S	Universal 85–264 Vac	3.0 A	—	—	1.0 A	—	—	—
	PU40-30S		3.0 A	2.0 A	—	—	0.3 A	—	—
	PU40-31S		3.0 A	2.0 A	0.3 A	—	—	—	—
	PU40-32S		3.0 A	—	—	—	—	2.0 A	0.3 A
65W	PU65-10	Universal 85–264 Vac	10.0 A	—	—	—	—	—	—
	PU65-12		—	5.5 A	—	—	—	—	—
	PU65-13		—	—	—	—	—	4.5 A	—
	PU65-14		—	—	—	3.0 A	—	—	—
	PU65-31		6.0 A	3.0 A	0.5 A	—	—	—	—
	PU65-40		6.0 A	3.0 A	0.5 A	—	0.5 A	—	—
100W	PX100-23	Selectable 110/220 Vac	10.0 A	5.0 A	—	—	—	—	—
	PX100-31		10.0 A	5.0 A	0.8 A	—	—	—	—
	PX100-40		10.0 A	4.0 A	0.8 A	—	0.8 A	—	—
	PX100-43		10.0 A	4.0 A	0.8 A	—	—	3.0 A	—
	PX100-45		10.0 A	4.0 A	0.8 A	3.0 A	—	—	—
125W	PX125-23	Selectable 110/220 Vac	15.0 A	5.0 A	—	—	—	—	—
	PX125-31		15.0 A	5.0 A	0.8 A	—	—	—	—
	PX125-40		15.0 A	4.0 A	0.8 A	—	0.8 A	—	—
	PX125-43		15.0 A	4.0 A	0.8 A	—	—	4.0 A	—
	PX125-45		15.0 A	4.0 A	0.8 A	4.0 A	—	—	—
200W	PX200-30	Selectable 110/220 Vac	20.0 A	6.0 A	—	—	1.0 A	—	—
	PX200-31		20.0 A	6.0 A	1.0 A	—	—	—	—
	PX200-40		20.0 A	6.0 A	1.0 A	—	1.0 A	—	—
	PX200-45		20.0 A	6.0 A	1.0 A	3.0 A	—	—	—
	PX200-50		20.0 A	6.0 A	1.0 A	—	1.0 A	4.0 A	—
	PX200-51		20.0 A	6.0 A	1.0 A	3.0 A	1.0 A	—	—

NEW! PUP55 Series — External Switching Power Supplies

- Universal Input Range 85–264 Vac
- Switching Power Supply Small Size
- UL 1950, CSA 1402C & IEC 950 Approved
- Enclosed Polycarbonate Case 94V-0 Rated
- Built-In EMI/RFI Filter VDE "A", FCC "B"
- IEC 320 Inlet, DIN Output Connectors

Power	Model	Input	Output						
			+5V	+12V	−12V	+24V	−5V	+15V	−15V
55W	PUP55-10	Universal 85–264 Vac	10.0A	—	—	—	—	—	—
	PUP55-12		—	4.6 A	—	—	—	—	—
	PUP55-13		—	—	—	—	—	3.7A	—
	PUP55-14		—	—	—	2.3 A	—	—	—
	PUP55-23		5.0 A	3.0 A	—	—	—	—	—
	PUP55-24		5.0 A	—	—	—	—	2.5 A	—
	PUP55-25		5.0 A	—	—	2.0 A	—	—	—
	PUP55-31		5.0 A	3.0 A	0.5 A	—	—	—	—
	PUP55-32		5.0 A	—	—	—	—	2.5 A	0.5 A

NEW! S/R Series 200–650 Watts AC/DC & DC/DC

- Up to 8 Outputs 5–48 VDC
- VME Eurorack Format 6U×14HP
- Semi & Fully Regulated Outputs
- "Custom Configured" Solutions, "Standard" Delivery
- DC Input Versions Available 24 & 48 Vdc
- Many Options Available

Choose Your Input & Output Combinations— Up to 650 Watts/8 Outputs

Models (Power)	Available Inputs	Available Outputs
S200 200 W R200 200 W R300 300 W R650 650 W	110/220 Vac 24 Vdc 48 Vdc	5 V @ 80 A, 60 A, 30 A, 20 A, 5 A, 4 A, 3 A, 1 A 12 V @ 56 A, 30 A, 20 A, 12.5 A, 10 A, 5 A, 4 A, 3 A, 1 A 15 V @ 45 A, 12.5 A, 10 A, 5 A, 4 A, 3 A, 1 A 24 V @ 28 A, 20 A, 16 A, 10 A, 8 A, 6 A, 5 A, 3 A, 2 A, 1 A 48 V @ 16 A, 8 A, 5 A, 4 A, 3 A, 1 A

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R E L I A B I L I T Y

interpoint

The World-Wide Reliability Standard

Interpoint is the premier world-wide supplier of high reliabilty dc-dc converters. Its components supply reliable power on virtually every commercial airliner in the West, the space shuttle, the most advanced U.S. and European fighters, and in a wide variety of missile systems, ground vehicles, industrial applications and medical electronic systems.

All Interpoint converters—even those intended for industrial programs—are manufactured to military program quality levels. Our production facilities offer full MIL-STD-1772 qualification, Statistical Process Controls, and audited verification of sources, processes, and procedures.

20 Years of Innovation and Quality

For over twenty years Interpoint Corporation has provided leadership for high reliability systems. Founded in 1969 as Integrated Circuits Incorporated (ICI), the company set the industry's size and reliability standards when it applied its thick-film hybrid techniques to dc-dc converters. Later, it became one of the first companies to be certified and qualified to MIL-STD-1772 quality levels.

Interpoint's power products include military/aerospace dc-dc converters, EMI filters and Hi-Rel Industrial converters.

Military/Aerospace Converters

These sealed, metal encased converters offer power levels from 1 to 200 watts with the highest reliability, best performance, and smallest size in the industry. Environmental screening is available referenced to the most demanding military specifications.

Filters and Protection Modules

Matched to our military/aerospace converters, these modules bring Interpoint converters within MIL-STD-461's CE03 noise limits and protect them against surges and spikes. Sealed, metal packages are standard. Optional environmental screening is also available.

Hi-Rel Industrial Converters

These metal or potted epoxy designs are intended for industrial applications that need higher reliability and smaller size than standard commercial grade parts. They are built to the same quality standards as our military parts but without the extra documentation, testing, and severe environmental requirements.

STANDARD SCREENING PROCEDURE FOR MHF DC-DC CONVERTERS

- Pre-cap internal visual inspection: Per method 2017.
- Stabilization bake: 24 hrs. at 125°C.
- Temp. cycle: 10 times, -55°C to +125°C per method 1010.
- Constant acceleration: 500 g per method 2001.
- Gross leak: Per method 1014, cond. C.
- Fine leak: Per method 1014, cond. A.
- Burn-in: 96 hr. at 125°C case (typ).
- Final electrical test (25°C).
- Final external visual inspection: Per method 2009.

Consult individual data sheets for screening options available for each model.

Comprehensive Environmental Screening Options

Before being offered as standard products, Interpoint military/aerospace converters undergo complete qualification testing using in-house procedures and methods from MIL-STD-883 and MIL-STD-202. The tests include thermal and mechanical shock, vibration, acceleration, hermeticity, bond strength, die shear, resistance to solvents, and a life test.

Interpoint also offers environmental screening for all of its military/aerospace converters and filter modules with procedures referenced to MIL-STD-883C, in-house procedures, or customer specifications.

interpoint

10301 Willows Road
P.O. Box 97005
Redmond, WA 98073-9705
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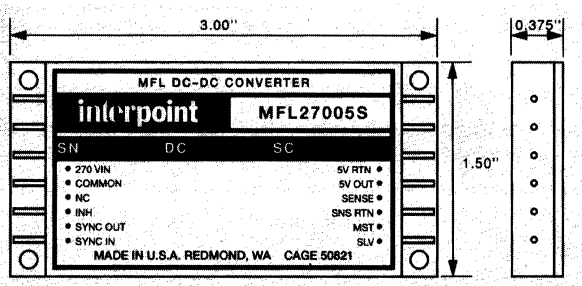
MILITARY/AEROSPACE DC-DC CONVERTERS



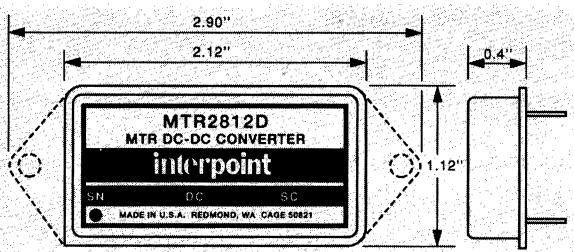
MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX WATTS
		VDC	A	EFF (%)	
MFL2805S	16 to 40	5	10.00	80	50
MFL2812S	16 to 40	12	5.00	82	60
MFL2815S	16 to 40	15	4.33	84	65
MFL2812D	16 to 40	±12	4.58*	80	55
MFL2815D	16 to 40	±15	4.00*	82	60
MFL27005S	160 to 400	5	10.00	80	50
MFL27012S	160 to 400	12	5.00	82	60
MFL27015S	160 to 400	15	4.33	84	65
MFL27028S	160 to 400	28	1.96	82	60
MFL27012D	160 to 400	±12	4.58*	80	55
MFL27015D	160 to 400	±15	4.00*	82	60

*Total; up to 90% from either output

MFL SERIES NEW 1991

- **28 or 270 Vdc input models**
- **Up to 65 watts output power**
- **Paralleled current sharing**
- **-55 to +125° C case temp range**

The MFL Series converters offer up to 65 watts output power in a sealed metal case measuring only 1.5 x 3.0 x 0.375 inches. Up to three units may be paralleled to provide a shared output of up to 195 watts. Standard features include undervoltage lockout, remote sense, and sync. Mounting options include side-leaded cage mount or through-hole styles. Operating temperature is -55 to +125° C. Environmental screening available.



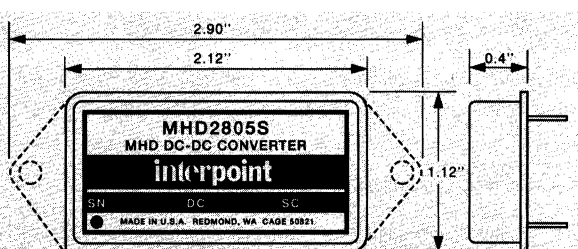
MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX WATTS
		VDC	mA	EFF (%)	
MTR2805S	16 to 40	5	5000	78	25
MTR2812S	16 to 40	12	2500	83	30
MTR2815S	16 to 40	15	2000	84	30
MTR2812D	16 to 40	±12	2250*	81	30
MTR2815D	16 to 40	±15	1800*	83	30
MTR28512T**	16 to 40	+5 ±12	4000*** ±625	78	30
MTR28515T**	16 to 40	+5 ±15	4000*** ±500	78	30

*Total; up to 90% from either output
**Case dimension 2.7 x 1.35 x 0.4 inches.
***Max. for each output; total power may not exceed 30 watts.

MTR SERIES NEW 1991

- **Up to 30 watts output power**
- **16 to 40 Vdc input range**
- **Up to 84% typical efficiency**
- **-55 to +125° C case temp range**

The high frequency MTR Series converters offer up to 30 watts output power in a hermetically sealed package only 1.12 x 2.12 x 0.4 inches – the same outline as our 15-watt MHE/MLP series. The parts offer full power operation from 16 to 40 Vdc input and over the full -55 to +125° C temperature range. Features for the isolated, regulated units include low-voltage lockout, remote sense, voltage trim, and sync. Single, dual, and triple outputs available. Environmental screening available.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX WATTS
		VDC	mA	EFF (%)	
MHD2805S	16 to 40	5	3000	81	15
MHD2812S	16 to 40	12	1667	82	20
MHD2815S	16 to 40	15	1333	83	20
MHD2812D	16 to 40	±12	±625	81	15
MHD2815D	16 to 40	±15	±500	81	15
MHD28512T*	16 to 40	+5 ±12	2000 ±208	79	15
MHD28515T*	16 to 40	+5 ±15	2000 ±167	79	15

*Case dimension 2.7 x 1.35 x 0.4 inches.

MHD SERIES NEW 1991

- **Up to 20 watts output power**
- **1, 2, or 3 outputs**
- **-55 to +125° C case temp range**
- **Case pinout and outline match MHE and MTO converters**

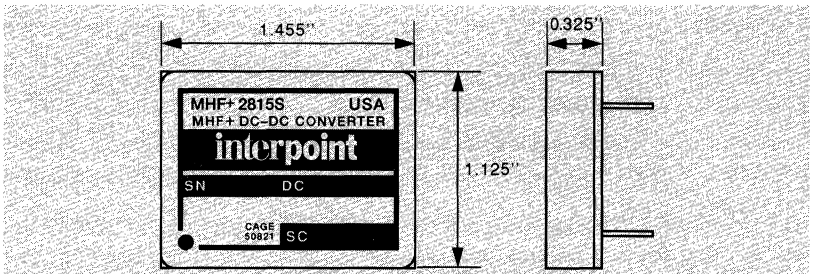
The MHD Series converters provide state-of-the-art dc-dc conversion with case outlines and pinouts that match our industry standard 28 V input MHE and MTO series products. The MHD series offers excellent audio rejection (up to 50dB), improved transient response, current limiting overload protection, 16 to 40 Vdc input, and -55 to +125° C full power operation. Height of the metal hermetic case is only 0.400 inch. Environmental screening optional.

MILITARY/AEROSPACE DC-DC CONVERTERS

MHF+ SERIES NEW 1991

- **Up to 15 watts output power**
- **16 to 40 Vdc input range**
- **Up to 82% typical efficiency**
- **-55 to +125° C case temp range**

An upgrade to our industry standard MHF Series, MHF+ Series converters provide up to 15 watts output power over the full -55 to +125° C temperature range. The sealed metal parts are available in welded hermetic packages that take up only 1.7 sq. in. of board area and are only 0.325 inch high. Up to 82% efficiency. Single and dual outputs. Environmental screening optional.

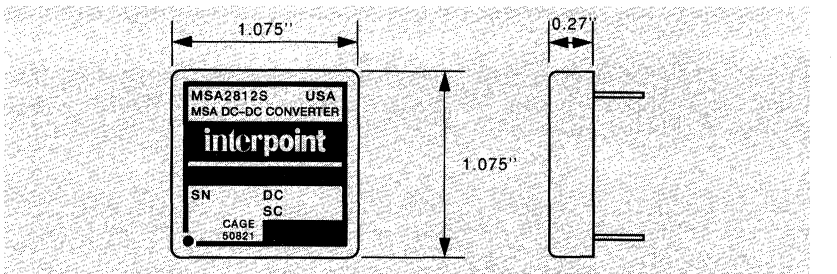


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX WATTS
		VDC	mA	EFF (%)	
MHF+2805S	16 to 40	5	2400	77	12
MHF+2812S	16 to 40	12	1250	82	15
MHF+2815S	16 to 40	15	1000	81	15
MHF+2812D	16 to 40	±12	±625	82	15
MHF+2815D	16 to 40	±15	±500	81	15

MSA SERIES NEW 1991

- **Up to 5 watts output power**
- **0.27 inch profile**
- **Up to 76% typical efficiency**
- **-55 to +125° C case temp range**

The MSA Series converters offer up to 5 watts output power in our lowest profile case—just 0.270 inch high. These regulated, isolated converters offer 600 kHz switching and full power operation over the full military temperature range. Audio rejection is up to 50 dB. No external capacitors are required. Metal sealed cases. Single and dual outputs. Environmental screening available.



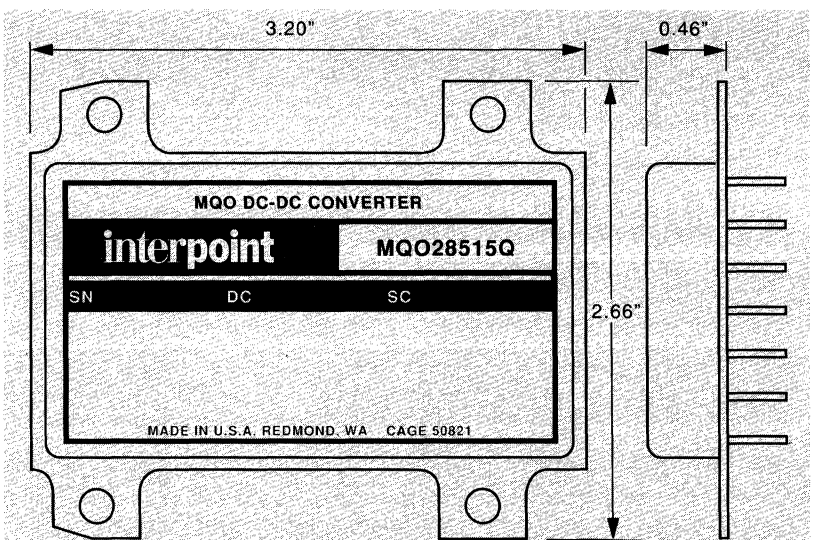
MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX WATTS
		VDC	mA	EFF (%)	
MSA2805S	16 to 40	5	1000	73	5
MSA2812S	16 to 40	12	417	75	5
MSA2815S	16 to 40	15	333	76	5
MSA2812D	16 to 40	±12	417*	75	5
MSA2815D	16 to 40	±15	333*	76	5

*Total; up to 90% from either output

MQO SERIES NEW 1991

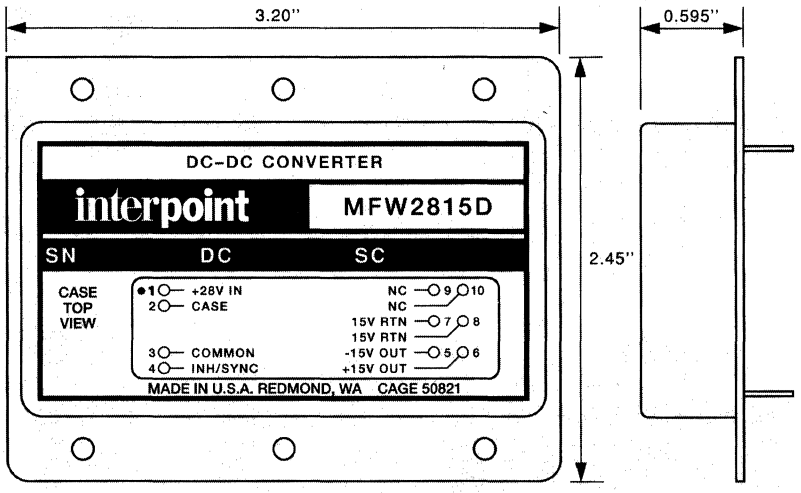
- **Up to 16.5 watts output power**
- **4 outputs (including -5 Vdc)**
- **Meets CE03, CS01, CS02, CS06, DO160B standards**
- **-55 to +125° C case temp range**

The new MQO Series dc-dc converters supply up to 16.5 watts in a four-output configuration. Outputs include +5 Vdc and -5 Vdc (often used for ECL applications) and either ±12 Vdc or ±15 Vdc. A built-in EMI filter and transient suppressor allows the unit to meet MIL-STD-461C's CE03 reflected ripple standard and CS01, CS02, CS06, and DO160B conducted susceptibility standards without any external components. An output holdup feature provides a low power flag and full output power holdup through transient dropout conditions. Metal hermetic case. Environmental screening optional.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX WATTS
		VDC	mA	EFF (%)	
MQO28512Q	16 to 36	±5 -5 ±12	2000 -350 ±200	66	16.5
MQO28515Q	16 to 36	+5 -5 ±15	2000 350 ±167	66	16.5

MILITARY/AEROSPACE DC-DC CONVERTERS

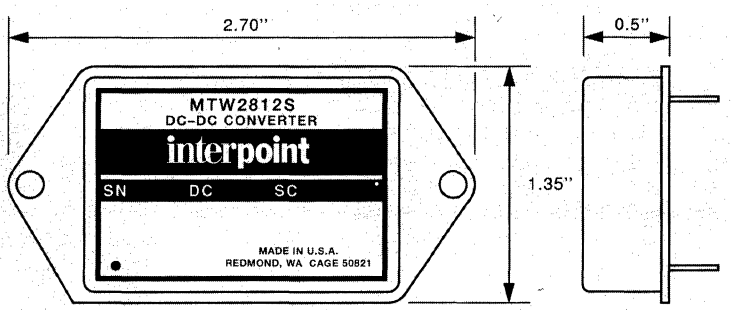


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MFW283R5S	19.0 to 40.0	3.5	14,000	76	50	V-1
MFW2805S	19.0 to 40.0	5	12,000	80	60	
MFW2812S	19.0 to 40.0	12	5830	83	70	
MFW2815S	19.0 to 40.0	15	4670	83	70	
MFW2812D	19.0 to 40.0	±12	±2920	83	70	V-2
MFW2815D	19.0 to 40.0	±15	±2330	84	70	
MFW2812T	19.0 to 40.0	+5 ±12	4000 ±1670	84	60	V-3
MFW2815T	19.0 to 40.0	+5 ±15	4000 ±1330	84	60	

MFW SERIES

- **Up to 70 watts—1, 2 or 3 outputs**
- **19 to 40 Vdc input range**
- **Up to 84% typical efficiency**
- **-55° to +85°C case temp range**

The MFW converters provide up to 70 watts of power at up to 84% efficiency with single, dual, or triple outputs. Outputs are regulated and isolated. On dual output models, up to 95% of rated power is available from either output. On triple output models, up to 83% of rated power is available from each output. Packages are sealed plated steel with heat dissipating flange mounting. Environmental screening available.

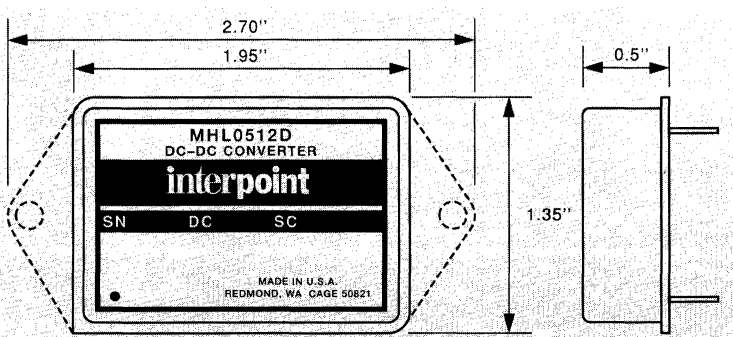


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MTW2805S	19.0 to 40.0	5.0	6000	82	30	S-1
MTW2812S	18.0 to 40.0	12.0	2500	84	30	
MTW2815S	18.0 to 40.0	15.0	2000	86	30	
MTW2812D	18.0 to 40.0	±12.0	±1250	84	30	S-2
MTW2815D	18.0 to 40.0	±15.0	±1000	85	30	

MTW SERIES

- **Up to 30 watts output power**
- **19 to 40 Vdc input range**
- **Up to 83% typical efficiency**
- **-55° to +85°C case temp range**

The MTW series offers 30 watt converters with regulated and isolated single or dual outputs at up to 86% efficiency. For dual outputs, up to 90% of full power is available from either output. Packages are sealed, plated steel. Environmental screening available.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MHL0512D	4.0 to 8.0	±12.0	±625	78	15	U
MHL0515D	4.0 to 8.0	±15.0	±500	78	15	

MHL SERIES

- **Up to 15 watts—dual output**
- **4 to 8 Vdc input range**
- **Up to 78% typical efficiency**
- **-55° to +85°C case temp range**

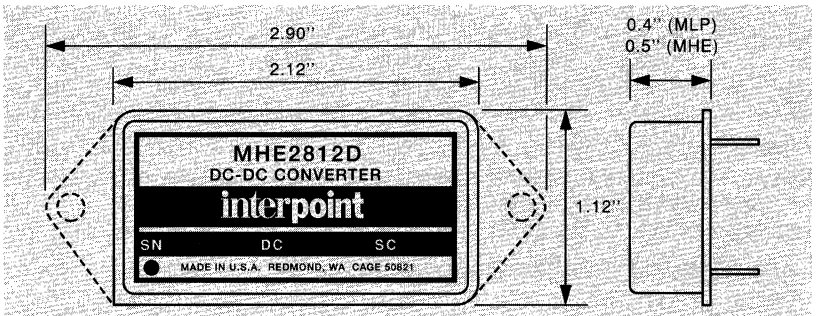
MHL converters have dual, regulated output voltages with a common output ground. Both outputs are fully isolated from the input. Up to 95% full power is available from either output up to a total of 15 watts. Sealed, plated steel packages with flange option. Environmental screening available.

MILITARY/AEROSPACE DC-DC CONVERTERS

MHE/MLP SERIES

- **Up to 20 watts output power**
- **9 to 16 and 16 to 40 Vdc input range**
- **Up to 86% typical efficiency**
- **-55° to +85°C case temp range**

High efficiency MHE/MLP converters feature single or dual isolated, regulated output voltages, wide input voltage range, and sealed, plated steel packages for military/aerospace applications. MLP models offer low profile cases. Flange mount optional. Environmental screening available.

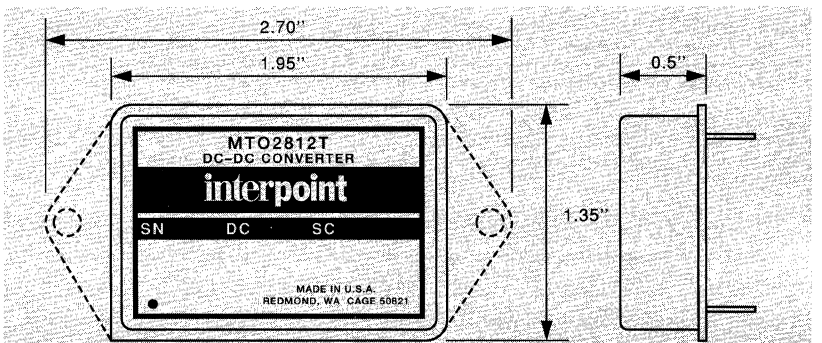


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MHE2805S	17.0 to 40.0	5.0	3000	81	15	M-1
MHE2812S	17.0 to 40.0	12.0	1667	82	20	M-2
MHE2815S	17.0 to 40.0	15.0	1333	83	20	
MHE2812D	17.0 to 40.0	±12.0	±625	79	15	
MHE2815D	17.0 to 40.0	±15.0	±500	79	15	
MHE1205S	9.0 to 16.0	5.0	3000	81	15	M-1
MHE1212S	9.0 to 16.0	12.0	1250	82	15	M-2
MHE1215S	9.0 to 16.0	15.0	1000	83	15	
MLP2805S	16.0 to 40.0	5.0	2000	81	10	M-1
MLP2812S	16.0 to 40.0	12.0	1250	82	15	M-2
MLP2815S	16.0 to 40.0	15.0	1000	83	15	
MLP2812D	16.0 to 40.0	±12.0	±414	81	10	
MLP2815D	16.0 to 40.0	±15.0	±333	81	10	

MTO SERIES

- **Up to 15 watts—triple output**
- **9 to 16 and 16 to 36 Vdc input range**
- **Up to 79% typical efficiency**
- **-55° to +85°C case temp range**

MTO converters have three regulated output voltages with a common ground. All outputs are isolated from the input. Full rated output power can be drawn from the 5 Vdc output, or the dual outputs can be loaded as shown. Total power is up to 15 watts. Package is sealed, plated steel with optional flange. Environmental screening available.

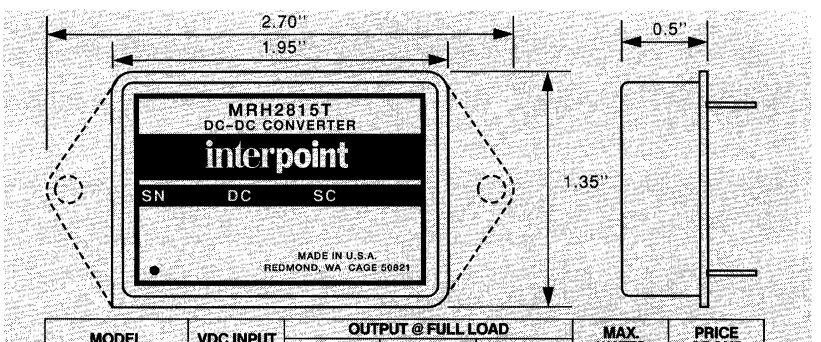


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MTO2812T	16.0 to 36.0	+5.0 ±12.0	2000 ±208	74	15	O
MTO2815T	16.0 to 36.0	+5.0 ±15.0	2000 ±167	75	15	

MRH SERIES

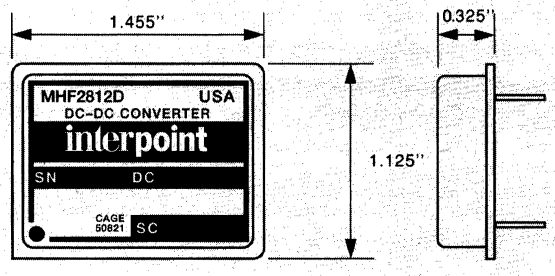
- **Radiation Hardened converter**
- **Up to 15 watts—1, 2, or 3 outputs**
- **16 to 36 Vdc input range**
- **-55° to +85°C case temp range**

MRH converters are radiation hardened to operate through 10^{13} neutrons/sq cm neutron fluence, 10^{11} rads(Si)/sec dose rates and 10^{5} rads(Si) total dose. Single, dual, or triple outputs are regulated and isolated. Up to 15 watts of power. Environmental screening available.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MRH2805S	16.0 to 40.0	5	3000	77	15	R-1
MRH2812S	16.0 to 40.0	12	1250	80	15	
MRH2815S	19.0 to 40.0	15	1000	81	15	
MRH28L15S	16.0 to 36.0	15	1000	81	15	
MRH2812D	16.0 to 40.0	±12	±625	80	15	R-2
MRH2815D	19.0 to 40.0	±15	±500	81	15	
MRH28L15D	16.0 to 36.0	±15	±500	81	15	
MRH2812T	16.0 to 36.0	+5 ±12	2000 ±500	72	15	R-3
MRH2815T	16.0 to 36.0	+5 ±15	2000 ±500	72	15	

MILITARY/AEROSPACE DC-DC CONVERTERS

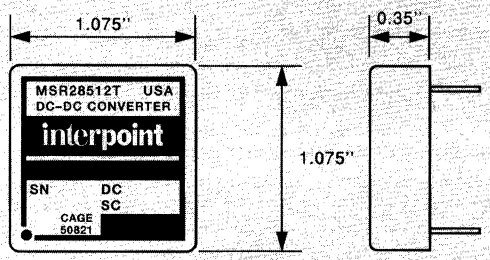


MHF SERIES

- **12 watts—low profile**
- **16 to 40 Vdc input range**
- **84% efficiency**
- **-55° to +125°C case temp range**

MHF series converters provide 30 watts/in³ power density in a low profile (.325 inch max) part. Regulated and isolated single or dual outputs provide up to 12 watts at up to 84% efficiency. Full power operation from -55° to +125°C. Environmental screening available.

MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MHF2805S	16.0 to 40.0	5	2000	77	10	W-1
MHF2812S	16.0 to 40.0	12	1000	81	12	
MHF28L15S	16.0 to 36.0	15	800	82	12	
MHF2815S	19.0 to 40.0	15	800	83	12	
MHF2812D	16.0 to 40.0	±12	±500	81	12	W-2
MHF28L15D	16.0 to 36.0	±15	±400	82	12	
MHF2815D	19.0 to 40.0	±15	±400	83	12	



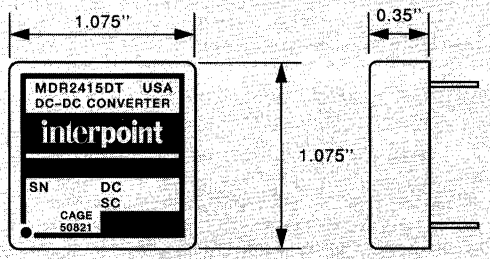
MSR SERIES

- **Up to 4 watts output power**
- **16 to 36 Vdc input range**
- **Up to 75% typical efficiency**
- **-55° to +85°C case temp range**

MSR models offer up to 4 watts output power in single, dual, or triple outputs. Outputs are regulated and isolated from the input. The low-profile packages are sealed plated steel and less than 1.2 square inches. Environmental screening available.

Note: External output capacitors are required.

MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MSR2805S	16.0 to 32.0	5.0	700	72	3.5	K
MSR2812D	16.0 to 32.0	±12.0	±167	75	4.0	
MSR2815D	16.0 to 32.0	±15.0	±133	75	4.0	
MSR28512T	16.0 to 32.0	+5.0 ±12.0	400 ±63	70	3.2	N
MSR28515T	16.0 to 32.0	+5.0 ±15.0	400 ±50	70	3.2	



MDR SERIES

- **Up to 3 watts output power**
- **12, 24 and 28 Vdc input voltages**
- **Regulated, isolated outputs**
- **-55° to +85°C case temp range**

The MDR series converters are fully isolated and offer the excellent regulation and low output ripple provided by a series output regulator. Sealed, plated steel package. Environmental screening available.

MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
MDR1212DT	10.8 to 13.0	±12.0	±125	58	3.0	I
MDR1215DT	10.8 to 13.0	±15.0	±100	58	3.0	
MDR2412DT	20.0 to 26.0	±12.0	±125	58	3.0	
MDR2415DT	20.0 to 26.0	±15.0	±100	58	3.0	
MDR2812DT	24.0 to 30.0	±12.0	±125	58	3.0	
MDR2815DT	24.0 to 30.0	±15.0	±100	58	3.0	

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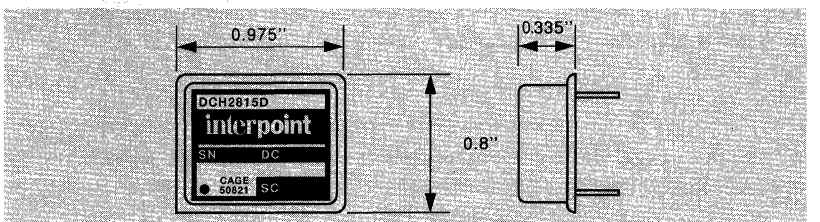
MILITARY/AEROSPACE DC-DC CONVERTERS

DCH SERIES

- **Up to 3 watts output power**
- **5, 12 and 28 Vdc input voltages**
- **Unregulated**
- **-55° to +100°C case temp range**

DCH models deliver up to 3 watts output power in single or dual isolated, unregulated outputs. The converters may be used in applications not requiring regulation or with external series regulators. Packages are sealed plated steel. Environmental screening is available.

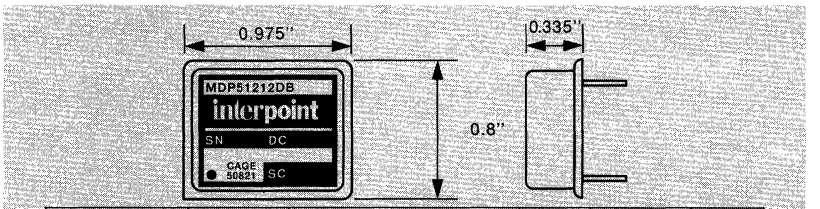


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
DCH0505S	4.0 to 6.5	5.0	400	67	2.0	L
DCH0512S	4.0 to 6.5	12.0	208	72	2.5	
DCH0512D	4.0 to 6.5	±12.0	±104	72	2.5	
DCH0515D	4.0 to 6.5	±15.0	±83	72	2.5	
DCH1205S	9.0 to 15.0	5.0	500	70	2.5	
DCH1212S	9.0 to 15.0	12.0	250	72	3.0	
DCH1212D	9.0 to 15.0	±12.0	±125	72	3.0	
DCH1215D	9.0 to 15.0	±15.0	±100	72	3.0	
DCH1228S	9.0 to 15.0	28.0	107	75	3.0	
DCH1228D	9.0 to 15.0	±28.0	±53	75	3.0	
DCH2805S	20.0 to 32.0	5.0	500	68	2.5	
DCH2812S	20.0 to 32.0	12.0	250	75	3.0	
DCH2812D	20.0 to 32.0	±12.0	±125	75	3.0	
DCH2815D	20.0 to 32.0	±15.0	±100	75	3.0	

MDP SERIES

- **Up to 1.5 watts output power**
- **5, 12 and 28 Vdc input voltages**
- **Up to 80% efficiency/non-isolated**
- **-55° to +100°C case temp range**

MDP converters offer models with one regulated and one unregulated output, and models with dual regulated outputs. The input common is connected internally to the output common. The sealed, plated steel packages use less than 0.8 square inch board space. Environmental screening available.



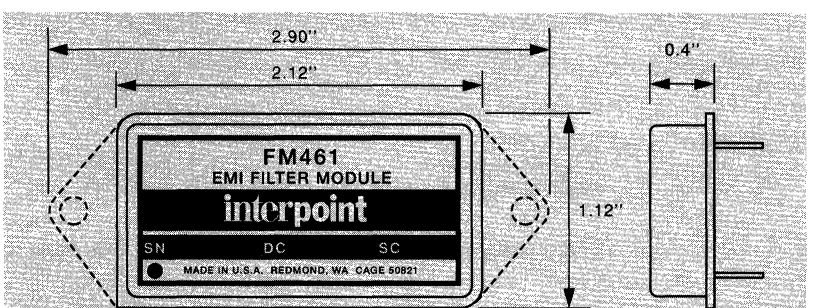
MODEL	VDC INPUT	OUTPUT VDC	EFF. %	MAX. WATTS	PRICE GROUP
MDP50505DP	3.0 to 7.0	+5 REGULATED/-5 UNREG.	75	1.25	P
MDP505SN	3.0 to 7.0	-5 REG. SINGLE OUTPUT	72	1.25	
MDP51205DP	3.0 to 7.0	+12 REGULATED/-5 UNREG.	75	1.25	
MDP51212DP	3.0 to 7.0	+12 REGULATED/-12 UNREG.	75	1.25	
MDP51212DN	3.0 to 7.0	-12 REGULATED/+12 UNREG.	75	1.25	
MDP51212DB	3.0 to 7.0	±12 REG./BALANCE UNREG	75	1.25	
MDP51515DB	3.0 to 7.0	±15 REG./BALANCE UNREG.	75	1.25	
MDP120505DP	9.0 to 15.0	+5 REGULATED/-5 UNREG.	72	1.50	
MDP1205SN	9.0 to 15.0	-5 REG. SINGLE OUTPUT	72	1.50	
MDP121205DN	9.0 to 15.0	-12 REGULATED/+5 UNREG.	78	1.50	
MDP121212DB	9.0 to 15.0	±12 REG./BALANCE UNREG.	80	1.50	
MDP121515DB	9.0 to 15.0	±15 REG./BALANCE UNREG.	80	1.50	
MDP240505DP	16.0 to 32.0	+5 REGULATED/-5 UNREG.	72	1.50	
MDP241212DP	16.0 to 32.0	+12 REGULATED/-12 UNREG.	80	1.50	
MDP241212DN	16.0 to 32.0	-12 REGULATED/+12 UNREG.	80	1.50	
MDP241212DB	16.0 to 32.0	±12 REG./BALANCE UNREG.	80	1.50	
MDP241515DB	16.0 to 32.0	±15 REG./BALANCE UNREG.	80	1.50	

EMI FILTERS & PROTECTION MODULES

FM-461 SERIES

- **MIL-STD-461 accessories for high frequency dc-dc converters**
- **MIL-STD-704B through D transient protection**
- **40 dB min reflected ripple current reduction**
- **-55° to +85°C case temp range**

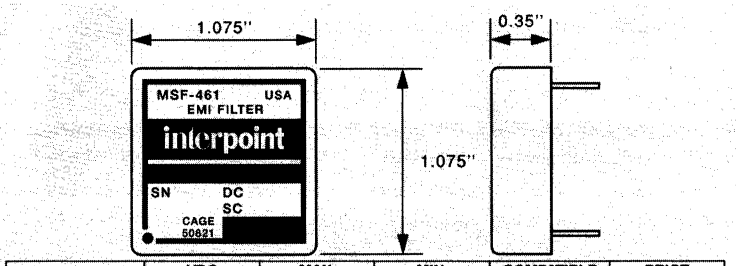
The FM-461, FMA-461, and FMB-461 filters bring MHE, MLP, MTW, MTO, MHL or MFW converters into compliance with MIL-STD-461B's CE03 limits for reflected input ripple current. The sealed, plated steel case has an optional flange. Environmental screening available.



MODEL	VDC INPUT	MAX. CURRENT	MIN. ATTENUATION	COMPATIBLE CONVERTERS*	PRICE GROUP
FM-461	0 to 40.0	1.75 A	40dB 100kHz to 50MHz	MHE, MLP, MHL, MTO	Q-1
FMA-461	0 to 40.0	4.0 A	40dB 100kHz to 50MHz	MTW	Q-2
FMB-461	0 to 40.0	5.0 A	40dB 100kHz to 50MHz	MFW	Q-3

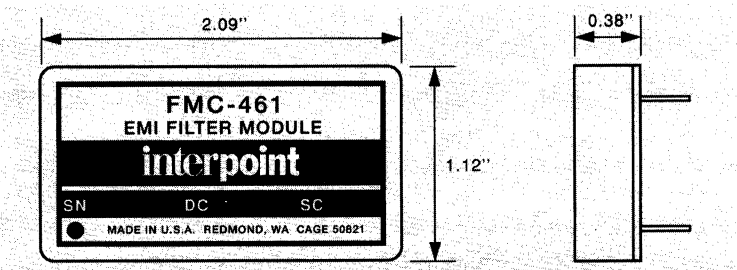
*For MIL-STD-461B CE03 limits for reflected ripple

FILTERS & PROTECTION MODULES



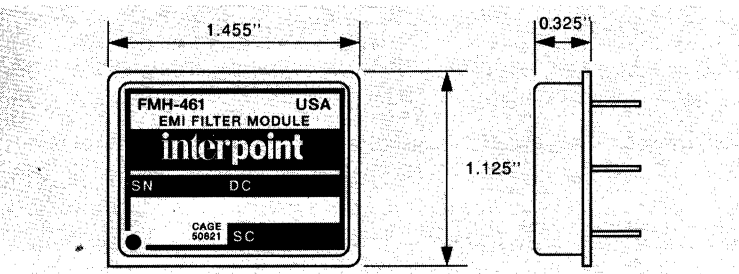
MODEL	VDC INPUT	MAX. CURRENT	MIN. ATTENUATION	COMPATIBLE CONVERTERS*	PRICE GROUP
MSF-461	0 to 40.0	420 mA	50dB 50kHz to 50MHz	MSR, MDR, DCH, MDP	T

*For MIL-STO-461B CEO 3 limits for refelcted ripple



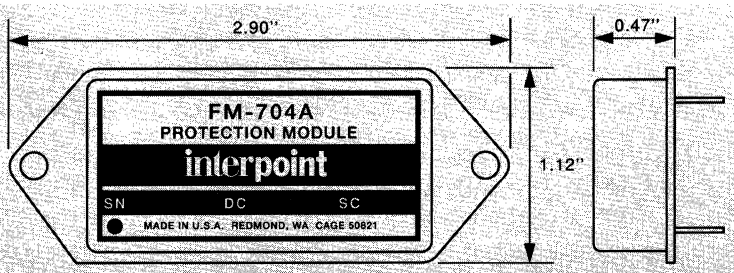
MODEL	VDC INPUT	MAX. CURRENT	MIN. ATTENUATION	COMPATIBLE CONVERTERS*	PRICE GROUP
FMC-461	0 to 40.0	1.75 A	40dB 200kHz to 50MHz	MHE, MLP, MTO, MHL, MTW, MRH, MHF	Q-5

*For MIL-STD-461B CE03 limits for reflected ripple



MODEL	VDC INPUT	MAX. CURRENT	MIN. ATTENUATION	COMPATIBLE CONVERTERS*	PRICE GROUP
FMH-461	0 to 40.0	1.15 A	40dB 200kHz to 50MHz	MHE, MLP, MTO, MHL, MRH, MHF	Q-6

*For MIL-STD-461B CE03 limits for reflected ripple



MODEL	VDC INPUT	MAX. OUTPUT POWER	MIN. ATTENUATION	SPIKE LIMIT	SURGE LIMIT	PRICE GROUP
FM-704A	0 to 40.0	40 W	50dB 200kHz to 50MHz	400 V, 0.5 Ω imp	100 V, 0.5 Ω imp	Q-4

MSF-461

- **MIL-STD accessory to MSR, MDR, DCH, and MDP series converters**
- **MIL-STD-704B thru D transient protection**
- **50 dB min reflected ripple current reduction**
- **-55° to +85°C case temp range**

In a sealed, plated steel case of less than 1.2 square inches, the MSF-461 brings MSR, MDR, DCH, and MDP dc-dc converters within MIL-STD-461's CE03 limits for reflected ripple current. Environmental screening available.

FMC-461

- **High temperature MIL-STD-461 accessory**
- **MIL-STD-704B through D transient protection**
- **40 dB min reflected ripple current reduction**
- **-55° to +125°C case temp range**

The FMC-461 will bring any Interpoint converter into compliance with MIL-STD-461B CE03 reflected input ripple current limits up to its rated current. Welded bathtub case, -55 to 125°C case temperature operation, and environmental screening available.

FMH-461

- **Low profile MIL-STD-461 accessory**
- **MIL-STD-704B through D transient protection**
- **40 dB min reflected ripple current reduction**
- **-55° to +125°C case temp range**

The lightweight (26 grams), low profile FMH-461 filter brings both high and low frequency converters into MIL-STD-461B's CE03 noise limits for reflected ripple. Up to 15 watt throughput over -55° to +125°C case temperature. Environmental screening available.

FM-704A

- **Combined EMI filter and protection module**
- **Protects against surges and spikes**
- **40 watts throughput power**
- **-55° to +125°C case temp range**

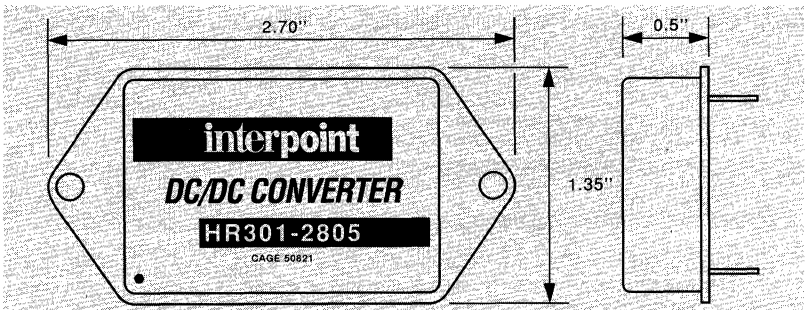
The FM-704A protection module protects any high frequency converter against MIL-STD-1275A and MIL-STD-704A surges and MIL-STD-461C CS06 spikes. Its filter element brings MHE, MLP, MTO, MTW, and MHL converters within MIL-STD-461B's CE03 noise limits. Up to 40 watts throughput from -55 to +125°C. Environmental screening available.

HI-REL INDUSTRIAL DC-DC CONVERTERS

HR300 SERIES

- **Up to 30 watts output power**
- **Metal, sealed package**
- **1 or 2 outputs**
- **Up to 85% efficiency**

The HR300 series offers Hi-Rel Industrial applications up to 30 watts of output power and military levels of quality. HR300 converters provide single or dual regulated, isolated outputs and up to 85% efficiency. Operating temperature range is from -20° to +70°C. Packages are sealed, plated steel.

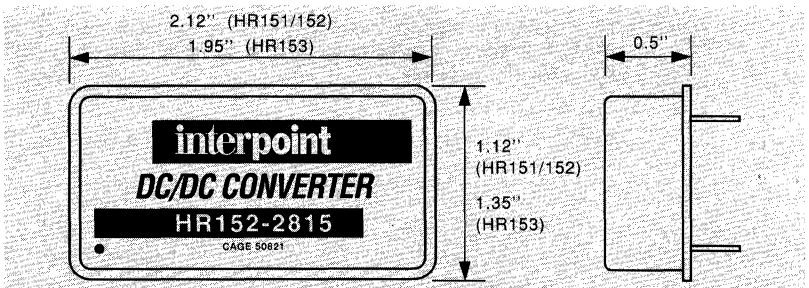


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
HR301-2805	18.0 to 36.0	5	6000	81	30	Y-1
HR301-2812	18.0 to 36.0	12	2500	83	30	
HR301-2815	18.0 to 36.0	15	2000	85	30	
HR302-2812	18.0 to 36.0	±12	±1250	83	30	Y-2
HR302-2815	18.0 to 36.0	±15	±1000	84	30	

HR150 SERIES

- **Up to 20 watts output power**
- **Metal, sealed package**
- **1, 2, or 3 outputs**
- **2 input voltage ranges**

The HR150 series converters provide military program levels of reliability in a Hi-Rel Industrial class part. They provide up to 20 watts of power at up to 83% efficiency. Outputs are tightly regulated and are isolated from the input. Operating temperature range is from -20° to +70°C. Like our military/aerospace converters, the packages are sealed, plated steel.

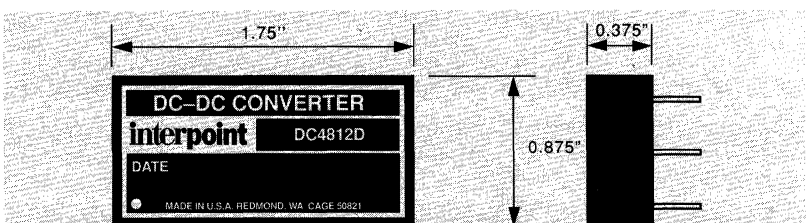


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
HR151-2805	18.0 to 36.0	5	3000	81	15	X-1
HR151-2812	18.0 to 36.0	12	1667	82	20	
HR151-2815	18.0 to 36.0	15	1333	83	20	
HR151-1205	10.0 to 16.0	5	3000	81	15	
HR151-1212	10.0 to 16.0	12	1250	82	15	
HR151-1215	10.0 to 16.0	15	1000	83	15	
HR152-2812	18.0 to 36.0	±12	±625	79	15	X-2
HR152-2815	18.0 to 36.0	±15	±500	79	15	
HR153-2812	18.0 to 36.0	+5 ±12	2000 ±208	79	15	X-3
HR153-2815	18.0 to 36.0	+5 ±15	2000 ±167	79	15	

DC SERIES

- **Up to 6.4 watts of output power**
- **Isolated, unregulated outputs**
- **Rugged encapsulated construction**
- **4 input voltage ranges**

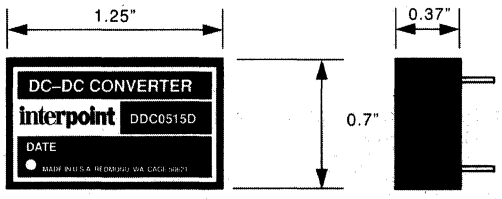
The dc series of unregulated dc-dc converters consists of single and dual output models in four input voltage ranges. They can be used with external regulators or in applications that do not require regulated voltages. Operating ambient temperature range for these plastic encapsulated devices is -20° to +70°C.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD*			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
DC0512D	4.0 to 6.5	±12	±208	75	6.0	A
DC0515D	4.0 to 6.5	±15	±167	77	6.0	
DC0525D	4.0 to 6.5	±25	±100	77	6.0	
DC1205S	9.0 to 15.0	5	1000	67	6.25	
DC1212D	9.0 to 15.0	±12	±267	77	7.5	
DC1215D	9.0 to 15.0	±15	±213	77	7.5	
DC1218D	9.0 to 15.0	±18	±178	77	7.5	
DC2805S	20.0 to 32.0	5	1000	73	6.25	
DC2812D	20.0 to 32.0	±12	±267	81	7.5	
DC2815D	20.0 to 32.0	±15	±213	81	7.5	
DC2818D	20.0 to 32.0	±18	±178	81	7.5	
DC4805S	36.0 to 56.0	5	1000	70	6.25	
DC4812S	36.0 to 56.0	12	530	80	7.5	
DC4812D	36.0 to 56.0	±12	±267	80	7.5	
DC4815D	36.0 to 56.0	±15	±213	80	7.5	
DC4818D	36.0 to 56.0	±18	±178	80	7.5	

*Full load = 80% max load

HI-REL INDUSTRIAL DC-DC CONVERTERS

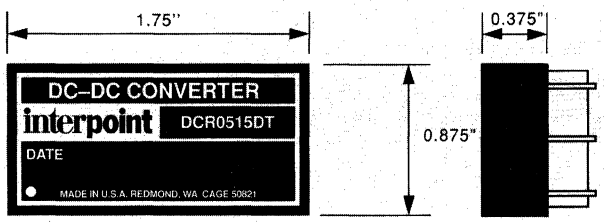


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
DDC0505S	4.0 to 6.5	5	800	63	4.0	F
DDC0512D	4.0 to 6.5	±12	±167	75	4.0	
DDC0515D	4.0 to 6.5	±15	±133	75	4.0	
DDC1205S	9.0 to 15.0	5	1000	68	5.0	
DDC1212D	9.0 to 15.0	±12	±208	80	5.0	
DDC1215D	9.0 to 15.0	±15	±167	80	5.0	
DDC2805S	20.0 to 32.0	5	1000	70	5.0	
DDC2812D	20.0 to 32.0	±12	±208	83	5.0	
DDC2815D	20.0 to 32.0	±15	±167	83	5.0	
DDC4805S	36.0 to 56.0	5	1000	72	5.0	
DDC4812D	36.0 to 56.0	±12	±208	84	5.0	
DDC4815D	36.0 to 56.0	±15	±167	84	5.0	

DDC SERIES

- **Up to 5 watts of output power**
- **Isolated, unregulated outputs**
- **24 pin DIP compatible package**
- **4 input voltage ranges**

The DDC models are unregulated and are designed to be used in applications where regulated voltages are not needed, or with external regulators. The outputs are isolated from the input. They can be operated over an ambient temperature range of -20 to +70°C, and they are encapsulated in plastic packages.

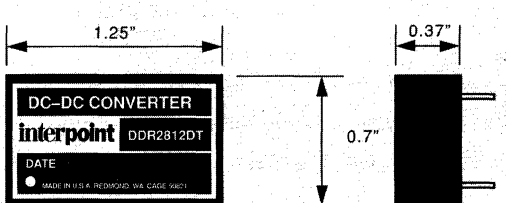


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
DCR0512DT	4.5 to 5.5	±12.0	±150	50	3.6	B
DCR0515DT	4.5 to 5.5	±15.0	±125	50	3.75	
DCR1212DT	10.8 to 14.0	±12.0	±150	52	3.6	
DCR1215DT	10.8 to 14.0	±15.0	±133	52	4.0	
DCR2812DT	24.0 to 32.0	±12.0	±150	55	3.6	
DCR2815DT	24.0 to 32.0	±15.0	±125	55	3.75	
DCR4812DT	44.0 to 56.0	±12.0	±167	55	4.0	
DCR4815DT	44.0 to 56.0	±15.0	±133	55	4.0	

DCR SERIES

- **Up to 4 watts output power**
- **Isolated, regulated outputs**
- **Foldback current limiting**
- **No external components required**

The DCR series features isolated, dual-tracking outputs and four different input voltage ranges. They have input pi filters for good ripple rejection and the nonsaturating core design minimizes radiated and conducted noise. These plastic, encapsulated converters can be operated over an ambient temperature range of -20° to +70°C.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
DDR0505S	4.5 to 5.5	5.0	400	45	2.0	G
DDR0512DT	4.5 to 5.5	±12.0	±104	52	2.5	H
DDR0515DT	4.5 to 5.5	±15.0	±83	52	2.5	
DDR1205S	10.8 to 14.0	5.0	500	45	2.5	G
DDR1212DT	10.8 to 14.0	±12.0	±125	55	3.0	H
DDR1215DT	10.8 to 14.0	±15.0	±100	55	3.0	
DDR2405S	20.0 to 28.0	5.0	500	45	2.5	G
DDR2412DT	20.0 to 28.0	±12.0	±125	55	3.0	H
DDR2415DT	20.0 to 28.0	±15.0	±100	55	3.0	
DDR2805S	24.0 to 32.0	5.0	500	45	2.5	G
DDR2812DT	24.0 to 32.0	±12.0	±125	55	3.0	H
DDR2815DT	24.0 to 32.0	±15.0	±100	55	3.0	
DDR4805S	44.0 to 56.0	5.0	500	45	2.5	G
DDR4812DT	44.0 to 56.0	±12.0	±125	55	3.0	H
DDR4815DT	44.0 to 56.0	±15.0	±100	55	3.0	

DDR SERIES

- **Up to 3 watts output power**
- **Isolated, regulated outputs**
- **24 pin DIP compatible package**
- **5 input voltage ranges**

The DDR series dc-dc converters are isolated and regulated. They are built with a nonsaturating core design to minimize reflected ripple and radiated noise. The rugged plastic 24-pin DIP packages are rated for operation from -20 to +70°C ambient.

CALL (800) 822-8782 TO ORDER DATA SHEETS

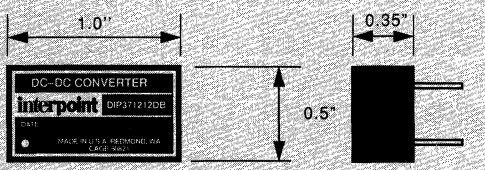
HI-REL INDUSTRIAL DC-DC CONVERTERS

DIP SERIES

- **Up to 1.5 watts output power**
- **Up to 82% typical efficiency**
- **Wide input voltage ranges**
- **14 pin DIP compatible package**

The DIP switching regulator series consists of units that operate over a wide input voltage range, over a wide range of loads, with high efficiency. They are ideal for battery applications or wherever high efficiency and small size are important. The output common is connected internally to the input common. They are encapsulated in plastic packages and will operate over an ambient temperature range of -20° to +70°C.

Note: External output capacitors are required.

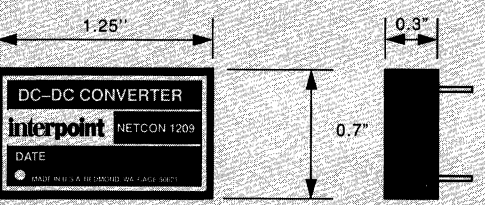


MODEL	VDC INPUT	OUTPUT VDC	EFF. %	MAX. WATTS	PRICE GROUP
DIP370505DP	3.0 to 7.0	+5 REGULATED/-5 UNREG.	75	1.25	D
DIP371205DP	3.0 to 7.0	+12 REGULATED/-5 UNREG.	75	1.25	E
DIP371212DP	3.0 to 7.0	+12 REGULATED/-12 UNREG.	75	1.25	
DIP371212DN	3.0 to 7.0	-12 REGULATED/+12 UNREG.	75	1.25	
DIP371212DB	3.0 to 7.0	±12 REG./BALANCE UNREG.	75	1.25	
DIP371515DB	3.0 to 7.0	±15 REG./BALANCE UNREG.	75	1.25	
DIP505SN	3.0 to 7.0	-5 REG. SINGLE OUTPUT	75	1.25	D
DIP1205SN	9.0 to 15.0	-5 REG. SINGLE OUTPUT	78	1.50	
DIP1205SP	9.0 to 15.0	+5 REG. SINGLE OUTPUT	78	1.50	
DIP120505DP	9.0 to 15.0	+5 REGULATED/-5 UNREG.	78	1.50	
DIP121212DB	9.0 to 15.0	±12 REG./BALANCE UNREG.	78	1.50	E
DIP121205DN	9.0 to 15.0	-12 REGULATED/+5 UNREG.	78	1.50	
DIP121515DB	9.0 to 15.0	±15 REG./BALANCE UNREG.	78	1.50	
DIP240505DP	16.0 to 32.0	+5 REGULATED/-5 UNREG.	72	1.50	D
DIP241212DP	16.0 to 32.0	+12 REGULATED/-12 UNREG.	82	1.50	E
DIP241212DN	16.0 to 32.0	-12 REGULATED/+12 UNREG.	82	1.50	
DIP241205DP	16.0 to 32.0	+12 REGULATED/-5 UNREG.	82	1.50	
DIP241212DB	16.0 to 32.0	±12 REG./BALANCE UNREG.	82	1.50	
DIP241515DB	16.0 to 32.0	±15 REG./BALANCE UNREG.	82	1.50	

NETCON SERIES

- **Cheapernet/Ethernet compatible**
- **Up to 1.25 watts output power**
- **24 pin DIP package**
- **-9 Vdc output**

Built to IEEE 803.2 CSMA/CD specifications, the NETCONs are intended for use with the AM7990 chip family offered by AMD for LAN applications. The rugged plastic 24-pin DIP package is rated for operation from -20° to +70°C ambient.

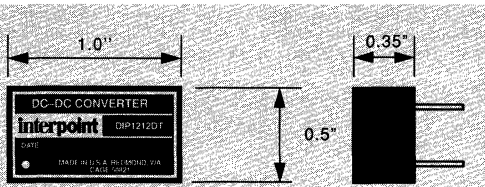


MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
NETCON 0509	5.0	-9	140	62	1.26	J
NETCON 1209	12.0	-9	140	68	1.26	

DIP_DT SERIES

- **Up to 1 watt output power**
- **Isolated, regulated outputs**
- **14 pin DIP compatible package**
- **5 input voltage ranges**

DIP_DT series converters can provide up to one watt of regulated, isolated output power. The ±12 Vdc and ±15 Vdc outputs are regulated by monolithic dual-tracking series regulators which provide good regulation and ripple characteristics. Also available as non-catalog standards are 5 Vdc Output models that provide up to 0.5 watts. The plastic encapsulated packages are rated for operation from -20° to +70°C ambient.



MODEL	VDC INPUT	OUTPUT @ FULL LOAD			MAX. WATTS	PRICE GROUP
		VDC	mA	EFF. %		
DIP512DT	4.5 to 5.5	±12.0	±42	52	1.0	C
DIP515DT	4.5 to 5.5	±15.0	±33	52	1.0	
DIP1212DT	10.8 to 14.0	±12.0	±42	55	1.0	
DIP1215DT	10.8 to 14.0	±15.0	±33	55	1.0	
DIP2412DT	20.0 to 28.0	±12.0	±42	55	1.0	
DIP2415DT	20.0 to 28.0	±15.0	±38	55	1.0	
DIP2812DT	24.0 to 32.0	±12.0	±42	55	1.0	
DIP2815DT	24.0 to 32.0	±15.0	±33	55	1.0	
DIP5012DT	44.0 to 56.0	±12.0	±42	55	1.0	
DIP5015DT	44.0 to 56.0	±15.0	±33	55	1.0	

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

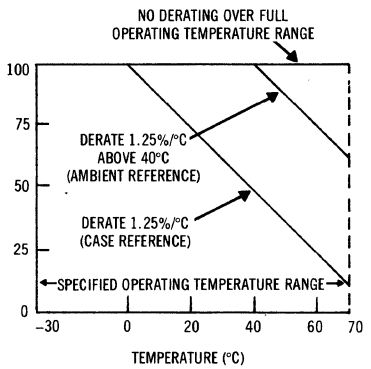


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

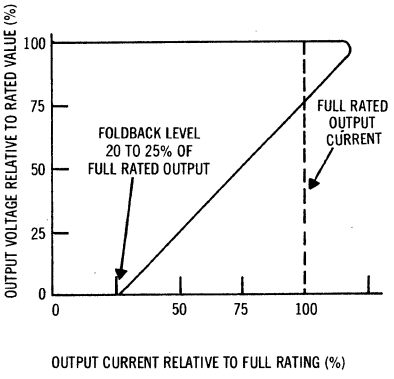


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

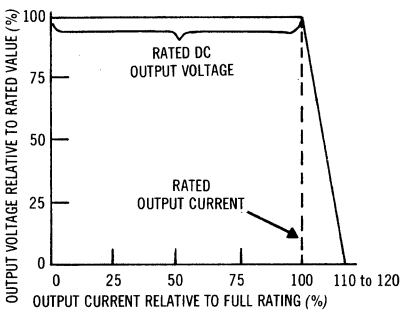


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

JEROME INDUSTRIES CORPORATION

POWER SUPPLIES/BATTERY CHARGERS/TRANSFORMERS

Made in the USA
DESIGNED
FOR THE WORLD

CUSTOM DESIGN COMPONENTS

This data is presented to show Jerome Industries Corporation's diversified line of products including UL & CSA Listed Items.

STANDARD DESIGN

One or more of the items shown in the charts may be suitable for your application. Our Customer Service Department can assist you with additional information.

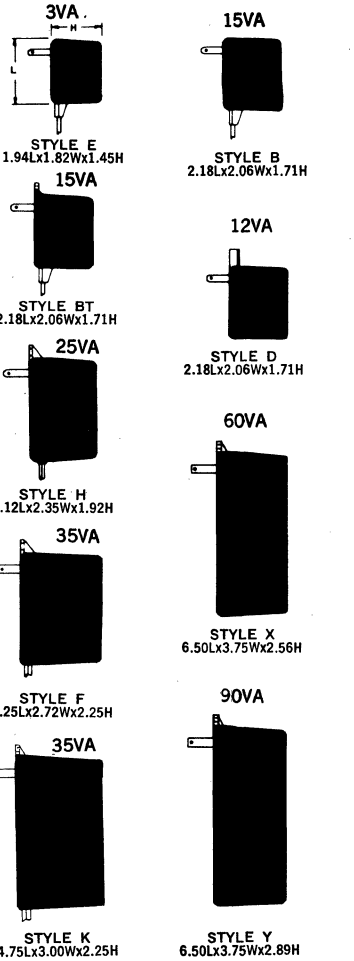
CUSTOM DESIGN

As you will note in these pages, Jerome Industries Corporation has many Case sizes and Output cords. Not shown are many transformers, P.C. Board Assemblies, and cord and plug types which we can modify to meet your specifications. After your review of our line of products, give our Customer Service Department your requirements and they will be pleased to have our Engineering Department design a unit to your specifications, and will quote you accordingly.

See Next Pages Of This Issue For Additional Product Information. Also See Transformer Section.

ENCLOSURES

HEAVY DUTY FIRE RETARDENT PLASTIC



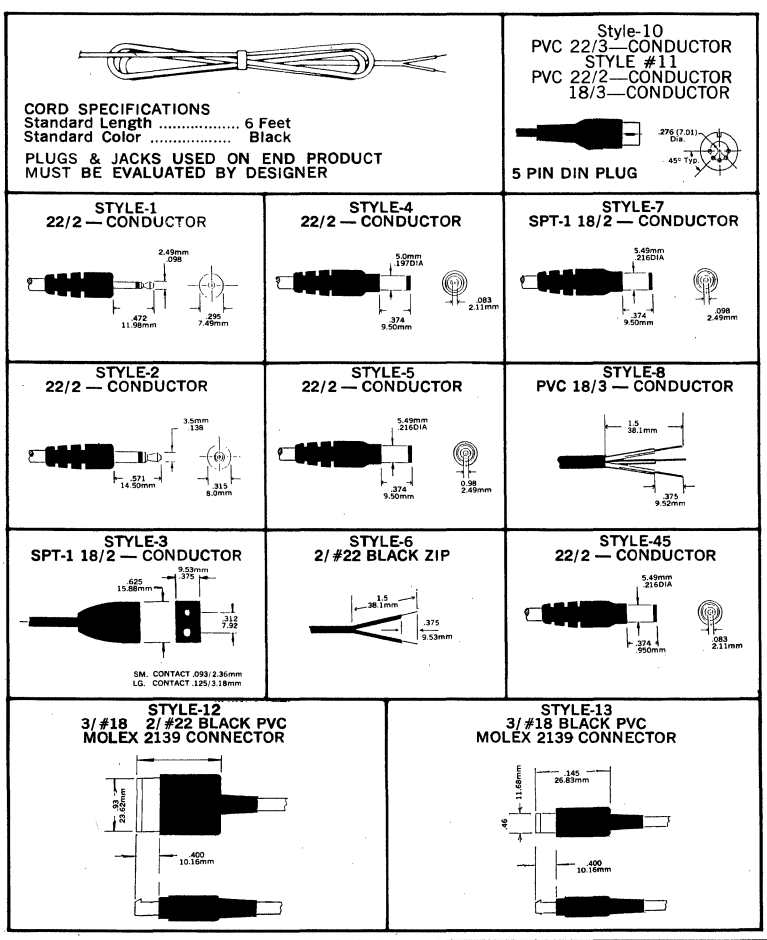
- The VA Rating Shown is for Transformers
- Housings Available as:
  - —Wall Plug-In or DeskTop
  - —With or Without Mounting Tab
  - —With Output Cordset or Screw Terminals

PLUG VARIATIONS FOR ALL HOUSINGS

POWER OUTPUT GUIDE—WALL PLUG IN AND DESKTOP POWER SOURCES

PRODUCT	CASE TYPE/POWER OUTPUT (VA)										
	E	D	B	H	J	F	G	K	M	X	Y
TRANSFORMER	2.5	12	15	20	20	34	34	45	45	60	90
POWER SUPPLY LINEAR FILTERED	1.5	5	7	15	15	25	25	35	35	50	75
POWER SUPPLY REGULATED	X	X	4	6	6	10	10	15	15	20	25
POWER SUPPLY MULTIPLE OUTPUT REGULATED	X	X	X	5	5	7	7	12	12	16	20
CONSTANT CURRENT BATTERY CHARGERS	1.5	6	7	15	15	25	25	35	35	40	45
GEL CELL CHARGERS	X	3	4	6	6	10	10	15	15	20	25

STANDARD CORDS AND PLUGS



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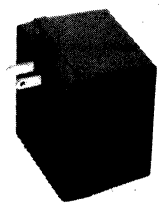
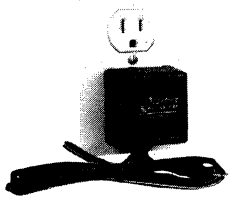
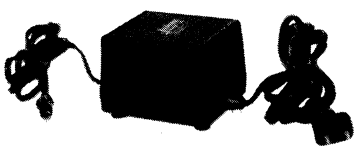
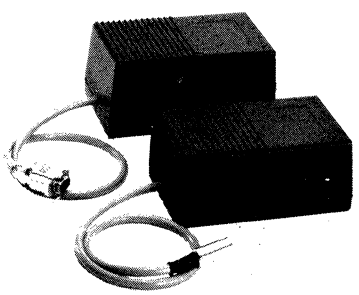
STANDARD AND CUSTOM DESIGNS

JEROME INDUSTRIES CORPORATION









All items made to U.L. specifications 478, 1310, 504, 516, 544 (Patient & Non Patient Connected), 694, 1012, 1235, 1411 and also equivalent C.S.A., V.D.E. IEC, TUV and other National and European specifications.

WALL PLUG-IN/DESKTOP STYLE/WALL MOUNTED

APPLICATIONS — Computers, Modems, Microprocessor Controlled Systems, Telecommunications, Operational Amplifiers, Computer Peripherals, Test Equipment, Security Systems, Multiplexers, Medical Equipment.

ELECTRICAL SPECIFICATION

INPUT:
120 VAC-50/60 Hz, 240 VAC-50/60 Hz, 120/240 VAC-50/60 Hz, Switchable.

OUTPUT:

TRANSFORMERS: Up to 90 Watts

POWER SUPPLIES:

Non Filtered-	
Non Regulated	Up to 60 Watts
Filtered only	Up to 45 Watts
Regulated	Up to 25 Watts
Multi Output	Up to 20 Watts
Switchers	Up to 60 Watts

BATTERY CHARGERS:
Ni-Cad Batteries Charge Rates of — C/10, C/5, C/1, Up to 45 VA Lead Acid/Gel Cells — Fixed & Automatic Dual Voltage

MECHANICAL SPECIFICATION

WALL PLUG-IN/WALL MOUNTED/DESKTOP

- Standard Cords For Output, or to Customer Specifications
- Screw Terminal Output On Various Styles
- Customer Logo can be Applied
- Variety of Case Colors Available
- European Style Plug-In Configuration
- On & Off Switch
- Pilot Light

See Next Pages Of This Issue For Additional Product Information Also See Transformer Section

POWER SUPPLIES—UNREGULATED

Partial Listing—Others Available

Part No.	Output Vdc	Output Idc	VA	Case Size	UL	CSA
PIDE-9A	9	0.1	0.9	E	YES	YES
PIDB-15	9	0.2	1.8	B	YES	YES
PIDB-15B	9	0.25	2.5	B	YES	YES
PIDB-28	9	0.5	4.5	B	YES	YES
PIDB-112	9	0.6	5.4	B	YES	YES
PIDH-16	9.5	0.9	8.5	H	YES	YES
PIDH-26	10.5	0.75	8.1	H	YES	Yes
PIDE-110	12	0.1	1.2	E		
PIDB-204	12	0.3	3.6	B	YES	
PIDB-205	12	0.5	6	B	YES	
PIDH-104	12	0.65	8	H	YES	
PIDH-108	12	1	12	H	YES	
PIDF-24	12	1.75	21	F	YES	
PIDK-3	12	2	24	K	YES	
PIDH-105	15	0.85	13	H	YES	
PIDB-163	16	0.33	5.5	B	YES	
PIDB-207	18	0.25	4.5	B	YES	
PIDH-106	18	0.71	13	H	YES	
PIDH-92	21.8	0.32	7.2	H	YES	
PIDH-107	24	0.50	12	H	YES	
PIDH-4	+8 −8	1.0 0.1	8.8	H	YES	
PIDB-184	±9	0.1	0.9	B	YES	
PIDH-9	+12 −12	0.5 0.15	7.8	H	YES	YES
PIDF-14	±14	0.3	5.2	F	YES	
ILDX-6	6	4	24	X		
ILDF-37	7.5	2.2	16.5	F		
ILDX-9	9	3	27	X		
ILDX-14	12	3	36	X		
ILDY-12	12	4	48	Y		
ILDX-20	18	2	36	X		
ILDY-24	24	2	48	Y		

FEATURES—ALL TYPES

Available electrical and mechanical features to enhance the appearance or working capability of plug-in adapters.

- Screw Terminals, Styles D, J, G, & M
- Cord & Plug assemblies to Customer Specs.
- On & Off Switch
- Multi Volt Switch for Dual Input
- Pilot Light
- Regulated Output
- Others to Specific Customer Requirements
- All Units can be designed to U.L. &/or CSA Requirements.
- Molded Cases have dual tapered surface for positive push-pull grip.
- Case available in a variety of colors to match your product.
- Your personal Hot Leaf stamped Logo or Trademark enhance the case appearance.

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JEROME INDUSTRIES CORPORATION

POWER SUPPLIES
REGULATED

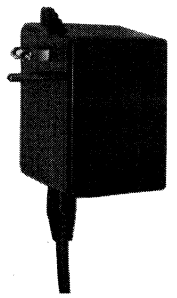
Made in the USA
DESIGNED
FOR THE WORLD

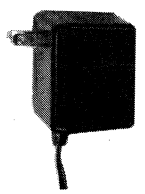
WE CUSTOMIZE TO YOUR REQUIREMENTS

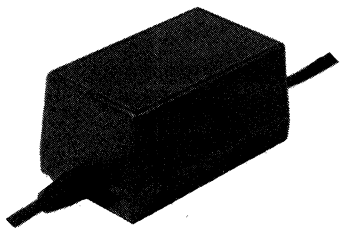
REGULATED POWER SUPPLIES

SPECIFICATIONS

—Input Range 105-130 VAC 60 Hz or 220-240V
—Output LIne-Load Regulation 5%
—Rated for Continuous Duty
—0°-40°C Operating Ambient
—Each Output Max 10 MV(RMS) Ripple
—AC Dielectric strength 1500 VRMS for One Minute Between Primary and Secondary Windings







Partial Listing—Others Available

Part No.	Output Vdc	Output Idc	VA	Case Size	UL	CSA
PIDB-218	5	0.1	0.5	B	YES	YES
PIDB-203	5	0.4	2	B		
RH101L	5	0.7	3.5	H	YES	
RH110F	5	1.0	5	H	YES	
RK101F	5	1.4	7	K	YES	
RK110F	5	2.0	10	K		
PIDB 216	9	0.25	2.5	B		
RH104L	9	0.6	5.4	H	YES	
RK104F	9	1.0	9	K		
PIDB-201	12	0.3	3.6	B	YES	
RH102L	12	0.5	6	H	YES	
RK102F	12	1.0	12	K		
RH105L	15	0.45	7.5	H	YES	
RK105F	15	0.9	13.5	K		
RK103F	24	0.5	12	K		
RK109F	48	0.25	2.4	K		
RH201L	+5 −5	0.15 0.15	1.5	H		
RH210L	+5 −5	0.35 0.35	3.3 3.5	H		
RK206F	+5 −5	1.2 0.5	8.5	K		
PIDH-50	+12 −12	0.2 0.2	4.8	H	YES	YES
PIDH-36	+12 −12	0.35 0.1	5.4	H	YES	YES
RK202F	+12 −12	0.5 0.5	12	K		

Part No.	Output Vdc	Output Idc	VA	Case Size	UL	CSA
RK221F	+5 +12	1.2 0.3	9.6	K		
RKD101F	5	1.4	7.0	K	YES	YES
RKD110F	5	2.0	10	K		
RXD101F	5	3.0	15	X		
RYD101F	5	3.5	17.5	Y	YES	
RKD104F	9	1.0	9	K	YES	YES
RXD104F	9	1.7	15.3	X		
RYD104F	9	2.2	19.8	Y	YES	
RKD102F	12	1.0	12	K	YES	YES
RXD102F	12	1.6	19.2	X		
RYD102F	12	2.0	24	Y	YES	
RKD105F	15	0.9	13.5	K		
RXD105F	15	1.3	19.5	X		
RYD105F	15	1.6	24	Y	YES	
RXD106F	18	1.0	18	X		
RYD106F	18	1.25	22.5	Y		
RKD103F	24	0.5	12	K		
RXD103F	24	0.75	18	X		
RYD103F	24	1.0	24	Y		
RXD108F	35	0.5	17.5	X		
RYD108F	36	0.1	3.6	Y		
RXD109F	48	0.4	19.2	X		
RYD109F	48	0.5	24	Y		
RKD206F	.+5 −5	1.2 0.5	8.5	K		
RXD201F	+5 −5	2.5 0.5	15	X		

Part No.	Output Vdc	Output Idc	VA	Case Size	UL	CSA
RYD22F	+12 +5	1.5 0.75	21.75	Y		
RXD233F	+12 +5	1.0 1.0	17	X		
RYD233F	+12 +5	1.0 1.5	19.5	Y		
RKD202F	+12 −12	0.5 0.5	12	K		
RXD212F	+12 −12	1.0 0.5	18	X		
RYD212F	+12 −12	1.5 0.5	24	Y		
RYD232F	+12 −12	1.0 1.0	24	Y		
RKD201F	+5 ±12	0.5 0.15	4.3	K	YES	YES
RKD307F	+5 ±12	1.0 0.20	8.6	K	YES	YES
RKD302F	+5 +12 −12	0.75 0.3 0.1	8.5	K	YES	YES
RKD308F	+5 ±12	0.75 0.120	5.5	K	YES	YES
RKD305F	+5 ±12	1.5 0.2	12.3	K	YES	YES
RKD304F	+5 ±15	1.0 0.2	11.0	K		
RXD301F	+5 ±12	2.0 0.25	16	X		
RYD302F	+5 ±12	2.0 0.35	17.1	Y	YES	
RYD301F	+5 ±12	2.5 0.25	21	Y	YES	

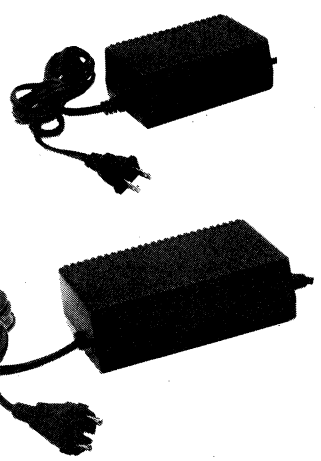
SWITCHING POWER SUPPLIES

STANDARD FEATURES

Input:
- Voltage: 90-130 VAC, 47-63 HZ.
- Ground available.

Output:
- Operating temperature: 0° to 40°C.
- Continuous Duty.
- Combined Regulation: 5% Max.
- No minimum load required for regulation.
- Output Ripple: 50 MV P-P max.
- Transient Response: 100 microseconds for 50% load change typical.
- Overcurrent and Short Circuit protected.
- Auto reset from overcurrent.
- Holdup Time: 32 MSec min at 120 VAC.
- Conducted EMI: meets FCC Class B. Radiated EMI: designed to FCC Class B.

See Next Pages Of This Issue For Additional Product Information Also See Transformer Section



Partial Listing—Others Available

WALL PLUG-IN	DESKTOP	CASE	VDC	IDC
SL101	SLD101	L	5.0	4.0
SZ101	SZD101	Z	5.0	8.0
SL102	SLD102	L	12.0	2.0
SZ102	SZD102	Z	12.0	4.0
SL105	SLD105	L	15.0	1.6
SZ105	SZD105	Z	15.0	3.2
SL103	SLD103	L	24.0	1.0
SZ103	SZD103	Z	24.0	2.0
SL130	SLD130	L	30.0	.8
SZ130	SZD130	Z	30.0	1.6
SL109	SLD109	L	48.0	.5
SZ109	SZD109	Z	48.0	1.0

OPTIONAL INPUT VOLTAGES AVAILABLE

Nominal	Range
220 VAC	180-260 VAC
*Wide Range	90-260 VAC
*24 VDC	18-36 VDC
*48 VDC	36-72 VDC

*Derate output current to approximately 75% for these input options.

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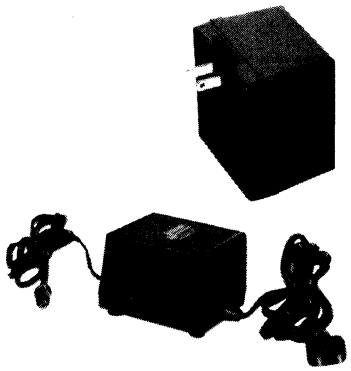
BATTERY CHARGERS

JEROME INDUSTRIES CORPORATION

WE CUSTOMIZE TO YOUR REQUIREMENTS

BATTERY CHARGERS—NI-CAD

The Ni—Cad battery chargers shown on chart, show the C/10 charge rate usually recommended. At this rate the batteries will take 14-16 hrs to charge. At the rated current, C/5 & C/3 rates can be applied to batteries under controlled time conditions. Jerome also designs special chargers at customer request.



Partial Listing—Others Available

Part No.	Charge Volts D.C.	Charge Current M.A.	Nickel Cadmium Battery		Case	UL	CSA
			Cell Type	No. of Cells			
PICE-17	4.5	10	AA-.1AH	3	E	YES	YES
PICE-37	5.8	10	AA-.1AH	4	E	YES	YES
PICE-46	5.8	25	AA-.25AH	4	E	YES	
PICE-34	6.0	35	AA-.35AH	4	E	YES	YES
PICE-33	8.7	9	AA—.09AH	6	E	YES	YES
PICE-80	7.2	50	AA-.5AH	5	E	YES	
PICE-40	8.7	50	AA-.5AH	6	E	YES	
PICE-99	2.9	120	SUB C-1.2AH	2	E	YES	
PICE-53	4.5	150	SUB C-1.5AH	3	E		
PICE-59	5.8	150	SUB C-1.5AH	4	E	YES	
PICB-43	9.0	150	SUB C-1.5AH	6	B	YES	
PICE-70	11.6	70	SUB C-.7AH	8	E	YES	
PICE-21	12.0	100	SUB C-1.0AH	8	E	YES	
PICB-134	14.5	150	SUB C-1.5AH	10	B	YES	
PICB-121	6.5	300	D-3AH	4	B	YES	
PICB-111	7.5	375	D-3.75AH	5	B	YES	
PICB-138	8.7	300	D-3.0AH	6	B		YES
PICB-132	12.0	400	D-4.0AH	8	B		
PICB-143	6.0	200	D-2.0AH	4	B		
PICB-140	8.7	200	D-20AH	6	B	YES	
PICB-10	14.5	200	D-2.0AH	10	B	YES	

All types of fast chargers available

BATTERY CHARGERS—GEL CEL—LEAD ACID

CYCLIC DESIGNS
(Automatic Dual Voltages)

- Will rapidly recharge batteries without danger of overcharge
- Should be used when batteries are repeatedly being discharged and recharged
- Allow remote product use because charger is not connected to battery during discharge. Typically used for portable instrumentation

FLOAT DESIGNS
(Fixed Voltage)

Provide optimum battery life in standby applications. Will maintain fully charged battery at a constant voltage, used typically in the event of power failure or when charger is always connected to battery during discharge. Can be used as a power supply and charger at the same time.

FLOAT CHARGERS — **Partial Listing—Others Available**

WALL PLUG-IN	DESKTOP	CASE	CELLS	END OF CHARGE VOLTAGE	AVERAGE CHARGE CURRENT-A
PICH-202	ILCH-202	H	3	6.9	.70
PICK-202	ILCK-202	K	3	6.9	1.50
PICH-204	ILCH-204	H	6	13.8	.50
PICK-204	ILCK-204	K	6	13.8	1.00
—	ILCY-204	Y	6	13.8	2.00

DUAL MODE—GEL CELL CHARGERS

WALL PLUG-IN	DESKTOP	CASE	CELLS	END OF CHARGE VOLTAGE	HIGH CHG STATE VOLTAGE	AVERAGE CHARGE CURRENT-A
PICH-206	ILCH-206	H	3	6.9	7.2	.7
PICK-206	ILCK-206	K	3	6.9	7.2	1.5
PICH-208	ILCH-208	H	6	13.8	14.4	.5
PICK-208	ILCK-208	K	6	13.8	14.4	1.0
—	ILCY-208	Y	6	13.8	14.4	2.0

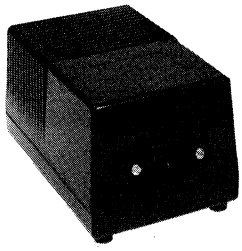
DUAL MODE—SEALED LEAD ACID CHARGERS

WALL PLUG-IN	DESKTOP	CASE	CELLS	END OF CHARGE VOLTAGE	HIGH CHG STATE VOLTAGE	AVERAGE CHARGE CURRENT-A
PICH-210	ILCH-210	H	3	6.9	7.50	.7
PICH-212	ILCH-212	H	6	13.8	15.00	.5
PICK-210	ILCK-210	K	3	6.9	7.50	1.5
PICK-212	ILCK-212	K	6	13.8	15.00	1.0
—	ILCY-212	Y	6	13.8	15.00	2.0

INTERNATIONAL DESIGNED WALL PLUG-IN AND DESKTOP PRODUCTS

EUROPE — IEC DESIGN — ASIA

- Power Supplies—Regulated/Unregulated/Switching
- Battery Chargers—Ni-Cad/Gel Cell/Lead Acid
- Transformers—Adapters/Converters



STANDARD FEATURES

- **Operating Temperature: 0°–40°C**
- **Combined Regulation: ±5%**
- **Output Ripple: 10MV RMS Max Each Output**
- **Short Circuit and Overload Protection**
- **No Minimum Load Required for Regulation**
- **Designed to IEC Specifications**
- **Switchable Input Units are also Designed to UL and CSA Specifications**
- **Input Mode—IEC 320 Jack**

See Next Pages Of This Issue For Additional Product Information Also See Transformer Section

POWER SUPPLIES — **Partial Listing—Others Available**

PRODUCT	CASE SIZE	INPUT VOLTAGE RANGE	INPUT FREQUENCY	VDC	IDC	TUV-EC	UL	CSA
EKD101L	K	200-260	50	5.0	.80	—	—	—
EKD151L	K	100-130 200-260	50/60	5.0	.70	YES	YES	YES
EXD151L	X	85-132 170-264	50/60	5.0	.85	YES	YES	YES
EXD101F	X	200-260	50	5.0	1.25	YES		
EXD110F	X	200-260	50	5.0	2.00			
EYD101F	Y	200-260	50	5.0	2.50			
EYD151F	Y	100-130 200-260	50/60	5.0	2.50			
EXD104L	K	200-260	50	9.0	.70			
EKD154L	K	100-130 200-260	50/60	9.0	.60			
EYD104L	Y	200-260	50	9.0	1.5			
EKD102L	K	200-260	50	12.0	.5			
EKD152L	K	100-130 200-260	50/60	12.0	.3			
EXD102F	X	200-260	50	12.0	1.0	YES		
EYD102F	Y	200-260	50	12.0	1.5			
EXD305F	X	200-280	50	5.0 12.0 −12.0	1.5 .20 .20	YES		
EXD306F	X	200-260	50	5.0 12.0 −12.0	1.5 .10 .10	YES		
EXD353F	Y	100-130 200-260	50/60	5.0 12.0 −12.0	1.5 .12 .12		YES	YES

*Auxillary mounted AC output available.

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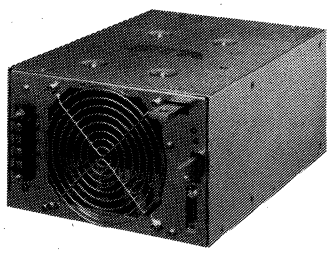
JETA HIGH CURRENT POWER SUPPLIES 500 to 3000 WATTS

500 to 3000W SINGLE

POWER	OUTPUT RATINGS (max) CURRENT	OUTPUT RATINGS (max) VOLTAGE	INPUT VAC	CASE SIZE	MODEL
500W 800W 1000W 1200W	100A 160A 200A 240A	2 to 48 VDC	115/230 1Ø	5"x8"x10"	A501 A801 A1001 A1201
1500W 1800W	300A 360A		115/230 1 or 3Ø	5"x8"x11"	G1501 G1801
2000W	400A		230, 1Ø OR 208, 3Ø	5"x8"x11"	L2001
3000W	600A			5"x8"x13.5"	M3001



CASE L

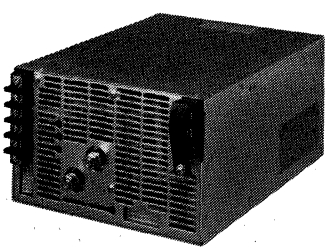
500 to 700W MULTI

POWER	OUTPUT RATINGS (max) V1	V2	V3	V4	INPUT VAC	CASE SIZE	MODEL
	2 to 24VDC						
500W	60A 300W	10A 150W	5A 100W	3A 72W	115/230 1Ø	5"x8"x10"	B500
700W	100A 500W	10A 240W	7A 168W	5A 100W			B700

CASE B

1000W to 1200W PFC MULTI

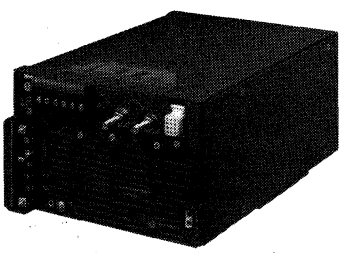
POWER	OUTPUT RATINGS (max) V1	V2	V3	V4	INPUT VAC	CASE SIZE	MODEL
	2 to 24VDC						
1000W	150A 750W	30A 360W	15A 175W	15A 100W	90-264 1Ø	5"x8"x11"	N100
1200W	180A 800W	40A 480W	20A 240W	20A 240W			N1200



CASE N

750W MULTI with BATTERY BACKED MODULE

POWER	OUTPUT RATINGS (max) V1	V2	V3	V4	INPUT VAC	CASE SIZE	MODEL
	2 to 24VDC			2-48V			
750W	120A 600W	20A 150W	5A 75W	1A 24W	115/230 1Ø with 48VDC	5"x8"x13"	H750



CASE H

CUSTOM PRODUCTS

Jeta's standard product design and production capability is equally reflected in its custom products. Call or fax Jeta for a quotation on your unique custom design or modified standard product.

JETA POWER SYSTEMS, INC.
2675 Junipero Avenue ■ Signal Hill, CA 90806 ■ 213/427-0095 ■ FAX: 2134262417

DISTINGUISHING FEATURES & BENEFITS OF JETA HIGH CURRENT POWER SUPPLIES

500 to 3000 WATTS:

A wide choice in high current DC power supplies enables you to minimize over-specification and make a selection closest to the applications needs. Models are available with 500, 800, 1000, 1200, 1500, 1800, 2000 and 3000 watt outputs in single output configurations.

ONE to FOUR OUTPUTS:

Your system's multiple DC voltage needs may be satisfied with a main output channel and selection of up to three auxiliary outputs. A variety of power levels for the main and auxiliary outputs, from 180 amps down to 3 amps, are available.

CURRENT to 600 AMPS and MORE:

High current needs may probably be satisfied in only one package but, should higher currents be needed, all JETA power supplies are automatically parallelable and capable of operation in fault tolerant (N+1) systems.

POWER FACTOR CORRECTION:

Some JETA products have PFC such as the 1000 watt four output model. It meets the proposed IEC harmonics standard 555-2 and UL requirements for a maximum line current of 12A from a 15A, 115V service. The PFC line conditioner changes the high current pulses into a sinusoidal waveform in phase with the line voltage, thus reducing rms line current and harmonics.

BATTERY BACKED MODULE:

A 750 watt battery backed module integrates JETA's proven high current multiple output switcher design with a dual-stage battery charger and a boost converter. Driven by a 48 volt battery it delivers highly reliable power even during brownouts and blackouts. And, you have unrestricted battery operation time. Nice.

INTERFACE SIGNALS and CUSTOMIZATION:

A variety of standard interface signals that are costly options elsewhere are provided enabling greater system utility. These include: power fail detection; remote inhibit; current monitor; remote programming; remote voltage adjust; and DC OK. In fact, JETA can fashion to your particular needs; OVP actuated,logic inverses or even reverse air flow. JETA can also start at the foundation and make electrical and mechanical modifications.

RELIABILITY THROUGH DESIGN:

JETA focuses on achieving the highest reliability in commercial and industrial products through: a unique hybrid thermal design (patent pending) that maintains the lowest component-to-ambient temperature gradient; a MOSFET based switching design that reduces the component count; high voltage transistor reshaping for safe area operation; fault tolerant design that provides protection for the system and the power supply; and the use of well established, conservative half-bridge, full-bridge and forward converter circuit designs. All ensure that the highest attainable reliability is replicated throughout the entire product line.

RELIABILITY THROUGH MANUFACTURING:

Reliability is not only a priority; it is ***the*** priority. JETA practices design for manufacturability (DFM) principles while designing its products and continuously monitors processes via statistical process controls (SPC) to intercept any undesirable trends on a real time basis.

STRESS TESTING:

Each unit is subject to our in-house vigorous stress tests. They consist of turning the unit on into short circuit and no-load conditions and shorting the outputs after the unit is on and loaded. This verifies the effectiveness of the circuitry and quality of components under abnormal conditions.

BURN-IN and GUARANTEE:

All products undergo a 24 hour cyclical burn-in prior to shipment. Infant mortality is eliminated, thus insuring that the most reliable product is delivered to you. And then, JETA guarantees the product for two full years for parts and labor. You will find no double standard, but one unvarying, inflexible standard for reliability.

PROTECTION and SAFETY CERTIFICATION:

Protective features for both the power supply and the system include overvoltage, thermal, overload, no-load, in-rush current, line fusing, AC ground termination, output isolation, brown-out, open and reverse sense leads and reverse voltage protection. In addition, JETA complies with the safety requirements of UL, CSA, IEC and VDE enabling the OEM speedy certification.

These are but a few of an impressive list of features and benefits. Match Jeta's specifications with your own needs. Discuss them with JETA engineers. Then see if JETA can't best meet those needs.

Call or fax for Jeta's complete data sheets.

JETA POWER SYSTEMS, INC.
2675 Junipero Avenue ■ Signal Hill, CA 90806 ■ 213/427-0095 ■ FAX: 2134262417

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

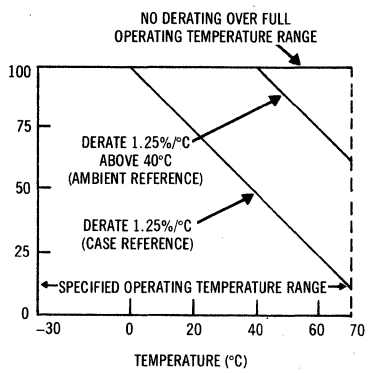


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

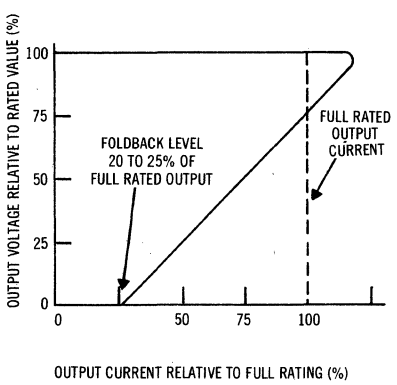


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

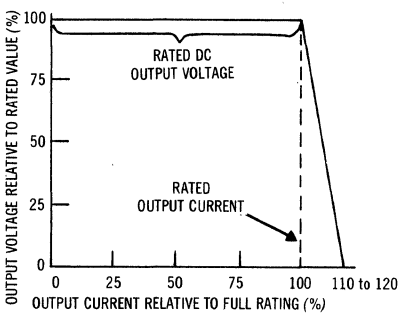


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

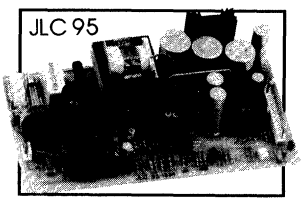
Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

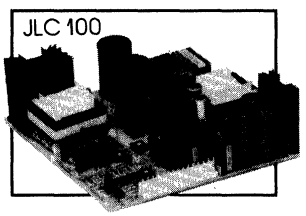
HIGH PERFORMANCE OEM POWER SUPPLIES

We've got the power

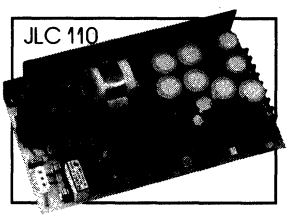
At Joule Power, we've got the power supplies to meet your needs. We use only high quality components and employ advanced design techniques which demand fewer parts for a clean layout. We offer a variety of configurations for multiple applications and flexibility.



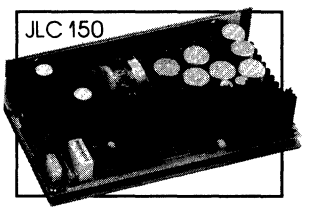
Input: 110 VAC / 220 VAC
Strappable
Size: 7.75" x 4.25" x 2.0"



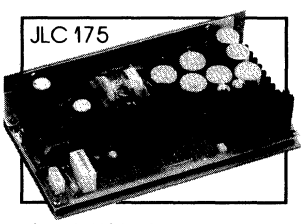
Input: 110 VAC / 220 VAC
Strappable, 12 VDC
Size: 6.0" x 6.5" x 2.0"



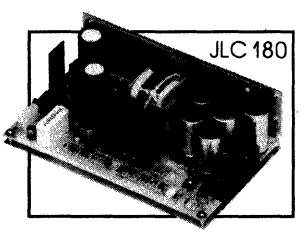
Input: 110 VAC / 220 VAC
Strappable
Size: 9.5" x 4.75" x 2.0"



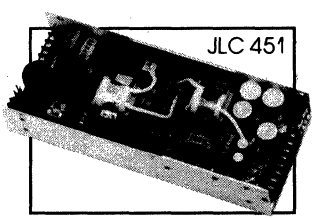
Input: 110 VAC / 220 VAC
Strappable
Size: 9.5" x 5.0" x 2.5"
w / cover: 9.5" x 5.0" x 2.7"



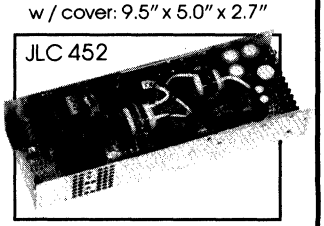
Input: 110 VAC / 220 VAC
Strappable
Size: 9.5" x 5.0" x 2.5"
w / cover: 9.5" x 5.0" x 2.7"



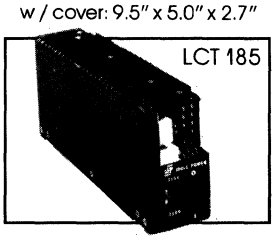
Input: 110 VAC / 220 VAC
Strappable
Size: 8.0" x 5.0" x 2.5"



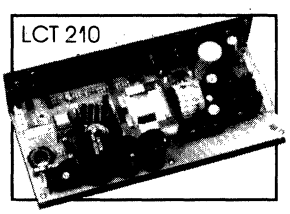
Input: 110 VAC / 220 VAC
Strappable
Size: 12.5" x 5" x 2.5"



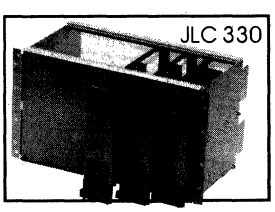
Input: Auto Ranging,
85 – 264 VAC
Size: 14.0" x 5.0" x 2.5"



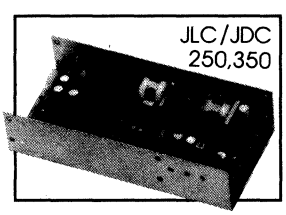
Input: 110 VAC / 220 VAC
Strappable
Size: 10.0" x 4.40" x 2.4"
w / cover: 10.15" x 4.45" x 2.54"



Input: 110 VAC / 220 VAC
Strappable
Size: 10.5" x 4.8" x 2.65"



Input: 110 VAC / 220 VAC
Strappable, 48 VDC
Rack mount
Size: 6U high x 220mm
deep x 12 HP wide



Input: 110 VAC / 220 VAC
Strappable, 48 VDC
Size: 10.5" x 5.0" x 2.5"

Joule Power has the ability to tailor all our standard products to meet various requirements of our customers, such as:

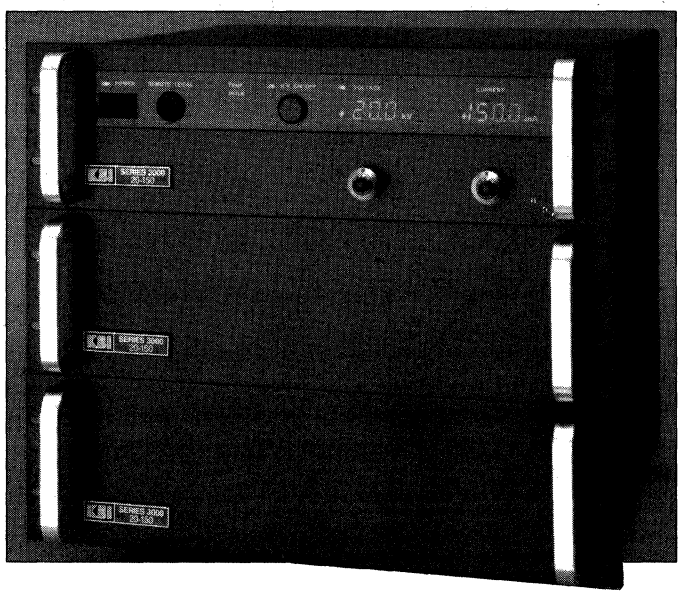
- Output Voltages from 5V to 48V
- Single or Multiple Outputs
- Auto Ranging Inputs
- UL 544 (Non Patient Connect)
- Power Factor Correction
- On/Off Switch
- Redundant Rack Mount Supplies (N+1 with Current Sharing)
- 2-Year Warranty

For more information call:

Joule Power, Inc.

Joule Power, Inc.
Joyce Industrial Park
Summer Road
Boxborough, MA 01719
(508) 263-9712
FAX (508) 263-9071

High Voltage Power Supplies



Reliable Power from the Reliable Source®

Kaiser Systems, Inc. designs, builds, and sells high performance, highly reliable power supplies that are engineered to protect themselves and the systems they power. From initial concept through prototype and production units, our employees are concerned with more than just the specs. **Quality, Performance, Cost,** and **Delivery** are also part of the design.

Quality starts with good people doing a good job. Designing reliable circuits that utilize high quality components. Adhering to stringent QA standards in manufacturing. Making sure that each and every KSI power supply meets or exceeds the published specs.

Performance depends on how well the design is thought out. Is the circuit optimized? Have all fault conditions been considered? Can it be manufactured consistently? At KSI, performance means the product still conforms to the original specs, long after the warranty runs out.

Cost to manufacture is a function of application, design, production methods and quality control. Cost to the customer is the sum of acquisition and ownership expenses. KSI produces products knowing that cost must be in relation to value, and that the customer must get the best value possible for the amount spent.

Delivery is just as important as product performance. Without it there's nothing but excuses. At KSI, our MRP II operates at Class A level. That means we know what we're doing, when we're doing it and, most importantly, how we're doing it. It also means we have an on-time delivery record of 98%!

When we say Reliable Power from the Reliable Source®, we mean it. Try us!

KSI Kaiser Systems, Inc.

126 Sohier Road, Beverly, MA 01915 • Phone: (508) 922-9300 • FAX: (508) 922-8374

Selection Guide High Voltage Power Supplies

Selecting the right HV power supply for a specific application requires careful consideration of many parameters. The following table, which compares the performance characteristics of several types of power supply technologies, will help in selecting the appropriate choice for your application. Note that the shaded areas indicate the optimum condition for each appropriate parameter.

	LINE FREQUENCY			HIGH FREQUENCY SWITCHING		
Design Parameters	**Unregulated**	**Input Regulated**	**Output Regulated**	**PWM**	**Series Resonant**	**Quasi Resonant**
Frequency	50 Hz to 400 Hz	50 Hz to 400 Hz	50 Hz to 400 Hz	20 kHz to 50 kHz	10 kHz to 20 kHz	20 kHz to 30 kHz
Output Voltage	to 300 kV	to 300 kV	to 200 kV	to 300 kV	to 500 kV	to 300 kV
Power Level	to 200 kW	to 200 kW	1 kW to 150 kW	to 12 kW	to 70 kW	to 10 kW
Regulation	N/A	variable tranformer or SCR control	series pass vacuum tube on output	pulse width modulation	frequency or phase modulation	pulse width and pulse amplitude modulation
Stored Energy[1]	high	high	lowest[2]	low	low	low
Current Limit Turnoff Time ΔT	≥ 10 ms	≈ 10 ms	< 1 μs[3]	≈ 0.1 ms	≈ 0.5 ms	≈ 0.1 ms
Transient Response	N/A	slow	very fast	medium	medium	medium
EMI	very low	low/medium	very low	high	medium	medium
Efficiency	≈ 95%	≈ 90%	75 to 90%	≈ 85%	≈ 80%	≈ 80%
Parts Count	lowest	low	low	high	high	medium
Size per Watt	large	large	large	small	small	small
Cost per Watt	low	low/medium	high	medium	medium	medium
Insulation Mediums	air, oil, SF_6			air, oil, encapsulation, SF_6		

1. Stored energy at the output is due to the output filter capacitor. Lower filter requirements (higher ripple) reduce the stored energy within any one type of design.
2. A series pass vacuum tube isolates internal capacitor stored energy from the load.
3. Prevents system damage from surges.

Choose your supplier as carefully as you choose your supplies. Ask yourself the following: are the designs modern, efficient, and reliable? Does your supplier care as much about quality as you do? Will delivery be on time? Will the power supply remain reliable over time? At KSI the answer is yes.

The High Voltage Power Supplies That Work®

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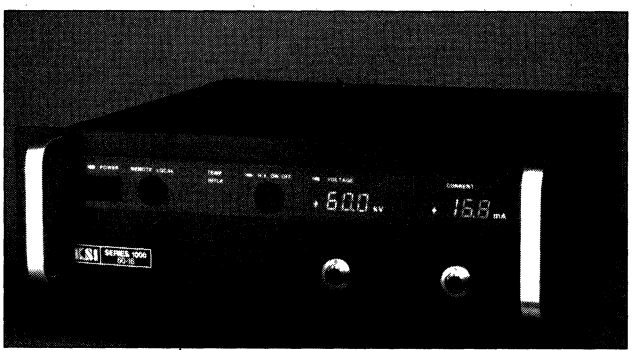
126 Sohier Road, Beverly, MA 01915 • Phone: (508) 922-9300 • FAX: (508) 922-8374

Standard High Voltage Power Supplies



The SERIES 1000 answers user needs for a multi-purpose, laboratory grade HV power supply with superior performance and unprecedented reliability.

Benefits:

High Frequency Switching Design
- Low stored energy for operator and equipment safety
- High efficiency and minimal heat dissipation
- Reduced size of internal components for smaller overall size
- Air-insulated for the lowest possible weight

Advanced Quasi-Resonant Inverter
- Greater reliability due to fewer components
- Better output regulation through optimized design
- Withstands minor fault conditions without system shut-down
- Control linearity with zero over-shoot
- Open and short circuit protected

Standard Features
- Constant voltage/constant current with automatic crossover and current limiting
- Full programming and monitoring from front panel or remote control
- Digital panel meters for voltage and current
- Soft start
- Self locking primary contactor
- Thermal overload protection
- Typical efficiency greater than 80%
- 5 year warranty

Optional Features
- OEM/Remote configuration
- Slaved bipolar operation
- IEEE-488 and RS-232C interface
- 220 Vac 50/60 Hz input

Performance Specifications Summary
- Voltage regulation: load and line better than ±0.005%
- Current regulation: load better than 100 microamps; line better than ±0.005%
- Ripple better than 0.1% rms, full load, dc to 100 kHz
- Stability better than 0.01% per hour, 0.05% per 8 hours, after ½ hour warm-up
- Transient response better than 3 ms with no overshoot, no load to full load change

Request Technical Specifications sheets for detailed specifications.

SERIES 1000 Standard Models

Output Voltage	Output Power (Watts)	Panel Height (Inches)
Choose from standard rated outputs: 5, 10, 20, 40, 60, 80, or 100 kV Negative or positive polarity	500	5¼
	1000	5¼
	2000	10½
	3000	15¾

All models have continuously adjustable voltage and current from zero to full rated output.

Request SERIES 1000 Technical Specifications Sheet for specific model numbers and rated outputs.

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Standard High Voltage Power Supplies

SERIES 5000
3 kW and 5 kW Models

The SERIES 5000 sets new standards for compact size and high performance in medium power high voltage supplies:

- Models available with outputs from 1 kV to 60 kV at 3 kW or 5 kW continuous power ratings
- All models only 5-1/4 inches high in a standard 19 inch rack mount design
- Stable, well regulated output
- High immunity to noise, EMI, transients
- Extensive fault protection for dependable operation

Features

- Advanced high frequency switchmode design with low stored energy
- Constant voltage/constant current with automatic crossover
- Open and short circuit protected
- Arc-over protected
- Full front panel controls with digital meters
- Complete remote control and monitoring

Optional Features

- Constant power
- Parallel operation for increased output power
- ArcQuench™ arc suppression circuitry
- Adjustable overload trip
- Low output ripple (0.05% peak-to-peak)
- EMI filter
- OEM/Remote configuration for remote-only operation

Performance Specifications Summary

- Input: 187-264 Vac, three phase, 50/60 Hz
- Voltage and current regulation better than ±0.01%
- Ripple less than 0.1% peak-to-peak
- Stability better than 0.01% per hour, 0.05% over 8 hours, after one-half hour warm-up
- Temperature coefficient better than 0.01% per °C
- Efficiency better than 85%

Contact KSI for detailed model and specification data.

SERIES 6000
6 kW and Higher

The SERIES 6000 is a family of highly reliable, high performance dc power supplies with output power ratings of 6 kW and higher. Customized for each application, they are the best choice for your toughest application.

- Output voltages from 50 V to 200 kV
- Modular design for packaging flexibility and compact size
- Tight regulation, low drift operation
- Extensive fault protection for long-term dependability

Features

- Advanced high frequency switchmode design
- Low stored energy
- Separate converter and output chassis for installation flexibility
- Fully protected against fault conditions
- Control and monitoring per customer requirements
- ArcQuench™ arc suppression circuitry

Typical Specifications

- Voltage and current regulation better than ±0.01%
- Ripple less than 0.05% peak-to-peak
- Stability better than 0.01% per hour, 0.05% over 8 hours, after one-half hour warm-up
- Forced air or water cooling

Contact KSI for detailed model and specification data.

Reliable Power from the Reliable Source®

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Capacitor Charging Power Supplies

LS1500
1500 J/s and Higher

The LS1500 series of capacitor charging power supplies offer unprecedented levels of reliability and dependability for lasers and other pulsed power applications.

- Models available with outputs from 1 kV to 40 kV at 1500 J/s average power
- Rack mounted or modular packaging
- High immunity to noise, EMI, transients

Features

- Advanced quasi-resonant high frequency converter utilizing IGBTs
- Open and short circuit protected, arc-over protected
- Rack mount chassis has full front panel control and monitoring with digital meters, plus full remote control interface
- Modular design is compact and air cooled
- Units can be operated in parallel for higher output power

Optional Features

- Custom interfaces, output configurations and performance specifications are available
- Modular units are available with output connector on top or rear
- EMI filter
- OEM/Remote rack mount configuration for remote-only operation

Performance Specifications Summary

- Voltage regulation better than ±0.5% at rep rates up to 200 Hz
- Fully protected against external open and short circuits, arc-overs, overvoltage and overtemperature
- Efficiency better than 85%

Contact KSI for detailed model and specification data.

LS5000
5000 J/s and Higher

The LS5000 series of capacitor charging power supplies offer the same high reliability as the LS1500 family, but at higher output power levels.

- Models available with outputs from 1 kV to 40 kV at 5000 J/s average power
- Only 5-1/4 inches high in a 19 inch rack mount design
- High immunity to noise, EMI, transients
- Compact, air cooled design

Features

- Advanced quasi-resonant high frequency converter utilizing IGBTs
- Open and short circuit protected, arc-over protected
- Full front panel control and monitoring with digital meters
- Full remote control and monitoring via standard 25 pin connector
- Units can be operated in parallel for higher output power

Optional Features

- OEM version with blank front panel
- Master/slave configurations for parallel operation
- EMI filter
- Custom interfaces, output configurations and performance specifications are also available

Performance Specifications Summary

- Voltage regulation better than ±0.5% at rep rates up to 200 Hz
- Fully protected against external open and short circuits, arc-overs, overvoltage and overtemperature
- Efficiency better than 85%

Contact KSI for detailed model and specification data.

Reliable Power from the Reliable Source®

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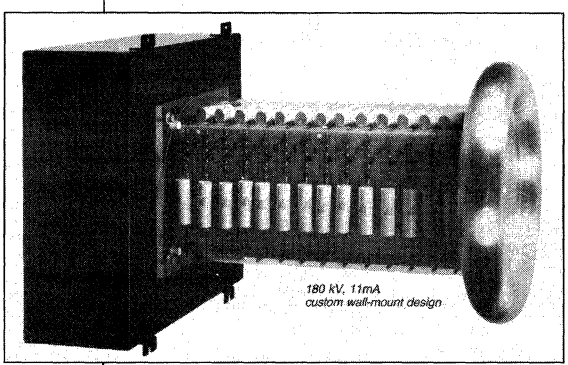
Custom High Voltage Power Supplies

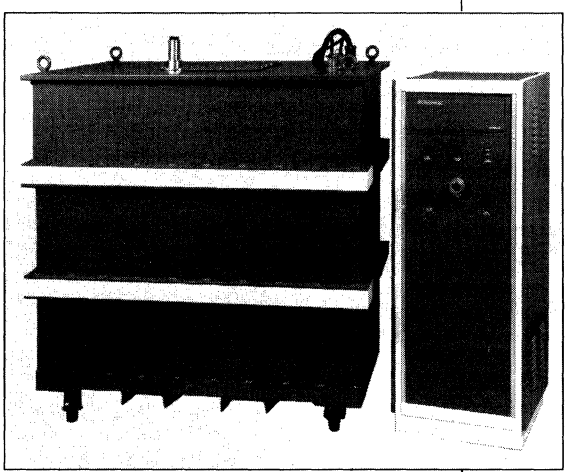
When you need extreme reliability and top performance in your critical high voltage application, call KSI. We're the leader in high performance highly reliable custom power supplies for these applications:

- Ion implantation equipment
- Flash lamps
- Electro-static air filtration
- Electron beam
- Capacitor charging
- Material deposition
- X-ray
- Lasers
- PMTs
- Accelerators
- Radar
- Research and Development

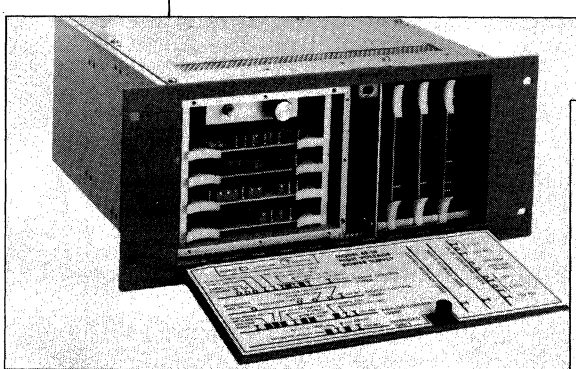
Shown below are some examples of custom HV power supplies that solved application problems other manufacturers couldn't solve. Call us with your HV problems ... we'll solve them too.



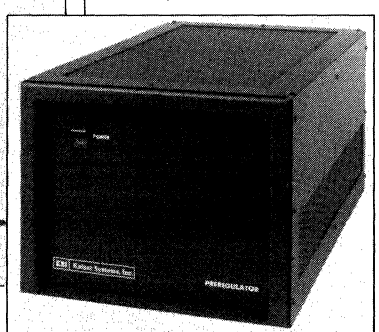
Resonant Converter, Air Insulated.
Output 2 kW, adjustable 0 to 180 kV, 0.05% regulation, 0.3% ripple.

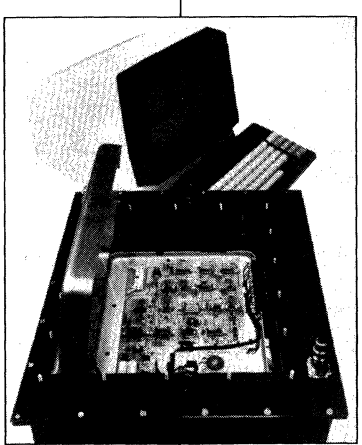


High Current Pulsed.
Output adjustable 40 to 130 kV, 0.1%, 1A. 12 kW average. 2 sec max pulse width, rise and fall time <10 ms.



Series Pass Regulator.
Output 8 kW, adjustable 1 to 100 kV, 0.01% regulation, 0.01% ripple.





Microprocessor Controlled HV Supply.
Output 40 kV, 20 mA, 0.01% ripple. Ultra compact vacuum tube regulated, full RS-232C interface via fiber optic cable links.

Reliable Power from the Reliable Source®

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SERIES DCB (24-PIN)

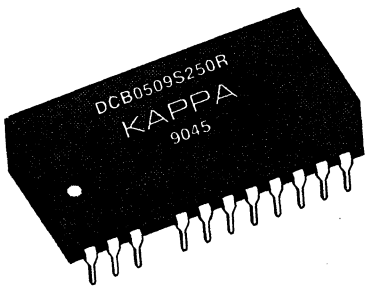
DC-DC CONVERTERS FOR NETWORKING APPLICATIONS

FEATURES

- 500 or 2000VRMS isolation available
- Industry standard 24-pin DIP package
- Continuous short-circuit protection (regulated units only)
- Input π filter available
- Low output noise
- All units burned-in at high input voltage, full load and maximum temperature

RATINGS

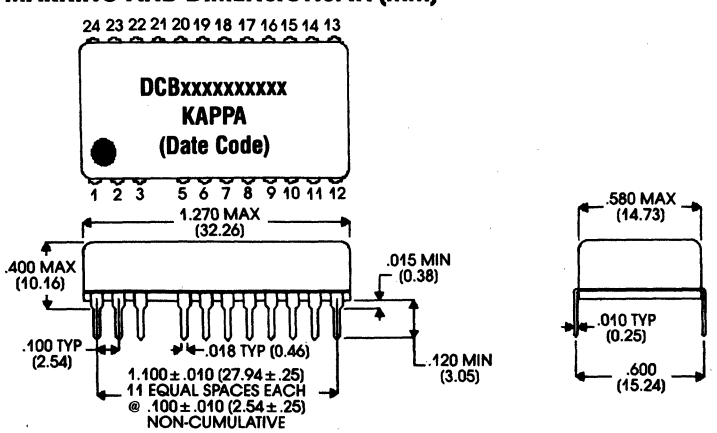
- Output power .....: 2 watts MAX.
- Efficiency .....: ≥50% (80% typical at full load)
- Operating temperature range ....: −25°C to +70°C
- Storage temperature range .....: −40°C to +100°C
- Operating frequency range:
  - Regulated configurations.....: 25 to 75 KHz
  - Unregulated configurations .....: 25 to 140 KHz
- Output Ripple (20 Hz to 20 MHz BW).:
  - Regulated configurations.....: 50m Vp-p MAX.
  - Unregulated configurations .....: 100m Vp-p MAX.
- Regulation .....: ±5%



ELECTRICAL SPECIFICATIONS: (+25°C)

Input Voltage (VDC)	Output Voltage (VDC)	Input Current (mA MAX)	Output Current (mA) MAX)	Regulated Output	Isolation Voltage 500 VRMS	Isolation Voltage 2000 VRMS
5±0.25	9±5%	612	170	YES	DCB0509S170R	DCB0509S170R2
5±0.50	9±10%	562	250	NO	DCB0509S250X	DCB0509S250X2
5±0.25	12±5%	600	125	YES	DCB0512S125R	DCB0512S125R2
5±0.50	12±10%	450	150	NO	DCB0512S150X	DCB0512S150X2
5±0.25	15±5%	600	100	YES	DCB0515S100R	DCB0515S100R2
5±0.50	15±10%	375	100	NO	DCB0515S100X	DCB0515S100X2
12±0.60	5±5%	250	300	YES	DCB1205S300R	DCB1205S300R2
12±1.20	5±10%	187	360	NO	DCB1205S360X	DCB1205S360X2
12±0.60	9±5%	255	170	YES	DCB1209S170R	DCB1209S170R2
12±1.20	9±10%	234	250	NO	DCB1209S250X	DCB1209S250X2
12±0.60	15±5%	250	100	YES	DCB1215S100R	DCB1215S100R2
12±1.20	15±10%	156	100	NO	DCB1215S100X	DCB1215S100X2

MARKING AND DIMENSIONS: IN (mm)



PIN CONNECTIONS

	DESIGNATION	PIN NUMBERS
500V	+ INPUT	1 or 24
	− INPUT	12 or 13
	+ OUTPUT	11 or 14
	− OUTPUT	10 or 15
2000V	+ INPUT	22, 23, 24
	− INPUT	1, 2, 3
	+ OUTPUT	13
	− OUTPUT	12

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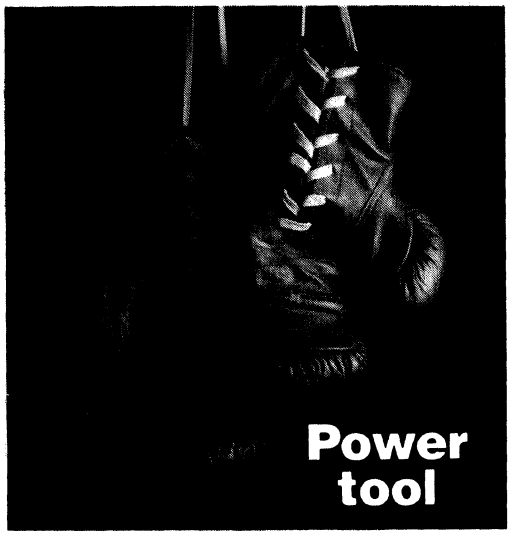
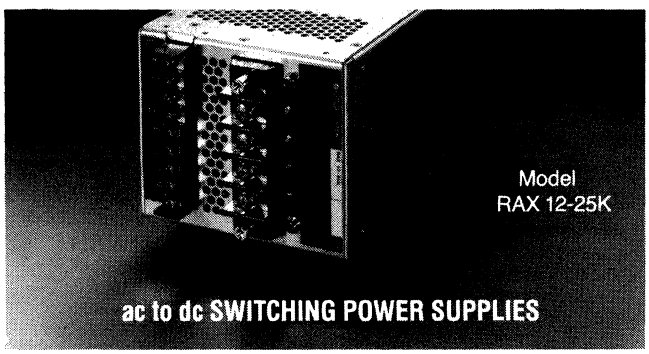
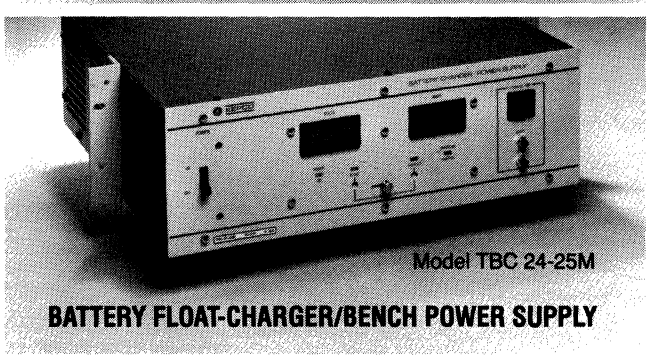


Power tools





Choose from ac-dc, dc-dc, ac-ac Power Sources. 3 Watt to 3000 Watt, 750VA to 90KVA.

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KEPCO THE POWER SUPPLIER™

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KEPCO® THE POWER SUPPLIER™

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KEPCO® THE POWER SUPPLIER™

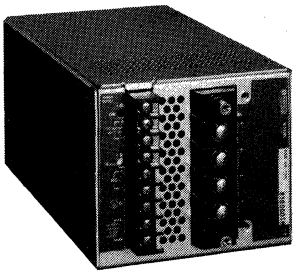
KEPCO HEAVY DUTY INDUSTRIAL GRADE SWITCHING MODULES

150KHz FET-BASED a-c to d-c SWITCHING POWER SUPPLIES

RAX™

115/230V a-c input

These single output a-c to d-c switching power supplies employ FETs operating at 150 KHz to provide a low profile (4.3") package that fits easily behind standard 5¼" panels. Reliability is assured by a low parts count that results from extensive use of custom hybrid microcircuits using surface mount components. Available sizes: 50W, 100W, 175W, 300W, and 1500W.



Shown: 300-Watt Model RAX 24-12K (24V/12A) supplied fully enclosed for industrial applications.

Features:

- **"Power-OK" LED**
- **Remote on/off:** Optically isolated logic signal.
- **Active soft-start circuit.** Limits initial input current surge.
- **Remote error sensing:** Compensates for voltage drops between power supply and load.
- **Remote voltage control:** Adjust output setting with external resistance.
- **Adjustable voltage:** Internal trimmer accessible through case.
- **Overvoltage protection.**
- **Undervoltage protection in 300W and 1500W models:** Shuts down for voltage below 70% of nominal after 20 seconds.
- **Rectangular current limiting** so you can drive non-linear loads.
- **Parallel operation:** Units may be paralleled for increased current. The 1500W models feature automatic current sharing.
- **Holding time:** 30 milliseconds typically, 20 milliseconds minimum.
- **Fan cooling in 300W and 1500W models:** Other models employ convection. No external heat sinks required.
- **Built-in EMI filter** attenuates conducted noise below the requirements of FCC 20780, Class A.
- **Safety:** All models recognized by UL 478 (4,5); UL 1950. Certified by CSA 1402 level 3. Approved by TÜV Rheinland IEC 380 & 950, VDE 0806, EN 60 950. Also certified to meet the MIL STD 810D environment.

50 WATT MODELS

MODEL	OUTPUT, VOLTS	ADJUSTMENT RANGE	OVP SETTING VOLTS Nom. input, 25°C	OUTPUT CURRENT, AMPS 50°C	60°C	71°C	SW RIPPLE mV typ	NOISE (Spike) max mV
RAX 3.3-10K	3.3	1.8~ 3.6	3.9~ 4.8	10.0	7.0	4.0	<25	100
RAX 5-10K	5	4.0~ 5.5	6.0~ 6.9	10.0	7.0	4.0	<25	100
RAX 12-4.2K	12	8.4~13.2	13.7~15.7	4.2	2.9	1.7	<25	170
RAX 15-3.4K	15	12.0~16.5	17.0~19.5	3.4	2.4	1.4	<25	200
RAX 24-2.1K	24	16.8~26.4	27.0~30.5	2.1	1.5	0.8	<25	290
RAX 28-1.8K	28	19.6~30.8	32.0~35.0	1.8	1.3	0.7	<25	330
RAX 48-1K	48	32.6~52.8	55.0~63.0	1.0	0.7	0.4	<25	530

Case Size: 4.3"H × 1.8"W × 7.5"D Net Weight: 1.8 lbs.

100 WATT MODELS

RAX 3.3-20K	3.3	1.8~ 3.6	3.9~ 4.8	20.0	14.0	8.0	<25	100
RAX 5-20K	5	4.0~ 5.5	6.0~ 6.9	20.0	14.0	8.0	<25	100
RAX 12-8.3K	12	8.4~13.2	13.7~15.7	8.3	5.8	3.3	<25	170
RAX 15-6.6K	15	12.0~16.5	17.0~19.5	6.6	4.6	2.6	<25	200
RAX 24-4.2K	24	16.8~26.4	27.0~30.5	4.2	2.9	1.7	<25	290
RAX 28-3.5K	28	19.6~30.8	32.0~35.0	3.5	2.5	1.4	<25	330
RAX 48-2K	48	32.6~52.8	55.0~63.0	2.0	1.4	0.8	<25	530

Case Size: 4.3"H × 2.6"W × 7.9"D Net Weight: 2.9 lbs.

175 WATT MODELS

RAX 3.3-35K	3.3	1.8~ 3.6	3.9~ 4.8	35.0	24.5	14.0	<25	100
RAX 5-35K	5	4.0~ 5.5	6.0~ 6.9	35.0	24.5	14.0	<25	100
RAX 12-14K	12	8.4~13.2	13.7~15.7	14.0	9.8	5.6	<25	170
RAX 15-11K	15	12.0~16.5	17.0~19.5	11.0	7.7	4.4	<25	200
RAX 24-7.2K	24	16.8~26.4	27.0~30.5	7.2	5.0	2.9	<25	290
RAX 28-6.2K	28	19.6~30.8	32.0~35.0	6.2	4.3	2.5	<25	330
RAX 48-3.6K	48	32.6~52.8	55.0~63.0	3.6	2.5	1.4	<25	530

Case Size: 4.3"H × 3.9"W × 8.7"D Net Weight: 4 lbs.

300 WATT MODELS

MODEL	OUTPUT, VOLTS	ADJUSTMENT RANGE	OVP SETTING VOLTS Nom. input, 25°C	OUTPUT CURRENT, AMPS 50°C	60°C	71°C	SW RIPPLE mV typ	NOISE (Spike) max mV
RAX 5-60K	5	4.0~ 5.5	6.0~ 6.9	60.0	42.0	24.0	<25	100
RAX 12-25K	12	8.4~13.2	13.7~15.7	25.0	17.5	10.0	<25	170
RAX 15-20K	15	12.0~16.5	17.0~19.5	20.0	14.0	8.0	<25	200
RAX 24-12K	24	16.8~26.4	27.0~30.5	12.0	8.4	4.8	<25	290
RAX 28-10K	28	19.6~30.8	32.0~35.0	10.0	7.5	4.3	<25	330
RAX 48-6K	48	32.6~52.8	55.0~63.0	6.0	4.2	2.4	<25	530

Case Size: 4.3"H × 5.1"W × 8.66"D Net Weight: 5.5 lbs.

1500 WATT MODELS

RAX 5-300K	5	4.0~ 5.5	6.0~ 6.9	300.0	210.0	120.0	<50	200
RAX 12-125K	12	8.4~13.2	13.7~15.7	125.0	87.5	50.0	<60	250
RAX 24-65K	24	16.8~26.4	27.0~30.5	65.0	45.5	26.0	<60	300
RAX 48-30K	48	32.6~52.8	55.0~59.0	30.0	21.0	12.0	<70	500

Case Size: 4.3"H × 8.0"W × 12.6"D Net Weight: 17.6 lbs.

This KEPCO product is backed by a firm 5-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED TÜV APPROVED

For summary specifications see pages 16 & 17

For complete specifications send for Kepco Switching Power Supply Catalog 146-1739.

Data and specifications subject to change without notice.

KEPCO® THE POWER SUPPLIER™

KEPCO HEAVY DUTY INDUSTRIAL GRADE SWITCHING MODULES

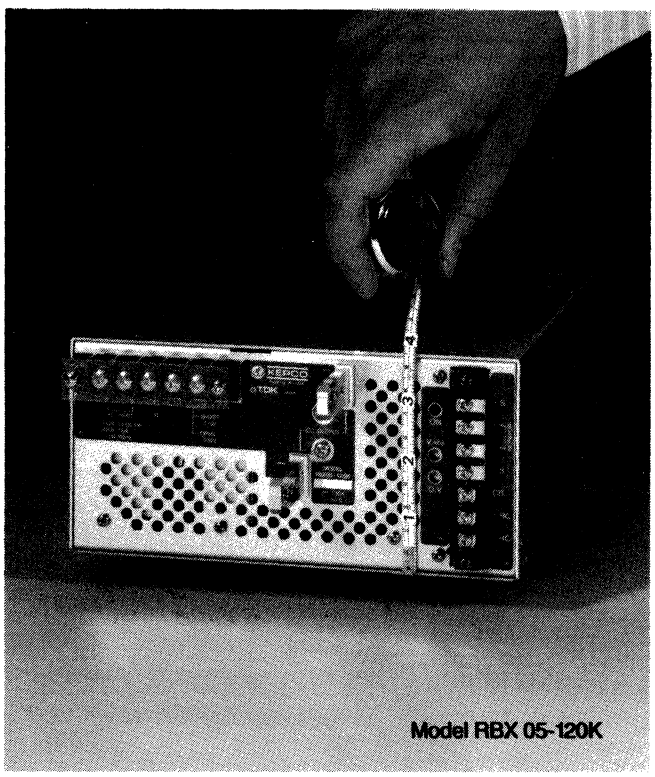
KEPCO 600 WATT, 150KHz a-c to d-c SWITCHING POWER SUPPLIES

RBX™ 115/230V a-c input

These single output a-c to d-c switchers squeeze 600 Watts of stabilized power into a low profile package only 3¾" high. Series RBX operates FETs at 150 KHz for high efficiency. The extensive use of custom hybrid microcircuits and a unique output power assembly contribute to high reliability by reducing the parts count well below that of conventional designs.

Features:

- **"Power-OK" LED**
- **Active soft-start circuit:** Limits a-c turn-on surge.
- **Remote error sensing:** Compensates for voltage drops between power supply and load.
- **Remote voltage control:** Adjust output setting with external resistance.
- **Adjustable voltage:** Internal trimmer accessible through case.
- **Overvoltage protection.** (See table)
- **Undervoltage protection:** Shuts down for voltage below 70% of nominal after 20 seconds.
- **Rectangular current limiting:** So you can drive non-linear loads.
- **Parallel operation:** Units may be paralleled for increased current. Provision is made for current sharing.
- **Holding time:** 30 milliseconds typically, 20 milliseconds minimum.
- **Fan cooling:** "Fan ok" circuit inhibits Power FET drive and turns off output if fan fails to operate.
- **EMI:** Auxiliary filter (FLA 250-20) available to meet FCC 20780 for Class B computing devices.
- **Safety:** All models recognized by UL and certified by CSA. Also certified to meet the MIL STD 810D Environment.



600 WATT MODELS

MODEL	OUTPUT VOLTS	MAX POWER	ADJUSTMENT RANGE	OVP SETTING VOLTS Nom. input, 25°C	OUTPUT CURRENT AMPS			RIPPLE (source & sw) mV		NOISE (spike) mV
					50°C	60°C	71°C	typ	max	max
RBX 02-120K	2	240	1.6- 2.2	2.6~ 2.8	0-120	0-84	0-48	<10	< 50	<100
RBX 05-120K	5	600	4.0- 5.5	6.0~ 6.5	0-120	0-84	0-48	<20	<100	<200
RBX 12-50K	12	600	9.6-13.2	14.0~14.5	0-50	0-35	0-20	<25	<100	<250
RBX 24-25K	24	600	19.0-26.5	27.0~27.5	0-25	0-17.50	0-10	<25	<100	<250
RBX 48-12.5K	48	600	38.4-52.8	55.0~57.0	0-12.5	0-8.75	0-5	<50	<200	<500

Case Size: 3.75"H × 7.9"W × 8.66"D Net Weight: 2V model 8.6 lbs.; 5V, 12V, 24V & 48V models 9.3 lbs.

This KEPCO product is backed by a firm 5-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED

For summary specifications see pages 16 & 17

For complete specifications send for Kepco Switching Power Supply Catalog 146-1739.

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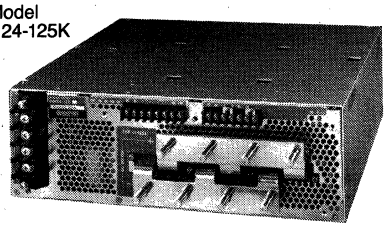
KEPCO® THE POWER SUPPLIER™

KEPCO HEAVY DUTY INDUSTRIAL GRADE SWITCHING MODULES

RAY™

Model
RAY 24-125K



3000 WATT, 3 PHASE a-c INPUT

Series RAY is an extension of Kepco's popular RAX power supply design. It comprises three models 5V, 24V and 48V, rated for approximately 3000 Watts. The 5V model produces 600 Amperes to drive heavy-duty loads. Yet RAY retain the low profile 110mm (4.3") height that characterize RAX.

To accommodate this enormous power, the input is configured for three phase delta input (200-240 Volts line to line, nominal, 50-60Hz).

RAY incorporate passive power factor correction. The power factor of 0.92 is typical. Approval is pending by TÜV to the new international safety standard IEC 950 and by UL to its counterpart, UL1950. CSA has certified to EB 1402C. An FCC class A EMI filter is built in. They have been tested in accordance with MIL STD 810D.

RAY are modern 150KHz forward converters that provide 80% conversion efficiency.

Features:

- **Current balance circuit:** In case 600 Amperes is not enough, a current balance allows up to three like units to be paralleled to share the load.
- **Remote on/off:** A TTL compatible signal applied to the optically isolated "RC" terminals turns the output on. This control reduces surge stress on the input circuit components.
- **Remote voltage adjustment:** Provides a means to trim the output setting remotely.
- **Over voltage/Under voltage:** These sensors shut the power supply down and require that the operator reset by removing the input. A red LED provides visual warning and the output alarm logic signal (open collector) is activated.
- **Power OK:** Provides a photocoupled open collector logic when the output is correct.
- **Open phase:** A sensor lights a red LED and shuts down the power supply if any one of the three input phases fails. This sensor also activates the output alarm logic signal (open collector).
- **Fan failure:** A lack of proper cooling (there are three fans) activates the output alarm logic, shuts down the power and lights a red LED.

DIMENSIONS
inches – 4.3 x 13.4 x 12.7 mm – 110 x 340 x 322

NET WEIGHT
33 lb, 15 Kg

UL PENDING CSA CERTIFIED TÜV PENDING

This KEPCO product is backed by a firm 5-YEAR WARRANTY

For summary specifications see pages 16 & 17

RAY MODEL TABLE

SPECIFICATION	OUTPUT VOLTAGE		OVP SETTING	OUTPUT CURRENT			CURRENT LIMIT	RIPPLE	NOISE 50MHz
Unit	Volts		Volts	Amps			Amps	mV	mV
Condition	Factory set	Adjustment range	Nom. input, 25°C	50°C	60°C	71°C	25°C Rectangular Fixed	0-50°C 10-100% load	
RAY 5-600K	5	4.0- 5.5	6.0- 6.9	600	420	240	630-700	100	250
RAY 24-125K	24	16.8-26.4	27.0-30.5	125	87.5	50	130-140	190	400
RAY 48-60K	48	32.6-52.8	55.0-59.0	60	42	24	64-70	240	600

RAY INPUT CHARACTERISTICS

SPECIFICATION	RATING/DESCRIPTION	CONDITION
Voltage range	170-264V a-c	Three phase, delta
Brownout voltage	165V a-c	Reduced hold-up time, increased ripple
Current	15A rms/phase	240V a-c l-l
Fuse value	30A, 250V	
Initial turn-on surge	90A max	Half cycle peak
Frequency	47-66 Hz	
EMI	FCC class A	Filter built-in
Soft-start circuit	Resistor and Thyristor	
Leakage current	2mA max	UL method, 50-60 Hz, 240V a-c
Start-up time	900ms max	
Hold-up time	30ms typ, 20 ms min	
Circuit type	Forward converter	
Switching frequency	150KHz typ	
Efficiency	80% typ	Nominal input, max load
Power factor	0.92 typ	Passive (choke) correction

RAY OUTPUT CHARACTERISTICS

SPECIFICATION		RATING/DESCRIPTION typ	RATING/DESCRIPTION max	CONDITION
Source effect		1%	2%	Minimum to maximum input
Load effect		1%	2%	10-100% load
Temperature effect		1%	2%	Nominal input, rated load, 0-50°C
Combined effect (source, load temperature)		2%	4%	
Time effect (drift)		0.1%	0.5%	0.5-8.5 hr, maximum load, 25°C
Recovery characteristics	Excursion	<4.0%		Nominal input, 25°C; step load change from 50% to 100% of rated load
	Recovery within ±1%	<5msec		

KEPCO® THE POWER SUPPLIER™

KEPCO HEAVY DUTY INDUSTRIAL GRADE d-c to d-c CONVERTERS

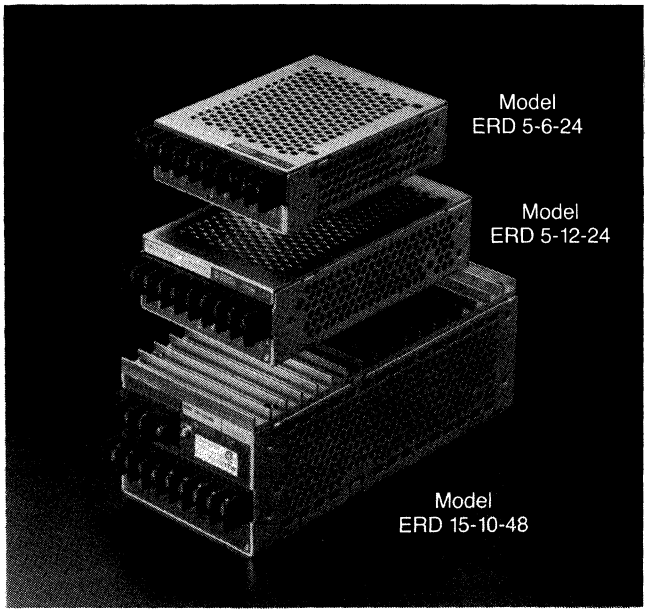
ERD™ SINGLE OUTPUT

24V and 48V d-c input

These are d-c to d-c converters operating at 300KHz. High frequency switching, plus extensive use of custom hybrid microcircuits with surface mount components, allow for small size (the ERD are only 3¾" high). The microcircuits afford high reliability by contributing to low parts count. The ERD are true transformer isolated power supplies whose output polarity is independent of the input. Available sizes: 30W, 60W, and 150W.

Features:

- **"Power-OK" LED.**
- **Remote on/off:** Optically isolated logic signal.
- **Remote error sensing:** Compensates for voltage drops between power supply and load.
- **Adjustable voltage** with internal trimmer.
- **Overvoltage protection.**
- **Rectangular current limiting** so you can drive non-linear loads.
- **Built-in EMI filter** meets conducted noise standard of MIL- STD 461B.
- **Safety:** All models recognized by UL, certified by CSA.



30 WATT MODELS

24V d-c input MODEL	48V d-c input MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OVP SETTING VOLTS Nom. input, 25°C	OUTPUT CURRENT AMPS 50°C	60°C	71°C	SW RIPPLE mV (typ)	NOISE (spike) mV max
ERD 5-6-24	**ERD 5-6-48**	5	4.0~ 5.5	6.0~ 6.9	6.0	4.2	2.4	<30	<100
ERD 12-2.5-24	**ERD 12-2.5-48**	12	8.4~13.2	13.7~15.7	2.5	1.8	1.0	<50	<170
ERD 15-2-24	**ERD 15-2-48**	15	12.0~16.5	17.0~19.5	2.0	1.4	0.8	<50	<200
ERD 24-1.3-24	**ERD 24-1.3-48**	24	16.8~26.4	27.0~30.5	1.3	0.9	0.5	<50	<290
ERD 48-0.6-24	**ERD 48-0.6-48**	48	32.6~52.8	55.0~63.0	0.6	0.4	0.2	<60	<530

Case Size: 3.74" × 1.38" × 5.12" Net Weight: 0.9 lb.

60 WATT MODELS

ERD 5-12-24	**ERD 5-12-48**	5	4.0~ 5.5	6.0~ 6.9	12.0	8.4	4.8	<30	<100
ERD 12-5-24	**ERD 12-5-48**	12	8.4~13.2	13.7~15.7	5.0	3.5	2.0	<50	<170
ERD 15-4-24	**ERD 15-4-48**	15	12.0~16.5	17.0~19.5	4.0	2.8	1.6	<50	<200
ERD 24-2.5-24	**ERD 24-2.5-48**	24	16.8~26.4	27.0~30.5	2.5	1.8	1.0	<50	<290
ERD 48-1.2-24	**ERD 48-1.2-48**	48	32.6~52.8	55.0~63.0	1.2	0.8	0.5	<60	<530

Case Size: 3.74" × 1.69" × 6.3" Net Weight: 1.2 lbs.

150 WATT MODELS

ERD 5-30-24	**ERD 5-30-48**	5	4.0~ 5.5	6.0~ 6.9	30.0	21.0	12.0	<30	<100
ERD 12-12-24	**ERD 12-12-48**	12	8.4~13.2	13.7~15.7	12.0	8.4	4.8	<50	<170
ERD 15-10-24	**ERD 15-10-48**	15	12.0~16.5	17.0~19.5	10.0	7.0	4.0	<50	<200
ERD 24-6-24	**ERD 24-6-48**	24	16.8~26.4	27.0~30.5	6.0	4.2	2.4	<50	<290
ERD 48-2.8-24	**ERD 48-2.8-48**	48	32.6~52.8	55.0~63.0	2.8	2.0	1.1	<60	<530

Case Size: 3.74" × 3.15" × 8.66" Net Weight: 2.6 lbs.

Current ratings are for vertical installation. For use horizontally, derate by 20%. Moving air (5 CFM) is sufficient to avoid derating in horizontal position.

For summary specifications see pages 16 & 17

For complete specifications send for Kepco Switching Power Supply Catalog 146-1739.
Data and specifications subject to change without notice.

This KEPCO product is backed by a firm 5-YEAR WARRANTY

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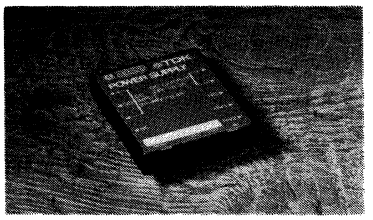
KEPCO® **THE POWER SUPPLIER™**

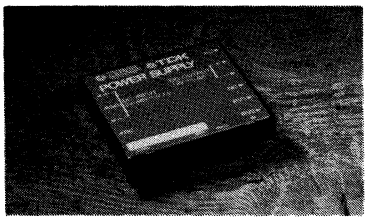
KEPCO FLAT PACK d-c to d-c BOARD-MOUNT CONVERTERS

FPD™

Flatpack d-c to d-c board-mount converters. Ideal for distributed power applications. Aluminum base plate/PCB stuffed with surface-mount devices... even a surface-mount transformer, a 500KHz fixed-frequency forward converter (not resonant mode) and beautiful, unpotted construction.



5 Watt Module



10 Watt Module

FPD MODEL TABLE

SPECIFICATION	OUTPUT VOLTS	OVP SETTING VOLTS	OUTPUT CURRENT AMPS	OVER CURRENT SETTING (2)	INPUT VOLTS
5 WATT MODELS(1)					
FPD 5-1-48W	5	5.5 - 6.9	1.0	1.20 - 2.0 FB	24 - 48
FPD 12-0.4-48W	12	13.2 - 15.7	0.4	0.48 - 0.8 FB	24 - 48
FPD 15-0.35-48W	15	16.5 - 19.0	0.35	0.42 - 0.7 FB	24 - 48
FPD 24-0.2-48W	24	26.4 - 31.5	0.2	0.24 - 0.4 FB	24 - 48
10 WATT MODELS(1)					
FPD 5-2-48W	5	5.5 - 6.9	2.0	2.4 - 4.0 FB	24 - 48
FPD 12-0.8-48W	12	13.2 - 15.7	0.8	1.0 - 1.6 FB	24 - 48
FPD 15-0.65-48W	15	16.5 - 19.0	0.65	0.8 - 1.3 FB	24 - 48
FPD 24-0.4-48W	24	26.4 - 31.5	0.4	0.5 - 0.8 FB	24 - 48
50 WATT MODELS					
FPD 5-10-12	5	5.5 - 6.9	10.0	10.3 - 13.5A SQ	12
FPD 12-4.2-12	12	13.2 - 15.7	4.2	4.3 - 5.7A SQ	12
FPD 15-3.4-12	15	17.0 - 19.0	3.4	3.5 - 4.5A SQ	12
FPD 24-2.1-12	24	27.0 - 30.5	2.1	2.2 - 2.9A SQ	12
50 WATT MODELS					
FPD 5-10-24	5	5.5 - 6.9	10.0	10.3 - 13.5A SQ	24
FPD 12-4.2-24	12	13.7 - 15.7	4.2	4.3 - 5.7A SQ	24
FPD 15-3.4-24	15	17.0 - 19.0	3.4	3.5 - 4.5A SQ	24
FPD 24-2.1-24	24	27.0 - 30.5	2.1	2.2 - 2.9A SQ	24
50 WATT MODELS					
FPD 5-10-48	5	5.5 - 6.9	10.0	10.3 - 13.5A SQ	48
FPD 12-4.2-48	12	13.7 - 15.7	4.2	4.3 - 5.7A SQ	48
FPD 15-3.4-48	15	17.0 - 19.0	3.4	3.5 - 4.5A SQ	48
FPD 24-2.1-48	24	27.0 - 30.5	2.1	2.2 - 2.9A SQ	48
50 WATT MODELS					
FPD 5-10-150	5	5.5 - 6.9	10.0	10.3 - 13.5A SQ	150
FPD 12-4.2-150	12	13.7 - 15.7	4.2	4.3 - 5.7A SQ	150
FPD 15-3.4-150	15	17.0 - 19.0	3.4	3.5 - 4.5A SQ	150
FPD 24-2.1-150	24	27.0 - 30.5	2.1	2.2 - 2.9A SQ	150
100 WATT MODELS					
FPD 5-20-24	5	5.5 - 6.9	20.0	20.6 - 27A SQ	24
FPD 12-8.3-24	12	13.7 - 15.7	8.3	8.5 - 11.2A SQ	24
FPD 15-6.6-24	15	17.0 - 19.0	6.6	6.8 - 8.9A SQ	24
FPD 24-4.2-24	24	27.0 - 30.5	4.2	4.3 - 5.7A SQ	24
100 WATT MODELS					
FPD 5-20-48	5	5.5 - 6.9	20.0	20.6 - 27A SQ	48
FPD 12-8.3-48	12	13.7 - 15.7	8.3	8.5 - 11.2A SQ	48
FPD 15-6.6-48	15	17.0 - 19.0	6.6	6.8 - 8.9A SQ	48
FPD 24-4.2-48	24	27.0 - 30.5	4.2	4.3 - 5.7A SQ	48
100 WATT MODELS					
FPD 5-20-150	5	5.5 - 6.9	20.0	20.6 - 27A SQ	150
FPD 12-8.3-150	12	13.7 - 15.7	8.3	8.5 - 11.2A SQ	150
FPD 15-6.6-150	15	17.0 - 19.0	6.6	6.8 - 8.9A SQ	150
FPD 24-4.2-150	24	27.0 - 30.5	4.2	4.3 - 5.7A SQ	150

(1) W = wide range input (2) FB = fold back/winker type current limit. SQ = square-type current limit

For summary specifications see pages 16 & 17

For complete specifications send for FPD Brochure 146-1718 or Kepco Switching Power Supply Catalog 146-1739. Data and specifications subject to change without notice.

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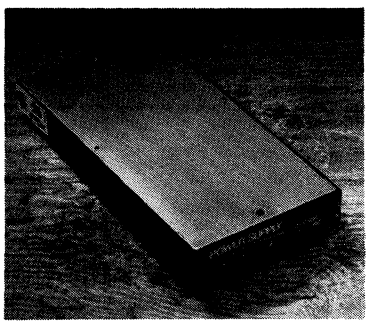
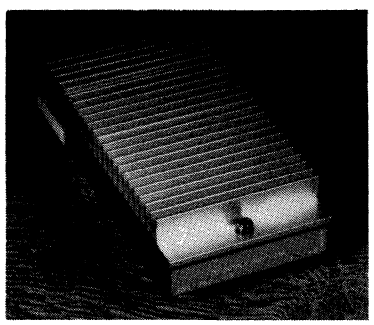
KEPCO® THE POWER SUPPLIER™ FPD™

KEPCO FLAT PACK d-c to d-c BOARD-MOUNT CONVERTERS



50 and 100 Watt Module



100 Watt Module Shown With Optional Finned Radiator

FINNED ACCESSORIES

Finned radiators available for 50W & 100W designs.

The FPD 5W and 10W modules require no added cooling for normal operation. The 50W and 100W modules may require additional heat sinking. The special construction of FPD fastens surface-mount devices to the aluminum base plate so that excellent thermal coupling is obtained. Depending upon your application, FPD modules may be fastened by their base plate surface to a chassis or other cold plate – or a finned radiator may be attached as illustrated.

For normal operation at 100% current, the average base plate surface temperature should be maintained at or below 85°C.

FPD 50W	12V, 24V, 50V, 150V	use FIN-50
FPD 100W	24V, 48V	use FIN-50
FPD 100W	150V	use FIN-100

DIMENSIONS

5W: inches – 2 x 1.57 x 0.3 mm – 50.8 x 39.8 x 8.5
10W: inches – 2 x 2 x 0.3 mm – 50.8 x 50.8 x 8.5
50W: inches – 2.28 x 4.53 x 0.52 mm – 58 x 115 x 13.2
100W: (24V, 48V) inches – 2.28 x 4.53 x 0.52 mm – 58 x 115 x 13.2
100W: (150V) inches – 2.28 x 5.12 x 0.52 mm – 58 x 130 x 13.2

NET WEIGHT

5W: 1.0 oz, 30 gm **10W:** 1.4 oz, 40 gm
50W: 5.3 oz, 150 gm **100W:** 5.3 oz, 150 gm

For summary specifications see pages 16 & 17

FPD INPUT CHARACTERISTICS

INPUT VOLTAGE RANGE

12V	9-18V
24V	20-30V
48V	40-56V
48V "W"	20-56V
150V	110-165V

This KEPCO product is backed by a firm 1-YEAR WARRANTY

EFFICIENCY

INPUT VOLTS	OUTPUT POWER	CONVERSION EFFICIENCY	OPERATING FREQUENCY
12V	50W	78% typ	300KHz
24V 24V	50W 100W	81% typ 80% typ	450KHz 450KHz
48V 48V	50W 100W	80% typ 80% typ	550KHz 550KHz
48V "W" (24-48)	5W	75% at 24V 71% at 48V	700KHz
Wide range	10W	80% at 24V 76% at 48V	700KHz
150V 150V	50W 100W	80% typ 80% typ	500KHz 500KHz

FPD OUTPUT CHARACTERISTICS

SPECIFICATION	TYP.	MAX.	CONDITION
Source effect	1%	2%	(min-max)
Load effect	1%	2%	(10%-100%)
Temperature effect	1%	2%	(0-71°C)
Combined effect	3%	6%	source, load, temp.
Time effect	0.1%	0.2%	0.5-8 hrs, 25°C

RIPPLE

OUTPUT VOLTS	SWITCHING FREQUENCY mV p-p			SPIKE mV p-p
	5W	10W	50~100W	
5V	100	200	150	250
12V	200	200	200	300
15V	200	200	200	300
24V	300	300	200	400

FPD GENERAL SPECIFICATIONS

SPECIFICATION	CONDITION	RATING/DESCRIPTION
Temperature	Operating	0-71°C (full power to 50°C)
	Storage	−40 to +75°C
	Baseplate	85°C, 100% load 95°C, 80% load (Overtemperature protection built-in) Finned radiators available for 50W and 100W
	5W and 10W	No finned radiator required 0-50°C, 100% load 60°C, 70% load 71°C, 40% load
Shock	50g, 3 axes	
Vibration	5g, 10-55Hz	
Withstand Voltage	Input-Output Input-Ground	500V d-c, 1 minute
Isolation	Output Ground	100M Ω, 500V at 25°C, 65% RH
Humidity		5%-95% RH (non-condensing)
Enclosure	Plastic UL 94V-0 with aluminum base	

For complete specifications send for FPD Brochure 146-1718 or Kepco Switching Power Supply Catalog 146-1739. Data and specifications subject to change without notice.

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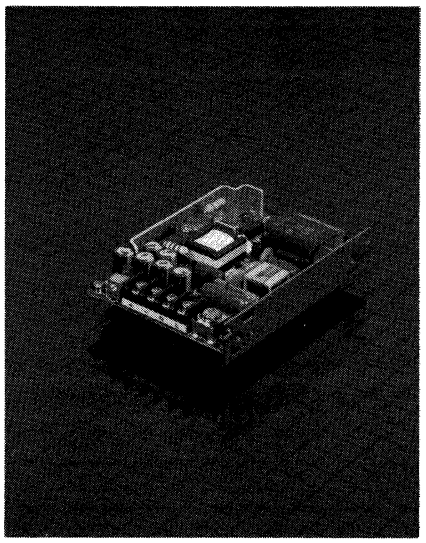
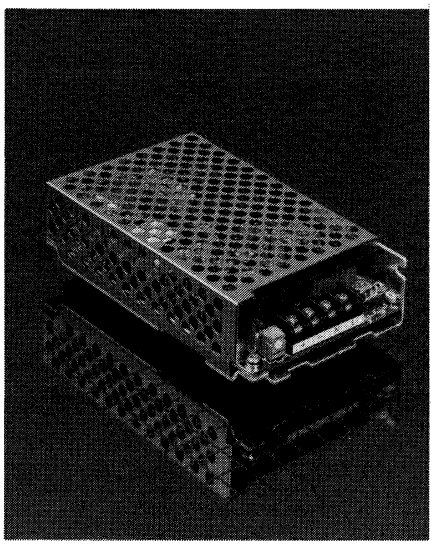
KEPCO OEM a-c to d-c SLIM SWITCHING MODULES

Very compact switching power supplies featuring surface mount construction, 1-inch thin.

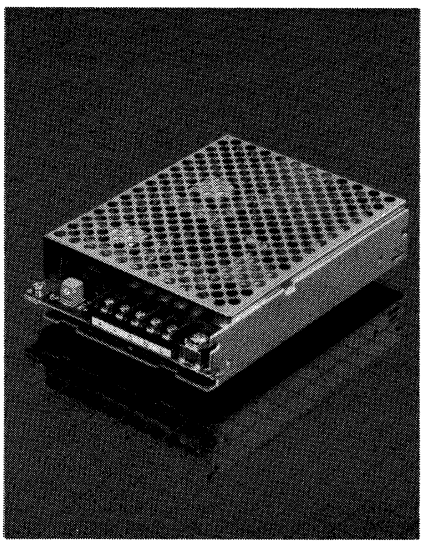
NORTH AMERICAN SERIES FAK™ 85-132V a-c input



15W Model FAK 5-3K
(optional enclosure CA-21)



25W Model FAK 5-5K
(shown with optional enclosure CA-22)



50W Model FAK 5-10K
(shown with optional enclosure CA-23)

These modern single output switchers employ advanced surface mount technology to achieve small size and very low profile, to fit where space is at a premium. They are designed to the standards of UL and CSA. Input is 85~132V a-c; outputs are 5V, 12V, 15V, and 24V d-c. The 15 and 25 Watt models employ flyback topology; the 50 Watt models are forward converters.

Features:

- **Power-OK LED:** green.
- **a-c input 85-132V; d-c input 110-170V.**
- **FET-based high frequency operation** (up to 250 KHz) for high efficiency.
- **Soft-start circuit:** Limits a-c turn-on surge.
- **Adjustable voltage:** Internal trimmer accessible through the case allows manual adjustment of the voltage setting.
- **Holding time:** 30 milliseconds typically, 20 milliseconds minimum.
- **Built-in EMI filter** attenuates conducted noise below the requirements of FCC 20780, for Class B computing devices. Optional perforated metal covers attenuate radiated noise and provide protection.
- **Safety:** UL recognized. CSA certified.
- **Optional Steel Enclosures:** CA 21, CA 22, CA 23.

For summary specifications see pages 16 & 17

This KEPCO product is backed by a firm 1-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED

15 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPS, 0-50°C	SW RIPPLE mV typ	SW RIPPLE mV max	NOISE (spike) mV max
FAK 5-3K	5	4.5- 5.5	0-3.0	30	60	<120
FAK 12-1.3K	12	10.8-13.2	0-1.3	30	70	<190
FAK15-1K	15	13.5-16.5	0-1.0	30	70	<220
FAK 24-0.7K	24	21.6-26.4	0-0.7	30	80	<310

Open frame — Size: 0.79″ x 2.76″ x 3.74″ Net weight: 0.44 lb.
With cover CA 21 (optional) — Case size: 0.9″ x 2.76″ x 3.74″ Net weight: 0.55 lb.

25 WATT MODELS

FAK 5-5K	5	4.5- 5.5	0-5.0	30	70	<120
FAK 12-2.1K	12	10.8-13.2	0-2.1	30	70	<190
FAK 15-1.7K	15	13.5-16.5	0-1.7	30	70	<220
FAK 24-1.1K	24	21.6-26.4	0-1.1	30	80	<310

Open frame — Size: 0.98″ x 2.76″ x 4.53″ Net weight: 0.49 lb.
With cover CA 22 (optional) — Case size: 1.12″ x 2.76″ x 4.53″ Net weight: 0.66 lb.

50 WATT MODELS

FAK 5-10K	5	4.5- 5.5	0-10.0	25	50	<120
FAK 12-4.2K	12	10.8-13.2	0-4.2	25	50	<190
FAK 15-3.4K	15	13.5-16.5	0-3.4	25	50	<220
FAK 24-2.1K	24	21.6-26.4	0-2.1	25	60	<310

Open frame — Size: 0.98″ x 3.74″ x 5.12″ Net weight: 0.66 lb.
With cover CA 23 (optional) — Case size: 1.12″ x 3.74″ x 5.12″ Net weight: 0.88 lb.

For complete specifications send for FAK Brochure 146-1715 or Kepco Switching Power Supply Catalog 146-1739.
Data and specifications subject to change without notice.

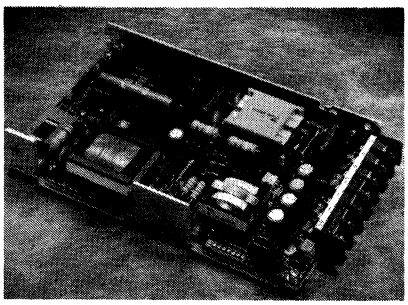
KEPCO® THE POWER SUPPLIER™

KEPCO OEM a-c to d-c SLIM SWITCHING MODULES

Very compact switching power supplies featuring surface mount construction, 1-inch thin.

INTERNATIONAL SERIES FAW™

Wide Range 85-264V a-c input



50W Model FAW 12-4.2K

These modern single output switchers employ advanced surface mount technology to achieve small size and very low profile, to fit where space is at a premium. They are designed to the standards of UL, CSA and TÜV Rheinland. Input is 85~264V a-c; outputs are 5V, 12V, 15V, and 24V d-c. The 100 and 150 Watt groups feature 28V and 48V output models. The 15 and 25 Watt models employ flyback topology; the 50, 100 and 150 Watt models are forward converters.

Features:

- **Power-OK LED:** green.
- **Power-OK logic:** open collector.
- **a-c input:** 85-264V a-c; **d-c input:** 105-370V d-c.
- **Operating frequency:** 120-130KHz.
- **Soft-start circuit:** limits a-c turn on surge.
- **Adjustable voltage:** internal trimmer.
- **Holding time:** output is sustained by internally stored energy for 20ms typical 15ms minimum.
- **Built in EMI filter:** attenuates the conducted noise below the requirements of both FCC 20780 and VDE 0871 for Class B computing devices. Optional perforated metal covers attenuate radiated noise and provide protection.
- **Safety:** All models recognized by UL 478 (4,5); UL 1950. Certified by CSA 1402 level 3. Approved by TÜV Rheinland IEC 380 & 950, VDE 0806, EN 60 950. Also certified to meet the MIL STD 810D environment.
- **Connections:** input and output screw terminal barrier strip.
- **Remote error sensing:** the 50W, 100W & 150W FAW provide separate remote error sense terminals: 0.25V drop/wire.
- **Optional Steel Enclosures:** CA 24, CA 25, CA 26, CA 27 and CA 28.

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPS. 0-50°C	SW RIPPLE mV typ	SW RIPPLE mV max	NOISE (spike) mV max
15 WATT MODELS						
FAW 5-3K	5	4.5- 5.5	0-3.0	15	30	<120
FAW 12-1.3K	12	10.8-13.2	0-1.3	10	30	<190
FAW 15-1K	15	13.5-16.5	0-1.0	10	30	<220
FAW 24-0.7K	24	21.6-26.4	0-0.7	20	50	<310
Size: Open - 0.98 x 3.94 x 3.94 in. (25 x 100 x 100 mm) Enclosed (CA 24) - 1.18 x 3.94 x 3.94 in. (30 x 100 x 100 mm) Net wt. 9.52 oz, 270 gm						
25 WATT MODELS						
FAW 5-5K	5	4.5- 5.5	0-5.0	31	62	<120
FAW 12-2.1K	12	10.8-13.2	0-2.1	32	65	<190
FAW 15-1.7K	15	13.5-16.5	0-1.7	42	85	<220
FAW 24-1.1K	24	21.6-26.4	0-1.1	57	115	<310
Size: Open - 0.98 x 3.74 x 4.92 in. (25 x 95 x 125 mm) Enclosed (CA 25) - 1.18 x 3.74 x 4.92 in. (30 x 95 x 125 mm) Net wt. 10.6 oz, 300 gm						
50 WATT MODELS						
FAW 5-10K	5	4.5- 5.5	0-10.0	30	60	<120
FAW 12-4.2K	12	10.8-13.2	0-4.2	35	70	<190
FAW 15-3.4K	15	13.5-16.5	0-3.4	45	90	<220
FAW 24-2.1K	24	21.6-26.4	0-2.1	50	100	<310
Size: Open - 0.98 x 3.74 x 6.50 in. (25 x 95 x 165 mm) Enclosed (CA 26) - 1.22 x 3.74 x 6.50 in. (31 x 95 x 165 mm) Net wt. 15.9 oz, 400 gm						
100 WATT MODELS						
FAW 5-20K	5	4.5- 5.5	0-20	30	60	<120
FAW 12-8.3K	12	10.8-13.2	0-8.3	35	70	<190
FAW 15-6.6K	15	13.5-16.5	0-6.6	45	90	<220
FAW 24-4.2K	24	21.6-26.5	0-4.2	50	100	<310
FAW 28-3.5K	28	25.2-30.8	0-3.5	60	120	<330
FAW 48-2K	48	43.2-52.8	0-2	80	160	<530
Size: Open - 1.38 x 3.74 x 7.87 in. (35 x 95 x 200 mm) Enclosed (CA 27) - 1.5 x 3.74 x 7.87 in. (38 x 95 x 200 mm) Net wt. 2.5 lbs, 1200 gm						
150 WATT MODELS						
FAW 5-30K	5	4.5- 5.5	0-30	30	60	<120
FAW 12-12K	12	10.8-13.2	0-12	35	70	<190
FAW 15-10K	15	13.5-16.5	0-10	45	90	<220
FAW 24-6K	24	21.6-26.4	0-6	50	100	<310
FAW 28-5K	28	25.2-30.8	0-5	60	120	<330
FAW 48-2.8K	48	43.2-52.8	0-2.8	80	160	<530
Size: Open - 1.97 x 3.74 x 7.87 in. (50 x 95 x 200 mm) Enclosed (CA 28) - 2.09 x 3.74 x 7.87 in. (53 x 95 x 200 mm) Net wt. 3.3 lbs, 1500 gm						

This KEPCO product is backed by a firm 1-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED TÜV RHEINLAND

For summary specifications see pages 16 & 17

For complete specifications send for FAW Brochure 146-1714 or Kepco Switching Power Supply Catalog 146-1739.
Data and specifications subject to change without notice.

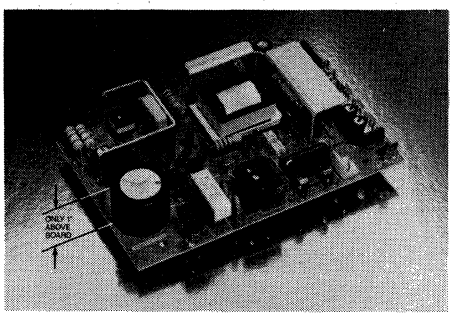
KEPCO® THE POWER SUPPLIER™

KEPCO OEM a-c to d-c SLIM SWITCHING MODULES

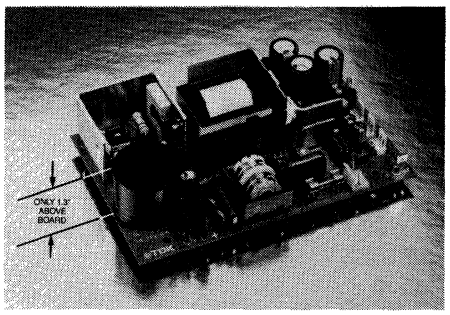
Universal input 90~264V a-c without user selection.
Low profile on industry standard 100 x 160mm PC card footprint, optional enclosure.

MRW™ 90~264V a-c input

A new series of multi-output PC card switchers which employ advanced input and output capacitors and magnetics to achieve a very slim profile. In Model MRW 150KV (35 Watts) the overall thickness is 30mm and component length is only 1" (25.4mm) above the PC card. All models are built on the same card footprint (100 x 160mm) to allow users for whom low profile and/or a wide input range will be significant, to easily upgrade. Connector cable kits available.



Model MRW 150KV



Model MRW 160KV, MRW 161KV

Features:

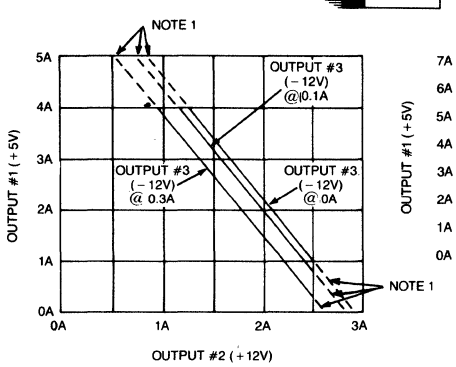
- **115/230V a-c operation without user intervention:** Special flyback circuit accepts any input voltage from 90V to 264V a-c.
- **Power-OK logic (TTL compatible) signal** may be used as power fail signal. Logic "1" is given when +5V output is above 4.5V.
- **Current trade-off:** Current may be increased from one of the outputs at the expense of the others, within the limits defined by Figure 1.
- **Adjustable voltage:** Internal trimmer.
- **Overvoltage protection for principal output** shuts down all outputs if output voltage is forced beyond the set limit.
- **Holding time:** 30 milliseconds typically, 20 milliseconds minimum.
- **Built-in EMI filter** attenuates conducted noise below the requirements of FCC 20780 for Class B computing devices.
- **Safety:** All models recognized by UL 478 (4,5); UL 1950. Certified by CSA 1402 level 3. Approved by TÜV Rheinland IEC 380 & 950, VDE 0806, EN 60 950. Also certified to meet the MIL STD 810D environment.
- **Optional Steel Enclosures:** CA 19, CA 20.

MRW 150KV					35W
OUTPUT	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPS	SW RIPPLE mV max	NOISE (SPIKE) mV max
Output #1	+ 5	4.75-5.25	1.0-2.2 (typ) 4.0 (max)	50	150
Output #2	+12	—	0.6-1.8 (typ) 2.5 (max)	50	290
Output #3	−12	—	0-0.1 (typ) 0.3 (max)	20	290
Size: Open 1.14" x 3.94" x 6.3" Enclosed (CA 19) 1.65" x 4.33" x 6.50" Net weight: 0.77 lbs.					
MRW 160KV					**50W**
Output #1	+ 5	4.75-5.25	1.0-5.0 (typ) 6.0 (max)	50	150
Output #2	+12	—	0.6-2.0 (typ) 2.5 (max)	50	290
Output #3	−12	—	0-0.1 (typ) 0.5 (max)	20	290
Size: Open 1.5" x 3.94" x 6.3" Enclosed (CA 20) 1.97" x 4.33" x 6.50" Net weight: 1.1 lbs.					
MRW 161KV					**50W**
Output #1	+ 5	4.75-5.25	1.0-5.0 (typ) 6.0 (max)	50	150
Output #2	+15	—	0.5-1.5 (typ) 2.0 (max)	50	350
Output #3	−15	—	0-0.1 (typ) 0.4 (max)	20	350
Size: Open 1.5" × 3.94" × 6.3" Enclosed (CA 20) 1.97" × 4.33" × 6.50" Net weight: 1.1 lbs.					

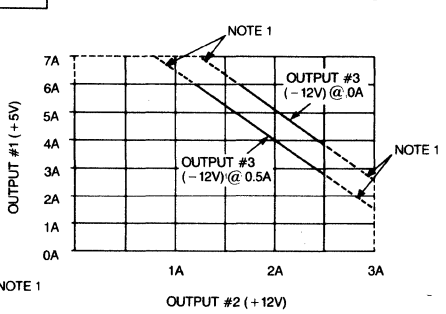
UL RECOGNIZED CSA CERTIFIED TÜV APPROVED

This KEPCO product is backed by a firm 1-YEAR WARRANTY

FIG. 1 OUTPUT RATINGS

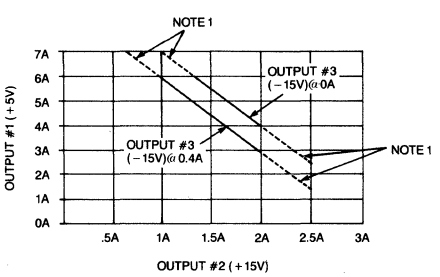


MRW 150KV MAX. POWER: 38.5W



MRW 160KV MAX. POWER: 60W

NOTE 1: Forced air 20 CMF at 1 atmosphere



MRW 161KV MAX. POWER: 60W

For summary specifications see pages 16 & 17

KEPCO® THE POWER SUPPLIER™

KEPCO OEM a-c to d-c SLIM SWITCHING MODULES

FMP™ 115V a-c input

SINGLE OUTPUT LOW PROFILE PLASTIC ENCASED SWITCHING POWER SUPPLIES

10W model shown
Model FMP 5-2K

These are plastic encased 3- and 10-Watt single output a-c to d-c flyback voltage stabilizers, producing 5V, 12V, 15V, or 24V.

Features:

- **±10% voltage adjustment.**
- **Voltage limited** by zener diode across output.
- **Rectangular current limiting** so you can drive nonlinear loads.
- **Low profile:** Only ¾" thick.

3 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT, AMPS, AT 50°C Max	SW RIPPLE mV	NOISE (SPIKE) Max mV
FMP 5-0.6K	5	4.5-5.5	0.6	<50	<100
FMP 12-0.25K	12	10.8-13.2	0.25	<80	<150
FMP 15-0.2K	15	13.5-16.5	0.2	<80	<150
FMP 24-0.13K	24	21.6-26.4	0.13	<100	<150

Case size: 2.17" x 0.75" x 1.97" Net weight: 0.15 lb. **Cased only.**

10 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT, AMPS, AT 50°C Max	SW RIPPLE mV	NOISE (SPIKE) Max mV
FMP 5-2K	5	4.5-5.5	2.0	<50	<100
FMP 12-0.85K	12	10.8-13.2	0.85	<80	<150
FMP 15-0.7K	15	13.5-16.5	0.70	<80	<150
FMP 24-0.45K	24	21.6-26.4	0.45	<100	<150

Case size: 2.17" x 0.75" x 3.16" Net weight: 0.2 lb. **Cased only.**

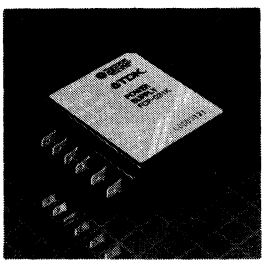
FCP™ 115V a-c input

DUAL OUTPUT LOW PROFILE PLASTIC ENCASED SWITCHING POWER SUPPLIES

These are plastic encased 3- and 10-Watt flyback a-c to d-c switchers producing a dual output (±12V or ±15V).

Features:

- **Principal (*plus*) output adjustable ±10%;** auxiliary (*minus*) tracks it with an accuracy of ±2% using a 3-terminal (linear) regulator.
- **Rectangular current limiting on both outputs.**
- **Low profile:** Only ¾" thick.



3W model shown
Model FCP 031K

3 WATT MODELS

MODEL	OUTPUT VOLTS (Output #1)	OUTPUT VOLTS (Output #2)	ADJUSTMENT RANGE (1)	OUTPUT CURRENT, AMPS, AT 50°C (Output #1) Max	OUTPUT CURRENT, AMPS, AT 50°C (Output #2) Max	SW RIPPLE mV	NOISE (SPIKE) Max mV
FCP 031K	+12	−12	10.8-13.2	0.12	0.12	<80	<150
FCP 032K	+15	−15	13.5-16.5	0.1	0.1	<80	<150

Case size: 2.17" x 0.75" x 1.96" Net weight: 0.15 lb. **Cased only.**

10 WATT MODELS

FCP 101K	+12	−12	10.8-13.2	0.4	0.4	<80	<150
FCP 102K	+15	−15	13.5-16.5	0.32	0.32	<80	<150

Case size: 2.17" x 0.75" x 3.16" Net weight: 0.18 lb. **Cased only.**

(1)Output #2 tracks Output #1 setting, ± 2%.

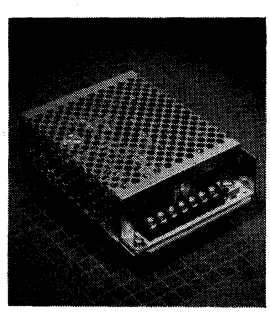
ECM™ 115V a-c input

TRIPLE OUTPUT L-CHASSIS SWITCHING POWER SUPPLIES

These are triple output, 16 Watt metal enclosed switching power supplies featuring simplicity and high reliability.

Features:

- **Adjustable voltage:** (+5V) set by internal trimmer.
- **Auxiliary outputs:** (±12V or ±15V) use 3-terminal stabilizer.
- **Metal enclosure** reduces the radiated noise and provides protection.



16 WATT MODELS

MODEL	OUTPUT VOLTS (Output #1)	OUTPUT VOLTS (Output #2)	OUTPUT VOLTS (Output #3)	OUTPUT CURRENT, AMPS, AT 50°C (Output #1) Max	OUTPUT CURRENT, AMPS, AT 50°C (Output #2) Max	OUTPUT CURRENT, AMPS, AT 50°C (Output #3) Max	SW RIPPLE mV	NOISE (SPIKE) Max mV
ECM 021K-CB	+5	+12	−12	2	0.3	0.2	<120(1)	2% E_O +50mV
ECM 022K-CB	+5	+15	−15	2	0.3	0.2	<120(1)	

Case size: 3.6" x 1.28" x 4.72" Net weight: 0.8 lb. **Cased only.**

(1) Outputs 2 & 3: <60mV.

ALL MODELS:

- **Holding time:** 30 milliseconds typically, 20 milliseconds minimum.
- **Built-in EMI filter** attenuates conducted noise below the requirements of FCC 20780 for Class B computing devices.
- **Safety:** All models recognized by UL, certified by CSA.

For summary specifications see pages 16 & 17

This KEPCO product is backed by a firm **1-YEAR WARRANTY**

UL RECOGNIZED CSA CERTIFIED

For complete specifications send for Kepco Switching Power Supply Catalog 146-1739.
Data and specifications subject to change without notice.

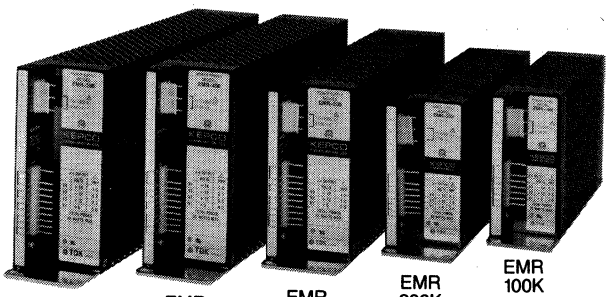
KEPCO, INC. • 131-38 SANFORD AVENUE • FLUSHING, NY 11352 USA • (718) 461-7000 • FAX: (718) 767-1102 • Easylink (TWX): 710-582-2631

KEPCO® THE POWER SUPPLIER™

KEPCO OEM a-c to d-c SWITCHING MODULES

EMR™ THREE AND FOUR OUTPUT

115/230V a-c input



EMR 500K | EMR 400K | EMR 300K | EMR 200K | EMR 100K

These fully enclosed multi-output power supplies are intended for industrial grade applications when low cost open frame units just won't do. Their built-in EMI filter meets FCC Class B, conducted EMI specifications. Molex input-output connectors allow easy installation. Connector cable kits available.

EMR 100K			22W
OUTPUT	VOLTS	AMPS	SW RIPPLE mV typ
Output #1	+5V	1.0 to 3.0	<50
Output #2	+12V	0.0 to 0.3	<50
Output #3	−12V	0.0 to 0.3	<50

Case size: 1.8″ x 3.9″ x 6.4″ Net weight: 1.3 lbs.

EMR 200K			42W
Output #1	+5V	1.0 to 3.0	<50
Output #2	+12V	0.4 to 2.0	<50
Output #3	−12V	0.0 to 0.3	<50

Case size: 2.0″ x 3.9″ x 7.8″ Net weight: 1.8 lbs.

EMR 300K			54W
Output #1	+5V	2.0 to 6.0	<50
Output #2	+12V	0.2 to 1.0	<50
Output #3	−12V	0.2 to 1.0	<50

Case size: 2.1″ x 4.5″ x 8.8″ Net weight: 2.2 lbs.

EMR 400K			53W
Output #1	+5V	2.0 to 4.0	<50
Output #2	+12V	0.1 to 0.5	<50
Output #3	−12V	0.0 to 0.3	<50
Output #4	+24	0.2 to 1.0	<50

Case size: 2.1″ x 5.1″ x 8.8″ Net weight: 2.4 lbs.

EMR 500K			80W
Output #1	+5V	2.0 to 5.0	<50
Output #2	+12V	0.4 to 2.3	<50
Output #3	−12V	0.0 to 0.3	<50
Output #4	+24V	0.2 to 1.0	<50

Case size: 2.1″ x 5.1″ x 10.0″ Net weight: 3.1 lbs.

For summary specifications see pages 16 & 17

For complete specifications on Series EMR send for Brochure 146-1507 or Kepco Switching Power Supply Catalog 146-1739.

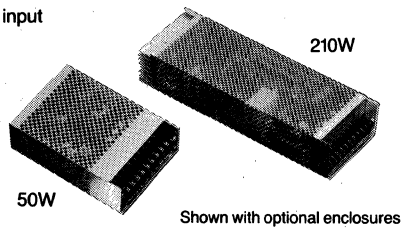
This KEPCO product is backed by a firm 1-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED

EFX™ FOUR OUTPUT

115/230V a-c input

Four convenient sizes: 50 Watts, 100 Watts, 150 Watts and 210 Watts. Each available in a variety of popular volt-ampere combinations. Built-in EMI filter attenuates conducted EMI to the limit of FCC Class A.



Shown with optional enclosures

Note: Figures in parenthesis ( ) are for 15V aux. output

50 WATT MODELS							
	AMPERES OUTPUT CURRENT AT 50°C						SW RIPPLE mV typ
MODEL	+5 VOLTS	−5 VOLTS	+12(15) VOLTS	+12 VOLTS	−12(15) VOLTS	+24 VOLTS	
EFX 050T-1	6.0 Typ. 7.2 Max.	—	1.0 Typ. 1.5 Max.	—	1.0 Typ. 1.5 Max.	0.2 Typ. 0.3 Max.	<50
EFX 050T-2	6.0 Typ. 7.2 Max.	—	(1.0 Typ.) (1.2 Max.)	—	(1.0 Typ.) (1.2 Max.)	0.2 Typ. 0.3 Max.	<50
EFX 050T-3	6.0 Typ. 7.2 Max.	0.8 Typ. 1.2 Max.	1.0 Typ. 1.5 Max.	—	1.0 Typ. 1.5 Max.	—	<50
EFX 050T-4	6.0 Typ. 7.2 Max.	0.8 Typ. 1.2 Max.	(1.0 Typ.) (1.2 Max.)	—	(1.0 Typ.) (1.2 Max.)	—	<50

Size: Open 1.97″ x 4.96″ x 7.20″ Enclosed (CA 11) 2.00″ x 5.00″ x 7.20″ Net wt.: 2.0 lbs.

100 WATT MODELS							
EFX 100T-1	8.0 Typ. 9.6 Max.	—	2.0 Typ. 3.0 Max.	—	2.0 Typ. 3.0 Max.	0.5 Typ. 0.75 Max.	<50
EFX 100T-2	8.0 Typ. 9.6 Max.	—	(1.6 Typ.) (2.4 Max.)	—	(1.6 Typ.) (2.4 Max.)	0.5 Typ. 0.75 Max.	<50,
EFX 100T-3	8.0 Typ. 9.6 Max.	1.5 Typ. 2.25 Max.	2.0 Typ. 3.0 Max.	—	2.0 Typ. 3.0 Max.	—	<50
EFX 100T-4	8.0 Typ. 9.6 Max.	1.5 Typ. 2.25 Max.	(1.6 Typ.) (2.4 Max.)	—	(1.6 Typ.) (2.4 Max.)	—	<50
EFX 100T-5	8.0 Typ. 9.6 Max.	—	3.5 Typ. 5.0 Max.	—	0.5 Typ. 0.75 Max.	0.5 Typ. 0.75 Max.	<50
EFX 100T-6	8.0 Typ. 9.6 Max.	—	2.8 Typ. 4.0 Max.	1.8 Typ. 2.7 Max.	0.5 Typ. 0.75 Max.	—	<50

Size: Open 1.97″ x 4.96″ x 9.41″ Enclosed (CA 12) 2.00″ x 5.00″ x 9.41″ Net wt.: 2.7 lbs.

150 WATT MODELS							
EFX 150T-1	15.0 Typ. 18.0 Max.	—	2.5 Typ. 3.75 Max.	—	2.5 Typ. 3.75 Max.	1.0 Typ. 1.5 Max.	<50
EFX 150T-2	15.0 Typ. 18.0 Max.	—	(2.0 Typ.) (3.0 Max.)	—	(2.0 Typ.) (3.0 Max.)	1.0 Typ. 1.5 Max.	<50
EFX 150T-3	15.0 Typ. 18.0 max.	2.0 Typ. 3.0 Max.	2.5 Typ. 3.75 Max.	—	2.5 Typ. 3.75 Max.	—	<50
EFX 150T-4	15.0 Typ. 18.0 Max.	2.0 Typ. 3.0 max.	(2.0 Typ.) (3.0 Max.)	—	(2.0 Typ.) (3.0 Max.)	—	<50

Size: Open 2.48″ x 4.96″ x 13.35″ Enclosed (CA 13) 2.52″ x 5.00″ x 13.40″ Net wt.: 3.8 lbs.

210 WATT MODELS							
EFX 210T-1	20.0 Max.	—	4.0 Max.	—	4.0 Max.	1.0 Max.	<50
EFX 210T-2	20.0 Max.	—	(3.0 Max.)	—	(3.0 Max.)	1.0 Max.	<50
EFX 210T-3	20.0 Max.	2.0 Max.	4.0 Max.	—	4.0 Max.	—	<50
EFX 210T-4	20.0 Max.	2.0 Max.	(3.0 Max.)	—	(3.0 Max.)	—	<50

Size: Open 2.48″ x 4.96″ x 14.96″ Enclosed (CA 14) 2.52″ x 5.00″ x 15.00″ Net wt.: 4.8 lbs.

For summary specifications see pages 16 & 17

For complete specifications on Series EFX send for Brochure 146-1469 or Kepco Switching Power Supply Catalog 146-1739.

This KEPCO product is backed by a firm 1-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED (except EFX 100T-5 and EFX 100T-6)

Data and specifications subject to change without notice.

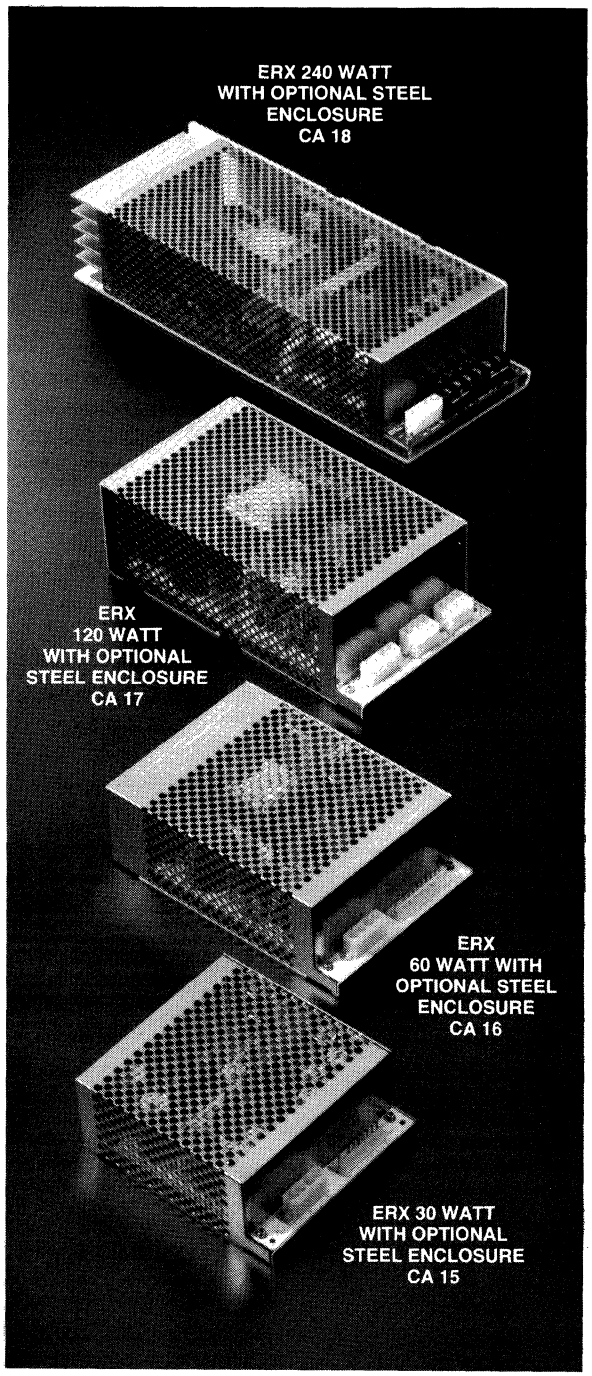
KEPCO® THE POWER SUPPLIER™

KEPCO OEM a-c to d-c SWITCHING MODULES

ERX™ 115/230V a-c input

WORLD POWER™ SINGLE OUTPUT

For the demanding requirements of OEM instrument makers, these are affordable low cost switching power supplies built on an open frame L-chassis, with optional perforated metal enclosures. Input and output is via Molex pin headers for easy installation (except for the 240 Watt models which use a barrier strip for their high current output). The built-in EMI filter meets the conducted EMI attenuation limits of FCC Class B. The use of custom hybrid microcircuits reduces parts count and contributes to high reliability. Connector cable kits available.



240 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPERES*				SW RIPPLE mV (typ)	NOISE (Spike) mV max
			40°C	50°C	60°C	70°C		
ERX 5-48	5	4.0- 5.5	48.0	38.4	28.8	19.2	<50	<150
ERX 12-20	12	8.4-13.2	20.0	16.0	12.0	8.0	<50	<300
ERX 15-16	15	10.5-16.5	16.0	12.8	9.6	6.4	<50	<300
ERX 24-10	24	16.8-26.4	10.0	8.0	6.0	4.0	<50	<400

Cased/Uncased size: 2.76" x 4.84" x 12.91" Net weight: 5.5 lbs.

120 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPERES*				SW RIPPLE mV (typ)	NOISE (Spike) mV max
			40°C	50°C	60°C	70°C		
ERX 5-24	5	4.0- 5.5	24.0	19.2	14.4	9.6	<40	<150
ERX 12-10	12	8.4-13.2	10.0	8.0	6.0	4.0	<40	<300
ERX 15-8	15	10.5-16.5	8.0	6.4	4.8	3.2	<40	<300
ERX 24-5	24	16.8-26.4	5.0	4.0	3.0	2.0	<40	<400

Cased/Uncased size: 2.76" x 4.84" x 8.90" Net weight: 3.1 lbs.

60 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPERES*				SW RIPPLE mV (typ)	NOISE (Spike) mV max
			40°C	50°C	60°C	70°C		
ERX 5-12	5	4.0- 5.5	12.0	9.6	7.2	4.8	<30	<150
ERX 12-5	12	8.4-13.2	5.0	4.0	3.0	2.0	<40	<300
ERX 15-4	15	10.5-16.5	4.0	3.2	2.4	1.6	<40	<300
ERX 24-2.5	24	16.8-26.4	2.5	2.0	1.5	1.0	<40	<400

Cased/Uncased size: 2.36" x 4.84" x 7.09" Net weight: 1.5 lbs.

30 WATT MODELS

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OUTPUT CURRENT AMPERES*				SW RIPPLE mV (typ)	NOISE (Spike) mV max
			40°C	50°C	60°C	70°C		
ERX 5-6	5	4.5- 5.5	6.0	4.8	3.6	2.4	<40	<150
ERX 12-2.5	12	10.8-13.2	2.5	2.0	1.5	1.0	<40	<300
ERX 15-2	15	13.5-16.5	2.0	1.6	1.2	0.8	<40	<300
ERX 24-1.3	24	21.6-26.4	1.3	1.0	0.8	0.5	<40	<400

Cased/Uncased size: 2.17" x 4.84" x 5.51" Net weight: 1.5 lbs.

*These ratings are for vertical installation without optional cover.
For horizontal mounting, enclosed, derate by 10%.

For summary specifications see pages 16 & 17

This KEPCO product is backed by a firm 1-YEAR WARRANTY

UL RECOGNIZED CSA CERTIFIED TÜV APPROVED

For complete specifications send for ERX Brochure 146-1641 or Kepco Switching Power Supply Catalog 146-1739.
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GENERAL SPECIFICATIONS AND FEATURES FOR SINGLE OUTPUT SWITCHING POWER SUPPLIES

MODEL	INPUT NOMINAL RANGE Volts a-c		d-c	EFFICIENCY Typical (%)	HOLDING TIME msec.	SOFT START	REMOTE CONTROL	REMOTE ERROR SENSING	RECOVERY TIME (TYP) for 50-100% load msec.	OVERVOLTAGE PROTECTION	CURRENT LIMIT	WITHSTAND VOLTAGE Input to case/output (KV a-c 1 min)
ERX	115	230	290	70-80	>20	Yes	No	Yes	<1	Fixed	Rectangular Fixed	1.25/3.75
	85-132	170-264	240-370									
FAK	120		145	70-75	>30	Yes	No	No	<1	Fixed 25W & 50W models only	15W & 25W: Foldback Fixed 50W: Rectangular Fixed	2.0/2.0
	85-132		110-170									
FAW	120/240		145/290	70-76	>20	Yes	No	Yes (50,100, 150W only)	<1	Fixed	15W & 25W: Foldback Fixed 50, 100, 150W: Rectangular Fixed	3.75/2.0
	85-264		105-370									
FMP	115		145	68-81	>20	Yes	No	No	<1	Zener Shunt	Rectangular Fixed	2.0/2.0
	85-132		110-170									
RAX	115	230	290	75-80	>30	Yes	Yes	Yes	<1	Fixed	Rectangular Fixed	2/3.75
	85-132	170-264	240-370									
RBX	115	230	290	65-85	>30	Yes	Yes	Yes	<0.3	Adjustable	Rectangular Fixed	2.0/2.0
	85-132	170-264	240-370									
RAY	170-264 Three Phase		–	80	>30	Yes	Yes	Yes	<5	Adjustable	Rectangular Fixed	3.0/2.0

GENERAL SPECIFICATIONS AND FEATURES FOR SINGLE OUTPUT d-c TO d-c CONVERTERS

MODEL	OUTPUT POWER Watts	INPUT NOMINAL RANGE Volts	CONVERSION EFFICIENCY Typical (%)	OPERATING FREQUENCY KHz	REMOTE CONTROL	REMOTE ERROR SENSING	RECOVERY TIME (TYP) for 50-100% lead msec.	OVERVOLTAGE PROTECTION	CURRENT LIMIT	WITHSTAND VOLTAGE Input to case/output (KV a-c, 1 min.)
ERD	30	24 / 20-30	77-79	300	Yes	Yes	<1	Fixed	Rectangular Fixed	2.0/2.0
	60	48 / 40-56	77-82							
	150									
FPD	5	24, 48 / 20-56	75-80 @ 24V 71-76 @ 48V	700	Yes	No	<1	Fixed	Foldback	0.5/0.5
	10									
	50	12 / 9-18	78	300	Yes	Yes	<1	Fixed	Rectangular Fixed	0.5/0.5
	50	24 / 20-30	81	450	Yes	Yes	<1	Fixed	Rectangular Fixed	0.5/0.5
	100		80							
	50	48 / 40-56	80	550	Yes	Yes	<1	Fixed	Rectangular Fixed	0.5/0.5
	100									
	50	150 / 110-165	80	500	Yes	Yes	<1	Fixed	Rectangular Fixed	2.0/2.0
	100									

GENERAL SPECIFICATIONS AND FEATURES FOR MULTI OUTPUT SWITCHING POWER SUPPLIES

MODEL	INPUT Volts a-c	d-c	EFFICIENCY Typical (%)	HOLDING TIME msec.	SOFT START	REMOTE CONTROL	REMOTE ERROR SENSING	RECOVERY TIME (TYP) for 50-100% load msec.	OVERVOLTAGE PROTECTION	CURRENT LIMIT	WITHSTAND VOLTAGE Input to case/output (KV a-c 1 min)
ECM[2]	115	145	>67	>20	Yes	No	No	2	No	Rect. Fixed	2.0/2.0
EFX[3]	115/230	290	70-75	>20	Yes	No	No	5	+ 5V fixed	Fixed 130%	2.5/2.5
EMR[3]	115/230	290	66-78	>20	Yes	No	No	2	+ 5V fixed	Rect. Fixed[1]	2.0/2.0
FCP[2]	115	145	64-77	>20	Yes	No	No	1	Fixed	Rect. Fixed	2.0/2.0
MRW	90-264	135-370	70	>20	Yes	No	No	2	+ 5V fixed	Winker Type	2.0/3.75

(1) EMR 100K & 200K – foldback (2) 115-ONLY INPUTS: 85-132V a-c; d-c input is 145V d-c; 110-170V d-c. (3) 115/230 SELECTABLE INPUTS: 85-132/170-264V a-c; d-c input is 290V d-c. 240-370 d-c.

KEPCO® THE POWER SUPPLIER™

STATIC SPECIFICATIONS FOR SINGLE OUTPUT SWITCHING POWER SUPPLIES

MODEL		SOURCE EFFECT %	LOAD EFFECT % (10%-100%)	TEMPERATURE EFFECT % Envelope 0-50°C	COMBINED EFFECT % (For rated changes in source voltage, load current, and temperature)	TIME EFFECT % (8-hour drift, with constant source voltage, load, and temperature)
ERD	Typical	<0.2	<0.3	0.3[1]	0.6	0.1
	Maximum	0.8	1.0	1.0[1]	2.0	0.5
FPD	Typical	<1.0	<1.0	1.0	3.0	0.1
	Maximum	2.0	2.0	2.0	6.0	0.2
ERX	Typical	<0.6	<0.6	1.0[1]	2.2	0.1
	Maximum	1.0	1.0	2.0[1]	4.0	0.5
FAK	Typical	<0.6	<1.2	<0.6	<1.0	<0.1
	Maximum	<2.0	<3.0	<2.0	<3.0	<0.5
FAW	Typical	<1.0	<1.0	<1.0	<2.0	<0.1
	Maximum	<2.0	<2.0	<2.0	<4.0	<0.5
FMP	Typical	<0.1	<0.8	1.0	1.0	–
	Maximum	0.5	2.0	3.0	3.0	0.5
RAX	Typical	<0.8[2]	<0.8[3]	1.0[1]	2.0[4]	0.1
	Maximum	1.5[2]	1.5[3]	2.0[1]	4.0[4]	0.5
RBX	Typical	<0.6-<1.5	<0.3-<1.0	0.2	1.1-2.7	<0.1
	Maximum	1.2-3.0	0.6-2.0	1.0	2.0-4.0	<0.5
RAY	Typical	1.0	1.0	1.0	2.0	0.1
	Maximum	2.0	2.0	2.0	4.0	0.5

[1]0-70°C; 1500W models 0.2% typ, 1.2% max. [2]1500W models – 0.2% typ, 1% max. [3]1500W models – 0.3% typ, 1% max. [4]1500W models – 1.2% typ, 3% max.

This table presents the range of values for each model that comprises a design. Please consult catalog or data sheets for individual specifications.

STATIC SPECIFICATIONS FOR MULTI OUTPUT SWITCHING POWER SUPPLIES

MODEL			SOURCE EFFECT %	LOAD EFFECT %[1] (10%-100%)	TEMPERATURE EFFECT % Envelope 0-50°C	COMBINED EFFECT % (For rated changes in source voltage, load current, and temperature)	TIME EFFECT % (8-hour drift, with constant source voltage, load, and temperature)
ECM	Output #1	Typical	<0.5	<1.0	<1.5	<2.0	–
		Maximum	1.5	3.0	3.5	4.0	0.5
	Outputs #2 and 3	Typical	<0.5	<0.5	<1.0	<1.5	–
		Maximum	1.5	1.5	3.0	4.0	0.5
EFX	Output #1	Typical	<0.1	<0.2	<0.5	<0.8	<0.02
		Maximum	0.5	1.0	1.0	2.5	0.1
	Outputs #2, 3, 4	Typical	<0.5	<5.0	<0.5	<6.0	<0.02
		Maximum	1.0	10.0	1.0	12.0	0.1
EMR	+5V	Typical	–	–	–	–	–
		Maximum	1.0-1.5	1.5-6	<3.0	<±3.0	<0.5
	Aux	Typical	–	–	–	<±5.0	–
		Maximum	1.0-1.5	1.5-6	<3.0	<±7.0	<0.5
FCP, both outputs		Typical	<0.1	<0.8	<1.0	1.0	–
		Maximum	0.5	2.0	3.0	3.0	<0.5
MRW	Output #1		1	<3	<2	+4, −2	<0.5
	Output #2		1	<5	<2	+4, −6	<0.5
	Output #3		1	<1	<1	±6	<0.5

[1]EFX 20%-100% load

Data and specifications subject to change without notice.

KEPCO® THE POWER SUPPLIER™

KEPCO CUSTOM SYSTEM POWER ASSEMBLIES

You design them... Kepco builds them for you.

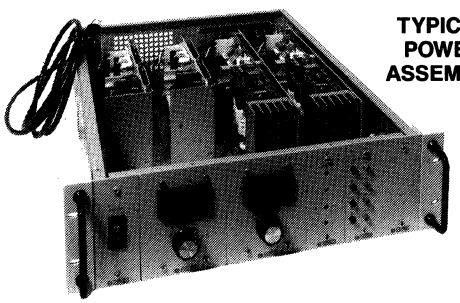
These are combinations of Kepco power supplies and accessories, custom-designed by you and your Kepco sales engineer, expertly wired, ready for your rack — at surprisingly low cost.

Our expert engineers will work with you to layout a custom assembly to your specifications choosing from power modules that span 3 Watts to 1500 Watts, 2 Volts to 48 Volts — a-c and d-c inputs.

Call your Kepco Sales Engineer to help you meet your Custom Power Assembly needs.

Let us send you a 4-page brochure that tells you a lot more. Ask for Power Assembly brochure 146-1637.

Consult factory for special requirements.



TYPICAL POWER ASSEMBLY

CURRENT SENSING RESISTORS

Model	Resistance	Current display
KT 1915	1.0Ω	0-199.9mA
KT 1387	0.1Ω	0-1.999A
KT 2713	0.01Ω	0-19.99A
KT 2714	0.001Ω	0-199.9A

ACCESSORY POWER SUPPLY TO ENERGIZE DVMs

Model	Description
DMS 2X9	Mounts internally, powers 2 DVMs

POWER FAIL DETECTOR

Model
PFD 01

CHASSIS SLIDES*

Model	Size
CS-01 (pr.)	20" deep
CS-02 (pr.)	22" deep
CS-03 (pr.)	24" deep

For other chassis slides, please consult factory.

REDUNDANT COMBINATION CIRCUIT BOARD

Model	
RDN-1	1 Pair of Power Supplies
RDN-2	2 Pair of Power Supplies
RDN-3	3 Pair of Power Supplies

For complete specifications send for Custom Assemblies Brochure 146-1637 or Kepco Switching Power Supply Catalog 146-1739. Data and specifications subject to change without notice.

RACK ADAPTERS

Model	H	W	D	Model	H	W	D
RA 42	5¼"	19"	21"	RA 45*	7"	19"	16"
RA 43*	7"	19"	21"	RA 46	5¼"	19"	24"
RA 44	5¼"	19"	16"	RA 47*	8¾"	19"	24"

* Supplied with either Vented Front Filler Panel FFP-A or Non-vented Front Filler Panel FFP-B.

FRONT PANEL COMPONENTS

Model	Description
MSP 1-1	Ckt. Breaker, Single Pole, 7.5 Amp., & Pilot
MSP 2-1	Ckt. Breaker, Single Pole, 15 Amp., & Pilot
MSP 3-1	4 Test Points (2 pr.)
MSP 4-1	8 Test Points (4 pr.)
MSP 5-1	4 LEDs
MSP 6-1	8 LEDs
MSP 7-1	2 Adj. Trimmers
MSP 8-1	4 Adj. Trimmers
MSP 9-2	Digital Voltmeter (DVM)
MSP 10-2	DVM with 2-Pos. Switch
MSP 11-2	DVM with 4-Pos. Switch
MSP 12-2	DVM with 8-Pos. Switch
MSP 13-2	DVM & Adj. Trimmer
MSP 14-2	DVM, Adj. Trimmer, 1 LED, 1 Pr. Test Pts., & 2-Pos. Switch
MSP 17-1	4 Toggle Switches for Remote On/Off (RAX, RBX, ERD)
MSP 18-1	8 Toggle Switches for Remote On/Off (RAX, RBX, ERD)
MSP 19-1	12 Test Pts. (6 pr.)
MSP 20-1	6 LEDs
MSP 21-1	6 Adj. Trimmers
MSP 22-1	Ckt. Breaker, Single Pole, 25 Amp., & Pilot
MSP 23-2	Ckt. Breaker, Double Pole, 25 Amp., & Pilot
MSP 24-3	4 LEDs, 4 Adj. Trimmers, & 8 Test Pts. (4 pr.)
MSP 25-3	5 LEDs, 5 Adj. Trimmers, & 10 Test Pts. (5 pr.)
MSP 26-3	6 LEDs, 6 Adj. Trimmers, & 12 Test Pts. (6 pr.)
MSP 27-3	7 LEDs, 7 Adj. Trimmers, & 14 Test Pts. (7 pr.)
MSP 33-1	Ckt. Breaker, Single Pole, 20 Amp., & Pilot
MSP 34-1	Ckt. Breaker, Single Pole, 30 Amp. & Pilot
MSP 35-2	Ckt. Breaker, Double Pole, 15 Amp & Pilot
MSP 36-2	Ckt. Breaker, Double Pole, 20 Amp & Pilot
MSP 37-2	Ckt. Breaker, Double Pole, 30 Amp & Pilot
MSP 38-2	Ckt. Breaker, Three Pole & Pilot (Consult factory for rating)

FRONT FILLER PANELS (BLANK)

FFP 1	1/8	FFP 3	3/8	FFP 5	5/8	FFP 7	7/8
FFP 2	1/4	FFP 4	1/2	FFP 6	3/4	FFP 8	Full

REAR PANEL COMPONENTS

Model	Description
RCP 1-1	1 a-c Inlet, 1 a-c Outlet
RCP 2-4	Fan, 1 a-c Inlet, 1 a-c Outlet
RCP 3-4	3 Barrier Strips (45 Terminals, 20 Amps/Terminal)
RCP 4-4	4 Barrier Strips (36 Terminals, 20 Amps/Terminal), Two 150 Amp Connector Studs
RCP 5-3	Vent Panel
RCP 6-1	a-c or d-c Inlet, 30 Amp. Barrier Strip, with Strain Relief Clamp & Cover
RCP 7-4	a-c Inlet, 30 Amp. Barrier Strip, with Strain Relief Clamp, Fan, & Cover
RCP 8-4	1 Barrier Strip (15 Terminals, 20 Amps/Terminal)
RCP 9-4	2 Barrier Strips (30 Terminals, 20 Amps/Terminal)
RCP 10-2	3 wire a-c Input with Mating Connector(1)
RCP 11-2	115V 1ϕ 3 wire a-c Input with 20 Amp Mating Connector & Plug(2)
RCP 12-2	115V 1ϕ 3 wire a-c Input with 30 Amp Mating Connector & Plug(2)
RCP 13-2	7 wire a-c Input with Mating Connector(1)
RCP 14-4	Fan, 115V 1ϕ (230V a-c optional), 3 wire a-c Input with Mating Connector)
RCP 15-4	Fan, 115V 1ϕ 3 wire a-c Input with 20 Amp Mating Connector & Plug(2)
RCP 16-4	Fan, 115V 1ϕ 3 wire a-c Input with 30 Amp Mating Connector & Plug(2)
RCP 17-4	Fan, 115V 1ϕ 7 wire a-c Input with Mating Connector & Plug(1)
RCP 18-4	Two 600 Amp Terminals (14 Terminals, 20 Amps/Terminal)

REAR FILLER PANELS (BLANK)

RFP 1	1/8	RFP 3	3/8	RFP 5	5/8	RFP 7	7/8
RFP 2	1/4	RFP 4	1/2	RFP 6	3/4	RFP 8	Full

EMI FILTERS

Model	Volts	Amps	Model	Volts	Amps
FLA 250-1	115/230V a-c	1.2	FLD 24-5	24V d-c	5.0
FLA 250-4	115/230V a-c	4.0	FLD 24-10	24V d-c	10.0
FLA 250-9	115/230V a-c	9.0	FLD 48-3	48V d-c	3.0
FLA 250-20	115/230V a-c	20.0	FLD 48-6	48V d-c	6.0

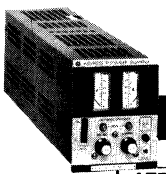
KEPCO® THE POWER SUPPLIER™

POWER MANAGERS™ for LABORATORY & SYSTEMS

ATE™ LINEAR PROGRAMMABLE POWER SUPPLIES FOR AUTOMATIC TEST EQUIPMENT SYSTEMS.

FEATURING:

- Full external control over both voltage and current with automatic crossover; separate voltmeter and ammeter for continuous output monitoring. Local control through 10-turn rheostats on front panel, remote through fixed gain power amplifier scaling from an input of 10 Volts to rated voltage.
- Digital control. ATE power supplies can be controlled by any of Kepco's systems programmers including the MATE-verified TLD 488-16.
- User selectable slow or fast mode of operation; slow mode is ideal for delivering constant voltage; in fast mode, the ATE can follow rapidly changing load voltages to deliver constant current, or follow high speed voltage or current programming.
- Two built-in, uncommitted amplifiers for scaling, summing, or other manipulation of programming signals. Both voltage and current control channels have full zeroing and calibration facilities for compatibility with Kepco's digital interfaces.
- Programmable/ tracking overvoltage protection.



QUARTER-RACK

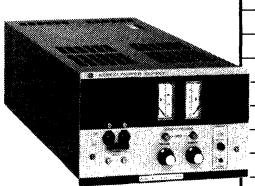
50 WATT MODELS

MODEL	VOLTS	AMPS
ATE 6-5M	0-6	0-5
ATE 15-3M	0-15	0-3
ATE 25-2M	0-25	0-2
ATE 36-1.5M	0-36	0-1.5
ATE 55-1M	0-55	0-1
ATE 75-0.7M	0-75	0-0.7
ATE 100-0.5M	0-100	0-0.5
ATE 150-0.3M	0-150	0-0.3

100 WATT MODELS

MODEL	VOLTS	AMPS
ATE 6-10M	0-6	0-10
ATE 15-6M	0-15	0-6
ATE 25-4M	0-25	0-4
ATE 36-3M	0-36	0-3
ATE 55-2M	0-55	0-2
ATE 75-1.5M	0-75	0-1.5
ATE 100-1M	0-100	0-1
ATE 150-0.7M	0-150	0-0.7

HALF-RACK



250 WATT MODELS

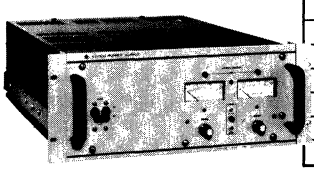
MODEL	VOLTS	AMPS
ATE 6-25M	0-6	0-25
ATE 15-15M	0-15	0-15
ATE 25-10M	0-25	0-10
ATE 36-8M	0-36	0-8
ATE 55-5M	0-55	0-5
ATE 75-3M	0-75	0-3
ATE 100-2.5M	0-100	0-2.5
ATE 150-1.5M	0-150	0-1.5
ATE 325-0.8M	0-325	0-0.8

THREE-QUARTER RACK

500 WATT MODELS

MODEL	VOLTS	AMPS
ATE 6-50M	0-6	0-50
ATE 15-25M	0-15	0-25
ATE 25-20M	0-25	0-20
ATE 36-15M	0-36	0-15
ATE 55-10M	0-55	0-10
ATE 75-8M	0-75	0-8
ATE 100-5M	0-100	0-5
ATE 150-3.5M	0-150	0-3.5

FULL-RACK



1000 WATT MODELS

MODEL	VOLTS	AMPS
ATE 6-100M	0-6	0-100
ATE 15-50M	0-15	0-50
ATE 25-40M	0-25	0-40
ATE 36-30M	0-36	0-30
ATE 55-20M	0-55	0-20
ATE 75-15M	0-75	0-15
ATE 100-10M	0-100	0-10
ATE 150-7M	0-150	0-7

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE Typ.	OUTPUT EFFECTS VOLTAGE MODE Max	OUTPUT EFFECTS CURRENT MODE Typ.	OUTPUT EFFECTS CURRENT MODE Max.	OFFSETS[3] ΔE_{io}	OFFSETS[3] ΔI_{io}
SOURCE VOLTAGE (min.-max.) [1]		<0.0005% E_o max.	0.001% E_o max.	<0.002% I_o max.	0.005% I_o max.	<1 μV	<1 nA
LOAD (no load-full load)		<0.001% E_o max.	0.002% E_o max.	<0.5 mA [2]	1 mA [2]	—	—
TIME 8-hour (drift):		<0.005% E_o max.	0.01% E_o max.	<0.01% I_o max.	0.02% I_o max.	<20 μV	<1 nA
TEMPERATURE, per °C		<0.005% E_o max.	0.01% E_o max.	<0.01% I_o max.	0.02% I_o max.	<20 μV	<2 nA
RIPPLE and NOISE	rms	<0.1 mV	0.3 mV	<0.01% I_o max.	0.03% I_o max.	—	—
(Slow Mode)	p-p	<1 mV	3 mV	<0.1% I_o max.	0.3% I_o max.	—	—
RIPPLE and NOISE	rms	<1 mV	3 mV	<0.01% I_o max.	0.03% I_o max.	—	—
(Fast Mode)	p-p	<10 mV	30 mV	<0.1% I_o max.	0.3% I_o max.	—	—

[1] 105-125/210-250V a-c.

[2] In slow mode, the leakage current through the output capacitor adds approximately 0-6 mA to the current mode load effect.

[3] Uncommitted amplifier offsets.

DYNAMIC SPECIFICATIONS

OUTPUT VOLTAGE RATING		6V	15V	25V	36V	55V	75V	100V	150V	325V
BANDWIDTH (−3db)[1] KHz	Min.	16	10.6	8	6.4	4	3.5	2.5	1.7	0.94
PROGRAMMING TIME CONSTANT (μsec)[1]	Max.	10	15	20	25	40	45	65	95	170
VOLTAGE RECOVERY	For step load change between 10% and 100% I_O maximum < 50 μsec typ., <100 μsec max. to recover within 10 mV									

(1) In fast mode, operating into a resistive load.

DIMENSIONS: **NET WEIGHT:**

50 Watt (Quarter-Rack):
$5^{7}/_{32}$"H x $4^{5}/_{32}$"W x $17^{1}/_{8}$"D[1] 14 lbs.

100 Watt (Quarter-Rack):
$5^{7}/_{32}$"H x $4^{5}/_{32}$"W x $17^{1}/_{8}$"D[1] 17 lbs.

250 Watt (Half-Rack):
$5^{7}/_{32}$"H x $8^{11}/_{32}$"W x $17^{9}/_{64}$"D[1] 35 lbs.

500 Watt (Three Quarter-Rack):
$5^{7}/_{32}$"H x $12^{17}/_{32}$"W x $17^{9}/_{64}$"D[1] 43 lbs.

1000 Watt (Full-Rack):[2]
$6^{31}/_{32}$"H x $16^{1}/_{2}$"W x $20^{1}/_{64}$"D[1] 87 lbs.

[1] Add $2^{1}/_{2}$" for connector protrusion.
[2] The full rack model is supplied with brackets for direct mounting in a standard 19-inch rack.

This KEPCO product is backed by a firm 5-YEAR WARRANTY

For complete specifications send for Kepco Instrumentation Catalog 146-1716.
Data and specifications subject to change without notice.

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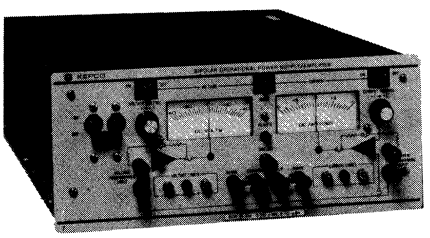
KEPCO®

THE POWER SUPPLIER™

POWER MANAGERS™ for LABORATORY & SYSTEMS

BOP™ 4-QUADRANT VOLTAGE/CURRENT STABILIZERS



These are four-quadrant bipolar power supplies that can be controlled (programmed) linearly from positive to negative output. They may be programmed as a voltage source with current limiting, or as a current source with voltage limiting. Their wide bandwidth encompasses nearly all of the audio spectrum for use as a powerful amplifier, or as a driver of complex waveforms for ATE operations. The BOPs are able to sink power when driving dynamic loads. IEEE-488 programming is possible with the optional internal BIT card (see below), or with one of the Kepco system programmers, including the MATE-verified TLD 488-16 which uses CIIL commands. For full TLD details, refer to page 30.

MODEL	d-c OUTPUT RANGE E_o max.	d-c OUTPUT RANGE I_o max.	CLOSED LOOP GAIN VOLTAGE CHANNEL G_V (V/V)	CLOSED LOOP GAIN CURRENT CHANNEL G_I (A/V)	OUTPUT IMPEDANCE VOLTAGE MODE SERIES R	OUTPUT IMPEDANCE VOLTAGE MODE SERIES L	OUTPUT IMPEDANCE CURRENT MODE SHUNT R	OUTPUT IMPEDANCE CURRENT MODE SHUNT C
100 WATT Size: $5^{7}/_{32}$"H x $12^{17}/_{32}$"W x $17^{9}/_{64}$"D Net weight: 38 lbs.								
BOP 50-2M	± 50V	± 2A	5.0	0.2	0.5 mΩ	100μH	50 kΩ	0.05μF
BOP 100-1M	± 100V	± 1A	10.0	0.1	2.0 mΩ	200μH	100 kΩ	0.05μF
200 WATT Size: $5^{7}/_{32}$"H x $12^{17}/_{32}$"W x $17^{9}/_{64}$"D Net weight: 41 lbs.								
BOP 20-10M	± 20V	± 10A	2.0	1.0	40 μΩ	50μH	20 kΩ	0.1μF
BOP 36-6M	± 36V	± 6A	3.6	0.6	120 μΩ	50μH	36 kΩ	0.1μF
BOP 50-4M	± 50V	± 4A	5.0	0.4	0.25 mΩ	100μH	50 kΩ	0.05μF
BOP 72-3M	± 72V	± 3A	7.2	0.3	0.48 mΩ	200μH	72 kΩ	0.05μF
BOP 100-2M	± 100V	± 2A	10.0	0.2	1.0 mΩ	200μH	100 kΩ	0.05μF
BOP 200-1M(1)	± 200V	± 1A	20.0	0.1	4.0 mΩ	1.2 mH	200 kΩ	0.03μF
400 WATT Size: $5^{7}/_{32}$"H x $16^{15}/_{32}$"W x $20^{5}/_{64}$"D Net weight: 68 lbs.								
BOP 20-20M	± 20V	± 20A	2.0	2.0	20 μΩ	50μH	20 kΩ	0.2μF
BOP 36-12M	± 36V	± 12A	3.6	1.2	60 μΩ	50μH	36 kΩ	0.2μF
BOP 50-8M	± 50V	± 8A	5.0	0.8	125 μΩ	100μH	50 kΩ	0.15μF
BOP 72-6M	± 72V	± 6A	7.2	0.6	240 μΩ	200μH	72 kΩ	0.1μF
BOP 100-4M	± 100V	± 4A	10.0	0.4	500 μΩ	200μH	100 kΩ	0.1μF

(1)Same size and weight as 400 Watt models.

DYNAMIC SPECIFICATIONS

MODEL	BANDWIDTH (d-c to f_{-3dB}) KHz (minimum) Mode V	Mode I	RISE & FALL TIME 10%-90% μsec (maximum) Mode V	Mode I	LARGE SIGNAL FREQUENCY (min) RESPONSE, KHz Mode V	Mode I	SLEWING RATE (minimum) Mode V	Mode I	RECOVERY STEP LOAD μsec (maximum) Mode V	Mode I
100 WATT										
BOP 50-2M	18	12	20	30	17	13	5V/μsec	0.15A/μsec	25	10
BOP 100-1M	18	11	17	22	18	11	11V/μsec	70mA/μsec	40	25
200 WATT										
BOP 20-10M	18	6	20	60	17	7	2V/μsec	0.4A/μsec	80	20
BOP 36-6M	16	13	20	27	15	14	3V/μsec	0.5A/μsec	50	35
BOP 50-4M	23	14	14	25	15	11	4.5V/μsec	0.25A/μsec	40	30
BOP 72-3M	20	15	18	26	17	12	10V/μsec	0.15A/μsec	30	30
BOP 100-2M	22	15	18	26	17	12	10V/μsec	0.15A/μsec	30	30
BOP 200-1M	4.0	2.5	110	150	4	2.5	5V/μsec	15mA/μsec	150	120
400 WATT										
BOP 20-20M	9.5	10	35	35	8	10	1V/μsec	1.25A/μsec	100	75
BOP 36-12M	20	10	16	30	19	10	4V/μsec	0.75A/μsec	50	30
BOP 50-8M	24	10	14	35	24	11	7.5V/μsec	0.5A/μsec	40	30
BOP 72-6M	19	9.5	18	40	20	11	9V/μsec	0.4A/μsec	50	20
BOP 100-4M	18	14	22	30	16	10	10V/μsec	0.25A/μsec	40	30

STATIC SPECIFICATIONS

This KEPCO product is backed by a firm 5-YEAR WARRANTY

INFLUENCE QUANTITY		OUTPUT EFFECTS(2) VOLTAGE MODE TYP	VOLTAGE MODE MAX	CURRENT MODE TYP	CURRENT MODE MAX	PREAMPLIFIER OFFSETS ΔE_{io}	PREAMPLIFIER OFFSETS ΔI_{io}	REFERENCE ±10V
SOURCE (min-max)(1):		<0.0005%	0.001%	<0.002%	0.005%	<5μV	<1nA	<0.0005%
LOAD (NL-FL):		<0.001%	0.002%	<0.5mA	1mA	—	—	<0.0005%
TIME (8-hour drift):		<0.005%	0.01%	<0.01%	0.02%	<20μV	<1nA	<0.005%
TEMP., per °C:		<0.005%	0.01%	<0.01%	0.02%	<20μV	<1nA	<0.005%
RIPPLE and NOISE:(3)	rms	<1mV	3mV	<0.01%	0.03%	—	—	—
	p-p(4)	<10mV	30mV	<0.1%	0.3%	—	—	—

(1) 105-125/210-250V a-c.
(2) Output effects, expressed as a percentage, are referred to the maximum rated output voltage or current.
(3) Measured with the common terminal grounded so that the common mode current does not flow through the load.
(4) Peak-to-peak ripple is measured over a 20 Hz to 10MHz bandwidth.

BIT™ OPTIONAL INTERFACE BOARD

Mounts inside BOP.

MODEL TABLE

SUFFIX (1)	MODEL (2)	DATA FORMAT	RESOLUTION Principal Channel	RESOLUTION Limit Channel	INPUT
—488-B	BIT 488-B	ASCII/Hex	12 Bits (binary)	8 Bits (binary)	For IEEE-488 (GPIB) bus
—488-D	BIT 488-D	ASCII/Decimal	3-Digit (BCD)	2-Digit (BCD)	For IEEE-488 (GPIB) bus
—500-B	BIT 500-B	Hexadecimal	12 Bits (binary)	8 Bits (binary)	For parallel data transfer bus
—500-D	BIT 500-D	Decimal	3-Digit (BCD)	2-Digit (BCD)	For parallel data transfer bus

(1) Add to model No. of the BOP to specify a factory-installed interface.
(2) Use this designation when ordering separately for field installation.

For complete specifications send for BOP Series Brochure 146-1704 or Kepco Instrumentation Catalog 146-1716.

Data and specifications subject to change without notice.

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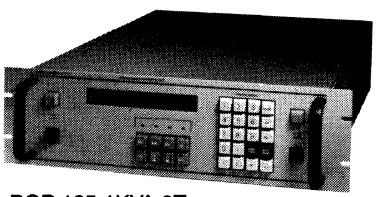
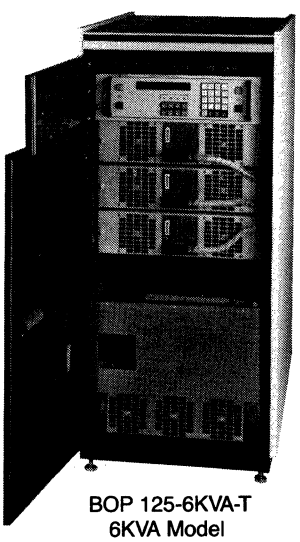
KEPCO. PACIFIC **THE POWER SUPPLIER™**

BOP-ac™ PROGRAMMABLE ac POWER SUPPLIES

GPIB-controlled ac power from 1KVA to 18KVA, 0-125Vac (rms), 47 to 2000Hz. Transient generation capability permits superimposition of amplitude and frequency disturbances including partial-cycle dropouts (6 & 18 KVA). A panel-mounted keyboard and 80-character LCD display offer local control and monitor. Linear design, high-efficiency circuit.



BOP 125-1KVA-3T
1KVA Model



BOP 125-6KVA-T
6KVA Model

This KEPCO product is backed by a firm 1-YEAR WARRANTY

BOP-ac SPECIFICATIONS

SPECIFICATION	CONDITION	1KVA MODELS	6KVA AND 18KVA MODELS
INPUT			
ac Voltage	Selectable	108-132 or 216-264Vac	240Vac L-L 3Ø delta
			120/208Vac 3Ø wye
			480Vac L-L 3Ø delta
			277/480Vac 3Ø wye
Power	At full load	≈1500VA	6KVA model: ≈ 10KVA
			18KVA model: ≈ 30KVA
Frequency	–	47-63Hz	47-63Hz
OUTPUT			
ac Voltage	Programmable in 0.1V steps	0-136.5Vac	0-132Vac(1)
(2:1 step-up auto-transformer available)	3Ø line-neutral	0-136.5Vac	0-132Vac(1)
	3Ø line-line	0-236Vac	0-228Vac(1)
	split phase	0-273Vac	0-264Vac(1)
Frequency	20-2000Hz for 1KVA	20Hz-49.99Hz in 0.01Hz steps	47-49.99Hz in 0.01Hz steps
	47-2000Hz for 6KVA and 18KVA models	50Hz-499.99Hz in 0.1Hz steps	50-999.9Hz in 0.1Hz steps
		500Hz-2000Hz in 1.0Hz steps	1000-2000Hz in 1Hz steps
Frequency Accuracy	20-2000Hz 1KVA, 47-2000Hz 6/18KVA	0.01% ± 1 count	0.01% ± 1 count
Distortion	At full load (typ)	<0.5% THD	<0.5% THD
	(max)	<1.0% THD	<0.75% THD
Small Signal Bandwidth	For subcycle transient reproduction	20Hz-20KHz	20Hz-40KHz

(1) 125Vac maximum (217Vac L-L, 250Vac split phase) at minimum source voltage.

BOP-ac STABILIZATION

SPECIFICATION	CONDITION	1KVA MODELS	6 & 18KVA MODELS
Source effect	±10% source voltage	±0.1% max	±0.1% max
Load effect	0-100% typ	0.1%	0.25%
	0-100% max	0.5%	0.5%
Temperature effect	0-50° C Frequency	0.25%	0.25%
	0-50° C Voltage	1.0%	1.0%
Ripple	Output modulation @ 120Vac	0.8Vac p-p	0.8Vac p-p

BOP-ac MODEL TABLE

SPECIFICATION	BOP 125-1KVA-T	BOP 125-1KVA-3T	BOP 125-6KVA-T		BOP 125-18KVA-T	
ac Output voltage	0-136.5Vac	0-136.5Vac	0-132Vac(2)		0-132Vac(2)	
Frequency	20Hz - 2000Hz	20Hz - 2000Hz	47Hz - 2000Hz		47Hz - 2000Hz	
Power	1000VA	1,000VA	6,000VA		18,000VA	
Power per phase	1000VA	500VA	2,000VA		6,000VA	
Number of phases	1Ø	3Ø	1Ø	3Ø	1Ø	3Ø
Current continuous	8.3A rms	3.0A rms/Ø	48A rms	16A rms/Ø	144A rms	48A rms/Ø
Current peak (1)	27.0A pk	9.0A pk/Ø	144A pk	48A pk/Ø	432A pk	144A pk/Ø
Current limit	12A max	6.0A max	75A max	25A max/Ø	225A max	75A max/Ø

(1) At sine crest (2) 125Vac maximum at minimum source voltage

For complete specifications send for BOP series brochure 146-1704

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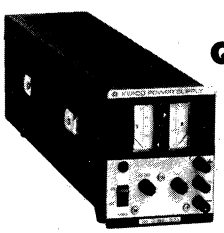
KEPCO® THE POWER SUPPLIER™

POWER MANAGERS™ for LABORATORY & SYSTEMS

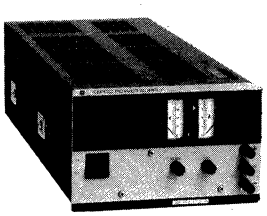
JQE™ 115/230V a-c input

GENERAL PURPOSE VOLTAGE STABILIZERS

Systems-type, voltage stabilizers with current limiting, programmable from the IEEE bus using Kepco digital interfaces. JQE's voltage control channel has an I-C front end for maximum stability and minimum offset. The rated power is delivered under the realistic thermal environs of a system's cabinet with no derating. The 10-turn voltage control is standard. For units requiring overvoltage protection and/or high speed programming, see the ATE group.



QUARTER RACK 100 WATT



HALF RACK 250/500 WATT

FULL-RACK 1000 WATT

MODEL	d-c OUTPUT RANGE VOLTS	AMPS	OUTPUT IMPEDANCE VOLTAGE MODE SERIES R	SERIES L	CURRENT MODE SHUNT R	SHUNT C	MAX INPUT AMPS AT 125V a-c
100 WATT MODELS							
JQE 6-10M	0-6	0-10	30 μΩ	1μH	50KΩ	3KμF	2.0
JQE 15-6M	0-15	0-6	125 μΩ	1μH	84KΩ	1KμF	2.1
JQE 25-4M	0-25	0-4	300 μΩ	1μH	125KΩ	700 μF	2.2
JQE 36-3M	0-36	0-3	600 μΩ	1μH	165KΩ	400 μF	2.2
JQE 55-2M	0-55	0-2	1.4mΩ	1μH	250KΩ	220 μF	2.3
JQE 75-1.5M	0-75	0-1.5	2.5mΩ	1μH	330KΩ	160 μF	2.3
JQE 100-1M	0-100	0-1	5 mΩ	2μH	500KΩ	110 μF	2.1
250 WATT MODELS							
JQE 6-22M	0-6	0-22	14 μΩ	0.5μH	23 KΩ	5.8KμF	4.2
JQE 15-12M	0-15	0-12	63 μΩ	0.5μH	42 KΩ	2.7KμF	4.0
JQE 25-10M	0-25	0-10	125 μΩ	0.5μH	50 KΩ	2.4KμF	5.3
JQE 36-8M	0-36	0-8	225 μΩ	0.5μH	62.5KΩ	1.4KμF	6.0
JQE 55-5M	0-55	0-5	550 μΩ	1 μH	100 KΩ	850 μF	5.0
JQE 75-3M	0-75	0-3	1.25mΩ	1 μH	165 KΩ	850 μF	4.0
JQE 100-2.5M	0-100	0-2.5	2 mΩ	1 μH	200 KΩ	600 μF	4.5
JQE 150-1.5M	0-150	0-1.5	5 mΩ	2 μH	330 KΩ	440 μF	4.6
500 WATT MODELS							
JQE 6-45M	0-6	0-45	7 μΩ	0.5μH	11 KΩ	8 KμF	9.0
JQE 15-25M	0-15	0-25	30 μΩ	0.5μH	20 KΩ	4.5KμF	8.4
JQE 25-20M	0-25	0-20	63 μΩ	0.5μH	25 KΩ	4.3KμF	10.5
JQE 36-15M	0-36	0-15	120 μΩ	0.5μH	33 KΩ	3.6KμF	9.5
JQE 55-10M	0-55	0-10	275 μΩ	1 μH	50 KΩ	2.1KμF	9.0
JQE 75-8M	0-75	0-8	469 μΩ	1 μH	62.5KΩ	1.2KμF	10.0
JQE 100-5M	0-100	0-5	1.25mΩ	1 μH	100 KΩ	600 μF	8.4
JQE 150-3.5M	0-150	0-3.5	2.2 mΩ	2 μH	140 KΩ	440 μF	8.7
1000 WATT MODELS							
JQE 6-90M	0-6	0-90	3.5 μΩ	0.5μH	3.5KΩ	17.6KμF	15.7
JQE 15-50M	0-15	0-50	15 μΩ	0.5μH	10 KΩ	12 KμF	16.6
JQE 25-40M	0-25	0-40	31 μΩ	0.5μH	12.5KΩ	14 KμF	21.0
JQE 36-30M	0-36	0-30	60 μΩ	0.5μH	16 KΩ	11 KμF	19.0
JQE 55-20M	0-55	0-20	138 μΩ	1 μH	25 KΩ	7.3KμF	18.0
JQE 75-15M	0-75	0-15	250 μΩ	1 μH	33 KΩ	4.2KμF	18.0
JQE 100-10M	0-100	0-10	0.62mΩ	1 μH	50 KΩ	2.2KμF	17.0
JQE 150-7M	0-150	0-7	1.1 mΩ	2 μH	72 KΩ	1 KμF	18.0

DIMENSIONS:

Quarter-Rack Models: 5 7/32"H x 4 5/32"W x 17 3/16"D(1); Net Weight: 17 lbs.

Half-Rack Models: 5 7/32"H x 8 11/32"W x 17 3/8"D
Net Weight: 250W — 35 lbs; 500W — 46 lbs.

Full-Rack Models: 5 7/32"H x 16 1/2"W(2) x 17 1/64"D(1); Net Weight: 95 lbs.

(1)behind panel (2)with supplied "ears" standard 19" panel width

This KEPCO product is backed by a firm **5-YEAR WARRANTY**

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	CURRENT MODE(1)	AMPLIFIER OFFSETS VOLTAGE ΔE_{io}	CURRENT ΔI_{io}	REFERENCE 6.2V ± 5%
SOURCE: 105-125/210-250V a-c		<0.0005%	<0.005%	<10 μV	<2 nA	0.0001%
LOAD: No load-full load		<0.005% or 0.2 mV(2)	<0.01%	<200 μV	<5 nA	—
TIME: 8-hours (drift)		<0.01% or 1 mV(2)	<0.02%	<20 μV	<2 nA	0.005%
TEMPERATURE: Per °C		<0.01%(3)	<0.02%(3)	<20 μV	<5 nA	0.005%
RIPPLE and NOISE:(4)	rms	<0.2 mV	<0.02% of I_o max.	—	—	—
	p-p(5)	<1.0 mV	<0.1% of I_o max.	—		—

(1)External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.
(2)Whichever is greater.
(3)Typical temperature effect coefficients are: 0.005% per °C voltage mode; 0.01% per °C externally sensed current mode.
(4)One terminal grounded or connected so that the common-mode current does not flow through the load or (in current-mode) through a sensing resistor.
(5)20 Hz to 10 MHz.

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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KEPCO® THE POWER SUPPLIER™

POWER MANAGERS™ for LABORATORY & SYSTEMS

HIGH VOLTAGE MODELS

APH™ 115/230V a-c input

AUTOMATIC CROSSOVER CONVENTIONALLY FILTERED

High voltage laboratory power supplies offering continuously adjustable or remotely programmable voltage and current in an automatic crossover configuration. APH 500M and APH 1000M can be digitally controlled by one of Kepco's SN-Series programmers. For control of the 2000V model please consult the factory.

20 WATT MODELS

MODEL	VOLTS	AMPS
APH 500M	0–500	0–0.04
APH 1000M	0–1000	0–0.02
APH 2000M	0–2000	0–0.01

DIMENSIONS: $5^{7}/_{32}$"H x $12^{17}/_{32}$"W x $12^{7}/_{8}$"D
NET WEIGHT: 20 lbs.

STATIC SPECIFICATIONS

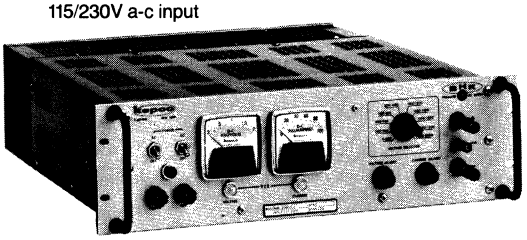
INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE (1)	CURRENT MODE (Internal Sensing)
SOURCE: 105-125/210-250V a-c		<0.001%	<0.005% of I_o max
LOAD (No load—full load):		<0.005%	<0.01% of I_o max.
TIME: 8-hour (drift)		<0.01%	<0.01% of I_o max.
TEMPERATURE: Per °C		<0.01%	<0.01% of I_o max.
RIPPLE and NOISE	rms	<2 mV	<40 μA
	p-p	<10 mV	<200 μA

(1) Specifications are expressed as a *percent-of-setting* for the output range 10% to 100%. Below 10% output, the specification limit is the rated percentage of the 10% output setting.

This KEPCO product is backed by a firm **5-YEAR WARRANTY**

BHK™ 200 WATT AUTOMATIC CROSSOVER, CONVENTIONAL AND HIGH SPEED

115/230V a-c input



Models BHK 500-0.4M and BHK 1000-0.2M are programmable from the IEEE-488 bus using one of the stand-alone Kepco digital interfaces. For control of the 2000V model please consult the factory. The BHK are arranged in an automatic crossover configuration for control of both voltage and current. Provision is made for disconnecting the output capacitor for high speed programming.

200 WATT MODELS

MODEL	VOLTS	AMPS
BHK 500-0.4M	0–500	0–0.4
BHK 1000-0.2M	0–1000	0–0.2
BHK 2000-0.1M	0–2000	0–0.1

CONTROL/PROGRAMMING:
Output voltage is controlled from the panel by a combination of a 10-position decade switch and a 10-turn vernier control. This arrangement provides 0.005% resolution yet does not inhibit the ability to sweep program a BHK linearly through its entire range. External control can be exercised by a resistance (1000 ohms per volt) or by a control voltage, delivering 0 to +1 milliampere into the summing junction with respect to the plus (+) output/sense terminal. External signals can be substituted for, or summed with, the internal reference for additional control. BHK can be strapped for either conventional speed operation or for fast programming. In fast mode the output can be controlled at 0.5V per microsecond.

DIMENSIONS: $5^{7}/_{32}$"H x 19"W x $15^{5}/_{16}$"D (behind panel) **NET WEIGHT:** 38 lbs.

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	CURRENT MODE (Internal Sensing)
SOURCE: 105–125/210–250V a-c		<0.005%	<100 μA
LOAD: No load—full load		<0.01%	<100 μA
TIME: 8 hours (drift)		<0.01%	<0.01% of I_o max
TEMPERATURE: Per °C		<0.01%	<0.05% of I_o max
RIPPLE and NOISE: (Slow Mode)	rms	<1 mV	<100 μA
	p-p	<10 mV	<1 mA
RIPPLE AND NOISE: (Fast Mode)	rms	<50 mV	<500 μA
	p-p	<500 mV	<5 mA

CAUTION!

NOTE: BHK Power Managers should be mounted in a 19" rack or rack-style cabinet. They are not fully enclosed for bench type use. Dangerous voltages are exposed at the rear of the unit.

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For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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KEPCO® THE POWER SUPPLIER™

POWER MANAGERS™ for LABORATORY & SYSTEMS
HIGH VOLTAGE MODELS

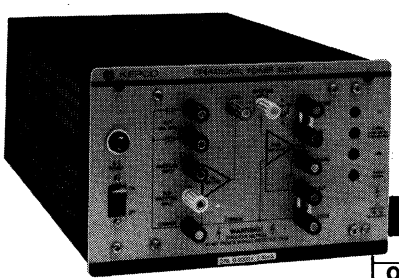
OPS™ 115/230V a-c input
group IX B

This KEPCO product is backed by a firm 5-YEAR WARRANTY

OPS™ 115/230V a-c input
group X

HIGH SPEED OPERATIONAL POWER SUPPLIES

20 Watt, high voltage stabilizer, equipped with an operational patch panel and featuring a capacitorless output for fast programming applications. Restricted to non-capacitive loads. OPS 500B and OPS 1000B can be digitally controlled by one of Kepco's SN-Series programmers.



DIMENSIONS:
5 7/32"H x 8 11/32"W x 12 7/8"D
NET WEIGHT: 19 lbs.

20 WATT MODELS

MODEL	VOLTS	AMPS
OPS 500B	0-500	0.04
OPS 1000B	0-1000	0.02
OPS 2000B	0-2000	0.01

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		UNCOMMITTED CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	UNCOMMITTED CONTROL CHANNEL OFFSET CURRENT ΔI_{io}	CURRENT CONTROL CHANNEL OUTPUT EFFECTS	REFERENCE ±6.2V ±5% NOMINAL
SOURCE VOLTAGE 105-125/210-250V a-c		< 10 μV	< 1 nA	< 10 μA	< 0.0005%
LOAD (No load—full load):		< 10 μV(2)	< 1 nA	< 10 μA	—
TIME (8-hour drift):		< 20 μV	< 1 nA	< 0.01% of $I_{o\,max}$	< 0.005%
TEMPERATURE, Per °C:		< 20 μV	< 0.5 nA	< 0.01% of $I_{o\,max}$	< 0.005%
RIPPLE and NOISE:	rms	<0.01% of E_{0max}		< 50 μA	—
	p-p	<0.1% of E_{0max}		< 250 μA	—

(1) ΔE_{io} for load in current stabilization mode is ΔE_O/open-loop gain. ΔE_O is the compliance voltage change.

The output effect can be calculated by the relationship:
$\Delta E_O = \pm \Delta E_r (R_f/R_i) \pm \Delta E_{io} (1 + R_f/R_i) \pm \Delta I_{io} (R_f)$,
where R_f is the feedback resistor and R_i is the input resistor from the reference, E_r.

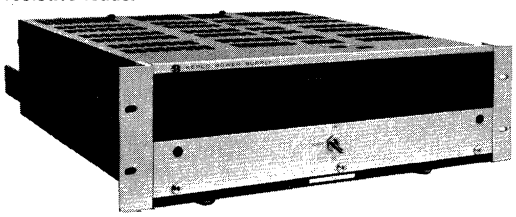
DYNAMIC SPECIFICATIONS

PARAMETER	STABILIZATION MODE	OPS 500B	OPS 1000B	OPS 2000B
BANDWIDTH (d-c to f_{-3dB})	Voltage	800 Hz	400 Hz	200 Hz
	Current	320 Hz	160 Hz	80 Hz
PROGRAMMING TIME CONSTANT	Voltage(1)	200 μsec	400 μsec	800 μsec
	Current(2)	500 μsec	1 msec	2 msec
LARGE SIGNAL FREQUENCY RESPONSE	Voltage	320 Hz	160 Hz	80 Hz
SLEWING RATE	Voltage	>1V/μsec	>1V/μsec	>1V/μsec
TRANSIENT RECOVERY (Step Load Change)	Voltage	<100 μsec	<100 μsec	<100 μsec
	Current	500 μsec	1 msec	2 msec

(1)Calculated for a feedback resistance of 1000 ohms per volt of output and a feedback capacitance of 400 pF. The range of capacitance available internally is 400 pF to 3900 pF.
(2)Calculated for a load resistance equal to E_0max/I_0max and the equivalent output capacitance.

HIGH SPEED OPERATIONAL POWER SUPPLIES

A high speed, high voltage fast-programmable voltage source: Because of its capacitorless output design, OPS models function at design-speed only when used with resistive loads.



25 & 35 WATT MODELS

MODEL	VOLTS	AMPS
OPS 3500	0-3500	0-0.01
OPS 5000(1)	0-5000	0-0.005

DIMENSIONS:
5 7/32"H x 19" W x 16 31/32"D
NET WEIGHT:
45 lbs.

(1)60 Hz ±3Hz only

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		UNCOMMITTED CONTROL CHANNEL OFFSET VOLTAGE ΔE_{io}	UNCOMMITTED CONTROL CHANNEL OFFSET CURRENT ΔI_{io}	CURRENT CONTROL CHANNEL OUTPUT EFFECTS	REFERENCE ±6.2V ±5% NOMINAL
SOURCE VOLTAGE 105-125/210-250V a-c		< 10 μV	< 1 nA	< 10 μA	< 0.0005%
LOAD (No load—full load):		< 10 μV(2)	< 1 nA	< 10 μA	—
TIME (8-hour drift):		< 20 μV	< 1 nA	< 0.01% of $I_{o\,max}$	< 0.005%
TEMPERATURE, Per °C:		< 20 μV	< 0.5 nA	< 0.01% of $I_{o\,max}$	< 0.005%
RIPPLE and NOISE:	rms	<0.01% of E_{0max}		< 50 μA	—
	p-p	<0.1% of E_{0max}		< 500 μA	—

(1) ΔE_{io} for load in current stabilization mode is ΔE_O/open-loop gain. ΔE_O is the compliance voltage change.

The output effect can be calculated by the relationship:
$\Delta E_O = \pm \Delta E_r (R_f/R_i) \pm \Delta E_{io} (1 + R_f/R_i) \pm \Delta I_{io} (R_f)$,
where R_f is the feedback resistor and R_i is the input resistor from the reference, E_r.

DYNAMIC SPECIFICATIONS

	STABILIZATION MODE	OPS 3500	OPS 5000
BANDWIDTH (d-c to f_{-3dB})	Voltage	230 Hz	160 Hz
	Current	130 Hz	100 Hz
PROGRAMMING TIME CONSTANT	Voltage(1)	700 μsec	1 msec
	Current(2)	1.2 msec	1.6 msec
LARGE SIGNAL FREQUENCY RESPONSE	Voltage	135 Hz	100 Hz
SLEWING RATE	Voltage	>3V/μsec	>3V/μsec
TRANSIENT RECOVERY (Step Load Change)	Voltage	<100 μsec	<100 μsec
	Current	1.2 msec	1.6 msec

(1)Calculated for a feedback resistance of 1000 ohms per volt of output and a feedback capacitance of 200 pF. The range of capacitance available internally is 200 pF to 1900 pF.
(2)Calculated for a load resistance equal to E_{0max}/I_{0max} and the equivalent output capacitance.

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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KEPCO® THE POWER SUPPLIER™

POWER MANAGERS™ for LABORATORY & SYSTEMS

HIGH VOLTAGE MODELS

FOUR-QUADRANT VOLTAGE/CURRENT STABILIZERS

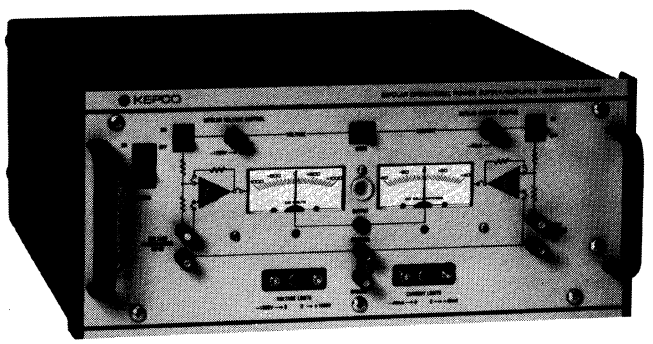
BOP-HV™

These high voltage power supplies share the bipolar and source/sink capabilities of the lower voltage BOP. Their outputs can be made to vary smoothly and linearly through their entire rated plus and minus ranges, passing linearly through zero. They can source as well as sink 100% of their current rating at any voltage setting. BOP-HV models are bounded in all four quadrants by four fully adjustable, programmable boundary limits, and are digitally programmable with any of the Kepco SN series systems programmers.

40 WATT MODELS

MODEL	d-c OUTPUT RANGE E_O max.	I_O max.	CLOSED LOOP GAIN VOLTAGE CHANNEL G_V (V/V)	CURRENT CHANNEL G_I (mA/V)	OUTPUT IMPEDANCE VOLTAGE MODE SERIES R	SERIES L	CURRENT MODE SHUNT R	SHUNT C
BOP 500M	± 500V	± 80 mA	50	8.0	0.05 Ω	10 mH	100 MΩ	0.02 μF
BOP 1000M	± 1000V	± 40 mA	100	4.0	0.2 Ω	10 mH	400 MΩ	0.01 μF

Size: 6 31/32"H × 16 1/2"W* × 17 5/64"D *19" with flanges. Net Weight: 65 lbs.



DYNAMIC SPECIFICATIONS

PARAMETER	MODE SWITCH	BOP 500M	BOP 1000M
BANDWIDTH (d-c to f_{-3dB})	Voltage	2 kHz	1 kHz
	Current	1.3 kHz	0.64 kHz
RISE & FALL TIME 10%-90% μsec (maximum)	Voltage	165	330
	Current	275	550
LARGE SIGNAL FREQUENCY RESPONSE	Voltage	2 kHz	0.5 kHz
	Current	2 kHz	0.5 kHz
SLEWING RATE	Voltage	6V / μsec	3V / μsec
	Current	1 mA / μsec	0.13 mA / μsec
TRANSIENT RECOVERY (Step Load Change)	Voltage	100 μsec	100 μsec
	Current	125 μsec	250 μsec

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		OUTPUT EFFECTS(1) VOLTAGE MODE	CURRENT MODE	PREAMPLIFIER OFFSETS ΔE_{IO}	ΔI_{IO}	REFERENCES
SOURCE: 105-125/210-250V a-c		<0.0005%	<0.0005%(2)	<5μV	<1nA	<0.0005%
LOAD (No load-full load)		<0.0005%	<0.005%	—	—	<0.0005%
TIME 8-hour (drift)		<0.01%	<0.01%	<20μV	<1nA	<0.005%
TEMPERATURE (Per °C)		<0.01%	<0.01%	<20μV	<1nA	<0.005%
RIPPLE and NOISE(3)	rms	<10mV	<25μA(5)	—	—	<10μV
	p-p BOP 500M	<100mV(4)	<25μA(5)	—	—	<100μV
	p-p BOP 1000M	<200mV(4)	<200μA(5)	—	—	<100μV

(1) Specifications are expressed as a *percent-of-setting* for the output range 10% to 100%. Below 10% output, specification limit is the rated percentage of the 10% output setting.
(2) Or 0.2μA, whichever is greater.
(3) Measured with the common terminal grounded so that the common mode current does not flow through the load.
(4) Peak-to-peak ripple is measured over a 20Hz to 10MHz bandwidth.
(5) For frequency components in the bandwidth of the current stabilizer. Beyond cutoff, noise will appear as a voltage component equal to the rated voltage mode noise.

This KEPCO product is backed by a firm 5-YEAR WARRANTY

For complete specifications send for BOP Series Brochure 146-1704 or Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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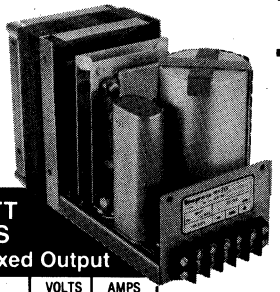
KEPCO® **THE POWER SUPPLIER™**

OEM MODULES

PRM™ FERRORESONANT VOLTAGE STABILIZERS



Enclosures available for Sizes A, AA and C

Fixed output, heavy duty stabilizers for exceptional longevity under rugged conditions. PRM's offer high efficiency (50-75%) and excellent source isolation.

NOTE: The models listed are for operation on 115V a-c 60 Hz mains only (tolerance ±3 Hz).

180 WATT MODELS
Size A Fixed Output

MODEL	VOLTS	AMPS
PRM 12-15	12.0	0-15
PRM 24-8	24.0	0-8
PRM 28-7	28.0	0-7
PRM 120-1.5	120.0	0-1.5

280 WATT MODELS
Size AA Fixed Output

MODEL	VOLTS	AMPS
PRM 8.5-30	8.5	0-30
PRM 12-23	12.0	0-23
PRM 15-18	15.0	0-18
PRM 24-12	24.0	0-12
PRM 28-10	28.0	0-10
PRM 48-6	48.0	0-6
PRM 120-2.4	120.0	0-2.4

120 WATT MODELS
Size B Fixed Output

MODEL	VOLTS	AMPS
PRM 12-10	12.0	0-10
PRM 24-5	24.0	0-5
PRM 120-1	120.0	0-1

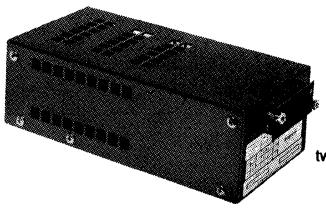
300 WATT MODELS
Size C Dual Output

MODEL	VOLTS	AMPS
PRM 2x12-12	12.0	0-12
PRM 2x15-10	15.0	0-10
PRM 2x24-6	24.0	0-6
PRM 2x60-2.5	60.0	0-2.5

Two independent outputs identically rated.

INFLUENCE QUANTITY	OUTPUT EFFECT
SOURCE VOLTAGE: 100-130V a-c	±1% E_0 max. (1) ±1.5% E_0 max. (2)
LOAD CHANGE: 100% to 50% 100% to 25%	< +10% E_0 max (3) < +20% E_0 max.(3)
TIME: 8-hour (drift)	< 1% E_0 max.
TEMPERATURE: Per °C	< 0.05% E_0 max.
RIPPLE and NOISE: rms	2 mV to 300 mV(3)

(1) At full load. (2) At no load. (3) Depends on model.



450 WATT MODELS
Size C Fixed Output

MODEL	VOLTS	AMPS
PRM 12-35	12.0	0-35
PRM 24-20	24.0	0-20
PRM 28-17	28.0	0-17
PRM 48-10	48.0	0-10

60 WATT MODELS
Size D Selectable Output

MODEL	VOLTS	AMPS
PRM 5-10	5.0	0-10.0
PRM 8-7	8.0	0-7.0
PRM 12-5	12.0	0-5.0
PRM 15-4	15.0	0-4.0
PRM 21-2.9	21.0	0-2.9
PRM 26-2.3	26.0	0-2.3
PRM 36-1.7	36.0	0-1.7
PRM 240-0.25	240.0	0-0.25

The nominal output is listed. Taps for two settings higher and two settings lower.

DIMENSIONS:
Size A Models: (1) $6\frac{13}{16}$H x $4\frac{3}{4}$W x $10\frac{27}{32}$D. Net weight: 20 lbs.
Size AA Models: (1) $6\frac{13}{16}$H x $4\frac{3}{4}$W x $10\frac{29}{32}$D. Net weight: 24 lbs.
Size B Models: $3\frac{13}{32}$H x 5W x $13\frac{7}{8}$D. Net weight: 17 lbs.
Size C Models: (1) $6\frac{13}{16}$H x $4\frac{3}{4}$W x $15\frac{1}{8}$D. Net weight: 30 lbs.(2)
Size D Models: $3\frac{13}{32}$H x 5W x $10\frac{7}{8}$D. Net weight: 11 lbs.

(1) Dimension, Models A and C are uncased.
(2) Dual Output: 38 lbs 450 Watt Series: 40 lbs

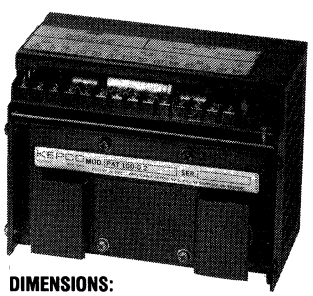
UL RECOGNIZED

This KEPCO product is backed by a firm **5-YEAR WARRANTY**

LINEAR PROGRAMMABLE VOLTAGE / CURRENT STABILIZERS

PAT™

These operationally programmable power modules offer a single high-gain control channel for voltage or current stabilization, backed up by an adjustable overcurrent limiter. Programmable from IEEE-488 bus using a Kepco digital interface.



20 WATT MODELS

MODEL	VOLTS	AMPS
PAT 7-2	0-7	0-2
PAT 15-1.5	0-15	0-1.5
PAT 21-1	0-21	0-1
PAT 40-0.5	0-40	0-0.5
PAT 72-0.3	0-72	0-0.3
PAT 100-0.2	0-100	0-0.2

DIMENSIONS:
$4\frac{7}{8}$"H × $6\frac{3}{8}$"W × $3\frac{11}{32}$"D
NET WEIGHT: 6 lbs.

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE(1)
SOURCE: 105-125.210-250V a-c		<0.0005%	<0.005%
LOAD: No Load – full load		<0.005%	<0.01%
TIME: 8-hours (drift)		<0.01%	<0.02%
TEMPERATURE: Per °C		<0.01%	<0.02%
RIPPLE and NOISE:	rms	<0.1 mV	<0.02% of I_O max
	p-p	<0.5 mV	<0.1% of I_O max

(1) External current sensing, using the *voltage* amplifier. Effects are measured for a 1-volt current sensing voltage drop.

PTR™

DIMENSIONS:
$3\frac{17}{64}$"H x 5"W x $13\frac{27}{32}$"D (including barrier-strip).
NET WEIGHT: 11 lbs.

Programmable voltage/current stabilizer with automatic crossover and optional overvoltage protection, conventional speed design. Programmable from IEEE-488 bus using a Kepco digital interface.

50 WATT MODELS

MODEL	VOLTS	AMPS
PTR 7-5.5	0-7	0-5.5
PTR 15-3.3	0-15	0-3.3
PTR 21-2.5	0-21	0-2.5
PTR 40-1.4	0-40	0-1.4
PTR 72-0.8	0-72	0-0.8
PTR 100-0.6	0-100	0-0.6

INFLUENCE QUANTITY		OUTPUT EFFECTS VOLTAGE MODE	OUTPUT EFFECTS CURRENT MODE INTERNAL	OUTPUT EFFECTS CURRENT MODE EXTERNAL(1)
SOURCE: 105-125/210-250V a-c		<0.001%	<0.005%	<0.005%
LOAD: No load — full load		<0.005%	<3.0 mA	<0.01%
TIME: 8-hours (drift)		<0.01%	<0.05%	<0.02%
TEMPERATURE: Per °C		<0.01%	<0.05%	<0.02%
RIPPLE and NOISE:	rms	<0.1 mV	<0.5 mA	<0.5 mA
	p-p	<2.0 mV	<2.0 mA	<2.0 mA

(1) External current sensing and feedback to the voltage amplifier.

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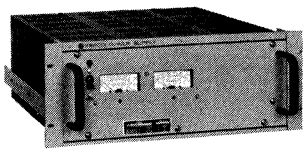
KEPCO® THE POWER SUPPLIER™

LABORATORY/BENCH POWER SUPPLIES

PRR™



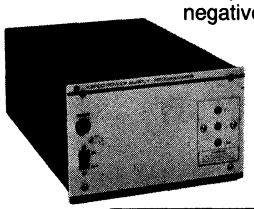
Ferroresonant stabilized 1000W designs producing fixed voltages.

DIMENSIONS:
$6^{31}/_{32}$"H x 19"W x $12^{5}/_{64}$"D behind panel.
NET WEIGHT: 63 lbs.

1000 WATT MODELS		
MODEL	VOLTS	AMPS
PRR 12-77M	12.0	0-77
PRR 24-42M	24.0	0-42
PRR 28-36M	28.0	0-36
PRR 48-22M	48.0	0-22

NTC™

Low power shunt stabilized power supplies that can be used on their own as a fast-programmable voltage source, or serve as an interface for higher powered operational power supplies. The NTC as an interface permits programming with the negative terminal common.



DIMENSIONS:
NTC-200: $5^{7}/_{32}$"H x $4^{5}/_{32}$"W x $17^{3}/_{16}$"D.
NTC-2000: $5^{7}/_{32}$"H x $8^{11}/_{32}$"W x $12^{7}/_{8}$"D.
NET WEIGHT: NTC-200:11 lbs.
NTC-2000:21 lbs.

2 WATT MODELS		
MODEL	VOLTS	AMPS
NTC-200	0-200	0-0.01
NTC 2000	0-2000	0-0.001

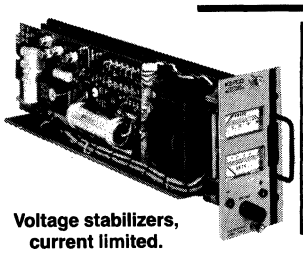
STATIC SPECIFICATIONS

INFLUENCE QUANTITY		PRR OUTPUT EFFECTS Typ.	PRR OUTPUT EFFECTS Max.	NTC[2] VOLTAGE AMPLIFIER OFFSETS ΔE_{io}	NTC[2] VOLTAGE AMPLIFIER OFFSETS ΔI_{io}	NTC[2] REFERENCE ±6.2V
SOURCE: 105-125/210-250V a-c		±0.5%	±1.0%	<100 μV	<10 nA	0.0005%
LOAD: No load – full load		[1]		<1 mV	< 10 nA	—
TIME: 8-hour (drift)		<1%		<20 μV	< 5 nA	0.005%
TEMPERATURE: Per °C		<0.05%		<20 μV	<5 nA	0.005%
RIPPLE and NOISE:	rms	—	50 mV	<0.01%		—
	p-p	—	—	<0.05%		—

This KEPCO product is backed by a firm 5-YEAR WARRANTY

[1] 100%-50% load change – Voltage increase 3~6%; 100%-25% load change – voltage increase 5~10%
[2] The output effect can be calculated by the relationship: $\Delta E_O = \pm \Delta E_r(R_f/R_i) \pm \Delta E_{IO}(1 + R_f/R_i)$, where R_f is the built-in feedback resistance, and R_i is the external coupling resistance from the signal source or reference, E_r.

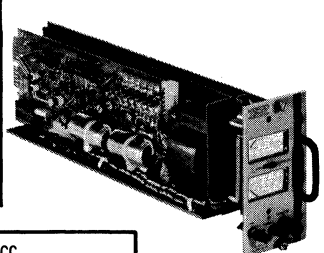
PCX-MAT™ PLUG-IN POWER SUPPLIES CC™



Voltage stabilizers, current limited. Programmable from IEEE-488 bus using a Kepco digital interface.

20 WATT MODELS		
MODEL	VOLTS	AMPS
PCX 7-2MAT	0-7	0-2.0
PCX 15-1.5MAT	0-15	0-1.5
PCX 21-1MAT	0-21	0-1.0
PCX 40-0.5MAT	0-40	0-0.5
PCX 72-0.3MAT	0-72	0-0.3
PCX 100-0.2MAT	0-100	0-0.2

20 WATT MODELS		
MODEL	AMPS	VOLTS
CC 7-2M	0-2.0	0-7
CC 15-1.5M	0-1.5	0-15
CC 21-1M	0-1.0	0-21
CC 40-0.5M	0-0.5	0-40
CC 72-0.3M	0-0.3	0-72
CC 100-0.2M	0-0.2	0-100



Current stabilizer. Programmable from IEEE-488 bus using a Kepco digital interface.

DIMENSIONS:
$5^{7}/_{32}$"H x
$2^{25}/_{32}$"W x
$14^{15}/_{16}$"D
(behind panel)
NET WEIGHT: 8 lbs.

STATIC SPECIFICATIONS

This KEPCO product is backed by a firm 5-YEAR WARRANTY

INFLUENCE QUANTITY		PCX-MAT OUTPUT EFFECTS VOLTAGE MODE	PCX-MAT OUTPUT EFFECTS CURRENT MODE	CC OUTPUT EFFECTS CURRENT MODE
SOURCE: 105-125/210-250V a-c		<0.0005%	<0.005%	<0.0005%
LOAD: No load—full load		<0.005%	<0.01%	<0.005%
TIME: 8-hour (drift)		<0.01%	<0.02%	<0.02%
TEMPERATURE: Per °C		<0.01%	<0.02%	<0.01%
RIPPLE and NOISE:	rms	<0.1 mV	<0.02% of I_o max.	<0.02% of selected scale
	p-p	<3 mV	<0.2% of I_o max.	<0.1% of selected scale

NOTE: Use optional cases CA-3, CA-4 or CA-5 for bench use, or plug-in style rack adapters RA-22-6A or RA-32. Consult factory for details of the mounting options.

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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KEPCO® THE POWER SUPPLIER™

BENCH TYPE POWER SUPPLIES

MSK™ SINGLE OUTPUT

This KEPCO product is backed by a firm 5-YEAR WARRANTY

Powerful linear power supplies with unique "preview" feature

This new series gives you a selection of five models, offering 100 Watts of clean, stable benchtop power. The Kepco Series MSK features front panel 10-turn precision controls for voltage and current, with automatic crossover between modes. A pair of LED mode indicators (green for voltage mode, amber for current), two 3½ digit meters and heavy duty output binding posts for easy connection to your breadboards, are also on the front panel.

The preview switch (d-c on-off) allows you to pre-set voltage and current with the digital meters displaying the set values. At "d-c off", no voltage is applied to the output terminals and no load current needs to be drawn to set the current control. At "d-c on", the set voltage is applied to the output terminals. The appropriate mode indicator is lit, and the meters indicate *actual* voltage and current.

Series MSK power supplies use fully dissipative, high gain linear (series pass) stabilizer circuits, for low noise output, good stability, and accurate resettability. A built-in quiet, low-speed fan ensures good cooling in the crowded environment of your laboratory.

100 WATT MODELS

MODEL	d-c OUTPUT RANGE Volts	Amps	POWER Watts
MSK 10-10M	0-10	0-10	0-100
MSK 20-5M	0-20	0-5	0-100
MSK 40-2.5M	0-40	0-2.5	0-100
MSK 60-2M	0-60	0-2	0-120
MSK 125-1M	0-125	0-1	0-125

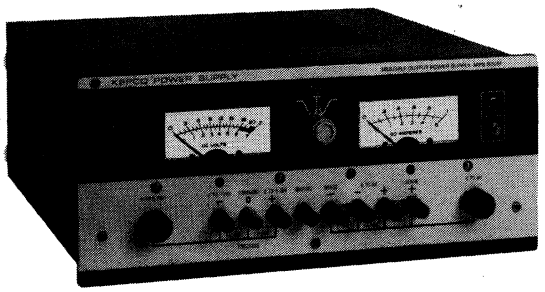
DIMENSIONS: 5 3/4"* H x 8 1/8"W x 13 5/32"D *including feet
NET WEIGHT: MSK 10-10M, 20-5M, 40-2.5M, 60-2M . . . 19 lbs. MSK 125-1M . . . 22 lbs.

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		VOLTAGE MODE	CURRENT MODE
SOURCE 105-125/210-250V a-c		0.01%	0.01%
LOAD No load – full load		0.01%	0.05%
TIME 8-hour (drift)		0.01%	0.02%
TEMPERATURE Per °C		0.01%	0.02%
RIPPLE and NOISE	rms	0.5mV	0.02%
	p-p	3.0mV	0.01%

Note: Percentage values are referenced to the maximum rated voltage or current of the unit.

MPS 620M™ MULTIPLE OUTPUT



This power supply has been specifically designed to meet the needs of the IC/microprocessor experimenter.

The MPS 620M is actually two linear (series pass) power supplies in one: The first has a single 0-6V, 0-5A output for digital work; the second has two *tracked* outputs, 0 to +20V and 0 to −20V, both rated at 0-1Amp. The two power supplies are completely isolated from each other, sharing only the front panel meters and the chassis.

The 0-6V output is continuously adjustable with a 10-turn control on the front panel, and is backed up by a current limiter and overvoltage crowbar. The crowbar is set by a locking-type screwdriver adjustment. The fixed rectangular current limit circuit is set to approximately 110% of maximum current. The dual 0 to ±20V outputs are continuously adjustable by a single 10-turn front panel control, and tracking is better than ±1% +10mV. The outputs can be used in series to provide 0-40V, but since they share a common (center) terminal, they cannot be used in parallel. Both outputs are equipped with adjustable current limits.

70 WATT MODEL

OUTPUT	VOLTS	AMPS
Output #1	0 to 6	0-5
Output #2	0 to +20	0-1
Output #3	0 to −20	0-1

Outputs 2 and 3 are tracked.
Output 1 is protected by an overvoltage crowbar.

DIMENSIONS: 5 7/32"H x 12 17/32"W x 12 7/8"D **NET WEIGHT:** 29 lbs.

STATIC SPECIFICATIONS

INFLUENCE QUANTITY		OUTPUT EFFECTS 0 to 6V Output	0 to ±20V Output
SOURCE 105-125/210-250V a-c		0.01%	0.01%
LOAD No load – full load		0.01%	0.05%
TIME 8 hour (drift)		0.01%	0.01%
TEMPERATURE Per °C		0.01%	0.01%
RIPPLE and NOISE	rms	0.1 mV	0.1 mV
	p-p	1.0 mV	1.0 mV

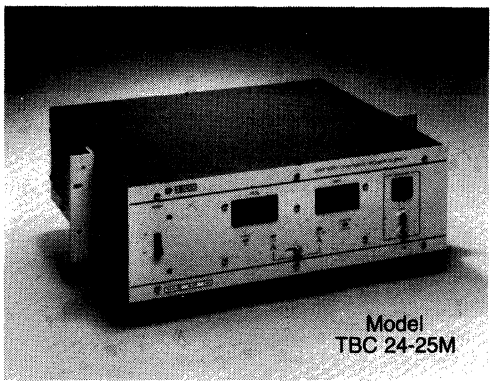
For complete specifications send for MSK Brochure 146-1659 or Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

KEPCO® THE POWER SUPPLIER™

BENCH TYPE POWER SUPPLIES

TELECOMMUNICATION BATTERY CHARGERS
SINGLE PHASE • 12A TO 120A • 300 TO 3000 WATTS

TBC™



Model TBC 24-25M

Kepco's TBC are designed for float-equalize service to maintain battery arrays such as are found in many telecommunication installations. The TBC are fully filtered and stabilized battery eliminators that also find application as burn-in power supplies. The float and equalize settings are fully independent adjustments whose settings are made by screwdriver access through small sliding doors in the front panel. The digital voltmeter allows precise adjustment. A digital ammeter displays the charging current or output current.

If the current drops to zero – either because the ac mains power to the TBC is lost, the front panel circuit breaker is turned off or the voltage setting is adjusted below the battery's voltage, a "charging stopped" LED is illuminated and a flag signal is provided.

Equalize mode can be selected either with a front panel push button – or a remote contact closure. This sets the voltage to the equalize level (adjustable). A timer is activated that will reset back to float mode after a period of time (0.1 to 99.9 hrs) that can be set from the front panel with a thumbwheel selector. A flag signal is produced when the TBC is in equalize mode.

Kepco's TBC employ high frequency switching technology (100-150 KHz forward converters) for high efficiency, small size and light weight. The output is filtered so that residual voice band noise (on battery) is below 22dB rnC.

This KEPCO product is backed by a firm 5-YEAR WARRANTY

TBC MODEL TABLE

MODEL	OUTPUT VOLTS NOMINAL	RANGE	OUTPUT CURRENTS	SIZE(2)	INPUT VOLTS	INPUT AMPS	EFFICIENCY
TBC 12-20M	12V	11.5-15V	0-20A	A	115/230	4.6A(1)	77%
TBC 12-50M	12V	11.5-15V	0-50A	A	115/230	12.5A(1)	80%
TBC 12-120M	12V	11.5-15V	0-120A	A	230	16A	82%
TBC 24-25M	24V	23-30V	0-25A	A	115/230	12A(1)	85%
TBC 24-60M	24V	23-30V	0-60A	A	230	16A	83%
TBC 24-120M	24V	23-30V	0-120A	B	230	32A	82%
TBC 48-12M	48V	47-60V	0-12A	A	115/230	12A(1)	85%
TBC 48-30M	48V	47-60V	0-30A	A	230	16A	84%
TBC 48-60M	48V	47-60V	0-60A	B	230	32A	83%

(1) Input current with input selector set to 115V a-c

(2) Size A — 5¼ x 19 x 13½ inches, 133 x 483 x 343 mm
Size B — 8¾ x 19 x 15 inches, 222 x 483 x 351 mm

TBC STATIC SPECIFICATIONS

SPECIFICATION	CONDITION		TYP	MAX
Source Effect	Min-Max		0.8%	1.5%
Load Effect	10%-100%		0.8%	1.5%
Temperature Effect	0-50°C		1.0%	1.5%
Combined Effect	(source, load, temp)		1.2%	3.0%
Time Effect	(1/2-8 hrs)		0.1%	0.8%
Output Noise	Voice band on battery		—	<22dB rnC
	Wide band 50 MHz	12V	—	100 mV p-p
		24V	—	100 mV p-p
		48V	—	100 mV p-p
Load Recovery	Excursion 50-100%		—	<4%
	Recovery within ± 1%		—	<1 msec.

TBC INPUT CHARACTERISTICS

SPECIFICATION	CONDITION	RATING/DESCRIPTION
Voltage range 300W & 600W models	115/230V a-c Selectable	100-130V a-c 200-260V a-c
1500W & 3000W models	230V a-c only	200-260V a-c
Initial surge at turn-on	115V a-c	20A
	230V a-c	40A
Input frequency		47-63Hz*
Conducted EMI	Back to mains	FCC 20780 Class A
Leakage to ground	115V a-c (UL Method)	1.0mA
	230V a-c (VDE Method)	2.0mA
Start-up time		800 msec.
Hold-up time	Loss of mains	20 msec.

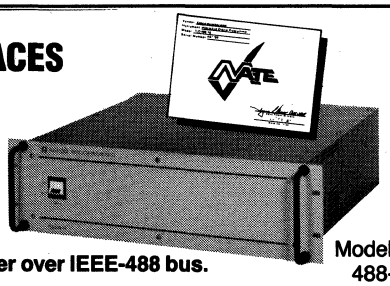
*400Hz available, consult factory.

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

KEPCO®

DIGITAL PROGRAMMING INTERFACES

TLD 488-16™ MATE-verified INTERACTIVE DIGITAL PROGRAMMER



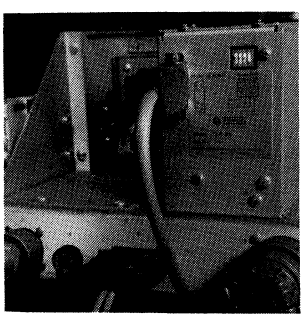
Model TLD 488-16

Commands and reacts to responses from up to 16 programmable power supplies... uses "CIIL" commands in communicating with computer or controller over IEEE-488 bus.

The Kepco TLD 488-16 digital interface is designed to operate with all Kepco Series ATE (Unipolar 50-1000W) and Series BOP (Bipolar 100-400W) to provide MATE-verified talker listener control using CIIL. Kepco-provided accessories include special mounting adapters for the power supplies to accommodate optional isolation relays per the MATE protocol.

You may use CIIL verbs and nouns with the TLD 488-16 to set up to 16 different power supplies with a voltage setting and current limit or current setting with a voltage limit.

The TLD measures the actual voltage or current, compares it with the setting and if not equal determines whether one of several conditions are responsible (out of range, overloaded, crowbarred, etc.) These are reported back to the host computer.



Isolation relay TLR 25

ISOLATION RELAYS TLR 25 AND TLR 200

Kepco offers two isolation relays which can be interposed between the power supply and the load in accordance with MATE system requirements: TLR 25, rated at 25 Amps, and TLR 200, rated at 200 Amps. They are operated by the TLD 488-16 through a separate, discrete interface and "I/O Isolation Relay Port," and respond to the CIIL commands "open" and "close." The address of each relay is set with a DIP switch on the back of the relay.

Interface functions implemented by Kepco's TLD 488-16 on the General Purpose Interface Bus (GPIB) defined by IEEE-488 are:

GPIB FUNCTION	SYMBOL SUBSET
Source Handshake	SH1
Acceptor Handshake	AH1
Talker(1)	T6
Listener(2)	L4
Service Request	SR1
Device Clear	DC1

(1)Basic talker, serial poll, unaddress if MLA
(2)Basic listener, unaddress if MTA

TLD 488-16 GENERAL SPECIFICATIONS

a-c voltage	115/230V; 50 - 60 Hz
Input current	@115V a-c: 5A; @230V a-c: 2.5A
Aux. d-c output	+5V at 10A
Ambient operating temperature range	0 to +55°C
Storage range	−20 to +75°C
Dimensions	(inches) 5 7/32H × 19W × 16 3/16D (mm) 132.6H × 482.6W × 411.2D
Weight (packed for shipment)	20 lbs., 9 kg.
Color	Gray, Fed. Std. 26440
Mounting	19" rack (Provisions for Jonathan 130-QD series slides)

PLUG-IN PROGRAM CARDS (Standard Multibus Size)

The TLD 488-16 has provision for up to four plug-in cards called TL 488-4A for Kepco's ATE power supplies or TL488-4B for Kepco's BOP series bipolar power supplies. Each plug-in card can control the voltage and current function of up to four power supplies. With a full complement of four TL 488-4A or TL 488-4B, the system will control 16 individual, isolated, power supplies.

MODEL TABLE

Specifications	For ATE Models: TL 488-4A	For BOP Models: TL 488-4B
Number of isolated input/output ports	4	4
Analog outputs/port	2 channels.	
Analog output channels mode of operation	Voltage and Current limit or Current and Voltage limit. Determined by noun modifiers within set command.	
Analog output voltage level	0 to +10V for Voltage or Voltage limit channel. 0 to +1V for Current or Current limit channel.	0 to ±10V for main Voltage or Current channel. 0 to +10V for Current or Voltage limit channel.
Analog output current level	0 to +2mA per channel.	0 to ±2mA for main channel. 0 to +2mA for limit channel.
Output impedance	<0.05 ohms.	
Output resolution	12 bit. (0.024%)	
Linearity error (0 to +70°C)	< ±½ LSB.	
Adjustments(1)	Full scale calibration. Zero adjustment.	
Temp. coefficient (per degree C)	±0.02% at full scale. ±20μV at zero.	
Input/output isolation	500V d-c.	
Power supply ident. codes	Set with DIP switch for each port.	
Input signals accepted from the power supply	Supply absent flag. Voltage/current mode flag. Crowbar flag. Voltage out of limit (0.1% of full scale). Current out of limit (1.0% of full scale).	
Input digital commands	Via Multibus from TLD 488-16. All signals TTL compatible.	
Power requirements	+5V at 2A, via Multibus from TLD 488-16.	+15V at 40mA, −15V at 40mA, & +5V at 15mA, per port; provided by BOP power supply via input/output cable port.
Card, physical characteristic	Width: 12" Length: 6.75" Thickness: 0.5" Net weight: 20 ounces	

(1) TL 488-4A: both channels. TL 488-4B: main channel only.

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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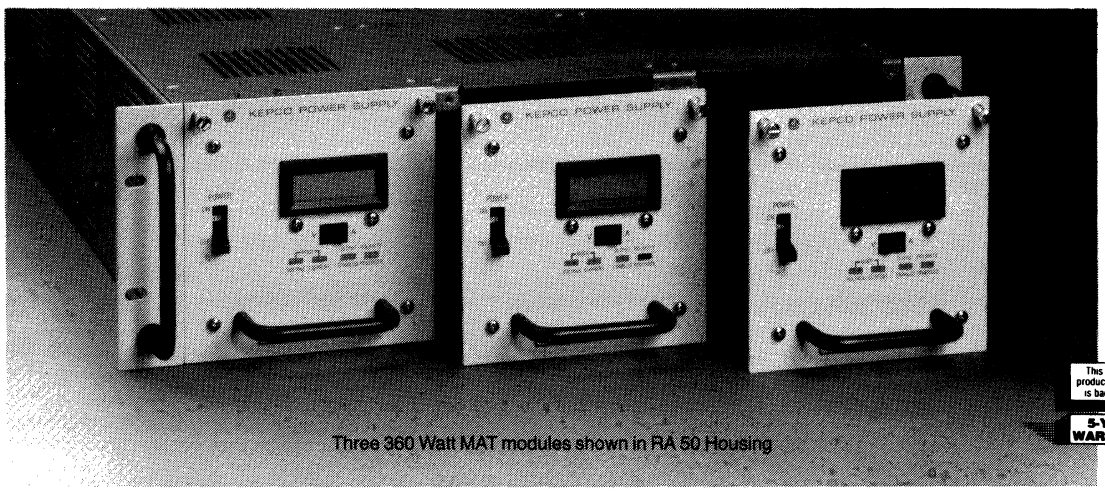
KEPCO® THE POWER SUPPLIER™

KEPCO, INC. announces a new class of Programmable Power Supplies that communicate and are controlled entirely by Digital Signals...Series TMA/MAT

Digital Power Supplies to the MATE Protocol..Kepco Series MAT



Three 360 Watt MAT modules shown in RA 50 Housing

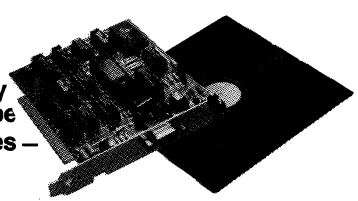
360 WATT MODULES – 1/3 RACK

Single output. Nominally 360 Watts.
Mount in RA 50 and RA 51.

Model	Volts	Amps	Power
MAT 6-32	0-6	0-32	192
MAT 15-20	0-15	0-20	300
MAT 25-14	0-25	0-14	350
MAT 36-10	0-36	0-10	360
MAT 55-7	0-55	0-7	385
MAT 75-5	0-75	0-5	375
MAT 100-3.6	0-100	0-3.6	360
MAT 150-2.4	0-150	0-2.4	360

NEW!

Use a PC to directly control Kepco's type MAT Power Supplies – without IEEE-488.



TMA PC-27 PLUG-IN CARD FOR YOUR PC

Software emulator of Kepco's model TMA 488-27. Where TMA 488-27 converts an IEEE-488 bus into the bit-bus to talk with a Kepco MAT power module, the new model, TMA PC-27, communicates directly from your PC to the MAT power modules. TMA PC-27 comprises a board that will fit into your PC or PC-AT or compatible computer. With the provided software, it allows your computer to emulate the whole TMA function. Your PC will communicate directly with up to 27 MAT power supplies providing all control and communication functions without requiring an IEEE-488 (GPIB) card.

720 WATT MODULES – 2/3 RACK

Single output. Nominally 720 Watts. Mount in RA 51

Model	Volts	Amps	Power
MAT 6-64	0-6	0-64	384
MAT 15-40	0-15	0-40	600
MAT 25-28	0-25	0-28	700
MAT 36-20	0-36	0-20	720
MAT 55-14	0-55	0-14	770
MAT 75-10	0-75	0-10	750
MAT 100-7.2	0-100	0-7.2	720
MAT 150-4.8	0-150	0-4.8	720

1080 WATT MODULES – FULL RACK

Single output. Nominally 1080 Watts.
Mount directly into 19" rack. Panel: 5 1/4" Depth: 25"

Model	Volts	Amps	Power
MAT 6-100	0-6	0-100	600
MAT 15-60	0-15	0-60	900
MAT 25-42	0-25	0-42	1050
MAT 36-30	0-36	0-30	1080
MAT 55-20	0-55	0-20	1100
MAT 75-15	0-75	0-15	1125
MAT 100-10	0-100	0-10	1000
MAT 150-7	0-150	0-7	1050

For complete specifications send for TMA/MAT Brochure 146-1706 or Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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KEPCO® THE POWER SUPPLIER™

MAT GENERAL SPECIFICATIONS

PARAMETER	CONDITION	MAT POWER MODULE		
Description		**360W**	**720W**	**1080W**
Input Voltage Range	User Selectable	105-125V a-c 210-250V a-c		
Input Current max	115V a-c	7.0A	14.0A	21.0A
	230V a-c	3.5A	7.0A	10.5A
Input Frequency	Range	47-63 Hz		
Source Effect	Voltage	0.001% E_{omax}		
	Current	0.005% I_{omax}		
Load Effect	Voltage	0.002% E_{omax}		
	Current	3 mA		
Time 8 Hour Drift	Voltage	0.01% E_{omax}		
	Current	0.02% I_{omax}		
Temperature Coefficient/°C	Voltage	0.01% E_{omax}		
	Current	0.02% I_{omax}		
Ripple & Noise rms/p-p	Voltage	0.001% / 0.01% E_{omax} or 0.3mV / 3mV(1)		
	Current	0.03%/0.3% I_{omax}		
Transient Recovery	Voltage	100 µsec.		
Programming Resolution	Voltage	0.024% E_{omax} (12 Bits)		
	Current	0.024% I_{omax} (12 Bits)		
Data Read-Back Accuracy	Voltage	0.1% E_{omax}		
	Current	0.1% I_{omax}		
Operating Temperature	Range	0° to 50°C		
Remote Sensing	Range	0.5V per lead		
DC Output Isolation	Voltage	500V d-c		
Output Display	3½ Digit LCD	Switch Selectable Voltage/Current		
Indicators	4 LED	Voltage Mode, Current Mode, Output enabled, Polarity reversed		
Output Enable/Disable		Built-in power & sense relays		
Polarity Reversal		Built-in polarity reversal power & sense relays		
Protection	Overvoltage	Tracks program voltage, crowbars output & turns-off input		
	Overcurrent	Tracks program current, crowbars output & turns-off input		
	Overtemperature	Monitors heatsink temperature, crowbars output & turns-off input		
	Polarity Reversal	Built in diode protects unipolar supply output		
	Power Loss	Detects loss of a-c input power, disables output		
Mounting	Front	1/3 rack modules plug into RA 50		
		1/3 plus 2/3 rack modules plug into RA 51		
		Full rack mounts directly in 19" rack		
Filler Panels	For either RA 50 or RA 51	RFP 50-1 1/3 panel; RFP 50-2 2/3 panel		

(1) Whichever is greater

For complete specifications send for TMA/MAT Brochure 146-1706 or Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

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KEPCO®

DIGITAL PROGRAMMING INTERFACES

This KEPCO product is backed by a firm 5-YEAR WARRANTY

SNR 488™

CARD-CAGE STYLE PROGRAMMERS FOR MULTIPLE UNIT SYSTEMS

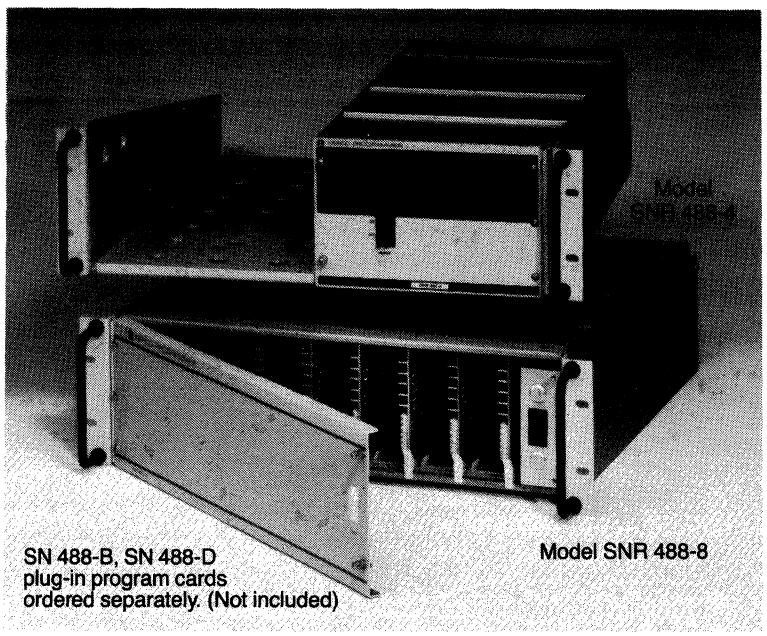
The SNR 488 system provides a card cage for plugging in dual channel program cards SN 488-B and/or SN 488-D.

Other provisions include:

IEEE-488 connector
Address select switch
Handshake card
Manual keyboard input connector
Local bus distribution to the card sockets

Each program card controls one Power Manager, and is isolated from the others in the card cage.

Two models of the SNR 488 card cages are available: **SNR 488-4** with space for four program cards, plus space for two ¼-rack or one ½-rack Power Managers. **SNR 488-8** with space for eight program cards.



SN 488-B, SN 488-D plug-in program cards ordered separately. (Not included)

Model SNR 488-8

SNR 488 GENERAL SPECIFICATIONS

	SNR 488-4	SNR 488-8
a-c voltage	105-125/210-250, 50-440 Hz.	
Power	≈ 6VA	
Dimensions (behind panel)	(inches) 5 7/32H × 19W × 17 13/16D (mm) 132.6H × 482.6W × 452.4D	
Weight (packed for shipment)	17 lbs. 7.7 Kg.	23 lbs. 10.5Kg.
Color	Two-tone black & gray Fed. Std. 26440	Gray Fed. Std. 26440
Mounting	19" rack (mounting "ears" supplied)	

SN 488-B plug-in program cards for SNR 488-4 and SNR 488-8, in 12 bit binary format.

SN 488-D plug-in program cards for SNR 488-4 and SNR 488-8, in 3 digit BCD.

SN cards can control two functions of any power supply in the following groups: ATE, BOP,(1) BOP-HV, JQE,(2) PTR, PAT, CC,(3) PCX-MAT,(2) BHK,(4) OPS IX,(4) and NTC.

RESOLUTION: 3 digit BCD (decimal) is 1 part in 999 (0.1%). 12 bit binary (hexadecimal) is 1 part in 4095 (0.024%).

DATA FORM: N = C AAA BBB (9 ASCII encoded characters). To "talk" to a power supply you should transmit a nine character set of the form:

N = C AAA BBB

N is the address of the particular program card to which you wish to "talk" (there are eight possible addresses from 0 to 7).

"=" is the ASCII character that separates the card address from data.

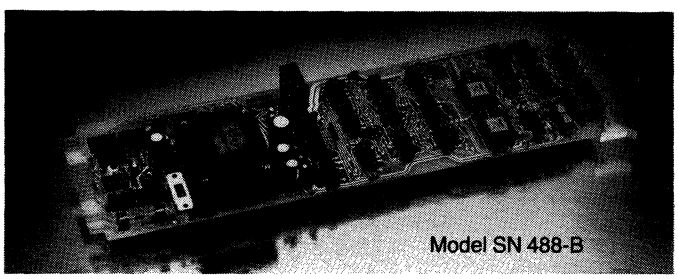
C is control character: 0, 1, 2,..., F (see Truth Table).

AAA is data as a percent of full scale (Channel A)

BBB is data as a percent of full scale (Channel B)

Note: The maximum output of the binary models is FFF (Hex). The maximum output of the BCD models is 999. In both instances "maximum" corresponds to an analog programming voltage of ± 10V or ± 1V (depending on the range and polarity selected).

(1) Instead of using built-in interface — when part of multiple unit installation
(2) Voltage channel only (3) Current channel only (4) 500V and 1000V models only



SN 488-B & SN 488-D GENERAL SPECIFICATIONS

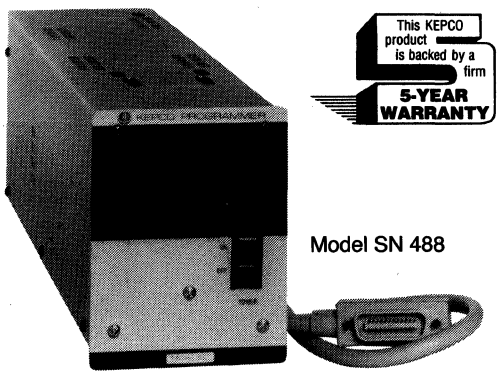
SPECIFICATIONS		MODEL SN 488-B	MODEL SN 488-D
INPUT DATA FORMAT		Hexidecimal	Decimal
RESOLUTION		12 Bit Binary	3 Digit BCD
OUTPUT VOLTAGE	High Range	± 10V	
	Low Range	± 1V	
OUTPUT CURRENT		± 2 mA max.	
OUTPUT IMPEDANCE		<0.05 ohms	
LINEARITY ERROR 0 to + 70°C		± 1/2 LSB	
TEMPERATURE COEFFICIENT	Full Scale	± 35 PPM/°C max.	
	Zero High Range	± 20μV/°C max.	
	Zero Low Range	± 10μV/°C max.	
LOGIC INPUT		TTL Compatible	
DATA TRANSFER FORMAT (ASCII CODED)		BYTE Serial BIT Parallel	
INTERFACE FUNCTIONS IMPLEMENTED		AH1, L1	
A-C INPUT	Voltage	105-125V/210-250V	
	Frequency	50-440 Hz	
	Power	≈ 7 VA	

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

KEPCO® STAND ALONE DIGITAL INTERFACES FOR SINGLE OR MULTIPLE CHANNEL OPERATION

SN 488™ For use with buses using IEEE format (byte serial, bit parallel) data transfer

SN 500™ For use with buses using bit parallel data transfer



Model SN 488

These digital programmers are designed for use with all Kepco operationally-programmable power supplies (high speed and conventionally filtered) and/or voltage-controlled instruments. They enable you to interface your d-c power supplies with the logic bus of a computer-controlled system.

SN 488 and SN 500 are both available in decimal format (3-digit BCD), or in hexadecimal format (12-bit binary). A single channel instrument can be converted in the field to a dual channel model by plugging in auxiliary boards SN 603 or SN 612.

IEEE-488 STANDARD: The SN 488 implements the AH1 acceptor handshake and L1 listener plus listener-only functions of the IEEE-488 protocol.

PARALLEL INPUT: The SN 500 uses data buses having bit-parallel data transfer. Sixteen bits control one channel: two additional bits add a second full channel.

ISOLATION: The SN Series programmers incorporate optical isolation (up to 1000 Volts d-c), so they may be used to control floating power supplies.

CHANNELS: The SN 488 and SN 500 offer a choice of single or dual channel operation. Each channel is completely isolated from the other so that they can be used to drive independent instruments or two functions of the same instruments. SN cards can control two functions of any power supply in the following groups: ATE, BOP,(1) BOP-HV, JQE,(2) PTR, PAT, CC,(3) PCX-MAT,(2) BHK,(4) OPS IX,(4) and NTC.

POLARITY: The SN 488 and SN 500 provide a means of controlling positive or negative polarity. This feature is useful when the programmer controls a bipolar power supply such as the Kepco Series BOP.

RANGE: The SN 488 and SN 500 provide a means of controlling range over a 10:1 ratio. This is accomplished by a programmable attenuator. The "high" range provides a 0 to ±10V analog output; the "low" range provides a 0 to ±1V analog output. This multiplies small output resolution by 10:1.

RESOLUTION: 3-digit BCD (decimal) is 1 part of 999 (0.1%). 12 bit binary (hexadecimal) is 1 part in 4095 (0.024%).

(1) Instead of using built-in interface-when part of multiple unit installation
(2) Voltage channel only
(3) Current channel only
(4) 500V and 1000V models only

SN 488 & SN 500 MODEL TABLE

MODEL	NO. CHANNELS	DATA FORMAT	RESOLUTION
SN 488-121, SN 500-121	one	hexadecimal	12 bit binary
SN 488-122, SN 500-122	two (isolated)	hexadecimal	12 bit binary
SN 488-031, SN 500-031	one	decimal	3 digit BCD
SN 488-032, SN 500-032	two (isolated)	decimal	3 digit BCD
Field installable add-on channel:			
SN 612	1 added channel	hexadecimal	12 bit binary
SN 603	1 added channel	decimal	3 bit BCD
Interconnect devices for use with IEEE-488 bus.			
MODEL	TYPE		LENGTH
SNQ 488-1	Cable, printed circuit edge to IEEE-488		1 meter
SNQ 488-2	Cable, printed circuit edge to IEEE-488		2 meter
PC-488	Plug printed circuit edge to IEEE-488		—

Note: The SNQ cables have an IEEE-488 connector at one end and a printed circuit edge connector at the other end. Model SNQ 488-2 is supplied with each type SN 488 single/dual channel programmer (one cable services both channels). If the PC 488 adapter plug is used, a separate IEEE-488 cable should be ordered.

The SN 500 is supplied with a connector, PC 12, which may be field wired to the parallel data source.

SN 488 & SN 500 GENERAL SPECIFICATIONS

SPECIFICATIONS		MODELS SN 488- & SN 500- 121	122	031	032
NUMBER OF CHANNELS		1	2	1	2
INPUT DATA FORMAT		Hexadecimal		Decimal	
RESOLUTION		12 Bit Binary		3 Digit BCD	
OUTPUT VOLTAGE	High Range	±10V			
	Low Range	± 1V			
OUTPUT CURRENT		±2 mA max.			
OUTPUT IMPEDANCE		<0.05 ohms			
LINEARITY ERROR 0 to +70°C		±1/2 LSB			
TEMPERATURE COEFFICIENT	Full Scale	±35 PPM/°C max.			
	Zero High Range	±20μV/°C max.			
	Zero Low Range	±10μV/°C max.			
LOGIC INPUT		TTL Compatible			
DATA TRANSFER FORMAT, SN 488 (ASCII CODED)		Byte serial, Bit parallel			
INTERFACE FUNCTIONS IMPLEMENTED, SN 488		AH1, L1			
DATA TRANSFER FORMAT, SN 500		Bit parallel			
A-C INPUT	Voltage	105-125V/210-250V			
	Frequency	50-440 Hz			
	Power	≈ 12 VA			
DIMENSIONS (behind panel)		(inches) 5 7/32H × 4 5/32W × 17 3/16D (mm) 132.6H × 105.6W × 436.6D			
WEIGHT (packed for shipment)		10 lbs., 4.6 Kg.			
COLOR		Two tone black & light gray, Fed Std. 26440			
MOUNTING ¼ rack size		Use Rack Adapter RA 24, RA 32, or RA 37 for mixing with Power Managers.			

For complete specifications send for Kepco Instrumentation Catalog 146-1716. Data and specifications subject to change without notice.

K.G.S. electronics, inc.

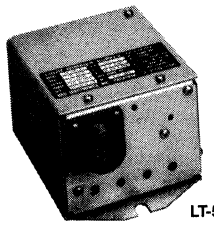
kgs electronics A GAR Enterprises Co.

Dept EM • 2029 North Lincoln Avenue • Pasadena, California 91103 • Telephone (818) 798-0786

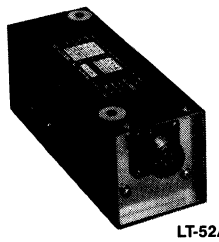
KGS ELECTRONICS DC POWER SUPPLIES

MODEL LT-SERIES SPECIFICATIONS

Input Voltage: 28 VDC nominal, 20 to 40 VDC
Output Voltage: Adjustable with external rheostat or potentiometer and most models have DC voltage control.
Regulation: 2% for line, 2% for load and 2% temperature.
Output Ripple: 50 mVpp max.
Altitude: 55,000 ft.
Protection: (Overvoltage) Output voltage is limited to approximately 125% of rating even though remote control rheostat opens or shorts, or internal failure occurs.
Temperature: −55°C to +71°C (sufficient cooling required at +71°C ambient)
Protection: (Overload) Input and output current limit when overload exceeds approximately 125% or rating.



LT-55

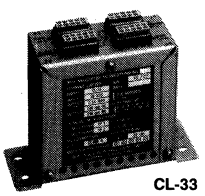


LT-52A

MODEL	OUTPUT (TOTAL) VOLT DC	AMPS	WATTS	RIPPLE	INPUT CURR. at 28 VDC, at Full Load	EFFICIENCY % Typical at Full Load	SIZE (INCH) W x L x H	WEIGHT (LBS.)
LT-45	0 to 28	2.5	70	25 mVpp	3.0 A	83	2.03 x 5.03 x 1.63	.60
LT-45(D)	0 to 28	3.6	100	25 mVpp	4.3 A	83	2.33 x 5.03 x 1.63	.62
LT-48	0 to 5	7.5	38	25 mVpp	1.7 A	75	2.03 x 5.03 x 1.63	.60
LT-245	0 to 28	3.6	100	25 mVpp	4.3 A	83	4.0 x 5.0 x 1.65	1.20
LT-246(C)	12	12	144	50 mVpp	6.2 A	84	4.0 x 5.0 x 1.65	1.20
LT-248	5 & 0–5	7.5 & 7.5	75	25 mVpp	3.4 A	75	4.0 x 5.0 x 1.65	1.20
LT-50	0 to 5	7.5	40	8 mVpp	1.7 A	75	2.3 x 6.9 x 2.0	1.2
LT-52A, 53	0 to 5	10	50	25 mVpp	2.5 A	75	3.43 x 5.8 x 2.3	1.5
LT-55(A)(D)	0 to 5	15	75	25 mVpp	3.6 A	75	3.43 x 5.1 x 2.6	1.2
LT-57(F)	13.75	10	138	50 mVpp	5.6 A	81	3.4 x 5.1 x 2.6	1.3
LT-70, 73	0 to 12	5.8	70	25 mVpp	3.2 A	78	2.3 x 5.8 x 2.3	1.5
LT-71, 71A	14	8	112	50 mVpp	4.7 A	80	2.4 x 6.9 x 2.2	1.5
LT-100, 103	0 to 28	3.6	100	25 mVpp	4.2 A	84	2.3 x 5.8 x 2.3	1.5
LT-352	0 to 5 (Three)	28	150	25 mVpp	7.5 A	73	6.7 x 6.5 x 2.35	3.6
LT-370	0 to 12 (Three)	17	200	25 mVpp	9.2 A	78	6.7 x 6.5 x 2.35	3.6

BATTERY CHARGERS, CURRENT LIMITERS, REGULATED & UNREGULATED DC CONVERTERS FOR AIRBORNE APPLICATIONS

Input: 28 VDC & 14 VDC
Output: Fixed DC Voltage
Altitude: 50,000 ft.
Temperature: −55°C to +71°C
Environmental: Per RTCA DO-160C Env.

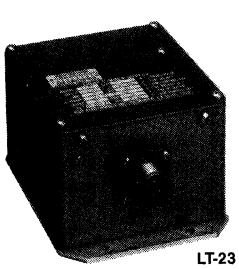


CL-33

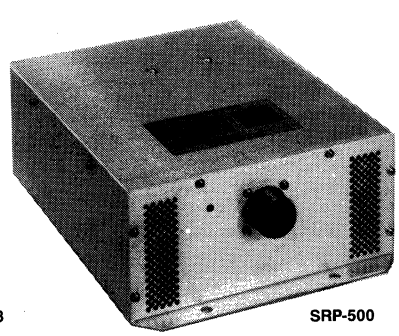
MODEL	Vin	Vout	AMPS	WATTS	INPUT CURRENT	EFFIC.	SIZE	WT.
BC-14	28	14 ± 1	5.0 ± 1	70	3.1 A	80	2.3 x 5.8 x 2.3	1.5
BC-28	28	28 ± 2	2.5 ± .5	70	3.0 A	85	2.3 x 5.8 x 2.3	1.5
CL-33	28	32 ind. outputs	200 mADC 250 mADC	60	2.5 A	85	1.56 x 4 x 3.05	0.57
RB125	11–14	28	5	140	14–11A	87	2.3 x 2.3 x 5.75	1.5
UC14-28	14	28	10	280	23 A	90	4.5 x 2.8 x 8.25	3.4
UC28-14	28	14	16	220	8.8 A	90	4.5 x 2.8 x 8.25	3.4

AC TO DC AIRBORNE AND MILITARY POWER SUPPLIES

Input: 115 VAC 400Hz Single Phase
*115/208 VAC 60-400Hz 4 Wire WYE
Output: Adjustable DC Output.
Output Ripple: 500 MvTyp., 2 Vpp Max. @ 800 Hz
Altitude: 50,000 ft.
Temperature: −55°C to +70°C



LT-23



SRP-500

MODEL	Vin	FREQ	Vout	AMPS	INPUT CURRENT	EFFIC.	SIZE	WT.
LT-23	115	400 Hz	.5–5	0–10 A	.70 A	63%	4.0 x 4.0 x 3.0	3.2
LT-25	115	400 Hz	1–28	0–10 A	2.9 A	84%	4.0 x 4.0 x 7.0	6.0
LT-258	115	400 Hz	.5–5/1–28	10 A/15 A	2.3 A	75%	4.0 x 4.0 x 7.0	6.0
SRP500-*	120 3PH	60–400 Hz	*VDC	*	2A/Phase	75%	7.75 x 3.6 x 10.7	7.0

*(Specify output voltage. Total output power: 500 VA continuous.)

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

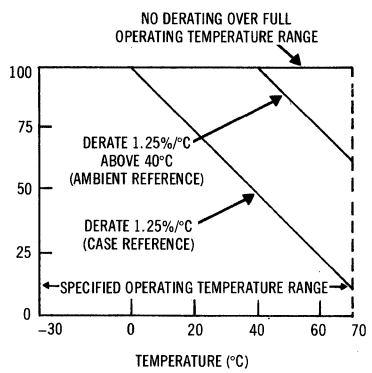


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

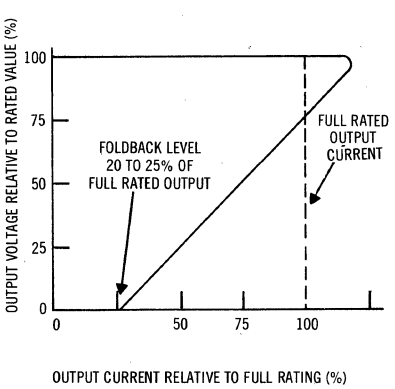


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

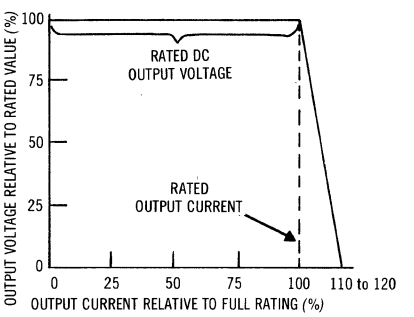


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

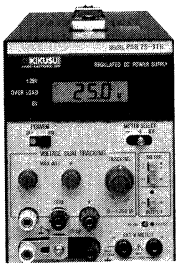
Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

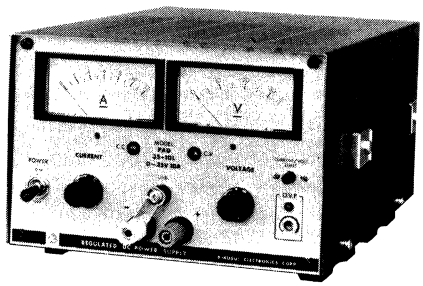
KIK POWER SUPPLIES

PAR SERIES

PAB SERIES



PAD SERIES



MULTI-RANGE – PAR Series
- 80 W in 4 ranges; 160 W in 3 ranges (8 V @ 10 A to 80 V @ 1 A; 16 V @ 10 A to 80 V @ 2 A).
- Ripple and noise < 300 μVRMS.
- Excellent EMI characteristics.
- Digital displays (voltage and current).

BENCH SUPPLIES – PAB & PAB-A Series
- 350 V @ .2 A to 5 A @ 8 V.
- Low cost, compact, small size.
- Excellent resolution (dual controls).
- Output on/off switch.
- Digital or analog readout.

DUAL TRACKING – PAB DU/TR Series
- Triple output: ±18 V @ ±2.5 A, ±32 V @ ±1.5 A, ± 25 V @ 1 A and 0–6 V @ 5 A.
- Adjustable, separate positive and negative tracking knobs.
- Applications include Op Amp and Bipolar IC testing.

HIGH CURRENT – PAD L Series
- 1000 V @ .2 A to 500 A @ 16 V.
- Low noise, high resolution.
- Options: preset output voltage selector (manual or scan), soft start, digital readout.

GPIB POWER SUPPLY CONTROLLER - PIA 3200
- Will control V and I of two Kik supplies.
- Full talk/listen function.
- Sequence contol mode provides: on-board memory for repetitive tests; storage for and recalls up to 6 test patterns at 256 steps per test; subset instruction codes to reduce bus traffic; and execution of tests via GPIB or LOCAL.

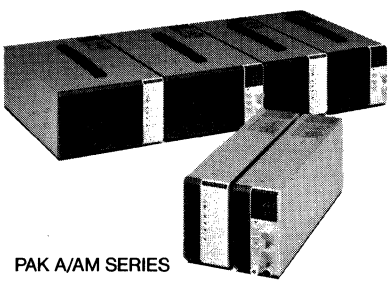
They cover every application. . . Kik's precision power supplies combine excellent line/load regulation and minimum ripple with long-term stability. All models are voltage and resistance programmable. Internal line filters eliminate EMI output noise. Demonstrated MTBFs from 92,000 to 300,000 hours.

Most supplies feature current/voltage limiting with automatic crossover as well as overvoltage protection.

Rack-mounting kits available for most supplies. In addition, our digital programming option (DPO) provides an interface for microprocessor and IEEE-488 GP-IB control.

Every Kik power source has a 30-day return priviledge, a 5-year warranty, and can be serviced in one of over 40 national centers.

Most supplies are in stock and shipped within 24 hours. Call us for your nearest Kik representative.



PAK A/AM SERIES

PLZ SERIES

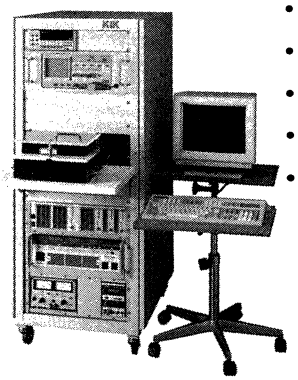
LOW NOISE DC SWITCHERS — PAK A/AM Series
- 15 models: 0-6/10/20/35/60 VDC with output capacities of 350/700/1 kW.
- Constant V, constant I.
- Reduced size, light weight.
- 70-80% overall efficiency.
- .05% line, .1% load reg.
- 2% ripple at full load current.
- Hi-Rel design, high MTBFs.
- Fail-safe design.
- Protection circuits.
- Bench or rack mounting.

GP-IB

DYNAMIC ELECTRONIC LOADS – PLZ Series

For power supply, capacitor and battery discharge testing.
- Up to 1000 W, 200 A (10 models).
- Input: 0–110 VDC.
- Built-in oscillator for dynamic load switching.
- Digital display of V, I and W.
- Master/slave parallel operation.
- Remotely controlled V, I and R (most models).
- Protection circuits (current, voltage, power, temp.).

KITS – Kikusui Integrated Test System



User-Configured, Expert Software
- Open software architecture using National Instruments LabWindows.
- Open hardware architecture - based on IEEE-488 bus.
- Comprehensive library of test routines and instruments.
- Complete analysis and reporting software.
- Programmed in C or QuickBASIC language.
- System instrumentation can include:
  - — AC and DC sources
  - — Electronic DC loads
  - — Hi-Pot insulation resistance testers
  - — Digital scopes
  - — Multimeters
  - — Switching matrices
  - — Other GPIB instruments
- MS-DOS computer based.

Specifications subject to change without notice

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Also see our ads under AC Sources, Oscilloscopes and Hi-Pot Testers.

LH RESEARCH, INC.
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LH RESEARCH SWITCHING POWER SUPPLIES

LH Switching Power Supplies are available in:

- 10 to 2500 Watt models
- 1 to 9 Outputs
- Standard, Modified Standard and Custom Configurations
- Rack Systems to 20 kW

This extensive line of high quality products is backed by the LH commitment to help customers define the optimum power supply performance for each application. LH can then deliver the right unit on time, either off-the-shelf, or from over 3 million standard configurations, or a totally custom design.

Many LH switchers have achieved documented MTBF in excess of 200,000 hours, while some models have reached a demonstrated MTBF in excess of 500,000 hours (*over 57 years!*). And LH already has the technology to meet the international safety and emission standards for 1992 and beyond.

The latest LH innovations in switching power supplies are shown on these two pages. For more information on the complete product line, and a copy of our new full line catalog, call **1-800-LH-SALES.**

TMA SERIES

- Greater than 75% efficiency typical
- 115 or 230V AC, 1 phase input
- Protected against input line transients (IEEE 587)
- Meets FCC & VDE conducted emission specifications (Level A)
- UL/CSA/TUV/IEC*
- Many standard options

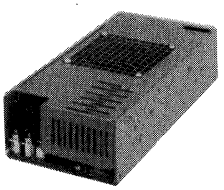
SMA HIGH DENSITY SERIES

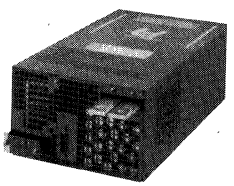
- 75-80% efficiency for 5V output
- 115 or 230V AC, 1-phase input
- Protected against input line transients (IEEE 587)
- UL/CSA/TUV/IEC*
- Meets FCC & VDE conducted emission specifications (Level A)
- Many standard options

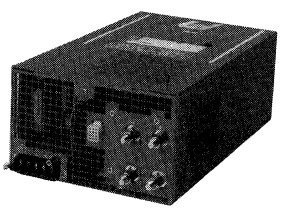
PSMA SERIES POWER FACTOR SWITCHING POWER SUPPLIES

- 99% (1-phase) and 95% (3-phase) typical PF performance at full load
- 85-265V AC input range without strapping
- Full 20 msec hold-up at 85V AC
- Precision current share capability
- Very low total harmonic distortion
- Meets IEC 555, UL 1950, IEC 950*

*Consult factory for status of specific configurations







SINGLE OUTPUT — 175 to 2500 Watts —See Table 1 for Dimensions

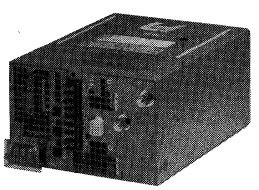
Total Power	V1 Outputs Expressed as Volt/Amps												Model Series
	2V	2.2V	3.3V	4.5V	5V	5.2V	6V	12V	15V	24V	28V	48V	
175W					35			15	12	7.5	6.5	4.0	TMA11
300W					60			25	20	13	11	6.5	TMA31
750W	200	200	200	150	150	144	126	63	51	33	28	16	PSMA71*
1000W	250	250	250	200	200	192	170	85	70	44	38	23	SMA11
1000W	250	250	250	200	200	192	167	84	67	42	36	21	PSMA11
1500W	300	300	300	300	300	288	250	125	100	63	54	32	PSMA81*
2000W	400	400	400	400	400	385	333	168	134	84	72	42	PSMA91*
2500W	500	500	500	500	500	481	417	210	168	105	90	52	SMA101

*Available without power factor correction by deleting 'P' prefix.

DUAL OUTPUTS — See Table 1 for Dimensions

Total Power	Outputs Expressed As Volts/Amps								Model Series
	V1 (select one)[1]			V2 (select one)[1]					
	4.5V	5V	12V	2V	2.2V	5V	12V	24V	
225W		30	13			9	6 (10)	3 (5)	TMA22
400W		60	25			16 (20)	16 (20)		TMAX42
1000W[1]	167	150	63	55	55	55	42		PSMAX22*
1500W	250	250	104	55	55	55	42		PSMAX82*
2000W	300	300	125	55	55	55	42		PSMAX92*

[1]Select one listed output each for V1 and V2; read currents horizontally.
[2]1250 Watts when ordered as the SMAX22 version (see note (*).
*Available as high density SMA Series (without power factor correction) by deleting 'P' prefix.
NOTE: Peak current indicated in ( ) for 10 seconds maximum.



THREE OUTPUTS — See Table 1 for Dimensions

Total Power	Outputs Expressed As Volts/Amps														Model Series
	V1	V2 (select 1)[1]							V3 (select 1)[1]						
	5V	2V	5V	12V	+12V	15V	+15V	24V	5V	12V	–12V	15V	–15V	24V	
225W	30				4 (8)						2				TMA23
							3.2						1.6		
400W	60				10 (14)						6				TMA43
							8						5		
				16 (20)					4						TMAX43
				16 (20)				8 (10)		4					
1000W	150	30	30	25		20		12.5	30	25		20		12.5	PSMAX23*
1500W	250	30	30	25		20		12.5	30	25		20		12.5	PSMAX83*
2000W	300	30	30	25		20		12.5	30	25		20		12.5	PSMAX93*

[1]Select one listed output each for V2 and V3; read currents horizontally.
*Available as high density SMA Series (without power factor correction) by deleting 'P' prefix.
NOTE: Peak current indicated in ( ) for 10 seconds maximum.

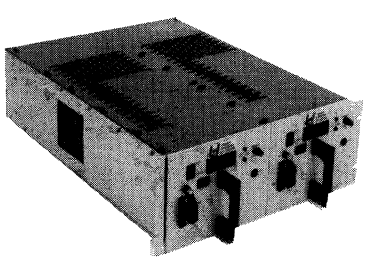
FOUR OUTPUTS — See Table 1 for Dimensions

Total Power	Outputs Expressed As Volts/Amps																	Model Series
	V1	V2 (select 1)[1]							V3 (select 1)[1]					V4 (select 1)[1]				
	5V	2V	5V	12V	+12V	15V	+15V	24V	12V	–12V	15V	–15V	24V	5	12V	15V	24V	
225W	30				4 (8)					2				1.5	1.5		3 (5)	TMA24
							3.2					1.6		1.5	3 (5)		3 (5)	
400W	60				10 (14)					6				4	4	4	3.5 (5)	TMA44
							8					5		4	4	4		
1000W	150		15	15		12			15		12		7.5		15	12	7.5	PSMA24*
		30	30	25		20		12.5	15		12			5	5	5		PSMAX24*
1500W	250		15	15		12			15		12		7.5		15	12	7.5	PSMA84*
		30	30	25		20		12.5	15		12			5	5	5		PSMAX84*
2000W	300		15	15		12			15		12		7.5		15	12	7.5	PSMA94*
		30	30	25		20		12.5	15		12			5	5	5		PSMAX94*

[1]Select one listed output each for V2, V3, V4; read currents horizontally.
*Available as high density SMA Series (without power factor correction) by deleting 'P' prefix.
NOTE: Peak current indicated in ( ) for 10 seconds maximum.

Table 1. Dimensions

PSMA11, PSMA71	4.88" H x 8.00" W x 11.50" L	SMA 11, SMA71	4.88" H x 8.00" W x 10.00" L	SMA101	4.88" H x 8.00" W x 14.00" L
PSMA22-24 Series	4.88" H x 8.00" W x 11.50" L	SMA22-24 Series	4.88" H x 8.00" W x 11.50" L	TMA11	2.50" H x 4.88" W x 9.00" L
PSMA81, PSMA91	5.00" H x 8.00" W x 14.00" L	SMA81, SMA91	5.00" H x 8.00" W x 11.00" L	TMA22-24 Series	2.50" H x 4.88: W x 11.00" L
PSMA82-84 Series	4.88" H x 10.00" W x 14.00" L	SMA82-84 Series	4.88" H x 8.00" W x 14.00" L	TMA31	2.50" H x 4.88" W x 10.00" L
PSMA92-94 Series	4.88" H x 10.00" W x 14.00"	SMA92-94 Series	4.88" H x 9.00" W x 14.00" L	TMA42-44 Series	2.50" H x 4.88" W x 12.00" L



Rack Mounted Power Systems

LH provides both standard and custom-built rack mounted power supply systems, assembled from off-the-shelf power supplies and standard enclosures. Selected rack sizes, enclosure depths, panel features and options give maximum design flexibility to package the system you need.

Assembled from the widest range of proven switching and linear power supplies available, your rack mount power system will get the most from your power supply dollar in terms of performance, quality and reliability.

The PA series rack-mounted power system is based on proven LH power supply technology and engineering experience, with the options and configurations to match your most critical application requirements.

In many cases, 2000 watts is not adequate to meet high power applications. LH has the expertise and the experience to design and build a power system to meet virtually any specification. Our engineering professionals have configured some of the most specialized rack power systems (using LH chassis and LH power supplies) in the industry.

• Power Factor Correction • Precision Current Sharing
• Uninterruptible (Battery Back-Up) • Latest Technology
• 10 Watt Modules to 20,000 Watt Rack Systems
Call 1-800-LH-SALES to meet your application requirements!

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
Encapsulation, Miniglossary **C**•1126
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **C**•1601
Fiber Optics, Miniglossary **B**•1224
Fiber Optics, Product Selection Guide **B**•1214
Filters, Power, Product Selection Guide **A**•1609
Filters, Signal, Product Selection Guide **A**•1651
Instruments, Test & Measuring, Product Selection Guide **D**•1207
Interconnection Systems, Product Selection Guide **C**•1678
Keyboards & Keypads, Product Selection Guide **B**•1794
Lamps, Lights, & Indicators, Product Selection Guide **B**•1135
Logofinder & Trademark Directories **C**•901
Microwave Components, Product Selection Guide **A**•1746
Military Qualified Products List **B**•1002
Motors, Drives, & Rotating Components, Product Selection Guide **B**•1233
Opto Semiconductors, Miniglossary **B**•1334
Oscilloscopes, Product Selection Guide **D**•1406
Panel Hardware, Product Selection Guide **C**•1582
Panel Meters, Analog & Digital, Product Selection Guide **D**•1340
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **A**•2013
Power Supplies, Miniglossary **D**•1522, **D**•2184
Power Supplies, AC, Product Selection Guide **D**•2146
Power Supplies, DC, Product Selection Guide **D**•1501
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **B**•1347
Relay Contact Forms **B**•1550
Relays, Electromechanical, Miniglossary **B**•1449
Relays, Product Selection Guide **B**•1397
Resistor Color Codes **A**•1924
Resistors, Product Selection Guide **A**•1835
Servo Components, Miniglossary **B**•1270, **D**•2244
SI Units, Basic Guide To, **A**•2080, **B**•1666, **C**•1362, **D**•2246
Solenoids, Product Selection Guide **B**•1614
Switches, Product Selection Guide **B**•1639
Symbols—International Authorities **A**•1139, **B**•1024, **C**•1156, **D**•1090
Thermal Components, Product Selection Guide **B**•1831
Thermal Conductivity of Dielectrics at Room Temperature **C**•1709
Thyristors/High Power Diodes, Miniglossary **A**•1728, **A**•2084
Timers, Miniglossary **B**•1409, **D**•1149
Trademark & Logofinder Directories **C**•901
Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

LOGITEK POWER PRODUCTS

THE LOGICAL CHOICE OF THE TECHNICAL MIND

DC/DC CONVERTERS AC/DC POWER SUPPLIES

FOR COMMERCIAL, INDUSTRIAL AND MILITARY APPLICATIONS

STANDARD POWER SUPPLIES

A complete range of DC/DC and AC/DC converters ranging from 50-1000 watts with individual units being parallelable to achieve greater levels.

CUSTOM DESIGNS

Logitek provides custom power supplies, up to 1000 watts, to meet the most rigid specifications, including size, power, environment and unique application requirements. Options include:

- Nuclear Hardening
- EMI Shielding
- Tempest Qualification
- Self-test Capability
- Virtually unlimited input/output combinations
- Spike and Transient testing to MIL-STD-1399

CONFORMANCE TO MILITARY SPECIFICATIONS

Logitek power supplies serve the low and medium power needs of military equipment. They are designed and manufactured in accordance with, but not limited to the following military specifications:

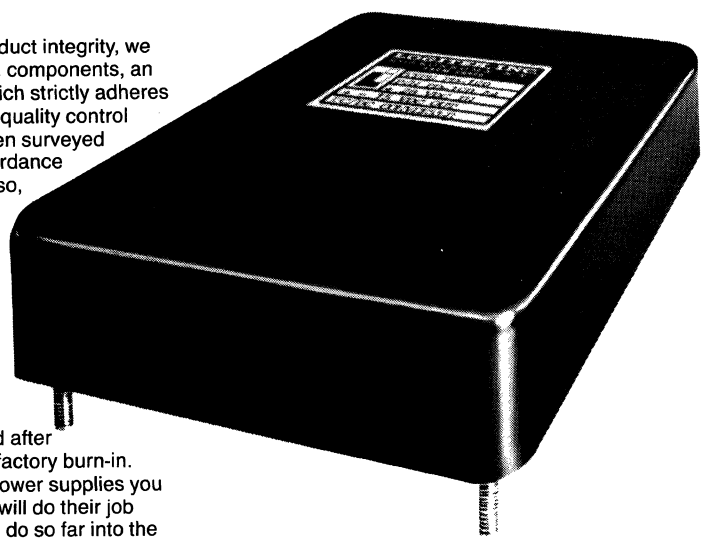
- MIL-STD-810C
- MIL-STD-704
- MIL-HDBK-217
- MIL-STD-461
- MIL-E-5400
- MIL-I-45208
- MIL-Q-9858A
- MIL-STD-38510
- MIL-STD-454
- NAVMAT P4855-1

All Logitek products carry a 3-year warranty and Logitek's standard 100 hour factory burn-in.

LOGITEK QUALITY

Logitek's internal qualification test program, in addition to any special testing that may be required for your specific application, ensures that all our power supply designs will meet or exceed your most demanding specifications.

And to further our product integrity, we use only MIL qualified components, an inspection system which strictly adheres to MIL-I-45208, and a quality control system which has been surveyed and approved in accordance with MIL-Q-9858A. Also, Logitek's facility is now qualified to MIL-STD-2000.



In addition to our many preliminary, in-process, and post production inspections, we run numerous functional tests, both before and after our routine 100 hour factory burn-in. The final result: the power supplies you receive from Logitek will do their job right, and continue to do so far into the future.

SPECIFICATIONS

ENVIRONMENTAL

Temperature	−55°C to +125°C −55°C to +85°C −55°C to +71°C	Acceleration	Per MIL-STD 810C, Method 513.2, Procedure I & II, 10g's
Vibration	Per MIL-STD 810C, Method 514.2, Procedure I, 10-2000 Hz, 20g's	Humidity	Per MIL-STD 810C, Method 507.1, Procedure I
Shock	Per MIL-STD 810C, Method 516.2, Procedure I, 50g's 11 ±1 millisecond any axis	Altitude	Per MIL-STD 810C, Method 504.1, Category 6 equipment, sea level to 70,000 ft.

LOGITEK
THE LOGICAL CHOICE OF THE TECHNICAL MIND
Logitek, Inc., 101 Christopher St., Ronkonkoma, NY 11779-6922
Phone: 516-467-4200 • Fax: 516-467-4090

CELEBRATING 30 YEARS OF SERVICE

AC ADAPTERS

DC output, U.S. version, wall plug-in type

INPUT: 120 VAC/60 Hz

Model No.	Output Voltage (VDC)	Output Current (MA)	No Load Voltage (VDC)	Unit Size	Approval UL	Approval CSA
AD-0310	3.0	100	4.5	A	✓	✓
AD-0350	3.0	500	4.5	A	✓	✓
AD-0410	4.5	100	5.8	A	✓	✓
AD-0450	4.5	500	5.8	B	✓	✓
AD-041A	4.5	1000	6.0	E	✓	
AD-0560	5.0	600	6.5	E	✓	✓
AD-052A	5.0	2000	10	K	✓	
AD-0610	6.0	100	7.9	A	✓	✓
AD-0620	6.0	200	9.5	A	✓	✓
AD-0630M	6.0	300	10.0	A	✓	✓
AD-0630	6.0	300	9.3	B	✓	✓
AD-0640	6.0	400	9.9	B	✓	✓
AD-0650	6.0	500	10.1	B	✓	✓
AD-0660	6.0	600	10.5	B	✓	✓
AD-0670	6.0	700	10.3	B	✓	✓
AD-0680	6.0	800	10.4	B	✓	✓
AD-0690	6.0	900	10.4	C	✓	✓
AD-061A	6.0	1000	10.6	C	✓	✓
AD-0615	6.0	1500	9.0	L	✓	Pend.
AD-062A	6.0	2000	10	K	✓	
AD-0710	7.5	100	10.4	A	✓	✓
AD-0720	7.5	200	11.4	A	✓	✓
AD-0730	7.5	300	11.4	B	✓	✓
AD-0740	7.5	400	11.5	B	✓	✓
AD-0780	7.5	800	11.5	C	✓	✓
AD-0790	7.5	900	11.3	C	✓	✓
AD-071A	7.5	1000	12.1	C	✓	✓
AD-0715	7.5	1500	12.3	L	✓	Pend.
AD-0830	8.0	300	12.4	E	✓	
AD-0880	8.0	800	12.8	D	✓	✓
AD-0811A	8.0	1100	12.8	D	✓	
AD-0910	9.0	100	12.2	A	✓	✓
AD-0920M	9.0	200	14.0	A	✓	✓
AD-0920	9.0	200	12.5	B	✓	✓
AD-0930	9.0	300	13.3	B	✓	✓
AD-0940	9.0	400	13.4	B	✓	✓
AD-0950	9.0	500	14.5	B	✓	✓
AD-0960	9.0	600	14.3	B	✓	✓
AD-0970	9.0	700	13.0	C	✓	✓
AD-0980	9.0	800	13.3	C	✓	✓
AD-0990	9.0	900	14.0	C	✓	✓
AD-091A	9.0	1000	14.3	C	✓	✓
AD-0911	9.0	1100	13.5	D	✓	
AD-0915	9.0	1500	13.5	L	✓	
AD-092A	9.0	2A	14.0	K	✓	
AD-1045	10.5	450	15.0	E	✓	
AD-1060	10.0	600	15.0	D	✓	✓
AD-1095	10.5	950	15.0	Desk Top	✓	✓
AD-1015	10.5	1500	15.7	L	✓	
AD-1119A	11.5	1900	16.0	Desk Top	✓	✓
AD-1210	12.0	100	15.5	A	✓	✓

Model No.	Output Voltage (VDC)	Output Current (MA)	No Load Voltage (VDC)	Unit Size	Approval UL	Approval CSA
AD-1220	12.0	200	16.8	B	✓	✓
AD-1230	12.0	300	17.2	B	✓	✓
AD-1240	12.0	400	17.8	B	✓	✓
AD-1250	12.0	500	18.8	B	✓	✓
AD-1260	12.0	600	16.9	C	✓	✓
AD-1270	12.0	700	17.6	C	✓	✓
AD-1280	12:0	800	17.8	C	✓	✓
AD-121A	12.0	1000	16.1	D	✓	✓
AD-1211	12.0	1100	16.2	D	✓	
AD-1212A	12.0	1200	19.4	K	✓	Pend.
AD-1215A	12.0	1500	16.5	K	✓	✓
AD-1515	15.0	150	19.6	B	✓	✓
AD-1520	15.0	200	20.5	B	✓	✓
AD-1530	15.0	300	21.2	B	✓	✓
AD-1540	15.0	400	22.5	B	✓	✓
AD-1550	15.0	500	21.0	C	✓	✓
AD-1560	15.0	600	22.0	C	✓	✓
AD-1580	15.0	800	20.0	D	✓	
AD-1590	15.0	900	21	D	✓	✓
AD-151A	15.0	1000	21.0	K	✓	✓
AD-1512A	15.0	1200	21.0	Desk Top	✓	✓
AD-1610	16.0	100	22.0	A	✓	✓
AD-1620	16.0	200	22.2	B	✓	✓
AD-1630	16.0	300	22.8	B	✓	✓
AD-1645	16.0	450	21.8	C	✓	✓
AD-1650	16.0	500	22.4	C	✓	✓
AD-1670	16.0	700	20.5	D	✓	
AD-1690	16.0	900	21.3	D	✓	
AD-161A	16.0	1000	22.0	L	✓	
AD-171A	17.0	1000	23.0	L	✓	
AD-1815	18.0	150	23.8	B	✓	✓
AD-1820	18.0	200	25.2	B	✓	✓
AD-1830	18.0	300	25.5	B	✓	✓
AD-1840	18.0	400	24.0	C	✓	✓
AD-1850	18.0	500	25.4	C	✓	✓
AD-1860	18.0	600	22.7	D	✓	
AD-1880	18.0	800	25.0	D	✓	✓
AD-2010	20.0	100	25.6	B	✓	✓
AD-2020	20.0	200	27.4	B	✓	✓
AD-2030	20.0	300	30.4	B	✓	✓
AD-2040	20.0	400	27.2	C	✓	✓
AD-2060	20.0	600	25.5	D	✓	
AD-2070	20.0	700	26.5	D	✓	
AD-2230	22.0	300	28.4	C	✓	✓
AD-2240	22.0	400	30.0	C	✓	✓
AD-2410	24.0	100	30.8	B	✓	✓
AD-2420	24.0	200	33.7	B	✓	✓
AD-2430	24.0	300	31.0	C	✓	✓
AD-2435	24.0	350	31.7	C	✓	✓
AD-2450	24.0	500	31.8	D	✓	
AD-2460	24.0	600	31.2	D	✓	

OTHER NON-STANDARD OUTPUTS ARE AVAILABLE UPON REQUEST. For Unit Size see Page D•1886

OPTIONS*

1. Input of 220-240 VAC/50 Hz to VDE, BS, SAA or other standards
2. Switchable input 110/220 VAC 50/60 Hz
3. Private Label per Customer Requirements
4. Custom Design per Customer Specifications
5. UL/CSA Applications for Non-Approved and Custom Design Models
6. Regulated Outputs of Standard DC Models
7. Ground Pins for DC Output Models
8. Ground Pin and Center-Tap for AC Output Models
9. Screw Terminal Enclosure for AC Output Models
10. Specially Molded Output Cords and Connectors
11. Desk Type Enclosures
12. Enclosures for European, Australian or other Standards (VDE, BS)

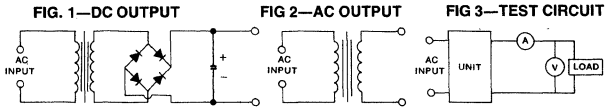
See EEM page D•1886 for output plug options

GENERAL SPECIFICATIONS:

1. Input: 120 VAC/60 Hz 2. Maximum AC Output: 50-60 VA
3. Maximum DC Output: 40 VA 4. Output: ±0.5V at Rated Load
5. Operating Temperature: 0° to 40°C
6. Dielectric Withstanding Voltage: 1500 VAC for 1 Sec.
7. Enclosure: Molded in Noryl, Black Color
8. Output Cord: 6 ft., 20-22 AWG, Black Color
9. Safety Standards: Built per UL 1310 and CSA Specifications

SCHEMATIC DIAGRAM:

FIG. 1—DC OUTPUT FIG 2—AC OUTPUT FIG 3—TEST CIRCUIT



REMARK: STANDARD CAPACITOR = 1000 MFD
HIGHER RATING ARE AVAILABLE ON SPECIAL ORDER

LZRelectronics,inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 LZR

AC ADAPTERS

AC output, U.S. version, wall plug-in type

INPUT: 120 VAC, 50/60 Hz. ALL MODELS ARE UL LISTED

EI 35 SERIES, SIZE E

MODEL NO.	OUTPUT
A0410	4V AC 100 mA
A0420	4V AC 200 mA
A0430	4V AC 300 mA
A0440	4V AC 400 mA
A0450	4V AC 500 mA
A0460	4V AC 600 mA
A0470	4V AC 700 mA
A0480	4V AC 800 mA
A0490	4V AC 900 mA
A0510	5V AC 100 mA
A0520	5V AC 200 mA
A0530	5V AC 300 mA
A0540	5V AC 400 mA
A0550	5V AC 500 mA
A0560	5V AC 600 mA
A0570	5V AC 700 mA
A0610	6V AC 100 mA
A0620	6V AC 200 mA
A0630	6V AC 300 mA
A0640	6V AC 400 mA
A0650	6V AC 500 mA
A0660	6V AC 600 mA
A0670	6V AC 700 mA
A0710	7V AC 100 mA
A0720	7V AC 200 mA
A0730	7V AC 300 mA
A0740	7V AC 400 mA
A0750	7V AC 500 mA
A0810	8V AC 100 mA
A0820	8V AC 200 mA
A0830	8V AC 300 mA
A0840	8V AC 400 mA
A0850	8V AC 500 mA
A0910	9V AC 100 mA
A0920	9V AC 200 mA
A0930	9V AC 300 mA
A0940	9V AC 400 mA
A1010	10V AC 100 mA
A1020	10V AC 200 mA
A1030	10V AC 300 mA
A1040	10V AC 400 mA
A1210	12V AC 100 mA*
A1220	12V AC 200 mA
A1230	12V AC 300 mA
A1240	12V AC 400 mA
A1510	15V AC 100 mA
A1520	15V AC 200 mA
A1530	15V AC 300 mA
A1610	16V AC 100 mA
A1620	16V AC 200 mA
A1630	16V AC 300 mA
A1810	18V AC 100 mA
A1820	18V AC 200 mA
A2010	20V AC 100 mA
A2020	20V AC 200 mA
A2210	22V AC 100 mA
A2220	22V AC 200 mA
A2410	24V AC 100 mA
A2420	24V AC 200 mA
A2710	27V AC 100 mA

E1 57 Series, Size K, L

AC output U.S. version wall plug-in or desk top

All models UL listed with optional ground & center-tap.

MODEL NO.	OUTPUT		SIZE
AA0728	7 VAC	2.85 A	K
AA083A	8 VAC	3.0 A	K
AA0874A*	8.7 VAC	4.0 A	L
AA102A*	10 VAC	2.0 A	K
AA122A*	12 VAC	2.0 A	K
AA123A*	12 VAC	3.0 A	K
AA1614*	16.5 VAC	1.45 A	K
AA1816*	18 VAC	1.67 A	K
AA1822	18 VAC	2.2 A	L
AA1984*	19 VAC	0.84 A	K
AA1912*	19 VAC	1.26 A	K
AA2215	22 VAC	1.5 A	L
AA2412*	24 VAC	1.25 A	K
AA2416	24 VAC	1.67 A	L
AA2622	26 VAC	2.25 A	4.2" x 3.6" x 3.4"
AA281A	28 VAC	1.0 A	K

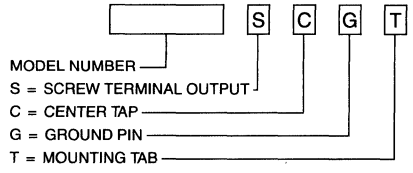
EI 41 SERIES, SIZE F WITH GROUND PIN SIZE G

MODEL NO.	OUTPUT
A048041	4V AC 800 mA
A049041	4V AC 900 mA
A041A	4V AC 1 Amp
A056041	5V AC 600 mA
A057041	5V AC 700 mA
A0580	5V AC 800 mA
A0590	5V AC 900 mA
A051A	5V AC 1000 mA
A065041	6V AC 500 mA
A066041	6V AC 600 mA
A067041	6V AC 700 mA
A0680	6V AC 800 mA
A0690	6V AC 900 mA
A061A	6V AC 1000 mA
A0612A	6V AC 1200 mA
A075041	7V AC 500 mA
A0760	7V AC 600 mA
A0770	7V AC 700 mA
A0780	7V AC 800 mA
A0790	7V AC 900 mA
A071A	7V AC 1000 mA
A084041	8V AC 400 mA
A085041	8V AC 500 mA
A0860	8V AC 600 mA
A0870	8V AC 700 mA
A0880	8V AC 800 mA
A0890	8V AC 900 mA
A081A	8V AC 1000 mA*
A094041	9V AC 400 mA
A0950	9V AC 500 mA
A0960	9V AC 600 mA
A0970	9V AC 700 mA
A0980	9V AC 800 mA
A0990	9V AC 900 mA
A091A	9V AC 1000 mA*
A103041	10V AC 300 mA
A104041	10V AC 400 mA
A1050	10V AC 500 mA
A1060	10V AC 600 mA
A1070	10V AC 700 mA
A1080	10V AC 800 mA
A1090	10V AC 900 mA
A101A	10V AC 1000 mA
A123041	12V AC 300 mA
A124041	12V AC 400 mA
A1250	12V AC 500 mA*
A1260	12V AC 600 mA
A1270	12V AC 700 mA
A1280	12V AC 800 mA*
A1290	12V AC 900 mA
A121A	12V AC 1000 mA
A152041	15V AC 200 mA
A153041	15V AC 300 mA
A1540	15V AC 400 mA
A1550	15V AC 500 mA
A1560	15V AC 600 mA
A1570	15V AC 700 mA
A1580	15V AC 800 mA
A182041	18V AC 200 mA
A1830	18V AC 300 mA*
A1850	18V AC 500 mA
A1860	18V AC 600 mA
A1880	18V AC 800 mA
A202041	20V AC 200 mA
A2030	20V AC 300 mA
A2040	20V AC 400 mA
A2050	20V AC 500 mA
A2060	20V AC 600 mA
A222041	22V AC 200 mA
A2230	22V AC 300 mA
A2240	22V AC 400 mA
A2250	22V AC 500 mA
A242041	24V AC 200 mA*
A2430	24V AC 300 mA
A2440	24V AC 400 mA
A2450	24V AC 500 mA
A2720	27V AC 200 mA
A2730	27V AC 300 mA
A2740	27V AC 400 mA

EI 48 SERIES, SIZE D WITH GROUND PIN, SIZE H

MODEL NO.	OUTPUT
A0614	6V AC 1400 mA
A0615	6V AC 1500 mA
A062A	6V AC 2000 mA
A0625	6V AC 2500 mA
A063A	6V AC 3000 mA
A0712	7V AC 1200 mA
A0714	7V AC 1400 mA
A0715	7V AC 1500 mA
A072A	7V AC 2000 mA
A0725	7V AC 2500 mA
A0812	8V AC 1200 mA
A0814	8V AC 1400 mA
A0815	8V AC 1500 mA
A0817	8V AC 1700 mA
A082A	8V AC 2000 mA
A0824	8V AC 2400 mA
A0912	9V AC 1200 mA
A0914	9V AC 1400 mA
A0915	9V AC 1500 mA
A0917	9V AC 1700 mA
A092A	9V AC 2000 mA
A1012	10V AC 1200 mA
A1014	10V AC 1400 mA
A1016	10V AC 1600 mA
A1018	10V AC 1800 mA
A1212	12V AC 1200 mA
A1214	12V AC 1400 mA
A1215	12V AC 1500 mA
A1216	12V AC 1600 mA
A1590	15V AC 900 mA
A151A	15V AC 1000 mA
A1512	15V AC 1200 mA
A1650	16V AC 500 mA
A1660	16V AC 600 mA
A1670	16V AC 700 mA
A1680	16V AC 800 mA
A1690	16V AC 900 mA
A161A	16V AC 1000 mA
A1612	16V AC 1200 mA
A1890	18V AC 900 mA
A181A	18V AC 1000 mA
A2070	20V AC 700 mA
A2080	20V AC 800 mA
A2090	20V AC 900 mA
A2260	22V AC 600 mA
A2270	22V AC 700 mA
A2280	22V AC 800 mA
A2290	22V AC 900 mA
A2460	24V AC 600 mA
A2470	24V AC 700 mA
A2480	24V AC 800 mA
A2750	27V AC 500 mA
A2760	27V AC 600 mA
A2770	27V AC 700 mA

OPTION NUMBERING SYSTEM EXCEPT EI-35 SERIES



Example 1: A101AC: 10VAC at 1A std. enclosure & center tap.

Example 2: A151ASCGT: 15VAC at 1A screw terminal enclosure with center-tap, ground & mounting tab.

NOTES:

1. **See EEM page D•1886 for unit sizes and optional output plugs.**
2. ***CSA Approved with standard enclosure only and no options.**
3. **Most models have a minimum purchase of 500 units. Lead time: 12 wks. A.R.O. non-standard outputs are available upon request.**

LZR electronics, inc. 8051 Cessna Ave., Gaithersburg, MD 20879 Telephone (301) 921-4600 Fax (301) 670-0436 LZR

DC REGULATED POWER SUPPLIES

General Specifications:

Input Voltage: 105V to 129V (117V ±10%)
Input Frequency: 57 to 63 Hz
Voltage Regulation: over all ±5%
Ripple Voltage: 50mV P-P max. at full load, low line
Dielectric Strength: 1500 Vrms
Overload Protection: Thermal shutdown

Storage Temperature: −20°C to +85°C
Operating Temperature: 0°C to +50°C
Humidity: 10% to 90%
Burn-In: 8 hours
Safety: UL 1310, UL 1012, and CSA C22.2 No. 223.
Ground Pin: is optional on most models.

Multi-Outputs, U.S. version

Model No.	Outputs		UNIT Size L"xW"xH"	Approval	
	VDC	mA		UL	CSA
AD511222	+5 +12 −12	1000 200 200	Desk Type 4.7 x 3.5 x 2.6	✓	✓
LZ581211	+5 +12 −12	800 100 100	Wall Mount 3x2.5x2	✓	✓
LZ581233	+5 +12 −12	850 300 300	Wall Mount 4.2x3x2.2	✓	
LZ583123	+5 −5 +12	850 300 300	Wall Mount 4.2x3x2.2	✓	
AD5151222	+5 +12 −12	1500 200 200	Desk Type 4.7x3.5x2.6	✓	✓
51152525	+5 +15 −15	1000 250 250	Desk Type 4.7x3x2.2	✓	✓
55121515	+5 +12 −12	500 150 150	Desk Type 3.8x2.6x2.0	✓	✓
AD521222	+5 +12 −12	2000 200 200	Desk Type 4.7 x 3.5 x 2.6	✓	✓
521255	+5 +12 −12	2000 500 500	Desk Type 7.4x4x3.5	✓	
5251205	+5 +12 −12	2500 50 50	Desk Type 7.4x4x3.5	✓	✓
55129	+5 +12	500 900	Desk Type 4.7x3x2.2	✓	
51125	+5 +12	1000 500	Desk Type 4.7x3x2.2	✓	✓
123030	+12 −12	300 300	Wall Mount 3.3x2.2x1.9	✓	✓
53122	+5 +12	300 200	Wall Mount 3.5x2.7x2.2	✓	
AD0820R	+8 −8	200 200	Wall Mount 3.5x2.7x2.2	✓	

Single Output, U.S. version

Model No.	Output		UNIT Size L"xW"xH"	Approval	
				UL	CSA
AD0520R	5 VDC	0.2 A	2.3x2x1.6 Wall Mount	✓	✓
AD0580R*	5 VDC	0.8 A	3.3x2.2x1.9 Wall Mount	✓	✓
AD051ARD	5 VDC	1.0 A	3.8x2.6x2.0 Desk Type	✓	✓
AD0515RD	5 VDC	1.5 A	4.7x3x2.2 Desk Type	✓	✓
AD052ARD	5 VDC	2.0 A	4.7x3.5x2.6 Desk Type	✓	✓
AD0670R*	6 VDC	0.7A	3.3x2.2x1.9 Wall Mount	✓	✓
AD0860R*	8 VDC	0.6 A	3.3x2.2x1.9 Wall Mount	✓	✓
AD081AR	8 VDC	1.0 A	3.3x2.6x2.2 Wall Mount	✓	
AD0960R*	9 VDC	0.6 A	3.2x2.2x1.9 Wall Mount	✓	✓
AD0980R	9 VDC	0.8 A	2.4x2.4x1.9 Wall Mount	✓	
AD091ARD	9 VDC	1.0 A	4.7x3.5x2.6 Desk Type	✓	✓
AD1250R*	12 VDC	0.5 A	3.2x2.2x1.9 Wall Mount	✓	✓
AD126ORD	12VDC	0.6 A	4.0 x 2.5 x 2 Desk Type	✓	✓
AD1212AR	12 VDC	1.2 A	4.7x3x2.2 Wall Mount	✓	
AD1212ARD*	12 VDC	1.2 A	4.7x3x2.2 Desk Type	✓	✓
AD1540R	15 VDC	0.4 A	3.8x2.6x2.0 Desk Type	✓	✓
AD161AR	16.5 VDC	1.0 A	4.7x3x2.2 Desk Top	✓	
AD181AR	18 VDC	1.0 A	4.7x3x2.2 Desk Type	✓	✓
AD2430R*	24 VDC	0.3 A	3.3x2.2x1.9 Wall Mount	✓	✓
AD2450R	24 VDC	0.5 A	2.4x2.4x1.9 Desk Type	✓	✓
AD3210R	32 VDC	0.1 A	3.3x2.7x2.2 Wall Mount	✓	✓
AD4810R	48 VDC	0.1 A	4.7x3x2.2 Desk Mount	✓	✓

*Ground pin optional, add "G" after Model No.

All models on this page are available with optional output plugs. See EEM Page D•1886 for unit sizes and plug types.

NOTE: Models which are not in stock have a minimum purchase of 500 units LEAD TIME: 12 wks. A.R.O.

LZR electronics, inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 LZR

INVERTERS DC to AC OUTPUT

NEW

100 WATT PORTABLE CAR INVERTER

Specifications

Input voltage: 10–15 VDC
Output voltage: 115 VAC/60 Hz
or 220 VAC/Hz
Regulation: ±5%
Output Power: 100 Watt Continuous
Peak Output: 200 Watt
Frequency Regulation: ±1%
No Load Current: 60 mA
Output Waveform: modified Sine wave
Efficiency: 90%
Dimensions: L = 5″, W = 3¾″, H = 1⅜″
Weight: 1 lb.

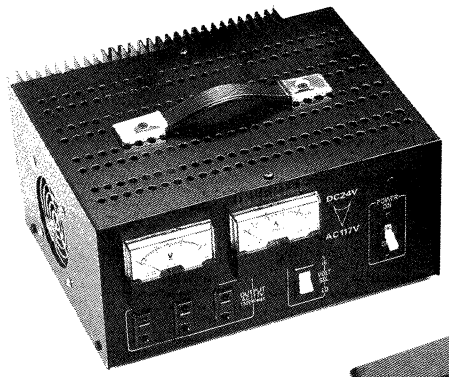
AC power switch is optional.

Model No: LZINV100–115 Volts
LZINV100 E-220 Volts

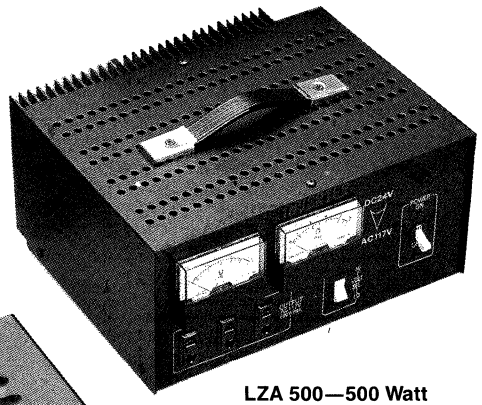
300–1000 WATT INVERTERS SQUARE WAVE

MODEL	Input Voltage	Output Voltage	Output Frequency	Output Capacity	Weight	Dimension
LZA 300	DC 12V	117V or 220V	50/60 Hz	300W MAX.	5.3kg	195 x 125 x 225m/m
LZA 500	DC 12V	117V or 220V	50/60 Hz	500W MAX.	10kg	280 x 160 x 240m/m
LZA 500A	DC 24V	117V or 220V	50/60 Hz	500W MAX.	8.5kg	280 x 160 x 240m/m
LZA 1000	DC 24V	117V or 220V	50/60 Hz	1000W MAX.	12.2kg	280 x 160 x 240m/m

NOTE: For 117 Volt model add U after the PN.
For 220 Volt model add E after the PN.



LZA 1000—1000 Watt



LZA 500—500 Watt

LZA 300—300 Watt

FOR FURTHER INFORMATION, DETAILED DRAWINGS & SAMPLES PLEASE CONTACT OUR SALES OFFICE.

LZR *electronics, inc.* 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 **LZR**

UNIVERSAL INPUT SWITCHING POWER SUPPLIES

General Specifications

AC Input: 90-260VAC / 47-63 Hz
DC Ouptuts: Output 1 adjustable 5%
Output 2 tracks Output 1
Temperature Coefficient: 0.02% / °C, all outputs
Humidity: 0-90%
Temperature Range: Operation: 0° to 50°C at rated output power
Storage: – 40°C to 80°C
Switching Frequency: 30-40 KHz
EMI: Meets FCC Class 'B' and VDE 0871 Class B rules using static load

Efficiency: 70% minimum
Overload Protection: All Outputs protected through short circuit conditions, automatic recovery
Overvoltage Protection: Output 1: output level exceeding 115-135% causes shutdown, automatic recovery
Hold-up Time: 20 ms after loss of nominal AC Input, for specified load regulation
In-rush Surge: 20A Pk/115 VAC, 40A Pk/230 VAC
Hi-pot Test: 1500 VAC / 3750 VAC

IEC950 FCC

I. DESK TYPE MODELS WITH IEC INPUT CONNECTOR POWER RANGE: 15-100 WATTS

Model	Power Watts	Output 1	Output 2 (peak)	Output 3	Size (inches) L x W x H	Approval		
						UL	CSA	TUV
LZUS1501	15	5V@3A	—	—	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS1502	15	5V@2A	12V@0.5A	—	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS1503	15	5V@1.8A	12V@0.4A (1A)	– 12V@0.1A	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS1504	15	12V@1.2A	—	—	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS1505	15	15V@1.0A	—	—	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS1506	15	18V@0.8A	—	—	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS1507	15	24V@0.62A	—	—	5.4 x 3.3 x 2.5	✓	✓	✓
LZUS02	30	5V@2A	12V@1.5A (3A)	—	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS03	30	5V@1.5A	12V@1.5A (3A)	– 12V@0.3A	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS05	30	5V@6A	—	—	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS09	30	9V@3.3A	—	—	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS12	30	12V@2.5A	—	—	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS15	30	15V@2A	—	—	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS24	30	24V@1.3A	—	—	7.1 x 3.5 x 2.4	✓	✓	✓
LZUS4301	43	5V@3A	12V@2A (3A)	– 12V@0.3A	6.0 x 3.3 x 2.1	✓	✓	✓
LZUS4302	43	5V@3A	12V@2A (3A)	– 5V@0.3A	6.0 x 3.3 x 2.1	✓	✓	✓
LZUS4303	43	5V@3A	15V@1.6A (2A)	– 15V@0.3A	6.0 x 3.3 x 2.1	✓	✓	✓
LZUS4304	43	5V@6A	—	—	6.0 x 3.3 x 2.1	✓	✓	✓
LZUS4305	43	5V@6A	24V@0.5A (1A)	—	6.0 x 3.3 x 2.1	✓	✓	✓
LZUS4306	43	12V@3.6A	—	—	6.0 x 3.3 x 2.1	✓	✓	✓
LZU124A	50	12V@4.2A	—	—	6.5 x 3.2 x 2.2	✓	✓	✓
LZU163A	50	16.5V@3A	—	—	6.5 x 3.2 x 2.2	✓	✓	✓
LZU1830	54	18V@3A	—	—	6.5 x 3.2 x 2.2	✓	✓	✓
LZU242	54	24V@2.2A	—	—	6.5 x 3.2 x 2.2	✓	✓	✓
LZU5401	54	9V@6A	—	—	8 x 3.5 x 2.3	✓	✓	✓
LZU5402	54	12V@4.5A	—	—	8 x 3.5 x 2.3	✓	✓	✓
LZU5403	54	15V@3.6A	—	—	8 x 3.5 x 2.3	✓	✓	✓

Notes: (1) Standard output cord: 6 ft with molded 5 pin DIN plug. (2) Other output connectors are available per customer request
(3) For optional AC input power cords, please refer to EEM Page C•1766

100 WATT UNIVERSAL INPUT EXTERNAL SWITCHERS

NEW

AVAILABLE THIRD QUARTER OF 1991

Model	Output 1	Output 2 (peak)	Output 3	Output 4	Size (inches) L x W x H	Tolerance	Ripple & Noise
LZUS1001	5V@10A	12V@3.5A (5A)	– 12V@0.7A	– 5V@0.7A	8 x 4 x 2.5	± 5%	50-100 mV p-p
LZUS1002	5V@13A	12V@2.5A (3.5A)	– 12V@0.2A	– 5V@0.2A	8 x 4 x 2.5	± 5%	50-100 mV p-p
LZUS1003	5V@20A	—	—	—	8 x 4 x 2.5	± 5%	50 mV p-p
LZUS1004	12V@8.5A	—	—	—	8 x 4 x 2.5	± 5%	50 mV p-p
LZUS1005	15V@7A	—	—	—	8 x 4 x 2.5	± 5%	50 mV p-p
LZUS1006	24V@4.5A	—	—	—	8 x 4 x 2.5	± 5%	50 mV p-p

LZR electronics, inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 LZR

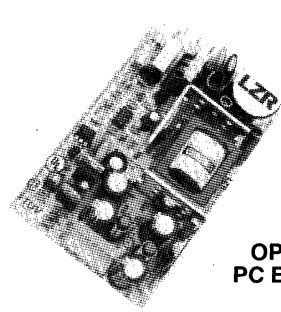
UNIVERSAL INPUT SWITCHING POWER SUPPLIES

II. OPEN FRAME PC BOARD TYPE

ALL WATT MODELS ARE UL/CSA/TUV APPROVED

Model	Power Watts	Output Voltage Volts	Load-Amp Min.	Load-Amp Rated	Load-Amp Max.	Tolerance ±%	Ripple And Noise	Regulation Line	Regulation Load	Size Inches L x W x H
LZUPC3001	30	+5 +12 −12	0.2 0 0	2.5 1.5 0.3	2.5 3 0.3	1% 3% 3%	50mV 100mV 150mV	1% 1% 1%	5% 5% 10%	5.1 x 2.75 x 1.25
LZUPC3002	30	+5 +12 −5	0.2 0 0	2.5 1.5 0.3	2.5 3 0.3	1% 3% 3%	50mV 100mV 150mV	1% 1% 1%	5% 5% 10%	5.1 x 2.75 x 1.25
LZUPC3003	30	+5 +15 −15	0.2 0.1 0.1	2.5 1 0.3	2.5 2 0.3	1% 3% 3%	50mV 100mV 150mV	1% 1% 1%	5% 5% 10%	5.1 x 2.75 x 1.25
LZUPC3004	30	+5 +24 −12	0.2 0.1 0	2 0.8 0.3	2 1.5 0.3	1% 5% 3%	50mV 200mV 100mV	1% 1% 1%	5% 5% 10%	5.1 x 2.75 x 1.25
LZUPC3005	30	+5	0.2	6	8	1%	50mV	1%	1%	5.1 x 2.75 x 1.25
LZUPC3006	30	+12	0.1	2.5	3.5	1%	100mV	1%	1%	5.1 x 2.75 x 1.25
LZUPC3007	30	+15	0.1	2	2.5	1%	150mV	1%	1%	5.1 x 2.75 x 1.25
LZUPC3008	30	+24	0.1	1.3	2	1%	200mV	1%	1%	5.1 x 2.75 x 1.25
LZUPC4001	40	+5 +12 −12	0.6 — —	3.0 2.0 0.3	5.0 5.0 0.5	1% 3% 3%	50mV 100mV 50mV	.5% 1% 1%	1% 3% 1%	5.0 x 3.0 x 1.2
LZUPC4005	40	+5	0.8	8.0	—	1%	100mV	.5%	1%	5.0 x 3.0 x 1.2
LZUPC4009	40	+9	0.2	4.4	—	1%	100mV	.5%	1%	5.0 x 3.0 x 1.2
LZUPC4012	40	+12	0.4	3.5	—	1%	100mV	.5%	1%	5.0 x 3.0 x 1.2
LZUPC4015	40	+15	0.4	2.67	—	1%	100mV	.5%	1%	5.0 x 3.0 x 1.2
LZUPC4024	40	+24	0.2	1.67	—	1%	100mV	.5%	1%	5.0 x 3.0 x 1.2
LZUPC5001	50	+5 +12	0.6 —	3.0 3.0	5.0 5.5	1% 3%	50mV 100mV	.5% 1%	1% 3%	7.0 x 2.0 x 1.9
LZUPC5002	50	+5 +12	0.6 —	3.0 3.0	5.0 5.5	1% 3%	50mV 100mV	.5% 1%	1% 3%	5.0 x 3.0 x 1.9
LZUPC6501	65	+5 +12 −12	0.2 — —	6.0 3.0 0.5	— 6.0 —	1% 5% 3%	50mV 100mV 100mV	.5% 1% 1%	1% 5% 3%	6.0 x 3.5 x 1.8
LZUPC6502	65	+5 +12 −12 −5	0.2 — — —	5.5 2.5 0.5 0.5	10.0 6.0 1.0 1.0	1% 5% 3% 3%	50mV 100mV 100mV 50mV	.5% 1% 1% 1%	1% 5% 3% 3%	6.0 x 3.5 x 1.8
LZUPC6505	65	+5	0.2	13.0	—	1%	50mV	.5%	1%	6.0 x 3.5 x 1.8
LZUPC6512	65	+12	0.2	5.5	—	1%	100mV	.5%	1%	6.0 x 3.5 x 1.8
LZUPC6515	65	+15	0.2	4.5	—	1%	100mV	.5%	1%	6.0 x 3.5 x 1.8
LZUPC6524	65	+24	0.2	2.75	—	1%	100mV	.5%	1%	6.0 x 3.5 x 1.8

DESK TOP MODEL



OPEN FRAME PC BOARD TYPE

LZR electronics, inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 **LZR**

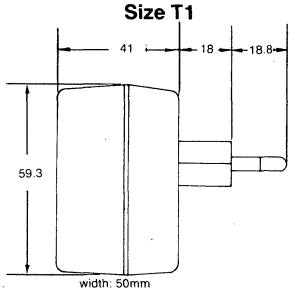
EUROPEAN POWER SUPPLIES
VDE/TUV APPROVED

DC OUTPUT, Wall Plug-in

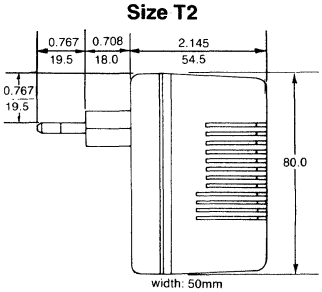
Input: 220 VAC/50 Hz

MODEL NO.	OUTPUT VDC	OUTPUT mA	APPROVAL	UNIT SIZE
E0330BO	3.0	300	TÜV	T1
E0360BO	3.0	600	TÜV/VDE	T2
E0410BT	4.5	100	TÜV	T4
E0430BO	4.5	300	TÜV	T1
E0460BO	4.5	600	TÜV/VDE	T2
E0610BT	6.0	100	TÜV	T4
E0630BO	6.0	300	TÜV	T1
E0660BO	6.0	600	TÜV/VDE	T2
E061ABT	6.0	1000	TÜV	T6
E0612BO	6.0	1200	TÜV/VDE	T3
E0730BO	7.5	300	TÜV	T1
E0760BO	7.5	600	TÜV/VDE	T2
E071ABO	7.5	1000	TÜV	T3
E0712BO	7.5	1200	TÜV/VDE	T3
E0910BT	9.0	100	TÜV	T4
E0930BO	9.0	300	TÜV	T1
E0950BO	9.0	500	TÜV	T1
E0960BO	9.0	600	TÜV/VDE	T2
E091ABO	9.0	1000	TÜV/VDE	T3
E091ABD	9.0	1000	VDE	DESK
E1220BO	12.0	200	TÜV	T1
E1230BO	12.0	300	TÜV	T1
E1250BO	12.0	500	TÜV/VDE	T2
E1280BO	12.0	800	TÜV/VDE	T3
AD121ABD	12.0	1000	VDE	DESK
E131ABD	13.0	1000	VDE	DESK
E1515BO	15.0	150	TÜV	T1
E1540BO	15.0	400	TÜV/VDE	T2
E1560BO	15.0	600	TÜV/VDE	T3
E1655BT	16.0	550	TÜV	T6
E1820BO	18.0	200	TÜV	T1
E1850BO	18.0	500	TÜV/VDE	T3
E1880BDT	18.0	800	TÜV	DESK
E2010BO	20.0	100	TÜV	T1
E2030BO	20.0	300	TÜV/VDE	T2
E2045BO	20.0	450	TÜV/VDE	T3
E2240BT	22.0	400	TÜV	T6
E2410BO	24.0	100	TÜV	T1
E2425BO	24.0	250	TÜV/VDE	T2
E2440BO	24.0	400	TÜV/VDE	T3
E2650BP	26.0	500	TÜV	DESK

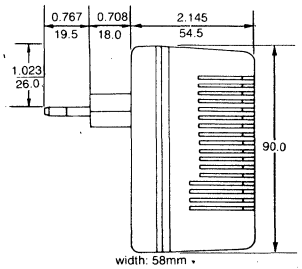
Size T1



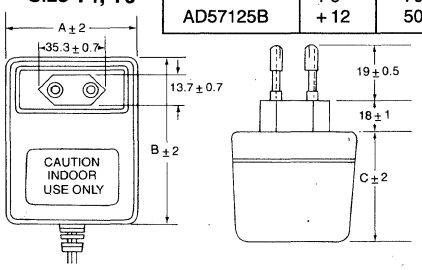
Size T2



Size T3



Size T4, T6



TYPE	DIMENSION (MM) A	B	C
T4	43.5	56.5	37.0
T6	55.5	69.5	47.5

AC OUTPUT, Wall Plug-in

Input: 220 VAC/50 Hz

MODEL NO.	OUTPUT VAC	OUTPUT mA	APPROVAL	UNIT SIZE
A0330BO	3.0	300	TÜV	T1
A0360BO	3.0	600	TÜV/VDE	T2
A0430BO	4.5	300	TÜV	T1
A0460BO	4.5	600	TÜV/VDE	T2
A0630BO	6.0	300	TÜV	T1
A0660BO	6.0	600	TÜV/VDE	T2
A0612BO	6.0	1200	TÜV/VDE	T3
A0730BO	7.5	300	TÜV	T1
A0760BO	7.5	600	TÜV/VDE	T2
A071ABO	7.5	1000	TÜV/VDE	T3
A0930BO	9.0	300	TÜV	T1
A0960BO	9.0	600	TÜV/VDE	T2
A091ABO	9.0	1000	TÜV/VDE	T3
A094ABT	9.0	4000	TÜV	DESK
A1230BO	12	300	TÜV	T1
A1250BO	12	500	TÜV/VDE	T2
A1280BO	12	800	TÜV/VDE	T3
A1540BO	15	400	TÜV/VDE	T2
A1560BO	15	600	TÜV/VDE	T3
A1820BO	18	200	TÜV	T1
A1850BO	18	500	TÜV/VDE	T3
A2030BO	20	300	TÜV/VDE	T2
A2045BO	20	450	TÜV/VDE	T3
A2425BO	24	250	TÜV/VDE	T2
A2440BO	24	400	TÜV/VDE	T3
A2412BD	24	1200	TÜV	DESK

LINEAR POWER SUPPLIES
5% Regulated

Input: 220VAC ± 10%/47-53 Hz. Single Output

MODEL NO.	OUTPUT VDC	OUTPUT mA	APPROVAL	UNIT SIZE L" × W" × H"
AD0550RB	5	500	VDE	Wall 4 × 2.5 × 2
AD051ARB	5	1000	VDE/TÜV	Desk 3.4 × 2.7 × 2
AD0515RB	5	1500	VDE/TÜV	Desk 6.0 × 3.0 × 3.0
AD0950RB	9	500	VDE	Wall 4 × 2.5 × 2
AD091ARB	9	1000	VDE	Desk 6.0 × 3.0 × 3.0
AD1250RB	12	500	VDE	Wall 4 × 2.5 × 2
AD1212RBD	12	1200	TÜV	Desk 4.7 × 3 × 2.2

Multi Output

MODEL NO.	OUTPUT VDC	OUTPUT mA	APPROVAL	UNIT SIZE L" × W" × H"
AD511222B	+5 +12V −12V	1000 200 200	VDE	6.0 × 3.0 × 3.0
5251205B	+5 +12 −12	2500 50 50	VDE	6.5 × 3.6 × 2.5
591123B	+5 −5 +12	900 100 300	VDE	5.0 × 3.0 × 2.5
AD57125B	+5 +12	700 500	VDE	6.0 × 3.0 × 2.5

Most models have a minimum purchase of 500 units. lead time: 12 wks. A.R.O. non-standard outputs are available upon request.

LZRelectronics,inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 LZR

BRITISH (U.K.) STYLE POWER SUPPLIES

All Models are designed to comply with British Standards BS6301 and BS415

DC output

U.K. version, wall plug-in
Input: 240VAC/50Hz

MODEL NO.	OUTPUT VDC	OUTPUT mA
AD071AUK	7.5	1000
AD0910UK	9	100
AD0930UK	9	300
AD0950UK	9	500
AD091AUK	9	1000
AD1210UK	12	100
AD1230UK	12	300
AD1250UK	12	500
AD1280UK	12	800
AD121AUK	12	1000
AD1560UK	15	600
AD1820UK	18	200
AD1850UK	18	500
AD1880UK	18	800
AD2435UK	24	350
AD2450UK	24	500

DC regulated OUTPUT 5%

U.K. version.
Input: 240VAC ± 10%/50Hz

MODEL NO.	OUTPUT VDC	OUTPUT mA
AD0550RUK	5	500
AD051ARUK	5	1000
AD0515RUK	5	1500
AD0950RUK	9	500
AD091ARUK	9	1000
AD1250RUK	12	500
AD121ARUK	12	1000
511220UK	+5	1000
	+12	200
	−12	200

AC output

U.K. version, wall plug-in.
Input: 240VAC/50Hz

MODEL NO.	OUTPUT VAC	OUTPUT mA
AA071AUK	7.5	1000
AA0930UK	9	300
AA0950UK	9	500
AA091AUK	9	1000
AA1230UK	12	300
AA1250UK	12	500
AA121AUK	12	1000
AA1650UK	16	500
AA161AUK	16	1000
AA2475UK	24	750

NOTES:
(1) Other outputs & custom made power supplies are available upon request.
(2) For unit size dimension drawing please contact our sales office.
(3) Most models have a minimum purchase of 500 units. Lead time: 12 wks. A.R.O.

AUSTRALIA STYLE POWER SUPPLIES

All models are designed to comply with SAA standards association of Australia.

DC OUTPUT, Wall plug-in

Input: 240VAC/50Hz

MODEL NO.	OUTPUT VDC	OUTPUT mA	APPROVAL	UNIT SIZE L″ × W″ × H″
AU0320	3	200	SAA	2.4 × 1.6 × 1.7
AU0450	4.5	500	—	2.3 × 2.0 × 1.6
AU0620	6.0	200	SAA	2.4 × 1.6 × 1.7
AU0630	6.0	300	SAA	2.4 × 1.6 × 1.7
AU0680	6.0	800	SAA	3.15 × 2.2 × 2.2
AU0710	7.5	100	SAA	2.2 × 1.8 × 1.8
AU0750	7.5	500	—	2.3 × 2.0 × 1.6
AU0940	9.0	400	SAA	2.2 × 1.8 × 1.8
AU091A	9.0	1000	—	3.2 × 2.2 × 1.9
AU1020	10.0	200	SAA	2.2 × 1.8 × 1.8
AU1230	12.0	300	SAA	2.2 × 1.8 × 1.8
AU1250	12.0	500	—	2.3 × 2.0 × 1.6
AU1280	12.0	800	—	3.2 × 2.2 × 1.9
AU121A	12.0	1000	—	3.2 × 2.2 × 1.9
AU1440	14.0	400	SAA	3.15 × 2.2 × 2.2
AU1540	15.0	400	—	2.3 × 2.0 × 1.6
AU1560	15.0	600	SAA	3.15 × 2.2 × 2.2
AU1820	18.0	220	SAA	2.2 × 1.8 × 1.8
AU1830	18.0	300	SAA	3.15 × 2.2 × 2.2
AU1850	18.0	500	—	3.2 × 2.2 × 1.9
AU2030	18.0	300	—	2.3 × 2.0 × 1.6
AU2440	24.0	400	—	3.2 × 2.2 × 1.9

AC OUTPUT, Wall plug-in

Input: 240VAC/50Hz

MODEL NO.	OUTPUT VAC	OUTPUT mA	APPROVAL	UNIT SIZE L″ × W″ × H″
AUA0930	9.0	300	—	2.3 × 2.0 × 1.6
AUA0980	9.0	800	SAA	3.15 × 2.2 × 2.2
AUA091A	9.0	1000	—	3.2 × 2.2 × 1.9
AUA101A	10.0	1000	SAA	3.15 × 2.2 × 2.2
AUA1240	12.0	400	SAA	2.2 × 1.8 × 1.8
AUA121A	12.0	1000	SAA	3.15 × 2.2 × 2.2
AUA1340	13.0	400	SAA	2.2 × 1.8 × 1.8
AUA1380	13.0	800	SAA	3.15 × 2.2 × 2.2
AUA1660	16.5	600	SAA	3.15 × 2.2 × 2.2

NOTES:
(1) Other outputs & custom made power supplies are available upon request.
(2) For unit size dimension drawing please contact our sales office.
(3) Most models have a minimum purchase of 500 units. Lead time: 12 wks. A.R.O.

JAPANESE STYLE POWER SUPPLIES

All models are designed to comply with JISC (MITI) Japanese Industrial Standards. Approvals are pending.

DC OUTPUT, Wall plug-in

Input: 100VAC/50-60Hz

MODEL NO.	OUTPUT VDC	OUTPUT mA	UNIT SIZE*
J0630	6.0	300	A
J0650	6.0	500	B
J061A	6.0	1000	C
J0930	9.0	300	A
J0950	9.0	500	B
J091A	9.0	1000	C
J1230	12.0	300	B
J1250	12.0	500	B
J1280	12.0	800	C
J121A	12.0	1000	D
J1560	15.0	600	C
J1820	18.0	200	B
J1850	18.0	500	C
J1880	18.0	800	D
J2040	20.0	400	C
J2440	24.0	400	C

AC OUTPUT, Wall plug-in

Input: 100VAC/50-60Hz

MODEL NO.	OUTPUT VAC	OUTPUT mA	UNIT SIZE*
JA0630	6.0	300	A
JA0650	6.0	500	B
JA061A	6.0	1000	C
JA0930	9.0	300	A
JA0950	9.0	500	B
JA091A	9.0	1000	C
JA1230	12.0	300	B
JA1250	12.0	500	B
JA1280	12.0	800	C
JA121A	12.0	1000	D
JA1560	15.0	600	C
JA1820	18.0	200	B
JA1850	18.0	500	C
JA1880	18.0	800	D
JA2040	20.0	400	C
JA2440	24.0	400	C

*For unit size please refer to EEM Page D•1886

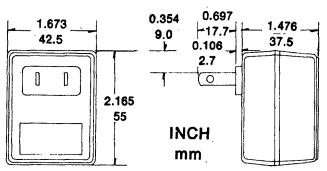
Most models have a minimum purchase of 500 units. Lead time: 12 wks. A.R.O. non-standard outputs are available upon request.

LZR *electronics, inc.* 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 **LZR**

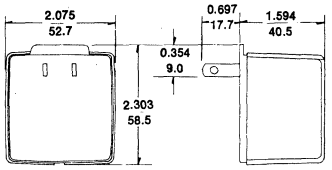
AC ADAPTERS

Enclosure dimensions: unit size inch (mm)

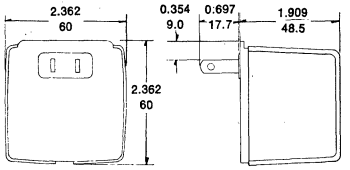
SIZE A



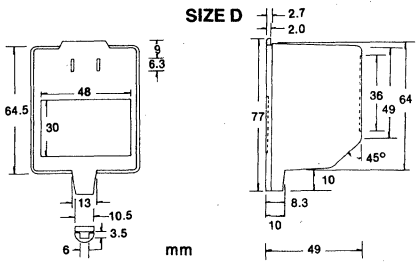
SIZE B



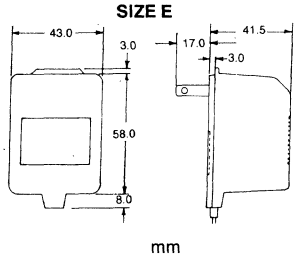
SIZE C



SIZE D



SIZE E



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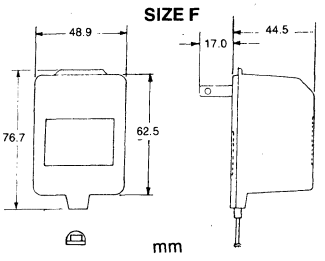

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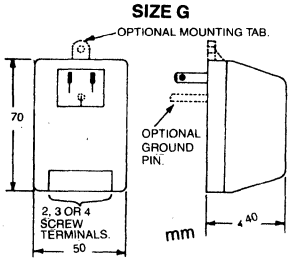

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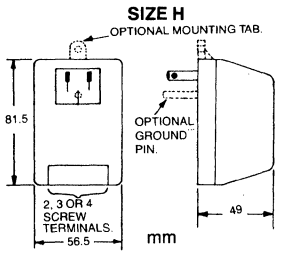
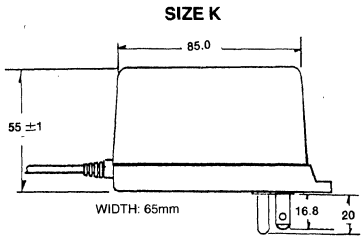


SIZE K



SIZE L

WALL MOUNT:

L = 94 mm

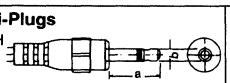
W = 64 mm

H = 50 mm

Output plugs

Mini-Plugs

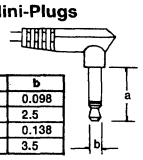
INCH
mm



Type	a	b
OP-01	0.453	0.098
	11.5	2.5
OP-02	0.571	0.138
	14.5	3.5

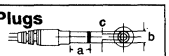
Right Angle Mini-Plugs

MIN: 500 pcs



Type	a	b
OP-03	0.492	0.098
	12.5	2.5
OP-04	0.571	0.138
	14.5	3.5

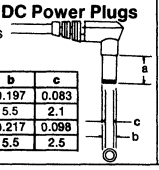
DC Power Plugs



Type	a	b	c
OP-05	0.472	0.197	0.083
	12.0	5.5	2.1
OP-07	0.472	0.217	0.098
	12.0	5.5	2.5

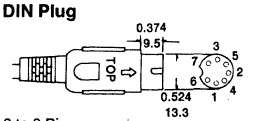
Right Angle DC Power Plugs

MIN: 500 pcs



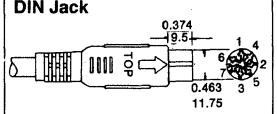
Type	a	b	c
OP-08	0.472	0.197	0.083
	12.0	5.5	2.1
OP-09	0.453	0.217	0.098
	11.5	5.5	2.5

DIN Plug



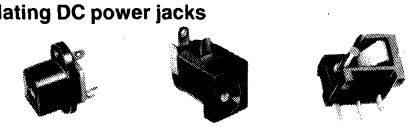
3 to 8 Pins
SD30–SD80

DIN Jack



3 to 8 Pins
SD30J–SD80J

Mating DC power jacks



DJ-001 Panel Mount
Pin Diameter: A = 2.1 mm

DJ-005 PCB Mount
B = 2.5 mm

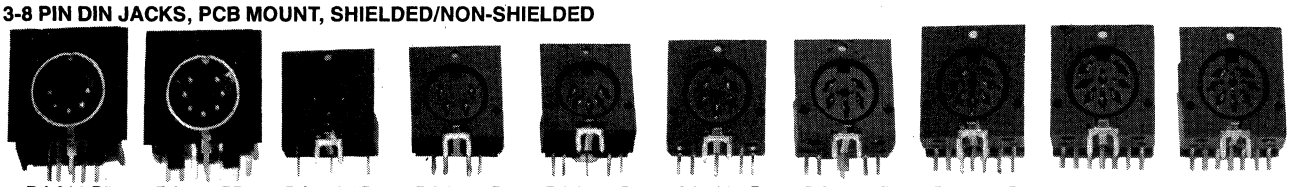
DJ-009 PCB Mount

3.5ϕ JACKS

SJ-360 **SJ-362** **SJ-370**

FOR DETAILED INFO REFER TO EEM SEC 2100 PGS C•1446–1449

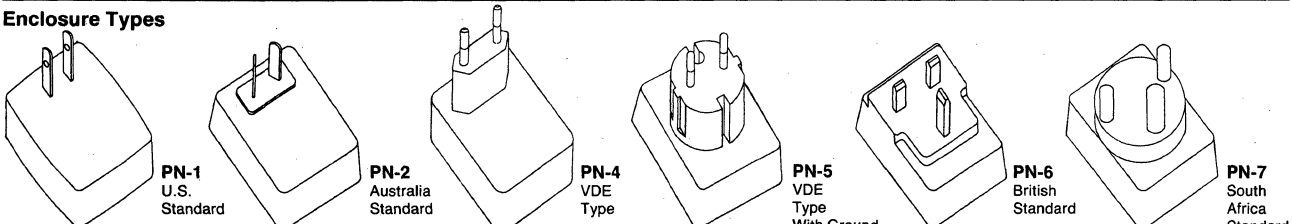
3-8 PIN DIN JACKS, PCB MOUNT, SHIELDED/NON-SHIELDED



DJ-014-P5 (5P 180°) **DJ-014-P7** (7P 270°) **DJ-020-3P** (3P 180°) **DJ-022-4P** (4P 210°) **DJ-021-5P** (5P 180°) **DJ-023-6P** (5P 240°) **DJ-024-6P** (6P 240°) **DJ-025-7P** (7P 270°) **DJ-026-8P** (8P 270°) **DJ-027-8P** (8P 262°)

For Detailed information on DIN Connectors please refer to EEM Section 2100 Pages C•1451-1452

Enclosure Types



PN-1 U.S. Standard

PN-2 Australia Standard

PN-4 VDE Type

PN-5 VDE Type With Ground

PN-6 British Standard

PN-7 South Africa Standard

LZRelectronics,inc. 8051 Cessna Ave., Gaithersburg, MD 20879
Telephone (301) 921-4600 Fax (301) 670-0436 LZR

DC / DC CONVERTERS

1 to 3 WATTS
REGULATED

Specifications:

- Input range: ±5%
- Input filter: Pi or Capacitor Network
- Isolation: 500 Vdc
- Isolation Resistance: 10^9 Ohms
- Switching Freq.: 25 KHz min.
- Line regulation: ±0.02% max.
- Load regulation: ±1% max.
- Ripple: 0.5-1% P-P max.
- Operating Temperature: −25°C to 71°C
- Storage Temperature: −55°C to 105°C
- Humidity: 20-95% Non-condensing

MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
D2001	5	5	360	A
D2002	5	9	250	A
D2003	5	12	150	A
D2004	5	15	120	A
D2005	5	+5, −5	100	A
D2006	5	+12, −12	75	A
D2007	5	+15, −12	60	A
D2008	5	5	600	B
D2009	5	9	300	B
D2010	5	12	250	B
D2011	5	15	200	B
D2012	5	+12, −12	120	B
D2013	5	+15, −15	100	B
D2014	12	5	360	A
D2015	12	9	250	A
D2016	12	12	150	A
D2017	12	+12, −12	75	A
D2018	12	+15, −15	60	A
D2019	12	5	600	B
D2020	12	9	300	B
D2021	12	12	250	B
D2022	12	+12, −12	120	B
D2023	12	+15, −15	100	B
D2024	24	5	360	A
D2025	24	12	150	A
D2026	24	15	120	A
D2027	24	+12, −12	75	A
D2028	24	+15, −15	60	A
D2029	24	5	360	B
D2030	24	12	150	B
D2031	24	15	120	B
D2032	24	+12, −12	75	B
D2033	24	+15, −15	60	B
D2034	48	5	360	B
D2035	48	12	150	B
D2036	48	15	120	B
D2037	48	+12, −12	75	B
D2038	48	+15, −15	60	B
D2039	48	5	600	B
D2040	48	12	250	B
D2041	48	15	200	B
D2042	48	+12, −12	120	B
D2043	48	+15, −15	100	B

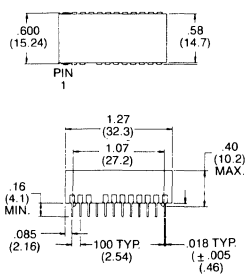
1.5, 3 WATTS
WIDE INPUT RANGE
REGULATED

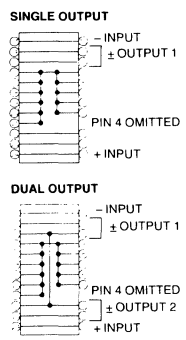
Specifications:

- Input range: Wide
- Input filter: Pi network
- Isolation: 500 Vdc
- Ripple: 0.5-1% P-P max.
- Switching Freq.: 25 KHz min.
- Line regulation: ±1% max.
- Load regulation: ±1% max.
- Voltage accuracy: ±3% max.
- Operating Temperature: −25°C to 71°C
- Storage Temperature: −55°C to 105°C
- Humidity: 20-95% Non-condensing

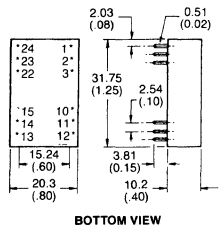
	MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
1.5W	D2044	4.5-6.0	5	300	B
	D2045	4.5-6.0	12	125	B
	D2046	4.5-6.0	15	100	B
	D2047	9-18	5	300	B
	D2048	9-18	12	125	B
	D2049	9-18	15	100	B
	D2050	18-36	5	300	B
	D2051	18-36	12	125	B
	D2052	18-36	15	100	B
	D2053	36-72	5	300	B
	D2054	36-72	12	125	B
	D2055	36-72	15	100	B
3W	D2056	4.5-6.0	5	500	B
	D2057	4.5-6.0	12	250	B
	D2058	4.5-6.0	15	200	B
	D2059	9-18	5	500	B
	D2060	9-18	12	250	B
	D2061	9-18	15	200	B
	D2062	18-36	5	500	B
	D2063	18-36	12	250	B
	D2064	18-36	15	200	B
	D2065	36-72	5	500	B
	D2066	36-72	12	250	B
	D2067	36-72	15	200	B

PACKAGE A





PACKAGE B



BOTTOM VIEW

PIN	SINGLE	DUAL
1 & 24	+ INPUT	+ INPUT
2 & 23	NC	– OUTPUT
3 & 22	NC	COMMON
10 & 15	– OUTPUT	COMMON
11 & 14	+ OUTPUT	+ OUTPUT
12 & 3	– INPUT	– INPUT

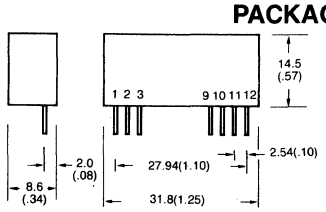
DC / DC CONVERTERS 1–10 WATTS

1 to 2 WATTS
SIP TYPE REGULATED

Specifications:

- Input range: ±10%
- Input filter: Capacitor type
- Isolation: 500 Vdc
- Switching Freq.: 50 KHz min.
- Isolation Resistance: 10^9 Ohms
- Line regulation: ±0.5% max.
- Load regulation: ±1% max.
- Voltage accuracy: ±3% max.
- Voltage stability: ±0.05% max.
- Ripple: 0.5-1% P-P max.
- Operating Temperature: −25°C to 105°C
- Storage Temperature: −55°C to 105°C
- Humidity: 20-95% Non-condensing

PACKAGE S



PIN	SINGLE	DUAL
1	+INPUT	+INPUT
2	NC	−OUTPUT
3	NC	+OUTPUT
9	NC	NC
10	−OUTPUT	−OUTPUT
11	+OUTPUT	+OUTPUT
12	−INPUT	−INPUT

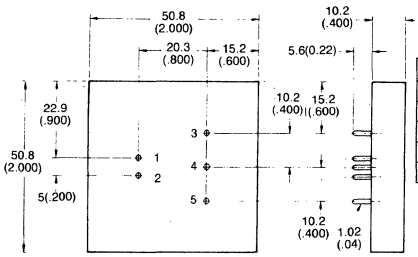
MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
D2068	5	5	200	S
D2069	5	9	200	S
D2070	5	12	125	S
D2071	5	15	100	S
D2072	5	+12, −12	60	S
D2073	5	+15, −15	50	S
D2074	12	5	200	S
D2075	12	9	200	S
D2076	12	12	125	S
D2077	12	15	100	S
D2078	12	+12, −12	60	S
D2079	12	+15, −15	50	S
D2080	24	5	200	S
D2081	24	12	125	S
D2082	24	15	100	S
D2083	24	+12, −12	60	S
D2084	24	+15, −15	50	S

3, 5, 10 WATTS
WIDE INPUT RANGE REGULATED

Specifications:

- Input range: Wide
- Input filter: Pi network
- Isolation: 500 Vdc
- Switching Freq.: 40-70 KHz min.
- Isolation Resistance: 10^9 Ohms
- Line regulation: ±0.1% max.
- Load regulation: ±1% max.
- Voltage accuracy: ±1% max.
- Voltage stability: ±0.05% max.
- Ripple: 0.5-1% P-P max.
- Operating Temperature: −25°C to 71°C
- Storage Temperature: −55°C to 105°C
- Humidity: 20-95% Non-condensing

PACKAGE E



BOTTOM VIEW

PIN	SINGLE	DUAL
1	+INPUT	+INPUT
2	−INPUT	−INPUT
3	+OUTPUT	+OUTPUT
4	NC	COMMON
5	−OUTPUT	−OUTPUT

	MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
3W	D2085	4.5-6	5	600	E
	D2086	4.5-6	12	250	E
	D2087	4.5-6	15	200	E
	D2088	4.5-6	+12, −12	125	E
	D2089	4.5-6	+15, −15	100	E
	D2090	9-18	5	600	E
	D2091	9-18	12	250	E
	D2092	9-18	+12, −12	125	E
	D2093	9-18	+15, −15	100	E
	D2094	18-36	5	600	E
	D2095	18-36	12	250	E
	D2096	18-36	15	200	E
	D2097	18-36	+12, −12	125	E
	D2098	18-36	+15, −15	100	E
	D2099	36-72	5	600	E
	D2100	36-72	12	250	E
	D2101	36-72	15	200	E
	D2102	36-72	+12, −12	125	E
	D2103	36-72	+15, −15	100	E
5W	D2104	4.5-6	5	1000	E
	D2105	4.5-6	12	400	E
	D2106	4.5-6	15	330	E
	D2107	4.5-6	+12, −12	200	E
	D2108	4.5-6	+15, −15	167	E
	D2109	9-18	5	1000	E
	D2110	9-18	12	400	E
	D2111	9-18	15	330	E

	MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
5W	D2112	9-18	+12, −12	200	E
	D2113	9-18	+15, −15	167	E
	D2114	18-36	5	1000	E
	D2115	18-36	12	400	E
	D2116	18-36	15	330	E
	D2117	18-36	+12, −12	200	E
	D2118	18-36	+15, −15	167	E
	D2119	36-72	5	1000	E
	D2120	36-72	12	400	E
	D2121	36-72	15	330	E
	D2122	36-72	+12, −12	200	E
	D2123	36-72	+15, −15	167	E
10W	D2124	9-18	5	1000	E
	D2125	9-18	12	400	E
	D2126	9-18	15	330	E
	D2127	9-18	+12, −12	200	E
	D2128	9-18	+15, −15	167	E
	D2129	18-36	5	1000	E
	D2130	18-36	12	400	E
	D2131	18-36	15	330	E
	D2132	18-36	+12, −12	200	E
	D2133	18-36	+15, −15	167	E
	D2134	36-72	5	1000	E
	D2135	36-72	12	400	E
	D2136	36-72	15	330	E
	D2137	36-72	+12, −12	200	E
	D2138	36-72	+15, −15	167	E

DC / DC CONVERTERS 10–30 WATTS

10 - 12 WATTS
WIDE INPUT RANGE REGULATED

Specifications:

- Input range: Wide
- Input filter: Pi network
- Isolation: 500 Vdc
- Switching Freq.: 50 KHz min.
- Isolation Resistance: 10^9 Ohms
- Line regulation: ± 0.5% max.
- Load regulation: ± 0.5% max.
- Voltage stability: ± 0.05% max.
- Overvoltage protection: All output
- Ripple: 0.5 - 1% P-P max.
- EMI/RFI shielding
- Operating Temperature: -25 °C to 71 °C
- Storage Temperature: -55 °C to 105 °C
- Humidity: 20-95% Non-condensing

MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
D2139	4.5-6	5	2000	E3
D2140	4.5-6	12	1000	E3
D2141	4.5-6	15	670	E3
D2142	4.5-6	+12, -12	400	E3
D2143	4.5-6	+15, -15	330	E3
D2144	9-18	5	2000	E3
D2145	9-18	12	1000	E3
D2146	9-18	15	670	E3
D2147	9-18	+12, -12	400	E3
D2148	9-18	+15, -15	330	E3
D2149	18-36	5	2000	E3
D2150	18-36	12	1000	E3
D2151	18-36	15	670	E3
D2152	18-36	+12, -12	400	E3
D2153	18-36	+15, -15	330	E3
D2154	36-72	5	2000	E3
D2155	36-72	12	1000	E3
D2156	36-72	15	670	E3
D2157	36-72	+12, -12	400	E3
D2158	36-72	+15, -15	330	E3

15 WATTS
WIDE INPUT RANGE REGULATED

Specifications:

- Input range: Wide
- Input filter: Pi network
- Isolation: 500 Vdc
- Switching Freq.: 75 KHz to 100 KHz
- Isolation Resistance: 10^9 Ohms
- Line regulation: ± 0.2% max.
- Load regulation: ± 1% max.
- Voltage stability: ± 0.05% max.
- Voltage Accuracy: ±1% max.
- Overvoltage protection: All output
- Ripple: 0.5 - 1% P-P max.
- Remote ON/OFF control
- EMI/RFI shielding
- Operating Temperature: -25 °C to 71 °C
- Storage Temperature: -55 °C to 105 °C
- Humidity: 20-95% Non-condensing

MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
D2159	9-18	5	3000	E4
D2160	9-18	12	1250	E4
D2161	9-18	15	1000	E4
D2162	18-36	5	3000	E4
D2163	18-36	12	1250	E4
D2164	18-36	15	1000	E4
D2165	36-72	5	3000	E4
D2166	36-72	12	1250	E4
D2167	36-72	15	1000	E4
D2168	9-18	5/+12, -12	1500/310	E4
D2169	9-18	5/+15, -15	1000/250	E4
D2170	9-18	5/12/-5	1500/310/500	E4
D2171	18-36	5/+12, -12	1500/310	E4
D2172	18-36	5/+15, -15	1000/250	E4
D2173	18-36	5/12/-5	1500/310/500	E4
D2174	36-72	5/+12, -12	1500/310	E4
D2175	36-72	5/+15, -15	1000/250	E4
D2176	36-72	5/12/-5	1500/310/500	E4

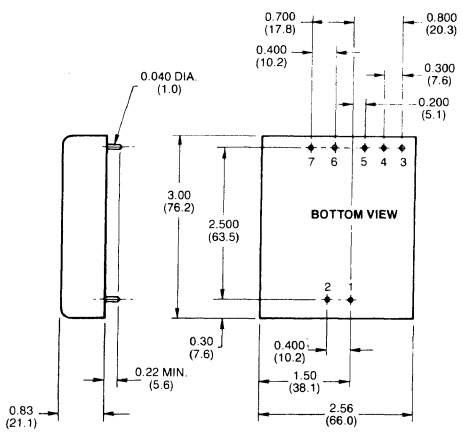
25 - 30 WATTS
WIDE INPUT RANGE REGULATED

Specifications:

- Input range: Wide
- Input filter: Pi network
- Isolation: 500 Vdc
- Switching Freq.: 75 KHz to 100 KHz
- Isolation Resistance: 10^9 Ohms
- Line regulation: ± 0.2% single and dual
  ± 1% triple output
- Load regulation: ± 1% single and dual
  ± 5% triple output
- Overvoltage protection: All output
- Ripple: 10 mV P-P max.
- EMI/RFI protection
- Operating Temperature: -25 °C to 71 °C
- Storage Temperature: -55 °C to 105 °C
- Humidity: 20-95% Non-condensing

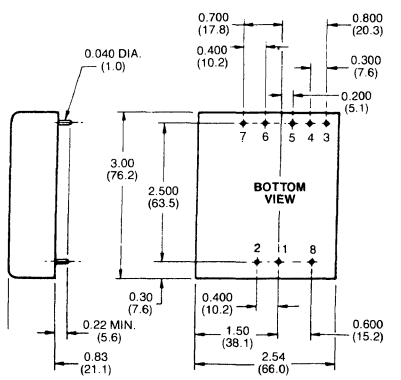
MODEL NO.	INPUT VOLTAGE Vdc	OUTPUT VOLTAGE Vdc	OUTPUT CURRENT mA	PACKAGE
D2177	9-18	5	5000	E5
D2178	9-18	12	2500	E5
D2179	9-18	15	2000	E5
D2180	9-18	+12, -12	1250	E5
D2181	9-18	+15, -15	1000	E5
D2182	9-18	+5/+12, -12	3000/450	E5
D2183	9-18	+5/+15, -15	3000/350	E5
D2184	9-18	+5/+12/-5	3000/450/1000	E5
D2185	18-36	5	5000	E5
D2186	18-36	12	2500	E5
D2187	18-36	15	2000	E5
D2188	18-36	+12, -12	1250	E5
D2189	18-36	+15, -15	1000	E5
D2190	18-36	+5/+12, -12	3000/450	E5
D2191	18-36	+5/+15, -15	3000/350	E5
D2192	18-36	+5/+12/-5	3000/450/1000	E5
D2193	36-72	5	5000	E5
D2194	36-72	12	2500	E5
D2195	36-72	15	2000	E5
D2196	36-72	+12, -12	1250	E5
D2197	36-72	+15, -15	1000	E5
D2198	36-72	+5/+12, -12	3000/450	E5
D2199	36-72	+5/+15, -15	3000/350	E5
D2200	36-72	+5/+12/-5	3000/450/1000	E5

PACKAGE E3



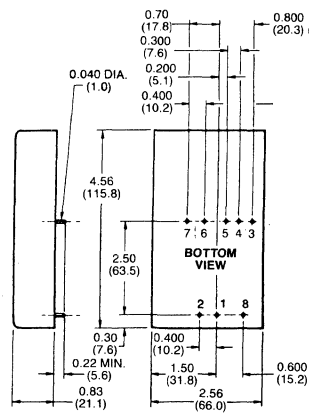
E3		
PIN	SINGLE	DUAL
1	+INPUT	+INPUT
2	-INPUT	-INPUT
3	NC	+OUTPUT
4	NC	COMMON
5	NC	-OUTPUT
6	+OUTPUT	NC
7	-OUTPUT	NC

PACKAGE E4



E4			
PIN	SINGLE	DUAL	TRIPLE
1	+INPUT	+INPUT	+INPUT
2	-INPUT	-INPUT	-INPUT
3	NC	+OUTPUT	+OUTPUT
4	OUTPUT TRIM	COMMON	COMMON
5	NC	-OUTPUT	-OUTPUT
6	+OUTPUT	NC	+5V
7	-OUTPUT	NC	NC
8	REMOTE ON/OFF CONTROL		

PACKAGE E5



E5			
PIN	SINGLE	DUAL	TRIPLE
1	+INPUT	+INPUT	+INPUT
2	-INPUT	-INPUT	-INPUT
3	+SENSE	+OUTPUT	+12V, 15V
4	OUTPUT TRIM	COMMON	COMMON
5	-SENSE	-OUTPUT	-12V, !5V 5V
6	+OUTPUT	NO PIN	+5V
7	-OUTPUT	NO PIN	+5V COM
8	REMOTE ON/OFF CONTROL		

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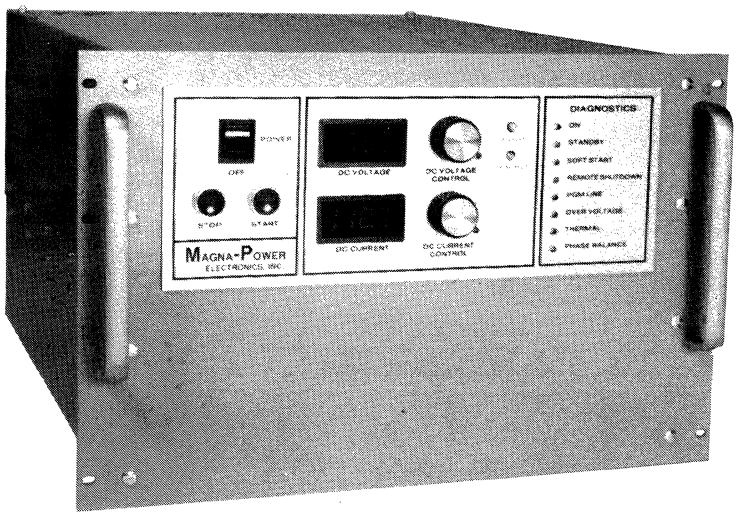


FEATURES

- 6 Models: 16 to 500 Vdc, 20 to 600 Adc
- Series and parallel master slave operation
- Programming resistors isolated from output
- Optional EMI suppression on ac lines meets VDE 871A
- OVP shutdown standard, SCR crowbar optional
- Digital meters standard
- Digital control lines optically isolated
- Exclusive control loop diagnostics
- High dielectric withstand: 2500 Vac
- Automatic V/I crossover
- IEEE-488 compatible
- Air exhaust in rear of cabinet
- Power factor corrected for low currents

MODELS AND RATINGS

Model	Output Voltage Vdc	Output Current Adc	Ripple Voltage mVrms
PX16-600	16	600	50
PX32-300	32	300	30
PX80-125	80	125	50
PX125-80	125	80	60
PX250-40	250	40	90
PX500-20	500	20	130

Note: Specifications subject to change without notice.

SPECIFICATIONS:

Input voltage: 208/240 Vac, 50-60 Hz, 3ø (440/480 Vac, 50-60 Hz, 3ø optional)

Regulation line and load combined: .10%

Stability: .10% for 8 hours after 30 minute warm up

Transient response: 75 ms to recover within 2% of regulated output with 50 to 100% or 100 to 50% load change

Ambient Temperature: 0 to 50°C

Programming resistors: 1K full scale for output voltage, output current, and over voltage shutdown

Temperature coefficient: .04%/°C of maximum output current

Size: 12 1/4"H x 19"W x 24"D

Weight: 260 lbs

APPLICATIONS

CW Lasers
Capacitor Forming
Electroplating
Battery Charging
Aging Racks for Semi-Conductors
General Electronics Applications
Focusing Coils for Accelerators
Cryogenic Magnet Applications

PRICE

All models: $4495

OPTIONS

SCR crowbar: $195
EMI filter: $295
440/480 Vac input: $195.00
Non-standard output: $495
Other options: consult factory

MAGNA-POWER ELECTRONICS, INC.
135 Route 10, Whippany, NJ 07981
(201) 428-1197 FAX: (201) 428-2853

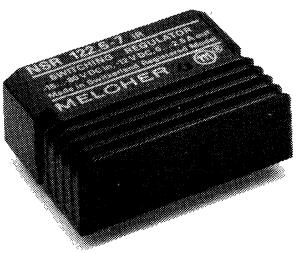
Switching Regulators
AC/DC Power Supplies
DC/DC Converters

MELCHER ®

200 Butterfield Drive • Ashland, MA 01721
TEL: 800-828-9712 • FAX: 508-881-5082

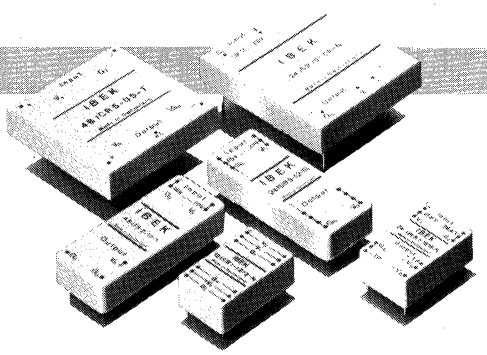
Switching mode regulators

MELCHER offers two basic versions of switching mode regulators, namely positive- and negative switching regulators. The positive switching regulators have the negative polarity defined as system ground, and the negative switching regulators have the positive polarity defined as system ground (e.g. telephone applications). 5...720 W Output power range.



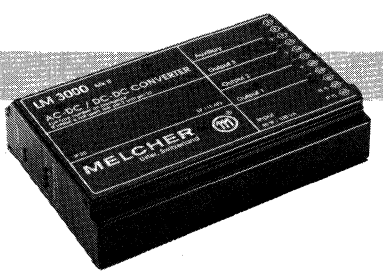
DC-DC converters

These units can supply output power from 1...50 W. Different versions with one, two or three outputs are available, all of them with a large number of options.
Efficient input circuitry absorbs source transient voltage and an input filter efficiently attenuates radiation interference.



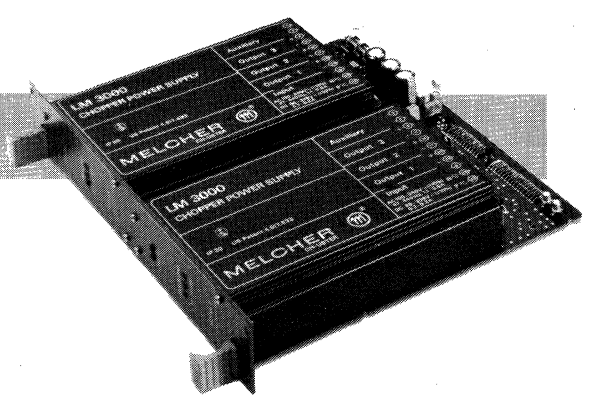
AC-DC converters

These converters can supply output power from 20...50 W. Different versions with one, two or three outputs are available, all of them with a large number of options. The AC-DC converters are mechanically identical and electrically similar to the DC-DC converters.



System application engineering

Unlimited possibilities of combining power supply modules exist as a result of our applications engineering facility. Based on standard units power supplies can be individually designed to customer requirement. Some examples



Switching Regulators
AC/DC Power Supplies
DC/DC Converters

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200 Butterfield Drive • Ashland, MA 01721
TEL: 800-828-9712 • FAX: 508-881-5082

Dynamic behavior

- Input voltage range up to 1 : 10 . . . . . highly flexible in application
- High efficiency up to 95% . . . . . low thermal stress and high reliability
- Constant efficiency over the whole input voltage range. . . . . stable operational conditions
- Continuously open/short circuit proof . . . . . self protected
- No derating within full temperature range . . . . . full load handling capability
- Excellent static and dynamic response . . . . . reliable and precise regulation
- Input undervoltage control and cut out . . . . . prevents malfunction at insufficient voltage levels

Mechanical design

- Very compact design . . . . . high power at low volume
- Solid and robust construction . . . . . ideal for mobile application
- Aluminium case serving as heat sink and as shield for radiation interference . . . . . uniform temperature distribution and low RFI emissions

Environmental durability

- Ambient temperature range. . . . . – 25°C...71°C (– 40°C...85°C)
- Relative humidity as per IEC 68-2-3. . . . . 93% at 40°C for 56 days
- Shock as per IEC 68-2-27:9 shocks. . . . . 100 g
- Bumping as per IEC 68-2-29: 6000 shocks . . . . . 40 g
- Vibration as per IEC 68-2-6:60...2000 Hz. . . . . 5 g/10 g
  Vibration as per IEC 68-2-6:10...60Hz . . . . . 0.35 mm/0.70 m
- Input transient/surge protection: IEC 801-4, IEC 571, RIA 12, VDE 0435, IEC 255.4 . . . . . 5 kV
- High frequency disturbance withstand as per VDE 0435, IEC 255.4 . . . . . 1.0 kV/2.5 kV

Security approvals, RFI levels

- SEV. 1061.1981, 1085.1983
- VDE, IEC, EN . . . . . VDE 0805, IEC 950, EN 60950
- High isolation test voltage up to 4 kV. . . . . VDE 0804, VDE 0806, IEC 380
- Low RFI: better than class B, as per . . . . . VDE 0871
  better than class B, as per . . . . . VDE 0878
- Low leakage currents: B, BF, CF . . . . . VDE 0750, IEC 601-1
- Underwriter Laboratories Recognition . . . . . UL 1012

Quality and reliability features

- Low component stress
- Precision screening of high quality components
- System research and development for design optimization
- Low temperature rise on components
- 100% burn-in at $T_A = 70°C$. . . . . for 24 h
- 100% function test and parameter test
- High MTBF figures as per MIL-HDBK 217-E

Data sheets

- Data sheets and application notes available

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Switching Regulators

ISR Family

Input: 24 V Nominal, (V_{out} + 4)...33 VDC
Outputs: 5, 12, 15 Volts, 5 Watts and 10 Watts

Small Size!

Model	$V_{out\ nom}$	$I_{out\ nom}$	Temp. Range	Dimensions
24 ISR 5-05-N[1,3]	+ 5 V	1.0 A	0...+71° C	1" X 2" X 0.4"
24 ISR 5-12-N[1]	+ 12 V	0.42 A	0...+71° C	1" X 2" X 0.4"
24 ISR 5-15-N[1]	+ 15 V	0.33 A	0...+71° C	1" X 2" X 0.4"
24 ISR 5-05-S[1,3]	+ 5 V	1.0 A	-40...+85° C	1" X 2" X 0.4"
24 ISR 5-12-S[1]	+ 12 V	0.42 A	-40...+85° C	1" X 2" X 0.4"
24 ISR 5-15-S[1]	+ 15 V	0.33 A	-40...+85° C	1" X 2" X 0.4"
24 ISR 10-05-N[2,3]	+ 5 V	2.0 A	0...+71° C	2" X 2" X 0.4"
24 ISR 10-05-S[2,3]	+ 5 V	2.0 A	-40...+85° C	2" X 2" X 0.4"

[1] Available with inhibit (suffix I). Example: 24 ISR 5-05-NI
[2] Available with inhibit (suffix I). Potentiometer (suffix P) or combined (suffix IP) Example: 24 ISR 5-05-SIP
[3] For V_i = 11 to 9 V: linear derating of the output current I_o from 100 to 80% of $I_{o\ nom}$

PSK Family

Inputs: (Vout + 4V)...80 Vdc
Outputs: 5, 12, 24, 36 Vdc at 16, 20, or 25 Amps
All output voltages fully adjustable from 0...110% of nominal setting.

Model	Input Voltage	Output Voltage	Output Current	Efficiency	Ambient Temperature
PSK 5A16-7	8...80 V	5.1 V	16 A	82%	-25...71°C
PSK 5A20-7	8...80 V	5.1 V	20 A	82%	-25...71°C
PSK 5A25-7	8...40 V	5.1 V	25 A	82%	-25...71°C
PSK 1216-7	15...80 V	12 V	16 A	89%	-25...71°C
PSK 1220-7	15...80 V	12 V	20 A	89%	-25...71°C
PSK 2416-7	29...80 V	24 V	16 A	91%	-25...71°C
PSK 2420-7	29...80 V	24 V	20 A	91%	-25...71°C
PSK 3616-7	42...80 V	36 V	16 A	94%	-25...71°C
PSK 3620-7	42...80 V	36 V	20 A	94%	-25...71°C

PSR Family

Input: (V_{out} + 4)...80 VDC
Outputs: 5, 12, 15, 24, 36 Volts, Up to 12 Amps

High Efficiency! Up to 95%

15 . . . 144V Input Range Now Available!

Nominal Output Voltage	Nominal Output Current	Input Voltage Range	Efficiency typ. @ V_{in} and $I_{o\ max}$	Model Type T_A= -25 to +71°C T_C= -25 to +95°C	Model Type T_A= -40 to +71°C T_C= -40 to +95°C	Case
5 V	3 A	8...80 V	79 %	PSR 53-7	PSR 53-9	A01
	4 A	7...38 V	84 %	PSR 54-7	PSR 54-9	A01
	5 A	7...35 V	83 %	PSA 55-7	PSA 55-9	A01
	5 A	8...80 V	79 %	PSR 55-7	PSR 55-9	B02
	7 A	7...38 V	84 %	PSR 57-7	PSR 57-9	B02
	10 A	8...80 V	77 %	PSR 510-7	PSR 510-9	C03
	10 A	8...80 V	77 %	PSR 510E-7	PSR 510E-9	L04
	12 A	7...38 V	82 %	PSR 512-7	PSR 512-9	C03
	12 A	7...38 V	82 %	PSR 512E-7	PSR 512E-9	L04
12 V	2.5 A	15...80 V	89 %	PSR 122.5-7	PSR 122.5-9	A01
	4 A	15...80 V	89 %	PSR 124-7	PSR 124-9	B02
	8 A	15...80 V	89 %	PSR 128-7	PSR 128-9	C03
	8 A	15...80 V	89 %	PSR 128E-7	PSR 128E-9	L04
15 V	2.5 A	19...80 V	91 %	PSR 152.5-7	PSR 152.5-9	A01
	4 A	19...80 V	90 %	PSR 154-7	PSR 154-9	B02
	8 A	19...80 V	91 %	PSR 158-7	PSR 158-9	C03
	8 A	19...80 V	91 %	PSR 158E-7	PSR 158E-9	L04
24 V	2 A	29...80 V	94 %	PSR 242-7	PSR 242-9	A01
	4 A	29...80 V	93 %	PSR 244-7	PSR 244-9	B02
	8 A	29...80 V	93 %	PSR 248-7	PSR 248-9	C03
	8 A	29...80 V	93 %	PSR 248E-7	PSR 248E-9	L04
36 V	2 A	42...80 V	95 %	PSR 362-7	PSR 362-9	A01
	4 A	42...80 V	95 %	PSR 364-7	PSR 364-9	B02
	8 A	42...80 V	94 %	PSR 368-7	PSR 368-9	C03
	8 A	42...80 V	94 %	PSR 368E-7	PSR 368E-9	L04

Consult factory for available options.

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AC/DC Power Supplies

LM Series

Input: 90 ... 264 VAC, 88...372 VDC
Outputs: Single, Dual, Triple, adjustable from 0 to 100%
RFI: Per VDE 0871B
Protection: Full Input/Output Protection
Isolation: 4 kV_{rms}

Output 1		Output 2		Output 3		Model
$V_{o\,nom}$	$I_{o\,max}$	$V_{o\,nom}$	$I_{o\,max}$	$V_{o\,nom}$	$I_{o\,max}$	
5.1 V	0...8.0 A	-	-	-	-	LM 1001
12.0 V	0...4.0 A	-	-	-	-	LM 1301
15.0 V	0...3.4 A	-	-	-	-	LM 1501
24.0 V	0...2.0 A	-	-	-	-	LM 1601
12.0 V	0...2.0 A	12 V	0...2.0 A	-	-	LM 2320
15.0 V	0...1.7 A	15 V	0...1.7 A	-	-	LM 2540
5.1 V	0...5.0 A	12 V	0...0.7 A	12 V	0...0.7 A	LM 3020
5.1 V	0...5.0 A	15 V	0...0.6 A	15 V	0...0.6 A	LM 3040

Lowest Output Ripple!

DC/DC Converters

IPS3 Series

Input: 4:1
Outputs: 3 Watt 24 Pin DIP

Output 1		Output 2		Model	
				Operating Input Voltages	
V_o	I_o	V_o	I_o	10...33 VDC	18...72 VDC
5 V	500 mA	-	-	24 IPS 3-05-T	48 IPS 3-05-T
12 V	250 mA	-	-	24 IPS 3-12-T	48 IPS 3-12-T
15 V	200 mA	-	-	24 IPS 3-15-T	48 IPS 3-15-T
5 V	250 mA	-5 V	-250 mA	24 IPS 3-0505-T	48 IPS 3-0505-T
12 V	125 mA	-12 V	-125 mA	24 IPS 3-1212-T	48 IPS 3-1212-T
15 V	100 mA	-15 V	-100 mA	24 IPS 3-1515-T	48 IPS 3-1515-T

High Isolation Now Available!

ITS2 Series

Input: 4:1
Outputs: 2 Watt 40 Pin DIP

Output 1		Output 2		Model
				Operating Input Voltages
V_o	I_o	V_o	I_o	18...70 VDC
5 V	300 mA	-	-	48 ITS 2-05-T
12 V	170 mA	-	-	48 ITS 2-12-T
15 V	140 mA	-	-	48 ITS 2-15-T
5 V	250 mA	-5 V	-50 mA	48 ITS 2-0505-T
12 V	85 mA	-12 V	-85 mA	48 ITS 2-1212-T
15 V	70 mA	-15 V	-70 mA	48 ITS 2-1515-T

M Series

Input: Wide Input Range 5:1 Ratio
Outputs: Single, Dual, Triple, adjustable from 0 to 100%
Rugged: Shock /Vibration per MIL Std. 810C
High Efficiency: Up to 85% 44...220 or 67...385 VDC inputs also available on request
Isolation: 4 kV_{rms}

Output 1		Output 2		Output 3		Model		
						Operating Input Voltage		
$V_{o\,nom}$	$I_{o\,max}$	$V_{o\,nom}$	$I_{o\,max}$	$V_{o\,nom}$	$I_{o\,max}$	7 to 35 V	14 to 70 V	28 to 140 V
5.1 V	0...8.0 A	-	-	-	-	AM 1001	BM 1001	CM 1001
12.0 V	0...4.0 A	-	-	-	-	AM 1301	BM 1301	CM 1301
15.0 V	0...3.4 A	-	-	-	-	AM 1501	BM 1501	CM 1501
24.0 V	0...2.0 A	-	-	-	-	AM 1601	BM 1601	CM 1601
12.0 V	0...2.0 A	12 V	0...2.0 A	-	-	AM 2320	BM 2320	CM 2320
15.0 V	0...1.7 A	15 V	0...1.7 A	-	-	AM 2540	BM 2540	CM 2540
5.1 V	0...5.0 A	12 V	0...0.7 A	12 V	0...0.7 A	AM 3020	BM 3020	CM 3020
5.1 V	0...5.0 A	15 V	0...0.6 A	15 V	0...0.6 A	AM 3040	BM 3040	CM 3040

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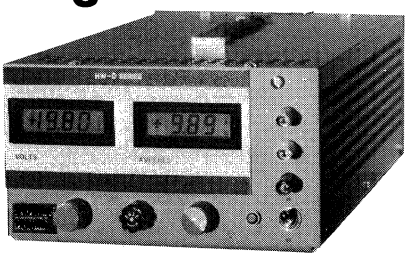
Division of TECHNOLOGY DYNAMICS, INC. 100 School Street, Bergenfield, New Jersey 07621 Phone (201) 385-0500
FAX (201) 385-0702

HWD Constant Voltage/Constant Current Supplies

FEATURES

- Digital Ammeter/Voltmeter
- Remotely Programmable
- Remote Sensing
- Series and Parallel Operation
- 500 μ Volts Ripple
- .01% Load Regulation
- .01% Line Regulation
- Separate Voltmeter and Ammeter
- Models to 200 Volts
- Half Rack Size or Bench Mounting



APPLICATION

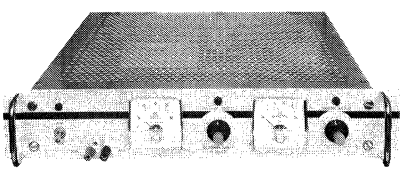
The HWD Series power supplies are designed to be used in the lab bench or for system application. The use of digital meters provides accurate readings of output voltage and current without the need of external DVM'S.

Model Number	Output Volts	Output Amps	Regulation Line % CV	Regulation Line % CC	Regulation Load % CV	Regulation Load % CC	Price
HWD 6-20A	0-6	0-20	0.01	0.1	0.01 or 1 mv	0.5	$ 950.
HWD 10-15A	0-10	0-15	0.01	0.1	0.01 or 1 mv	0.5	950.
HWD 20-10A	0-20	0-10	0.01	0.1	0.01 or 1 mv	0.5	950.
HWD-50-4	0-50	0-4	0.01	0.1	0.01 or 1 mv	0.5	950.
HWD 40-5A	0-40	0-5	0.01	0.1	0.01 or 1 mv	0.5	$ 950.
HWD 60-3A	0-60	0-3	0.01	0.1	0.01 or 1 mv	0.5	950.
HWD 100-2A	0-100	0-2	0.01	0.1	0.01 or 1 mv	0.5	1065.
HWD 200-1A	0-200	0-1	0.01	0.1	0.01 or 1 mv	0.5	1200.

PR Constant Voltage/Current Silicon Supplies

FEATURES

- High Power — Small Size
- Remotely Programmable
- All Silicon Semiconductors
- Mode Lites
- Low Ripple
- .01% Regulation
- Constant Voltage/Constant Current
- Parallel Operation



APPLICATION

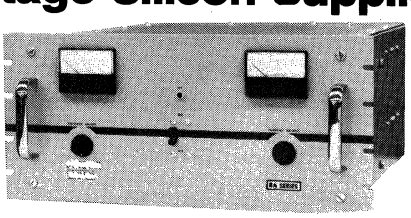
The PR Series find application in the laboratory and in systems where both versatility of operation and a high degree of regulation is required. The voltage to current crossover point may be set anywhere within the limits of zero to full rated output voltage and zero to full rated output current.

Model Number	Output Volts	Output Amps	Regulation Line % CV	Regulation Line % CC	Regulation Load % CV	Regulation Load % CC	Panel Ht.	Price
PR 20-15A	0-20	0-15	0.01	0.01	0.01	0.25	3½″	$1595.
PR 40-10A	0-40	0-10	0.01	0.01	0.01	0.25	3½″	1550.
PR 60-7A	0-60	0-7	0.01	0.01	0.01	0.25	3½″	1650.
PR 125-3.2A	0-125	0-3.2	0.01	0.01	0.01	0.25	3½″	1885.
PR 20-25A	0-20	0-25	0.01	0.01	0.01	0.25	5¼″	1830.
PR 40-20A	0-40	0-20	0.01	0.01	0.01	0.25	5¼″	$1770.
PR 60-14A	0-60	0-14	0.01	0.01	0.01	0.25	5¼″	1890.
PR 125-6.5A	0-125	0-6.5	0.01	0.01	0.01	0.25	5¼″	2060.
PR 125-10A	0-125	0-10	0.01	0.01	0.01	0.25	7″	2835.
PR 250-10A	0-250	0-10	0.01	0.01	0.01	0.25	8¾″	5000.

RA Constant Voltage Silicon Supplies

FEATURES

- High Power — Small Size
- Remotely Programmable
- Low Ripple
- Parallel Operation
- .01% Regulation
- All Silicon Semiconductors



APPLICATION

The RA Series are all silicon, relatively high in power, and tightly regulated. They find application in the laboratory and in systems where both versatility of operation and a high degree of regulation is required. Adjustable solid state current limiting provides load protection.

Model Number	Output Volts	Output Amps	Regulation Line %	Regulation Load %	Panel Ht.	Price
RA 20-15A	0-20	0-15	0.01	0.01	3½″	$1435.
RA 40-10A	0-40	0-10	0.01	0.01	3½″	1433.
RA 60-7A	0-60	0-7	0.01	0.01	3½″	1433.
RA 125-3.2A	0-125	0-3.2	0.01	0.01	3½″	1460.
RA 20-25A	0-20	0-25	0.01	0.01	5½″	1630.
RA 40-20A	0-40	0-20	0.01	0.01	5½″	1580.
RA 60-14A	0-60	0-14	0.01	0.01	5½″	1650.
Options include: meters, overvoltage, special input voltages.						
RA 125-6.5A	0-125	0-6.5	0.01	0.01	5½″	$1840.
RA 40-30A	0-40	0-30	0.01	0.01	7″	2160.
RA 60-20A	0-60	0-20	0.01	0.01	7″	2280.
RA 125-10A	0-125	0-10	0.01	0.01	7″	2265.
RA 40-50A	0-40	0-50	0.01	0.01	8¾″	3400.
RA 60-30A	0-60	0-30	0.01	0.01	7″	3510.
RA 250-10A	0-250	0-10	0.01	0.01	8¾″	4650.
RA 25-100A	0-25	0-100	0.01	0.01	10½″	4975.

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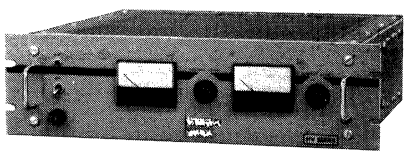
HV Constant High Voltage Supplies

FEATURES

- All Solid State
- Adjustable Current Limit
- < 1 Millivolt Ripple
- 10-Turn Voltage Adjustments
- Remote Programming
- Remote Sensing



APPLICATION

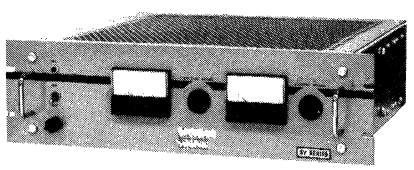
The HV is a versatile series of constant voltage units adjustable from zero to full rated voltage. Adjustable solid state current limiting is a feature. Options provide for either systems or laboratory use. Crossover from constant voltage to current limiting is automatic solid state and noninterrupting. Units may be operated in parallel for increased current capacity.

Model Number	Output		Regulation		Size	Price
	Volts	Amps	Line %	Load %		
HV 350-1	0-350	1		0.01	3½ × 19 × 16½	$2450.
HV 350-2	0-350	2	0.005	0.01	5¼ × 19 × 16½	2900.
HV 350-3	0-350	3	0.005	0.01	7 × 19 × 16½	3250.
HV 350-5	0-350	5	0.005	0.01	8¾ × 19 × 16½	3700.

SV Constant High Voltage Power Supplies

FEATURES

- All Solid State
- Adjustable Current Limit
- 1 Millivolt Ripple
- 0.01% Regulation
- 10-Turn Voltage Adjustments
- Remote Programming
- Remote Sensing
- Meters



APPLICATION

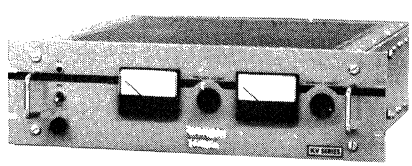
The SV is a versatile series of constant voltage units adjustable from 0 to full rated voltage. Options provide either systems or laboratory use. Crossover from constant voltage to current limiting is automatic solid state and noninterrupting. Units may be operated in parallel for increased current capacity.

Model Number	Output		RMS Ripple	Regulation		Size	Price
	Volts	Amps		Line %	Load %		
SV 600-0.5	0-600	0-0.5	<3mv	0.01	0.01	3½ × 19 × 16½	$2900.
SV 600-1	0-600	0-1	<3mv	0.01	0.01	5¼ × 19 × 16½	3500.
SV 600-2	0-600	0-2	<3mv	0.01	0.01	7 × 19 × 16½	4400.

KV High Voltage Power Supplies

FEATURES

- Output 100 to 1500 VDC
- Voltage Regulated 0.5%
- Current Regulated 0.5%
- Voltmeter and Ammeter
- Ripple 0.5% RMS
- Voltage/Voltage Programmable
- Resistance Programmable



APPLICATION

The KV1000 Series Power Supplies are constant voltage/constant current units with automatic crossover. Models are available with up to 3 ampere current capacity over the full voltage range. Options such as remote voltage and current programming, remote turn on and turn off make the unit a versatile piece of equipment for laboratory or manufacturing operations.

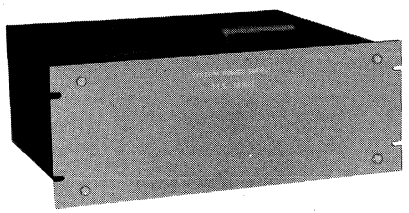
Model Number	Output		Regulation %		Panel Height	Price	Model Number	Output		Regulation %		Panel Height	Price
	Voltage	Amps	Current	Voltage				Voltage	Amps	Current	Voltage		
KV 1000-0.5	100-1000	0-0.5	0.5	0.5	5¼″	$2700.	KV 1500-0.5	100-1500	0-0.5	0.5	0.5	7″	$3095.
KV 1000-1	100-1000	0-1.0	0.5	0.5	7″	3400.	KV 1500-1	100-1500	0-1.0	0.5	0.5	10½″	4300.
KV 1000-2	100-1000	0-2.0	0.5	0.5	10½″	5800.	KV 1500-1.5	100-1500	0-1.5	0.5	0.5	14″	6600.
KV 1000-3	100-1000	0-3.0	0.5	0.5	14″	6900.							

MID-EASTERN INDUSTRIES, INC.
Division of TECHNOLOGY DYNAMICS, INC. 100 School Street, Bergenfield, New Jersey 07621 Phone (201) 385-0500
FAX (201) 385-0702

MS High Power System Component Power Supplies

FEATURES

- Most Complete Coverage
  Up to 600 Volts
  Up to 1200 Amperes
- Low Cost
- All Solid State
- Extreme Reliability



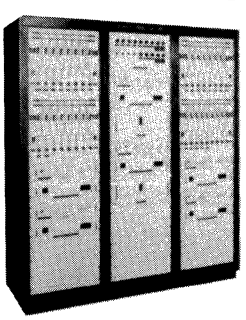
APPLICATION

Strictly designed for incorporation into systems, these supplies are considered as components. They are of exceptionally high reliability; yield the highest power at the lowest cost; and provide complete coverage of all possible needs.

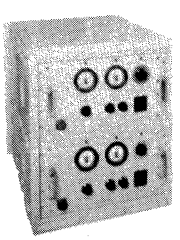
Model Number	Height in Inches	Model Number	Height in Inches	Model Number	Height in Inches	Model Number	Height in Inches	Model Number	Height in Inches	Model Number	Height in Inches
MS 9-600	48⅝	MS 20-30	5¼	MS 34-20	5¼	MS 65-10	5¼	MS 128-6	5¼	MS 350-1.5	5¼
MS 9-1200	67⅞	MS 20-45	8¾	MS 34-30	8¾	MS 65-15	8¾	MS 128-10	8¾	MS 350-3	8¾
		MS 20-80	12¼	MS 34-50	12¼	MS 65-25	12¼	MS 128-15	12¼	MS 350-5	12¼
MS 12-40	5¼	MS 20-120	17½	MS 34-75	17½	MS 65-35	17½	MS 128-24	17½	MS 350-7	17½
MS 12-60	8¾	MS 20-180	24	MS 34-125	24	MS 65-50	24	MS 128-35	24	MS 350-10	24
MS 12-100	12¼	MS 20-400	67⅞	MS 34-300	67⅞	MS 65-75	48⅝	MS 128-45	48⅝	MS 350-30	67⅞
MS 12-150	17½					MS 65-150	67⅞	MS 128-90	67⅞		
MS 12-225	24									MS 410-1.5	5¼
MS 12-400	67⅞									MS 410-3	8¾
		MS 25-25	5¼	MS 38-20	5¼	MS 77-10	5¼	MS 240-.75	3½	MS 410-5	12¼
		MS 25-37	8¾	MS 38-30	8¾	MS 77-15	8¾	MS 240-3	5¼	MS 410-7	17½
MS 13.5-40	5¼	MS 25-60	12¼	MS 38-50	12¼	MS 77-25	12¼	MS 240-5	8¾	MS 410-10	24
MS 13.5-60	8¾	MS 25-90	17½	MS 38-75	17½	MS 77-35	17½	MS 240-7	12¼	MS 410-30	67⅞
MS 13.5-100	12¼	MS 25-140	24	MS 38-125	24	MS 77-50	24	MS 240-10	17½	MS 470-2	8¾
MS 13.5-150	17½	MS 25-200	48⅝	MS 38-300	67⅞	MS 77-75	48⅝	MS 240-15	24	MS 470-3	12¼
MS 13.5-225	24	MS 25-400	67⅞			MS 77-150	67⅞	MS 240-40	67⅞	MS 470-5	17½
MS 13.5-400	67⅞									MS 470-7	24
										MS 470-10	48⅝
		MS 29-25	5¼	MS 46-15	5¼	MS 109-6	5¼	MS 273-.75	3½	MS 470-20	67⅞
MS 17-30	5¼	MS 29-37	8¾	MS 46-22	8¾	MS 109-10	8¾	MS 273-3	5¼	MS 545-2	8¾
MS 17-45	8¾	MS 29-60	12¼	MS-46-40	12¼	MS 109-15	12¼	MS 273-5	8¾	MS 545-3	12¼
MS 17-80	12¼	MS 29-90	17½	MS 46-60	17½	MS 109-24	17½	MS 273-7	12¼	MS 545-5	17½
MS 17-120	17½	MS 29-140	24	MS 46-90	24	MS-109-35	24	MS 273-10	17½	MS 545-7	24
MS 17-180	24	MS 29-200	48⅝	MS 46-120	48⅝	MS 109-45	48⅝	MS 273-15	24	MS 545-10	48⅝
MS 17-400	67⅞	MS 29-400	67⅞	MS 46-240	67⅞	MS 109-90	67⅞	MS 273-40	67⅞	MS 545-20	67⅞

NOTE: The digits of the Model Number indicate the output voltage and current in amps. Example: MS9-600 has an output of 9 volts, current of 600 amps. MS9-1200 has an output of 9 volts at 1200 amps. **Consult factory for prices.**

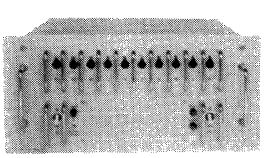
Custom Power Supplies and Systems



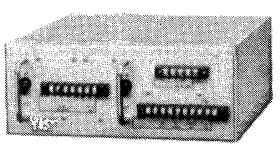
Double redundant regulated DC power distribution system for process industry. Features no break transfer and battery backup.



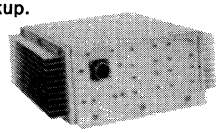
High power, 150-volt, constant current/constant voltage, shipboard-qualified power supply.



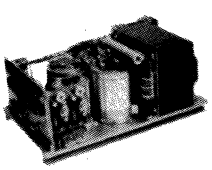
Regulated no-break, redundant 24-volt dc, 15-ampere, 10-channel power distribution system for television studios.



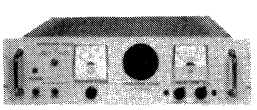
Uninterrruptable power supply, with internal battery charger, used for avionics instrumentation.



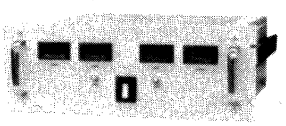
Mil Spec 4 output regulated power supply.



Regulated multi-output power supply for computer.



Automatic constant current battery charger with automatic range selection based on battery temperature and voltage level.



±5V 50A linear regulated power supply for semi-conductor testing and burn-in.

NOTE: Not pictured are these special devices: (a) Power supply for CW lasers; (b) Redundant power systems for military telephone communications systems; (c) Xenon lamp power supplies; (d) True RMS regulated ac power supplies; and (e) High current dc power supply for automotive production line testing.

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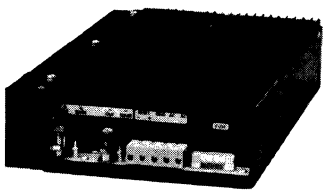
Division of TECHNOLOGY DYNAMICS, INC. 100 School Street, Bergenfield, New Jersey 07621 Phone (201) 385-0500
FAX (201) 385-0702

SM High Current Switching Power Supplies

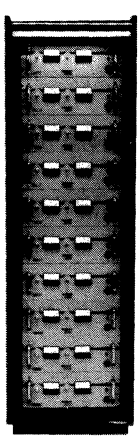
FEATURES
- Soft Start—Solid State
- Overvoltage Protection
- Current Limit
- Remote Shut Down
- Over Temperature Protection
- 47-400 Hz AC Input
- Convection Cooled
- Fully Enclosed
- −0° to +70°C Ambient
- Lightweight
- Input Line Filter



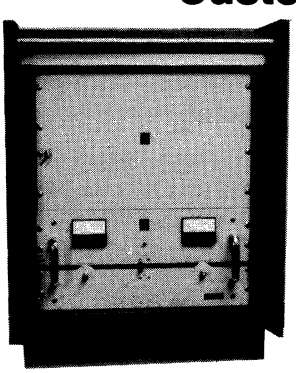
SPECIFICATIONS
- Line Regulation 0.1%
- Load Regulation 0.1%
- Ripple and Noise 2% pp
- Efficiency 75% Typical
- Temperature Coefficient .02%/°C
- Stability 0.1%/8 hours
- Hold Up Time 16.5 MSec Minimum

Model No.	Volts	Amps @40°C	Price	Model No.	Volts	Amps @40°C	Price
300W							
SM 5-300	5	60	$399.	SM 24-300	24	12.5	$460.
SM 6-300	6	50	399.	SM 28-300	28	10.7	460.
SM 12-300	12	25	399.	SM 48-300	48	6.3	460.
SM 15-300	15	20	399.	SM 125-300	125	2.4	460.
600W							
SM 5-600	5	120	675.	SM 24-600	24	25	725.
SM 6-600	6	100	675.	SM 28-600	28	21.4	725.
SM 12-600	12	50	675.	SM 48-600	48	12.5	725.
SM 15-600	15	40	675.	SM 125-600	125	4.8	725.
1000W							
SM 5-1000	5	200	900.	SM 24-1000	24	41.7	990.
SM 6-1000	6	165	900.	SM 28-1000	28	35.7	990.
SM 12-1000	12	83	900.	SM 48-1000	48	20.8	990.
SM 15-1000	15	67	900.	SM 125-1000	125	8	990.

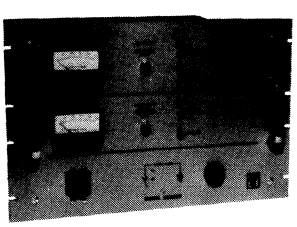
Custom Power Supplies and Systems



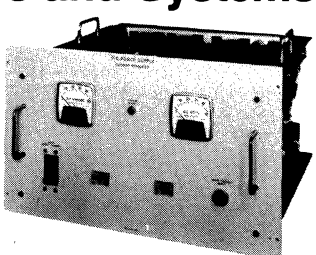
48-volt, 240-ampere redundant power supply for process industry.



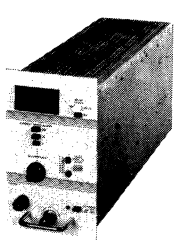
24-volt, 50 ampere distributed power system for process industry.



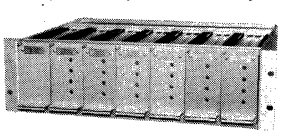
Tracking power supply: ± 15-volt, 75-ampere.



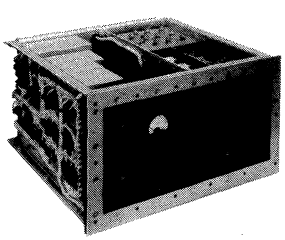
Constant 100 ampere current power supply for Xenon lamp application.



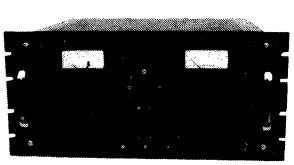
Constant current power supply. 3 ranges: 0-2ma, 0-20ma, 0-200ma. Maximum output voltage 1200 volts.



24-channel, individually adjustable, constant current distributed power source.



Multi-output Mil Spec power supply.



± 13-volt, 40-ampere power supply for telecommunications industry. Designed for redundant operation.

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
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Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
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Power Supplies, DC, Product Selection Guide **D**•1501
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Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

1 to 2000 Watts

YOUR CHOICE OF POWER TECHNOLOGIES

Discrete • Part Hybrid • Full Hybrid

Modular Devices Inc (MDI) designs and manufactures a wide range of standard and custom power supplies for aerospace, military and industrial use. MDI has a complete thick film hybrid capacity on site, which permits us to produce unique power electronic functions for our customers more quickly and more efficiently.

Switching power supply technology for critical aerospace, military and industrial application is constantly achieving higher operating frequencies, smaller sizes and higher power densities. These technological trends make it inevitable that signal and power hybrids will form a key part of future state-of-the-art power electronic equipment. With MDI's high technology power supply capability and custom hybrid facility, MDI is uniquely positioned to apply the best and most appropriate packaging technology to your diverse and challenging requirements.

MDI offers the optimum technology for each application.

Discrete Power Electronics encompasses a wide spectrum of power supply products as well as areas such as servo and power amplifiers, motor drives and controls. MDI's power supply technology incorporates the latest advances in high frequency switch mode power FET techniques. MDI's product capability includes:

- AC to DC power supplies to 5 KVA with single and multiple outputs with power densities to 4 W/in^3
- DC to DC converters to 2 KVA, operating frequencies to 400 kHz, power densities to 10 W/in^3
- DC to AC static inverters to 2 KVA, inputs 12 VDC to 350 VDC, output from 50 Hz to 1600 Hz
- Design and construction to MIL–E–16400, NAVMAT P–4855A, WS 6536E, MIL–STD–2000 and other military specifications

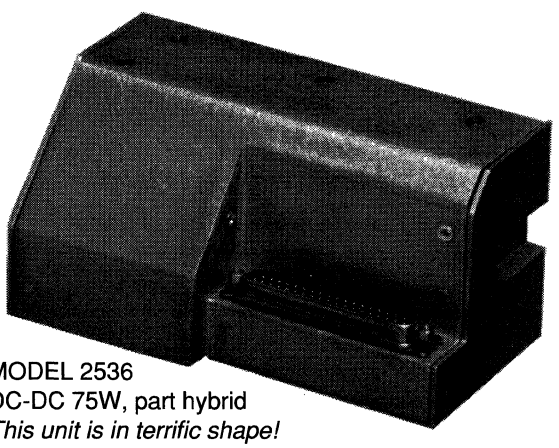
Hybrids combined with discrete components allow great volumetric efficiency as compared to all discrete designs. MDI's packaging technology incorporates the latest advances in NC milled and dip brazed enclosures, FLEX PRINT wiring and surface mount technology. This product capability provides:

- Higher packaging densities than all discrete designs
- Lower cost and quicker delivery than all hybrid designs
- Best suited for aerospace/high reliability, high density requirements at power levels from 50 watts to 1 KVA

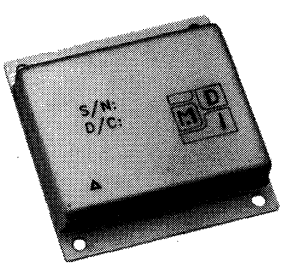
Full Hybrid Power Supplies using thick film, chip and wire/surface mount components within hermetic hybrid enclosures allows ultimate power density. Low tooling and set up costs and availability of unique hybrid enclosures make power hybrid technology economical for small production runs. Careful computer aided thermal analysis and proven thermal management techniques assure high reliability. MDI's hybrid power supply technology incorporates the latest advances in high frequency techniques, power hybrid and miniature magnetic components. MDI's product capacity includes:

- Standard, off the shelf DC to DC converters to 50 watts, operating frequencies to 400 kHz, power densities to 40 W/in^3
- Custom variations of standard DC to DC converters to 100 watts
- Custom DC to AC static inverters to 10 watts
- Design and construction to MIL–STD–883 "S" level, "B" level and other requirements

MODEL 2549
AC-DC 600W, all discrete
We call this unit "Arnold"



MODEL 2536
DC-DC 75W, part hybrid
This unit is in terrific shape!



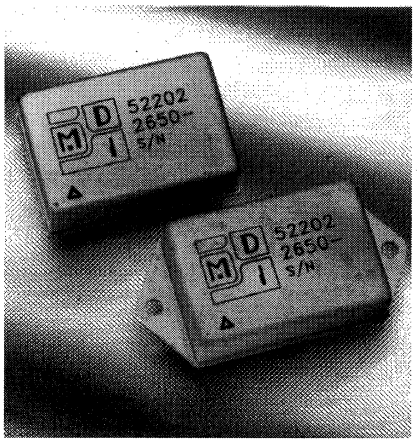
MODEL 2670
DC-DC 50W
full hybrid
"The mouse that roared!"

Product specifications for some MDI products can be found on the following pages in EEM Section 4000, and in Section 3500

MODULAR DEVICES INC
BROOKHAVEN R&D PLAZA • ONE RONED ROAD • SHIRLEY, NEW YORK 11967
TEL 516-345-3100 • FAX 516-345-3106

15-30 Watt HYBRID DC-DC CONVERTER

SERIES 2650



30 WATT SINGLE OUTPUT

PARAMETER	CONDITION	2650-S05 MIN	2650-S05 TYP	2650-S05 MAX	2650-S12 MIN	2650-S12 TYP	2650-S12 MAX	2650-S15 MIN	2650-S15 TYP	2650-S15 MAX
Output Voltage	—	+4.9	+5.0	+5.1	+11.9	+12.0	+12.1	+14.9	+15.0	+15.1
Output Current	V_{in} = 16–50 VDC	—	—	6 A	—	—	2.5 A	—	—	2 A
Output Power	T_{case} = -55°C to +85°C	—	—	30 W	—	—	30 W	—	—	30 W
Efficiency	P_{out} = Max Rated Load	78%	82%	—	80%	82%	—	81%	83%	—
Line Regulation	P_{out} = Max Rated Load V_{in} = 16–50 VDC	—	7 mV	20 mV	—	25 mV	50 mV	—	30 mV	60 mV
Load Regulation	P_{out} = 0–30 W	—	5 mV	20 mV	—	50 mV	100 mV	—	60 mV	125 mV
Output Ripple	Full Load BW 2 Mhz mV_{P-P}	—	30	50	—	30	65	—	30	65

20 WATT DUAL OUTPUT

PARAMETER	CONDITION	2650-D05 MIN	2650-D05 TYP	2650-D05 MAX	2650-D12 MIN	2650-D12 TYP	2650-D12 MAX	2650-D15 MIN	2650-D15 TYP	2650-D15 MAX
Output Voltage	$+I_{out} = -I_{out}$	+4.9 -4.9	+5.0 -5.0	+5.1 -5.1	+11.9 -11.9	+12.0 -12.0	+12.1 -12.1	+14.9 -14.9	+15.0 -15.0	+15.1 -15.1
Output Current	V_{in} = 16–50 VDC	150 mA*	—	2 A*	125 mA*	—	0.833A*	100 mA*	—	0.667 A*
Output Power	T_{case} = -55°C to +85°C	—	—	20 W	—	—	20 W	—	—	20 W
Efficiency	P_{out} = Max Rated Load	78%	80%	—	80%	82%	—	81%	83%	—
Line Regulation	P_{out} = Max Rated Load V_{in} = 16–50 VDC	—	10 mV	25 mV	—	25 mV	50 mV	—	30 mV	60 mV
Load Regulation	P_{out} = 2–20 W	—	20 mV	50 mV	—	50 mV	100 mV	—	60 mV	125 mV
Output Ripple	Full Load BW 2 Mhz mV_{P-P}	—	50	85	—	50	85	—	50	85

NOTE (*) UP TO 90% FULL POWER IS AVAILABLE FROM EITHER OUTPUT OF THE DUAL VERSIONS, PROVIDED THAT THE TOTAL OUTPUT POWER OF 20 WATTS IS NOT EXCEEDED.

15 WATT TRIPLE OUTPUT

PARAMETER	CONDITION		2650-T12 MIN	2650-T12 TYP	2650-T12 MAX	2650-T15 MIN	2650-T15 TYP	2650-T15 MAX
Output Voltage	$+I_{out} = -I_{out}$	main dual dual	+4.9 +11.9 -11.9	+5.0 +12.0 -12.0	+5.1 +12.1 -12.1	+4.9 +14.9 -14.9	+5.0 +15.0 -15.0	+5.1 +15.1 -15.1
Output Current	V_{in} = 16–50 VDC	main dual	60 mA 15 mA	— —	2 A ± 208 mA	60 mA 15 mA	— —	2 A ± 167 mA
Output Power	T_{case} = -55°C to +85°C		—	—	15 W	—	—	15 W
Efficiency	P_{out} = Max Rated Load		76%	79%	—	76%	79%	—
Line Regulation	P_{out} = Max Rated Load V_{in} = 16–50 VDC	main dual	—	0.1% 0.25%	0.2% 0.4%	—	0.1% 0.25%	0.2% 0.4%
Load Regulation	P_{out} = 1.5–15 W	main dual	—	0.2% 0.25%	0.4% 0.4%	—	0.2% 0.25%	0.4% 0.4%
Output Ripple	Full Load BW 2 Mhz mV_{P-P}	main dual	—	— —	80 30	—	— —	80 30

We can modify these units to meet your custom converter requirements.

Features

- Completely self contained Thick Film Hybrid DC-DC Converter
- Operates from 16 - 80 VDC for MIL-STD-704/1275 applications
- Internal EMI filter
- Fully isolated
- Single, dual or triple outputs
- Current limiting, power on soft start
- 200 kHz operation for low ripple and fast response time
- No external capacitors required
- High reliability screening available, specify "M" (e.g. 2650M-T15)
- Full hermetic package
- "S" level configuration available
- Radiation hardened available

Specifications

INPUT: 28VDC nominal
Range: 16 to 50 VDC continuous.
Survives 80 V transients/MIL-STD-704

OUTPUT: Voltage & Current (see chart)

REGULATION: (see chart)

RIPPLE: 50 mV peak-to-peak, typical

PROTECTION: Short circuit protection by current limit.

ISOLATION:
Input to case: 500 VDC
Input to output: 500 VDC*
(*) inputs shorted to case, outputs shorted together

ENVIRONMENT:
Operating temperature:
- 55°C ambient to +85°C case
Linearity derates to zero at 115°C
Storage temperature: -55°C to +150°C
Shock: 50G
Acceleration: 500G
Vibration: 30G

WEIGHT: 2.5 ounces

DIMENSIONS: 1.345" x 1.945" x 0.495"
(without flange)

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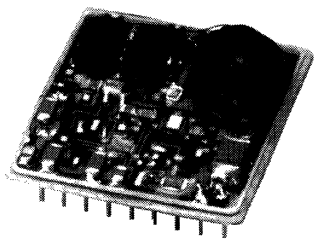
4 Watt HYBRID

DC-DC CONVERTERS

SERIES 2578



Features

- Completely self contained Thick Film Hybrid DC-DC Converter
- Operates from 16 - 80 VDC for MIL-STD-704/1275 applications
- Fully isolated
- Single, dual or triple outputs
- Current limiting, power on soft start
- 200 kHz operation for low ripple and fast response time
- No external capacitors required
- High reliability screening available, specify "M" (e.g. "2578M-5")
- Full hermetic package
- Radiation hardened available

Specifications

INPUT: 28VDC nominal
Range: 16 to 50 VDC continuous.
Survives 80 V transients/MIL-STD-704
Current: 200 mA typical at full load

OUTPUT: Voltage & Current (see chart)

REGULATION: (see chart)

RIPPLE: 50 mV peak-to-peak, typical

PROTECTION: Short circuit protection by current limit.

ISOLATION:
Input to case: 500 VDC
Input to output: 500 VDC*
(*) inputs shorted to case, outputs shorted together

ENVIRONMENT:
Operating temperature:
- 55°C ambient to +85°C case
Linearity derates to zero at 115°C
Storage temperature: -55°C to +150°C
Case rise 30°C typical at full load
Shock: 50G
Acceleration: 500G
Vibration: 30G

MECHANICAL:
Dimensions: 1.075" x 1.075" x 0.375"
Terminals: PC board mount
Case: Kovar header, tin plate cover
Weight: 0.5 ounces

Other input/output voltages and custom configurations are available.

SINGLE OUTPUT CONVERTERS		2578–8 (3.3 VDC)			2578–1 (5 VDC)			2578–9 (-5.2 VDC)		
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	—	+3.2	+3.3	+3.4	+4.9	+5.0	+5.1	-5.1	-5.2	-5.3
Output current	V_{in}= 16 to 50 VDC	—	—	900mA	—	—	700mA	—	—	700mA
Efficiency	P_{in}= max rated load	65%	69%	—	68%	72%	—	68%	72%	—
Line regulation	P_{in}= max rated load, V_{in}= 16 to 50 VDC	—	7 mV	20 mV	—	7 mV	20 mV	—	7 mV	20 mV
Load regulation	P_{out}= 0 to 4 watts	—	5 mV	20 mV	—	5 mV	20 mV	—	5 mV	20 mV
Output ripple	Full load BW 2 MHz mV_{pp}	—	30	50	—	30	50	—	30	50

SINGLE OUTPUT CONVERTERS		2578–22 (12 VDC)			2578–16 (15 VDC)			2578–10 (28 VDC)		
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	—	+11.9	+12.0	+12.1	+14.9	+15.0	+15.1	+27.8	+28.0	+28.2
Output current	V_{in}= 16 to 50 VDC	—	—	333mA	—	—	267mA	—	—	142mA
Efficiency	P_{in}= max rated load	74%	77%	—	75%	78%	—	75%	78%	—
Line regulation	P_{in}= max rated load, V_{in}= 16 to 50 VDC	—	25 mV	50 mV	—	30 mV	60 mV	—	30 mV	60 mV
Load regulation	P_{out}= 0 to 4 watts	—	50 mV	100 mV	—	50 mV	125 mV	—	75 mV	150 mV
Output ripple	Full load BW 2 MHz mV_{pp}	—	40	85	—	50	100	—	100	150

DUAL OUTPUT CONVERTERS		2578–25 (±5 VDC)			2578–2 (±12 VDC)			2578–3 (±15 VDC)		
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	$+I_{out} = -I_{out}$	+4.9 -4.9	+5.0 -5.0	+5.1 -5.1	+11.9 -11.9	+12.0 -12.0	+12.1 -12.1	+14.9 -14.9	+15.0 -15.0	+15.1 -15.1
Output current	V_{in}= 16 to 50 VDC	35mA	—	350mA	15mA	—	167mA	12mA	—	133mA
Efficiency	P_{in}= max rated load	65%	69%	—	72%	75%	—	73%	76%	—
Line regulation	P_{in}= max rated load, V_{in}= 16 to 50 VDC	—	10 mV	25 mV	—	25 mV	50 mV	—	30 mV	60 mV
Load regulation	P_{out}= 0 to 4 watts	—	20 mV	50 mV	—	50 mV	100 mV	—	60 mV	125 mV
Output ripple	Full load BW 2 MHz mV_{pp}	—	50	85	—	50	85	—	50	85

TRIPLE OUTPUT CONVERTERS			2578–4 (+5, ±12 VDC)			2578–5 (+5, ±15 VDC)		
PARAMETER	CONDITION		MIN	TYP	MAX	MIN	TYP	MAX
Output voltage	$+I_{out} = -I_{out}$	main	+4.9	+5	+5.1	+4.9	+5	+5.1
		dual	+11.5	+12.0	+12.5	+14.5	+15.0	+15.5
		dual	-11.5	-12.0	-12.5	-14.5	-15.0	-15.5
Output current	V_{in}= 16 to 50 VDC	main	100mA	—	400mA	100mA	—	400mA
		dual	—	—	±50mA	—	—	±40mA
Efficiency	P_{in}= max rated load		68%	70%	—	68%	70%	—
Line regulation	P_{in}= max rated load, V_{in}= 16 to 50 VDC	main	—	0.1%	0.2%	—	0.1%	0.4%
		dual	—	0.25%	0.4%	—	0.25%	0.4%
Load regulation	P_{out}= .0 to 4 watts	main	—	0.2%	0.4%	—	0.2%	0.4%
		dual	—	0.25%	0.4%	—	0.25%	0.4%
Output ripple	Full load BW 2 MHz mV_{pp}	main	—	—	80	—	—	80
		dual	—	—	30	—	—	30

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210/270 Watt

MULTIPLE OUTPUT POWER SUPPLY

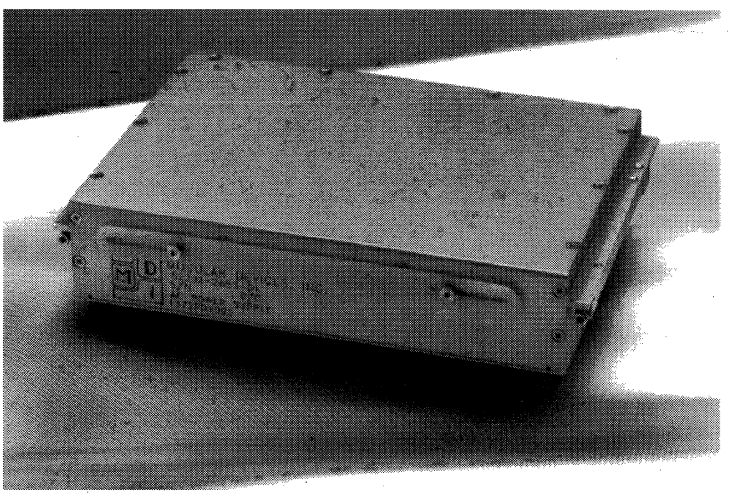
MODEL 2652/2653

Description

The model 2652/2653 are very compact multiple output power supplies designed for direct plug in to full ATR cases for VME bus and related applications. These power supplies operate from a wide range of input power sources, including single phase 200 VAC, 3Ø 115 VAC (both at 400 Hz) 208 VAC at 60 Hz (with derating), or a 270 VDC input to MIL-STD-704D parameters. A high frequency power FET design delivers ample system power with low output ripple. A full EMI filter is contained within the unit. These rugged power supplies are well suited for airborne and other demanding environments.

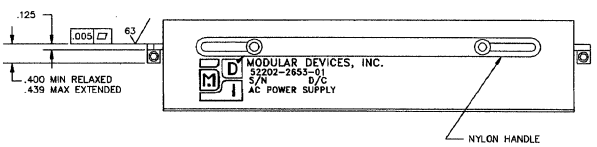
Model 2652 delivers 210 watts with three outputs: 5 VDC at 30 A, ±15 VDC at 2 A.

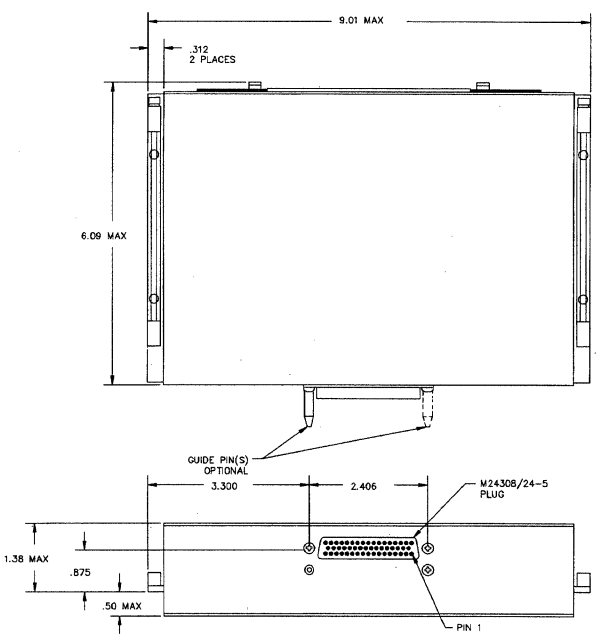
Model 2653 delivers 270 watts with four outputs: 5 VDC at 40 A, ±12 VDC at 2 A.



Features

- Low profile: 1.88 inches thick
- Operates from a wide range of power sources
- Conduction cooled via side wedge locking
- Power density 2.8 W/in^3 for 4 outputs
- Fully EMI filtered
- TTL level power inhibit input
- AC line dropout/fault indicator output
- Overtemperature shut down
- Strap handle for easy removal
- All high reliability components
- ESS burn in standard





Specifications

INPUT VOLTAGE:

100-130 VAC line-neutral 57-440 Hz 3Ø

200-260 VAC line-line 360-440 Hz 1Ø

220-340 VDC per MIL-STD-704 Rev D

DC OUTPUTS

#2652: 5 VDC at 30 A, ±15 VDC at 2 A

#2653: 5 VDC at 40 A, ±12 VDC at 2 A, -5.2 VDC at 4 A

EFFICIENCY: #2652: 75% (typ)
#2653: 70% (typ)

REGULATION, LINE: 100 mV

REGULATION, LOAD: 100 mV

OPERATING FREQUENCY: 100 kHz (typ)

OUTPUT RIPPLE: 25 mV rms/100 mV_{p-p} on main 5 VDC outputs; 50 mV rms/150 mV_{p-p} on all other outputs

OVERCURRENT PROTECTION: all outputs protected above 110%

OVERVOLTAGE PROTECTION: all outputs protected above 120%

ISOLATION: 450 VDC input/outputs, chassis; 45 VDC outputs to chassis

ENVIRONMENT:

Temperature, operating: -55°C to 85°C, derate to zero at 105°C

Temperature, storage: -62°C to 105°C

Shock: 15 Gs peak

Vibration: 6 Gs rms per Navmat P-9492

Humidity: per MIL-E-5400 Class 2

EMI: meets MIL-STD-461 CEO3, CEO7, CS01, CS02 and CS06

FINISH: Gold chem film per MIL-C-5541 Class 3

WEIGHT #2652: 4.3 LBS; #2653: 4.5 LBS

We can modify these units to meet your custom converter requirements.

MODULAR DEVICES INC

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10 & 20 Watt

DC-DC REGULATED CONVERTERS

SERIES 2639 - 2669

MODEL NOS. 2659 & 2669 ALSO PROVIDE REMOTE ADJUSTMENT FOR LAMP DIMMER, FLASHER, MOTOR CONTROL AND OTHER FUNCTIONS

REMOTE ADJUSTMENT NOT AVAILABLE WHERE INDICATED (*)

Features

- Available in single & dual output
- 1.56 watts/cubic inch (#2639/59)
- 2.78 watts/cubic inch (#2649/69)
- Silicon rubber encapsulation
- Environmentally rugged for military application
- Operates down to zero load
- Parallelable
- Remote potentiometer for lamp dimming, flashing, motor controls (#2659/2669 only)

Specifications

INPUT:
28VDC nominal
Range: 22 to 40 VDC cont.
50VDC for 1 second maximum
Reverse polarity protected to 50VDC
Current (#2639/59):
530 mA typical at full load
Current (#2649/69):
1020 mA typical at full load
Other inputs available

OUTPUT ADJUST UNITS:
A 10K rheostat connected between the adjust output and positive output varies output from full-to-zero voltage. Over 50 VDC, a 100K pot is used. Adjust pot may be up to 100-ft from unit.

MINIMUM LOAD: zero

REGULATION: (see chart)

RIPPLE: (see chart)
Frequency: 150KHz ± 20%

PROTECTION:
Short circuit protection by current limit.

ISOLATION:
Input to case: 500 VDC
Input to output: 500 VDC
inputs shorted to case, outputs shorted together

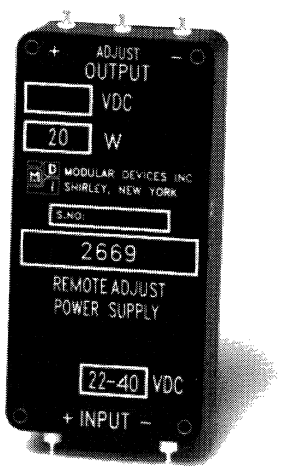
ENVIRONMENT:
Operating temperature:
- 55°C ambient to +100°C case
Storage temperature:
- 55°C to +150°C
Meets or exceeds MIL-E-5400

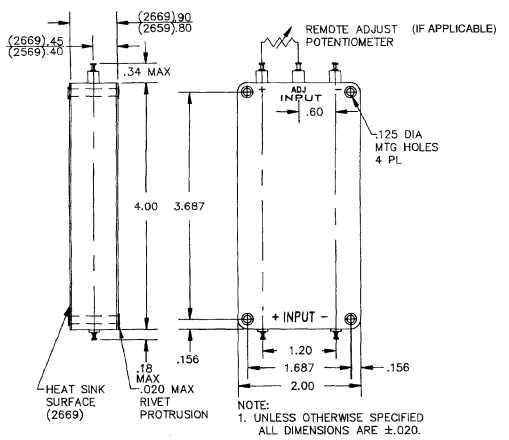
EMI: Input filter reduces conducted emissions.

MECHANICAL:
Dimensions (#2639/59): 4"x2"x0.8"
Dimensions (#2649/69): 4"x2"x0.9"
Terminals: turret solder type
Case: extruded aluminum with black anodized finish
Encapsulation: RTV silicon rubber
Weight (#2639/59): 9.6 ounces
Weight (#2649/69); 11 ounces

SERIES SPECIFICATIONS

Model Number 2639-69 Suffix	Output Voltage VDC nom.	Output Current mA max. 2639 2659	Output Current mA max. 2649 2669	Output Ripple Vp-p max.	REGULATION, VDC Line Vin 22-40 VDC max.	REGULATION, VDC Load 10-100% max.	REGULATION, VDC Temp –55°–100° typ.	R. Adj.
101	2	3750	7500	.040	.008	.150	.075	10K
102	5	2000	4000	.030	.008	.100	.075	10K
103	7.5	1300	2600	.045	.012	.100	.112	10K
104	10	1000	2000	.040	.015	.100	.150	10K
126	12	830	1660	.035	.020	.12	.18	10K
105	15	670	1330	.045	.022	.15	.225	10K
106	30	330	670	.060	.030	.25	.450	10K
107	50	200	400	.050	.050	.5	.750	10K
108	75	130	260	.075	.075	.75	1.13	100K
109	100	100	200	.100	1.0	1.0	1.5	100K
110	150	67	130	.150	1.5	1.5	2.25	100K
111	300	33	67	.30	3.0	3.0	4.50	100K
120*	±12	±416	±830	.035	.15	.12	.18	
121*	±15	±333	±666	.030	.22	.15	.225	
122*	±25	±200	±400	.050	.30	.25	.38	
123*	±50	±100	±200	.100	.50	.50	.75	
124*	±100	±50	±100	.100	1.0	1.00	1.5	





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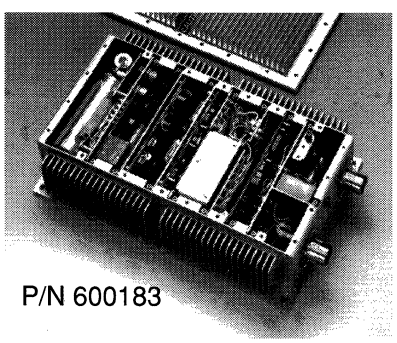
Plasma

DISPLAY POWER SUPPLIES

P/N	INPUT VOLTAGE	Series Specifications: OUTPUT VOLTAGES / OUTPUT CURRENTS +5V	-5V	+12V	-12V	+13V	+55V	+70V	135V / OTHER	DIMENSIONS EXCLUDING CONNECTOR LxWxH (inches)	REMARKS
600057	115V; 50/60 Hz	10A*	—	400MA	60MA	—	1A	—	+133V; 900MA*	10.5 x 9.5 x 2.0	Commercial flange mount.
600046	115V; 50/60 Hz	8A*	—	250MA	250MA	—	270MA	—	+133V; 300MA*	10.0 x 6.0 x 2.0	Hi-reliability shipbrd MIL-STD-1399 POWER.
600187	115V; 50/60 Hz	—	—	—	—	—	200MA	—	+133V; 120MA*	7.0 x 4.0 x 1.5	Low-cost commercial.
600183	115V; 50/60 Hz	10A	500MA	—	—	250MA	—	250MA	115-135V; 200MA*	11.2 x 7.18 x 3.8	Drip-proof, multi-svc environment, remote programming.
600036	115/230V; 50/60 Hz	10A*	—	1A	—	—	1A	—	+136V; 900MA	12.0 x 9.0 x 2.5	Shipbrd application MIL-STD-1399 POWER.
600031	115/230V; 50/60 Hz	4A*	—	500MA	—	—	150MA	—	+133V; 100MA*	8.5 x 1.91 x 4.6	EMI feed through terminal outputs.
600045	115/230V; 50/60 Hz	4A*	—	500MA	—	—	150MA	—	+133V; 100MA*	8.5 x 1.62 x 4.0	Multiple side adjustments.
600185	8-18 VDC	—	—	—	—	—	—	—	+95V 210MA	6.5 x 3.35 x 0.63	Low-cost, low-profile board level, commercial.
600189	115V; 47-500 Hz	10A*	—	400MA	60MA	—	1A	—	+136V; 900MA*	9.5 x 9.0 x 2.0	Military.
600184	28 VDC	10A	500MA	—	—	250MA	—	250MA	115-135V; 200MA*	11.2 x 7.18 x 3.8	Drip-proof, multi-svc environment, remote programming.
600186	115/230 VAC or 200 VDC	—	—	150MA	—	—	—	—	+95V; 200MA*	6.5 x 3.66 x 0.35	Low-cost, low profile board level, commercial.

(*) *Denotes adjustable*



P/N 600183

Options:

- ❑ Radiation hardened
- ❑ Military environment required
- ❑ MIL STD 461 RFI/EMI
- ❑ MIL STD 2000
- ❑ Short circuit protection
- ❑ Overvoltage protection
- ❑ Inhibit function
- ❑ BIT
- ❑ Remote sensing
- ❑ Sync capability
- ❑ Reverse polarity protection
- ❑ Hold-up
- ❑ Input/Output connectorization

We can meet your custom requirements.

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COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

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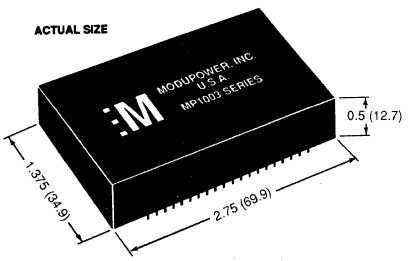
POWER SUPPLIES

MP1003 SERIES

3 Watt AC Power Supply



FEATURES

- P.C. Board Mount
- Over Current Protection
- Over Temperature Protection
- Over Voltage Protection
- UL, CSA Pending

DESCRIPTION

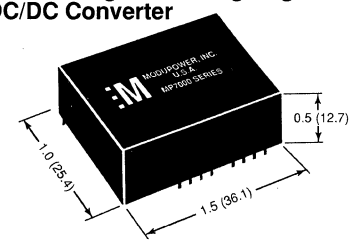
This power supply is a small size module that is convenient for automatic insertion into a printed circuit board. Reliability is assured by providing current limiting, thermal shutdown, over and under voltage protection and filtering.

GENERAL SPECIFICATIONS

Input
Voltage Range: AC 85 to 132V, DC 110 to 70V
Frequency: 1MHz Typ
Efficiency: 70% Typ
Isolation: 1500VAC, 1500VDC
Output Voltage: 5VDC
Output Current: 0.6A
Line Regulation: +/-1%
Load Regulation: +/-5%
Output Ripple: 50mVp-p
Operating Temperature: 0° to +70°C

MP7000 SERIES

1A Wide Range Switching Regulator & DC/DC Converter



FEATURES

- Wide Input Range
- Filter on Input and Output
- No External Components Needed
- Thermal Shut Down and Current Limit Protection
- Up to 1A Output Current
- More than 80% Efficiency
- +/-3% Regulation over Line and Load
- Low Power Standby Mode
- Adjustable Output Version

GENERAL SPECIFICATIONS

Operating Temperature Range: –25°C to + 70°C

Storage Temperature Range: –55°C to + 150°C

SELECTION GUIDE

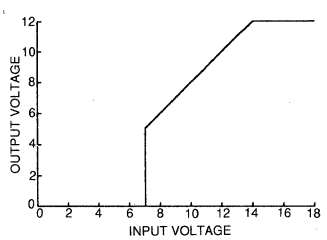
Part #	Input Range	Output Voltage
MP7001	7-35V	5V
MP7003	14-35V	12V
MP7004	17-35V	15V
MP7008	7-35V	3.3V
MP7009	7-35V*	Adjustable

* Input must be at least 2V above output.

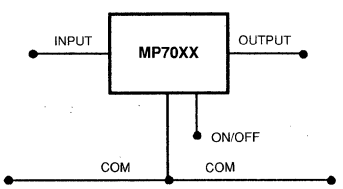
DESCRIPTION

The MP7000 series modules are a hassle free means of providing a regulated output from raw DC or DC/DC conversion.
The modules are non-isolated regulating DC/DC converters that offer high efficiency and protection with pulse by pulse current limiting and thermal shut down. The package is convenient for automatic insertion on printed circuit boards.
A logic level On/Off control is also provided.

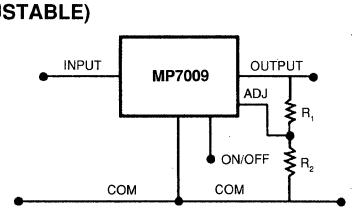
OUTPUT CHARACTER (SHOWN FOR MP7003)



TYPICAL APPLICATION (FIXED)



(ADJUSTABLE)



ELECTRICAL CHARACTERISTICS

Part Number	Input Range Min	Input Range Max	Output Voltage Min	Output Voltage Max	Output Current Min	Output Current Max	Efficiency	Standby Quiescent Current	Quiescent Current	Current Limit	Output Ripple	Input Ripple 1 OHM Source
MP7001	7V	35V	4.75V	5.25V	0.2A	1A	82%	500µA	15mA	3.2A	50 mVp-p	200 mVp-p
MP7003	14V	35V	11.4V	12.60V	0.2A	1A	88%	500µA	15mA	3.2A	100 mVp-p	200 mVp-p
MP7004	17V	35V	14.25V	15.75V	0.2A	1A	92%	500µA	20mA	3.2A	100 mVp-p	200 mVp-p
MP7008	7V	35V	3.13V	3.47V	0.2A	1A	80%	500µA	20mA	3.2A	50 mVp-p	200 mVp-p
MP7009	7V	35V	1.33V	30V	0.2A	1A	80%	500µA	20mA	3.2A	100 mVp-p	200 mVp-p

MECHANICAL CONSTRUCTION

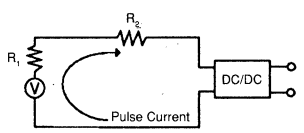


Fig. 1

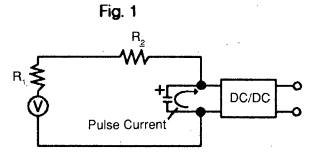
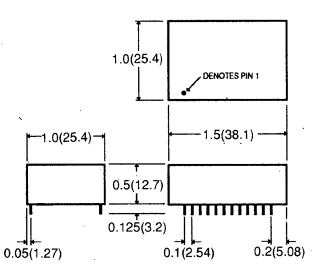
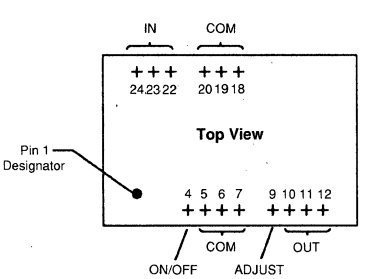


Fig. 2



PIN CONNECTIONS



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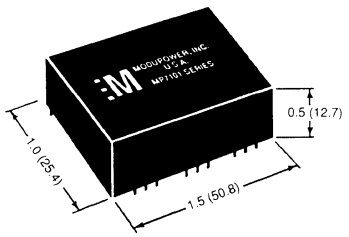
POWER SUPPLIES

MP7101SERIES
1A 5V to 3.3V Converter



FEATURES
- No External Components Needed
- Thermal Shut Down and Current Limit Protection
- Up to 1A Current
- No EMI or Spikes Generated

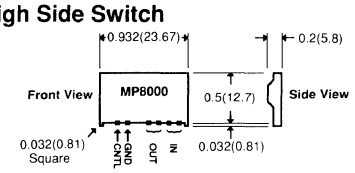
DESCRIPTION

The MP7101 is a convenient way to derive 3.3V to power newer forms of circuits without adding a power supply to the system. The low profile dual in line package allows automatic insertion and minimum stacking height.

GENERAL SPECIFICATIONS

Input Voltage Range: 4.5V to 10V
Maximum Output Current: (Continuous) 1.0A
Output Voltage: 3.3V ± 5%
Load Regulation: 0.3%
RMS Output Noise: 0.1 MV RMS
Operating Temperature Range: -25°C to +85°C
Storage Temperature Range: -55°C to +150°C

MP8000 SERIES
High Side Switch

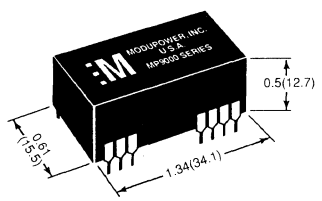


FEATURES
- Zero Footprint Package
- Surface Mount or SIP
- 5V CMOS Logic control
- 0.1 OHM on Resistance
- Up to 5 AMP
- 250 µA Leakage

DESCRIPTION

The MP8000 is designed to allow control of the power to loads that are connected to a chassis such as the hard drive or display in a lap top computer. The switch operates from a Vcc of 4.5V to 7V (other versions to 32V) and the switch is rated to 32V. The low leakage and significantly reduces current consumption from a battery.

MP9000 SERIES
2 Watt DC/DC Converter



SELECTION GUIDE

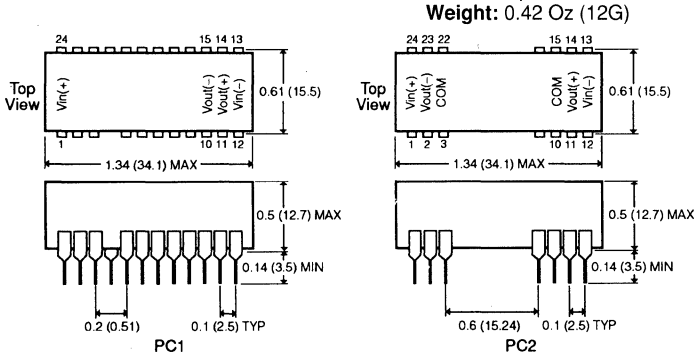
Part #	Input Voltage	Output Voltage
MP9001	5V	5V
MP9002	5V	9V
MP9003	5V	12V
MP9004	5V	15V
MP9005	5V	18V
MP9006	5V	24V
MP9011	12V	5V
MP9012	12V	9V
MP9013	12V	12V
MP9014	12V	15V
MP9015	12V	18V
MP9016	12V	24V
MP9053	5V	+/-12V
MP9054	5V	+/-15V
MP9063	12V	+/-12V
MP9064	12V	+/-15V

FEATURES
- 24 Pin DIP Configuration
- Regulated Output
- Isolation of 500VDC Minimum
- Short Circuit Protected
- Thermal Shut Down Protected

DESCRIPTION

This series is intended to be a low cost DC/DC converter that mounts on a board just like an integrated circuit. The output is fully isolated from the input, allowing voltage inversion or supplying external circuitry.

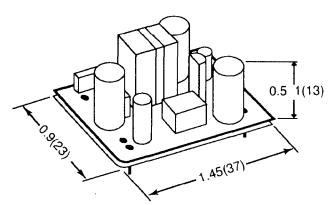
MECHANICAL CONSTRUCTION



GENERAL SPECIFICATIONS

Isolation Voltage: 500 VDC Min
Isolation Resistance: 100M OHM
Operating Frequency: 20kHz Min
Protection: Short Circuit and Thermal Shutdown
Operating Temperature: -20°C to +70°C
Storage Temperature: -40°C to +100°C
Operating Humidity: 10% to 90% RH
Storage Humidity: 10% to 90% RH
Output Voltage Tolerance: +/-5%
Output Ripple: 100 mVp-p Max @ 20MHz BW
Filter: Single has Pi Filter on both Input and Output
Weight: 0.42 Oz (12G)

MP9100 SERIES
1.8 Watt Regulated DC/DC Converter



DESCRIPTION

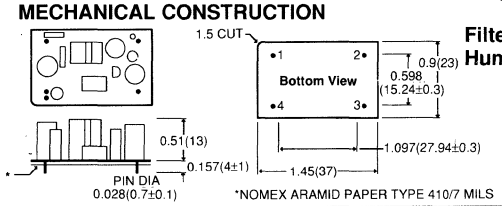
This series is intended to be a low cost DC/DC converter on a small integrated circuit board. The output is fully isolated from the input, allowing voltage inversion or supplying external circuitry.

FEATURES
- Regulated Output
- High Isolation of 2000VDC Minimum
- Short Circuit Protected

SELECTION GUIDE

Part #	Input Voltage	Output Voltage	Output Current
MP9102	5V	9V	200mA
MP9112	12V	9V	200mA
MP9141	48V	5V	400mA

MECHANICAL CONSTRUCTION



GENERAL SPECIFICATIONS

Isolation Voltage: 2000 VAC Min
Isolation Resistance: 100M Ohm
Input/Out Resistance: 100M Ohm
Input/Output Capacitance : 50pF
Protection: Short Circuit
Operating Temperature: 0°C to +60°C
Storage Temperature: -20°C to +85°C
Output Voltage Tolerance: +/- 5%
Output Ripple: 100 mVp-p Max @ 20MHz BW
Filter: Pi Filter on Output and Input
Humidity: 10% to 95% RH

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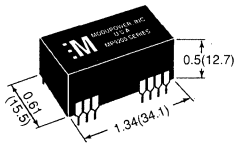
POWER SUPPLIES

MP9200 SERIES
1 Watt DC/DC Converter with High Isolation



DESCRIPTION

This series is intended to be a low cost DC/DC converter that mounts on a board just like an integrated circuit. The output is fully isolated from the input, allowing voltage inversion or supplying external circuitry.

GENERAL SPECIFICATIONS

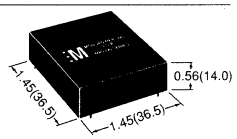
Isolation Voltage: 2000 VDC Min
Isolation Resistance: 100M Ohm
Operating Frequency: 20kHz Min
Protection: Short Circuit and Thermal Shut Down
Operating Temperature: 0°C to +55°C Full Load
0°C to +70°C Half Load

FEATURES

- 24 Pin DIP Configuration
- Regulated Output
- High Isolation of 2000VDC Minimum
- Short Circuit Protected

Storage Temperature: -10°C to +85°C
Operating Humidity: 10% to 90% RH
Storage Humidity: 10% to 95% RH
Output Voltage Tolerance: +/-5%
Output Ripple: 200 MVp-p Max @ 20MHz BW
Weight: 0.4 Oz. (12G)

MP9300 SERIES
2 Watt DC/DC Converter With High Isolation



DESCRIPTION

This series is intended to be an inexpensive high isolation DC/DC converter that conveniently mounts on a printed circuit board and is only 0.56 inch high. The output is fully isolated from the input, allowing voltage inversion or supplying external circuitry.

GENERAL SPECIFICATIONS

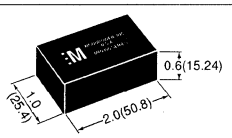
Isolation Voltage: 2000 VDC Min
Isolation Resistance: 50M Ohm
Operating Frequency: 30kHz Min
Protection: Short Circuit
Operating Temperature: 0°C to +50°C
Storage Temperature: -40°C to +85°C

FEATURES

- Printed Circuit Board Mounting
- PWM Regulated Output
- High Isolation of 2000VDC Minimum
- Short Circuit and Overload Protected
- 70% Efficiency

Humidity: 20% to 90% RH
Output Voltage Tolerance: +/-5%
Output Ripple: 100 MVp-p Max @ 20MHz BW
Weight: 1 Oz. (28G)

MP9400 SERIES
6 Watt Regulated DC/DC Converter



DESCRIPTION

This series provides 6 watts of DC/DC conversion with 60% efficiency. The package can be conveniently mounted on a printed circuit board and is only 0.6 inch high.

GENERAL SPECIFICATIONS

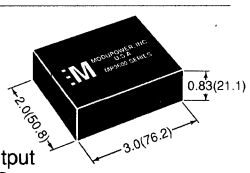
Isolation Voltage: 500 VDC Min
Isolation Resistance: 100M Ohm
Operating Frequency: 20kHz Min
Operating Temperature: 0°C to +55°C Full Load
0°C to +70°C Half Load
Storage Temperature: -20°C to +85°C
Operating Humidity: 10% to 90% RH

FEATURES

- Single or Dual Regulated Output
- High Isolation of 500V Minimum
- Short Circuit Protected
- Low Profile Metal Case

Storage Humidity: 10% to 95% RH
Output Voltage Tolerance: +/-5%
Output Ripple: 200 MVp-p Max @ 20MHz BW
Filter: Pi Filter In and Out
Weight: 1.3 Oz. (39G)

MP9600 SERIES
6 Watt Regulated DC/DC Converter



DESCRIPTION

This series provides 20 watts of DC/DC conversion with typically 72% efficiency. The package can be conveniently mounted on a printed circuit board and is only 0.83 inch high.

GENERAL SPECIFICATIONS

Isolation Voltage: 500 VDC Min
Isolation Resistance: 100M Ohm
Operating Frequency: 80kHz Min
Operating Temperature: 0°C to +55°C
Storage Temperature: -40°C to +85°C
Operating Humidity: 10% to 90% RH
Storage Humidity: 10% to 95% RH

FEATURES

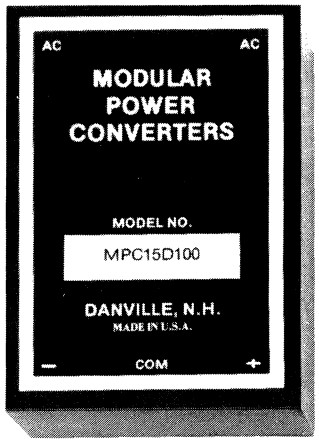
- Single or Dual Output
- PWM Regulated Output
- Isolation Voltage of 500VDC Min
- Short Circuit And Overload Protected

Output Voltage Tolerance: +/-5%
Output Ripple: 200 MVp-p Max @ 20MHz BW
Filter: Pi Filter In and Out
Weight: 5 Oz. (14 G)

Part #	Input Voltage	Output Voltage	Output Current
MP1003	115 VAC	5	600mA
MP7001	7-35	5	1000mA
MP7003	14-35	12	1000mA
MP7004	17-35	15	1000mA
MP7008	7-35	3.3	1000mA
MP7009	7-35	ADJ	1000mA
MP7101	4.5-10	3.3	1000mA
MP9001	5	5	220mA
MP9002	5	9	200mA
MP9003	5	12	160mA
MP9004	5	15	100mA
MP9005	5	18	80mA
MP9006	5	24	60mA
MP9011	12	5	220mA
MP9012	12	9	200mA
MP9013	12	12	160mA
MP9014	12	15	100mA
MP9015	12	18	80mA
MP9016	12	24	60mA
MP9053	5	+/-12	60mA
MP9054	5	+/-15	40mA
MP9063	12	+/-12	60mA
MP9064	12	+/-15	40mA
MP9102	5	9	200mA
MP9112	9.4-16	9	200mA
MP9141	36-72	5	400mA
MP9201	5	5	220mA
MP9202	5	9	200mA
MP9203	5	12	160mA
MP9204	5	15	100mA
MP9205	5	18	80mA
MP9206	5	24	60mA
MP9211	12	5	220mA
MP9212	12	9	200mA
MP9213	12	12	160mA
MP9214	12	15	100mA
MP9215	12	18	80mA
MP9216	12	24	60mA
MP9301	5	5	300mA
MP9302	5	9	200mA
MP9303	5	12	140mA
MP9304	5	15	100mA
MP9306	5	24	80mA
MP9311	9.4-18	5	300mA
MP9312	9.4-18	9	200mA
MP9313	9.4-18	12	140mA
MP9314	9.4-18	15	100mA
MP9316	9.4-18	24	80mA
MP9321	20-30	5	300mA
MP9322	20-30	9	200mA
MP9323	20-30	12	140mA
MP9324	20-30	15	100mA
MP9326	20-30	24	80mA
MP9341	36-72	5	300mA
MP9394	36-72	+/-15	+/-50mA
MP9401	5	5	800mA
MP9403	5	12	500mA
MP9404	5	15	300mA
MP9406	5	24	250mA
MP9411	12	5	800mA
MP9413	12	12	500mA
MP9414	12	15	300mA
MP9416	12	24	250mA
MP9431	24	5	800mA
MP9433	24	12	500mA
MP9434	24	15	300mA
MP9436	24	24	250mA
MP9441	36-72	5	800mA
MP9453	5	+/-12	200mA
MP9454	5	+/-15	150mA
MP9456	5	+/-24	120mA
MP9463	12	+/-12	200mA
MP9464	12	+/-15	150mA
MP9466	12	+/-24	120mA
MP9483	24	+/-12	200mA
MP9484	24	+/-15	150mA
MP9486	24	+/-24	120mA
MP9494	36-72	+/-15	150mA
MP9611	9-18	5	4000mA
MP9613	9-18	12	1600mA
MP9614	9-18	15	1300mA
MP9616	9-18	24	800mA
MP9631	18-36	5	4000mA
MP9633	18-36	12	1600mA
MP9634	18-36	15	1300mA
MP9636	18-36	24	800mA
MP9641	36-72	5	4000mA
MP9644	36-72	15	1300mA
MP9661	9-18	5	4000mA
MP9663	9-18	12	1600mA
MP9664	9-18	15	1300mA
MP9666	9-18	24	800mA
MP9681	18-36	5	4000mA
MP9683	18-36	12	1600mA
MP9684	18-36	15	1300mA
MP9686	18-36	24	800mA
MP9694	36-72	+/-15	650mA

MPC/ DIVISION OF CONSULTING SYSTEMS • 638 MAIN STREET DANVILLE, NH 03819 603-642-5913 FAX 603-642-5913

MODULAR POWER CONVERTERS



FEATURES

- EXCELLENT REGULATION
- HIGH QUALITY QC/QA TO YOUR PROGRAM
- ENCAPSULATED MODULES
- ENVIRONMENT RESISTANT
- COST EFFECTIVE
- DELIVERY FROM STOCK
- OPTIONS AVAILABLE

	SUFFIX	PRICE ADDER
220 Vac Input	E	$5.00
240 Vac Input	K	5.00
100 Vac Input	J	5.00
2.0" Input Pin Configuration	A	None
Chassis mounting with right angle barrier strip *	RCM	10.00
Chassis mounting with straight barrier strip	SCM	10.00
Chassis mounting with top mount barrier strip	TCM	20.00

* This option is recommended only for mounting on non-conductive surfaces.

SELECTION GUIDE

SINGLE OUTPUT UNITS					DUAL OUTPUT UNITS						TRIPLE
MODEL (E Vdc) 1(mA) Case	MPC5S250 5 250 A	MPC5S500 5 500 A	MPC5S1000 5 1000 B	MPC5S2000 5 2000 C	MPC15D100 15 100 A	MPC12D100 12 100 A	MPC15D200 15 200 B	MPC12D200 12 200 B	MPC15D300 15 300 C	MPC12D300 12 300 C	MPC5S500 /15D100 C
UNIT PRICES ($) F.O.B. DANVILLE, NH 03819 USA											
1-4	37.00	42.00	50.00	64.00	43.00	45.00	51.00	55.00	60.00	62.00	80.00
5-9	34.00	40.00	48.00	60.00	40.00	43.00	49.00	51.00	57.00	58.00	75.00
10-99	30.00	35.00	41.00	52.00	36.00	37.00	42.00	45.00	49.00	51.00	66.00
100-499	27.00	31.00	37.00	46.00	32.00	34.00	38.00	40.00	44.00	45.00	58.00
500-999	24.00	27.00	32.00	40.00	29.00	29.00	34.00	35.00	39.00	40.00	51.00
1000 & UP	22.00	25.00	30.00	37.00	27.00	27.00	32.00	32.00	37.00	37.00	47.00

ELECTRICAL SPECIFICATIONS

TYPICAL AT 25°C UNLESS OTHERWISE SPECIFIED

INPUT

VOLTAGE	105 to 125 Vac
FREQUENCY	50 to 440 Hz

OUTPUT

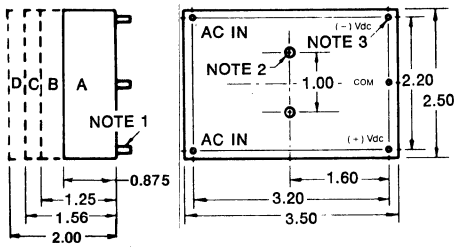
FIXED VOLTAGE (Vdc)	1% Max.
LINE REGULATION	0.05%
LOAD REGULATION (5 Vdc Models)	0.2%
LOAD REGULATION (Dual Models)	0.05%
RIPPLE & NOISE (PARD)	1mV RMS Max.
OVERVOLTAGE PROTECTION on 5Vdc Models Only	Set for 6.5 Vdc
SHORT CIRCUIT PROTECTED	Continuous

ENVIRONMENT

OPERATING	−25°C to +71°C
STORAGE	−25°C to +85°C
TEMPERATURE COEFFICIENT	0.02%/°C
WARM-UP DRIFT	0.25% after 15 minutes

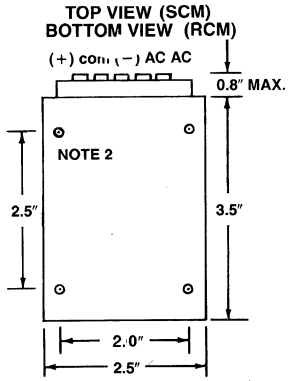
PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

MECHANICAL SPECIFICATIONS



SINGLE AND DUAL

NOTES:
1. Gold Plated 0.040 Dia 0.20 Lg Min
2. Mounting Inserts 4-40 0.10 Lg Min
3. Single Output Models No Connection
4. All Dimensions in Inches



CHASSIS MOUNTING WITH TERMINAL BARRIER STRIP

MPC designs power converters, including DC to DC converters to exact requirements when they differ from standard specifications.

Please send MPC your specifications for a fast response.

MultiPower, Inc.

YOUR POWER SUPPLY PARTNER

A Spectrum Electronics Corporation

Our Work Is The Design And Manufacture Of Custom Switching Power Supplies From 3 Watts Single Output To 2000 Watts And Over 20 Outputs

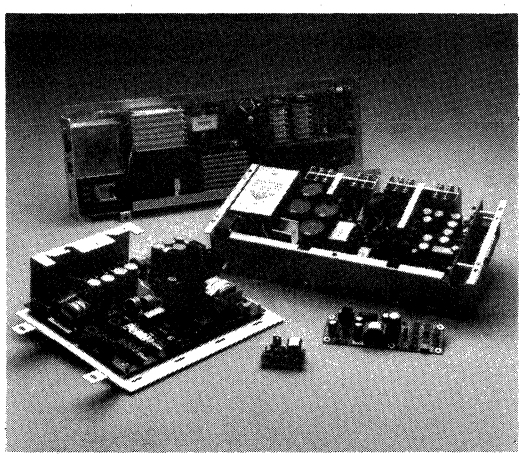
FEATURES:

- HIGH-FREQUENCY—100KHz TECHNOLOGY
- BATTERY BACK-UP WHEN YOU NEED POWER THAT CANNOT FAIL
- INTEGRATED HV/LV DESIGNS
- CUSTOM PACKAGING
- SURFACE MOUNT APPLICATIONS
- PROVEN CIRCUITS WHICH ENABLE MULTIPOWER TO QUICKLY AND ECONOMICALLY CONFIGURE A DESIGN TO UNIQUE CUSTOMER REQUIREMENTS

APPLICATIONS

- MEDICAL
- TEST AND MEASUREMENT
- FLAT—SCREEN TECHNOLOGY
- COMMUNICATIONS
- AVIATION
- SPECIALTY COMPUTER
- INDUSTRIAL AND ROBOTICS

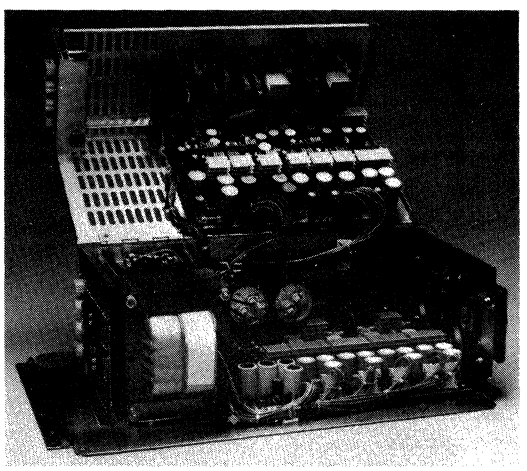
TYPICAL POWER ASSEMBLIES



MultiPower, Inc.'s Switching Power Supplies Are Custom Engineered For OEM's:

We have:

- DESIGNS ACCOMMODATING A WIDE RANGE OF VOLTAGE AND WATTAGE REQUIREMENTS
- SHORTENED LEAD TIMES FROM QUOTES TO PROTOTYPES
- MAGNETIC DESIGN AND MANUFACTURING IN-HOUSE
- DESIGNS COMPLY WITH DOMESTIC AND INTERNATIONAL SAFETY AND EMI/RFI REGULATIONS
- LIGHT-WEIGHT, LOW-LEAKAGE SWITCHING SUPPLIES WHICH DO NOT REQUIRE HEAVY ISOLATION TRANSFORMERS
- SAFETY AND REGULATORY CERTIFICATION STAFF IN-HOUSE



REPRESENTATIVE PRODUCTS DESIGNED AND MANUFACTURED BY MPI

MODEL	REGULATED WATTS	REGULATED OUTPUTS	TYPE	APPLICATION	FEATURES
MP29-6	29	6	DC-DC	E-L SCREEN	MINIATURIZED
MP151-7	150	7	12 VDC/OFF-LINE	DATA LOGGING	AC MAINS GR 12 VDC INPUT
MP350-1	350	5	OFF-LINE	TEST AND MEASUREMENT	EXTENSIVE FUNCTIONAL MONITORING
MP480-5	480	5	OFF-LINE	BAR CODE PRINTER	HIGH POWER: AUTO RANGE SELECT
MP1350-21	1350	21	OFF-LINE	MEDICAL	21 LOW RIPPLE ISOLATED SUPPLIES

ALL PRODUCTS ARE CERTIFIED TO APPROPRIATE DOMESTIC AND INTERNATIONAL REGULATORY STANDARDS.

OUR OBJECTIVE AT MULTIPOWER IS TO SERVE AS AN EXTENSION OF YOUR ENGINEERING GROUP THROUGH A CLOSE WORKING RELATIONSHIP—FROM PRODUCT SPECIFICATION THROUGH PRODUCTION.

CALL US FOR CONSULTATION. LET US SEND YOU OUR POWER SUPPLY SPECIFICATION FORM TO ASSIST IN DESIGNING YOUR OPTIMUM POWER SUPPLY.

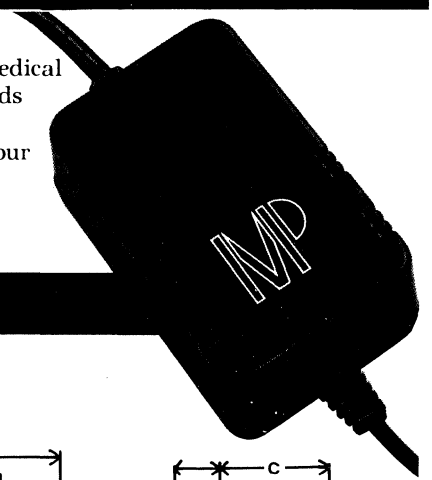
3005 S.W. 154th TERRACE, BEAVERTON, OREGON 97006 • (503) 646-4700 • FAX (503) 643-4889

Multi Products International
250 Lackawanna Ave., West Paterson, New Jersey 07424
(201) 890-1344 • Telex: 219289 • FAX: 201-890-1677

MPI is one of the most reliable suppliers, on a large scale, of transformer and magnetic components to the computer, data processing, communications & medical and recreational electronics OEMS. All units meet MPI's stringent QC standards and are UL CSA & VDE listed as required.

The product categories below provide general specification information for our basic product lines. However, our ability to design and manufacture custom components, to your specs, makes us the industry's true "super source".

Call today!–(201) 239-8183 • Fax (201) 239-8449



SINGLE OUTPUT UNREGULATED

WALL PLUG-IN ADAPTERS AC/AC

	Output Volts	Current (MA)
W41A-G1000-2/1	8	1000
W41A-J700-2/1	12	700
W41A-N500-2/1	18	500
W48A-Q700-2/1	24	700

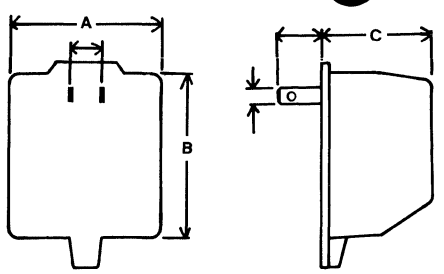
TABLE TOP MODELS	AC/AC	CENTER TAPPED
T57A-M1750-A6/1	16.5	1750
T57A-N2220-A6/1	18	2220

WALL PLUG-IN ADAPTERS AC/DC

AC/DC ADAPTERS **INPUT: 120 Vac 60 Hertz**

OUTPUT: Part Number:	Volts DC(NL)	Volts DC	Curr. Ma
W35D-E500-2/1	10.5	6.0	500
W41D-E900-2/1	10.5	6.0	900
W35D-H300-2/1	12.5	9.0	300
W41D-H600-2/1	12.5	9.0	600
W41D-J500-2/1	16.5	12.0	500
W48D-J1000-2/1	16.5	12.0	1000
W41D-L400-2/1	20.7	15.0	400
W48D-L900-2/1	20.7	15.0	900
W48D-Q500-2/1	32.0	24.0	500

All above items in stock & UL listed. Others available as special order.



TYPICAL Case Size	AC/DC A	B	C
W35	40.0 mm (1.57) (in)	57.0 mm (2.25) (in)	36.0 mm (1.42) (in)
W41	50.6 (2.00)	60.0 (2.36)	39.0 (1.54)
W48	61.5 (2.42)	66.1 (2.60)	47.0 (1.85)
W57	69.5 (2.74)	81.5 (3.21)	54.0 (2.12)

EXTERNAL REGULATED LINEAR POWER SUPPLIES

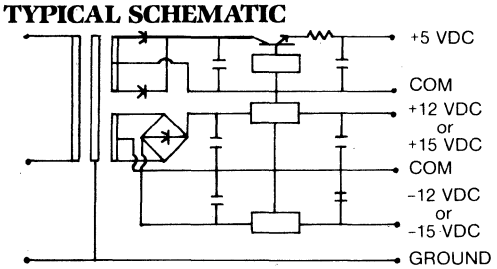
TABLE TOP MODELS

	Output Volts	1 ma	Output Volts	2 ma	Output Volts	3 ma
T48R-05750-G/1	+5	750	—		—	
T66R-052300-G/1	+5	2300	—		—	
T60R-H1500-G/1	+9	1500	—		—	
T60R-J1200-G/1	+12	1200	—		—	
T57R-051500-G/1	+5	1500	—		—	
T66R-M885-G4/1	+5	600	+12	1000	—	
T5121000/1	+5	1000	+12	310	−12	310
T5151000/1	+5	1000	+15	250	−15	250
T512750/1	+5	750	+12	360	−12	360
T515750/1	+5	750	+15	290	−15	290
T512500/1	+5	500	+12	415	−12	415
T515500/1	+5	500	+15	330	−15	330

WALL PLUG-IN MODELS

	Output Volts	1 ma	Output Volts	2 ma	Output Volts	3 ma
WA512750/1	+5	750	+12	80	−12	80
WA515750/1	+5	750	+12	64	−12	64
WA512500/1	+5	500	+12	130	−12	130
W5515500/1	+5	500	+12	105	−12	105

TYPICAL SCHEMATIC



NORTHERN AMPOWER CORPORATION

Designers and Manufacturers
of Standard & Custom Built Power Supplies

The "N40" Series

(0-40 volt, 0-250 amp, D.C. Power Supply)

The N40-250 is a versatile piece of testing equipment that has proved its performance in developmental, life, and durability testing. It was originally designed for testing automotive flasher systems and conforms to SAE J68, J112, J234, J235, J259, J564, J589b, J590e, **J823c**, J945b, J1054, J1056, and J1104 specifications. It can be used to test headlamps, incandescent tungsten lamp loads, radios, light switches, power locks, D.C. motors, solenoids, electro magnets, or virtually any automotive or other **high inrush current** electrical system or component.

Performance Oriented

The N40-250 is a stiff, quick response power supply with ample power for testing complete systems requiring high current capacity.

A Stiff Power Supply

The N40-250 generates and maintains a virtually constant output voltage regardless of load fluctuations. The N40-250 is specifically designed to respond to the high surges encountered with initial startup, thereby testing the product itself rather than the power source.

Quick Response

The N40-250's ability to react to a sudden change in load, at high current rates, is unequalled in the industry. The transient surge recovery response of under 100 microseconds is 1000 times better than conventional SCR methods. Fast response translates to a truer test of your product (nearer to battery characteristics).

Ample Power

Full system testing requires high current capacity to accommodate the load fluctuations from initial surges. The N40-250 delivers what you need, when you need it—consistently and dependably.

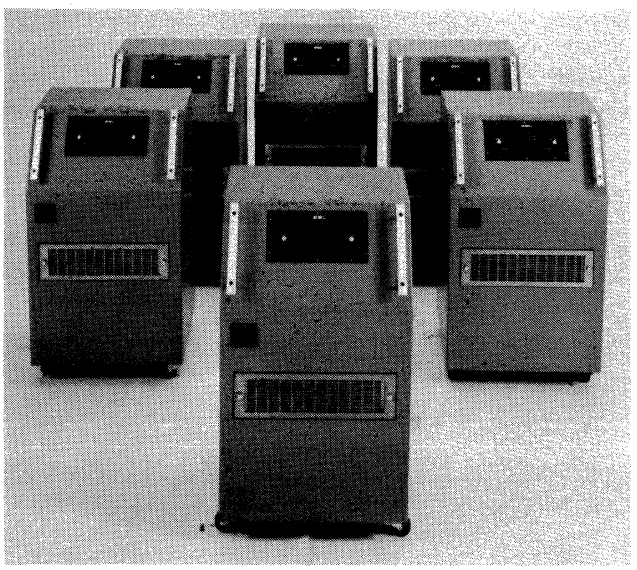
N40 Series Specifications

- **Voltage range**—0 to 40V D.C., continuously variable.
- **Current ranges**—Available in 125 amp increments to 2000 D.C. amps, continuously variable over each range.
- **Voltage regulation**—
  DYNAMIC—Does not deviate more than 1.0 volt from no load to full load. Recovers 63% of maximum excursion within 100 microseconds.
  STATIC—Does not deviate more than 0.2%.
- **Ripple**—75 millivolts, peak to peak, maximum.
- **Overload capability**—Meets all regulation specifications at twice rated current for 0.1 seconds, then automatically reduces current to front panel set value if the overload persists.
- **Input power**—208/230/460V A.C., 3 phase. (Other 3 phase input voltages available on special order.)
- **Physical characteristics**—41.25" height, 22.5" width, 21" depth, 485 lbs. weight. (N40-250 only)

In the real world, inrush current can cause part failures. Testing must not mask these inrushes and the effects of their rapid transitions and recovery cycles if it is to be a valid test of your **product**.

After your product is out in the market is not the time to find out what **our** testing equipment could have revealed. By developing your products with NAC power supplies, you'll push your product in the developmental stages so that it will perform under real life conditions.

Don't find out about your product tomorrow what you could have discovered today. Give us a call. We're ready to meet your needs.



Features

- ***Exceptionally fast transient response***—Recovery from surge to running level in less than 100 microseconds—1000 times faster than conventional SCR methods.

- **Short term 100% overload capability**—In response to initial surges, the N40 series can draw 100% overload (2 times the maximum specified current) without going out of regulation.
- **Current limiting**—In the event of a short circuit or product failure, the current can be limited to a lower level.
- **Provisions for remote sensing**—Remote sensing enables you to sense the voltage at the point nearest to the testing, thereby elliminating the errors caused by the resistance of long output leads.
- **Remote programmability**—The voltage can be remotely controlled with a 0-4 volt D.C. signal (0.1 v/v).
- **Adjustable overvoltage trip point**—When the preset maximum voltage level is exceeded, the unit automatically shuts down. Ideal for protecting valuable prototypes. (Front panel adjustable.)
- **LED fault indicators**—The N40 series provides a clear display of Loss of Phase, Overvoltage, Over temperature, and Current Limit. These indicator lamps are located on the unit's front panel for easy monitoring.
- **Front panel mounted voltmeter and ammeter**—Convenient, easy to read digital display.
- **Front panel circuit breaker**—Reliable protection from overloading with convenient access.
- **A full wattage supply**—Unlike many other power supplies, NAC's N40 series will output full current at any voltage setting.
- **Thermal protection shutdown**—The N40 series' internal fan-cooled heat sink has a temperature sensitive switch which causes shutdown upon cooling failure. This feature eliminates the potential for overheating.
- **Casters and Handles**—The N40 series is built for maneuverability.
- **Quality internal and external components for longevity**—Our products are built to last—many of our early models are still performing in industry today, after 20 years or more.
- **Limited warranty**—We warrant the N40 series to be free from defects in materials and workmanship for three years. Complete warranty policy available on request.

47087 Grand River Novi, Michigan 48374 (313) 349-4860 FAX (313) 349-5692

CUSTOM AC/DC POWER SUPPLIES
CONVERTERS, INVERTERS, CONTROLLERS

FROM WATTS TO MEGAWATTS

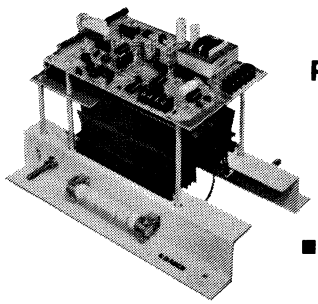
NWL TRANSFORMERS

- AC/AC & AC/DC power supplies and controllers
- Silicon controlled rectifier (SCR) supplies
- High or low amperage and voltage
- Regulated: voltage, current and power
- Polarity reversing power supplies
- Transformers (oil, silicone, water-cooled, epoxy, dry)
- Reactors/chokes/filters

MEP CONTROLS

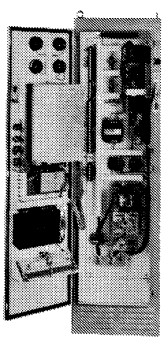
- Full service contract electronic engineering and manufacturing
- Phase angle and zero crossover modular power controllers
- Phase angle and zero crossover analog and microprocessor firing circuits
- Voltage current regulators and current limiters
- DC amplifiers (5 AMP + 25 AMP models)
- Microprocessor Control Systems

TYPICAL OF THE RANGE OF NWL CAPABILITIES . . .

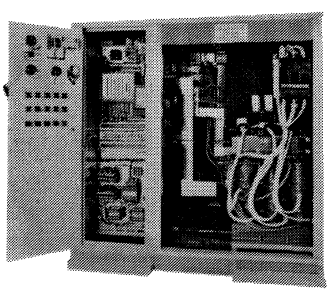


Phase Angle Modular Power Controllers

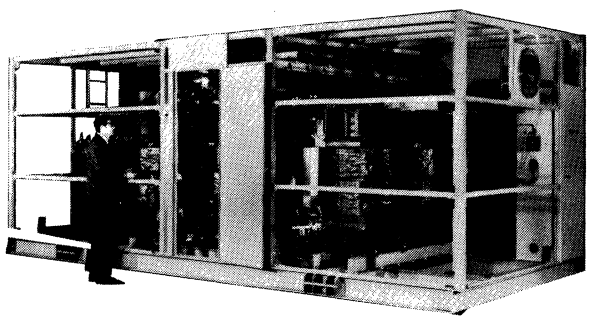
- AC line amperes: from 40 to 495
- "Linear" firing circuit
- RC network and MOV
- SCR's individually fused



Patented Microprocessor based SCR Controller with spark-rate logic for electrostatic precipitator application.



DC Power Supply for Super-conducting Magnets — 0-50 VDC @ 5000 Amps DC. Incorporates 12 pulse output, phase-angle controlled SCR's, L.C. Filter and programmable controller.



6.34 Megawatt Power Supply

• 20-ton unit for Compact Toroid Experiment (CTX). . .entirely produced at NWL's facilities. . .from micro-electronics, to magnetics, to fabrication and assembly, to full-load testing

MANUFACTURING RANGE
Up to 300 KV
1 mA to 50,000 AMP
4 Hz to 50 kHz
1 VA to 6,000 KVA
Dry, Oil-Filled, Silicone Fluid-Filled, Water Cooled, and Epoxy Cast Units Available.

NWL also manufactures various types of power transformers, reactors, chokes. See our full page ad in the transformer section of EEM. Our engineers are available to assist you in selecting magnetic components to meet your application requirements.

NWL TRANSFORMERS

Rising Sun Road, P.O. Box 358, Bordentown, NJ 08505, (609) 298-7300, FAX: (609) 298-1982, Toll Free 1-800-448-1269

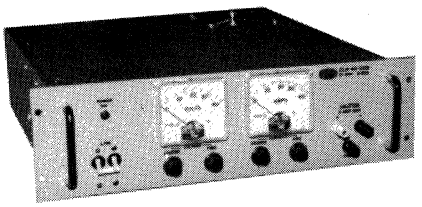
ORAM HIGH VOLTAGE

P.O. BOX 1176, KLEMP ROAD, DAYTON, TX 77535-1176
Telephone: (409) 258-5553 FAX: (409) 258-5555

ORAM CUSTOM DESIGNS AND MANUFACTURES POWER SUPPLIES AND TRANSFORMERS TO ANY SPECIFICATIONS. CONTACT US WITH YOUR REQUIREMENTS.

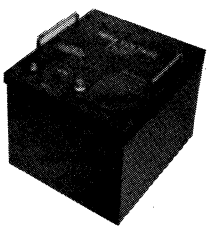
POWER SUPPLIES

Low Voltage/High Current Power Supplies–DLR Series



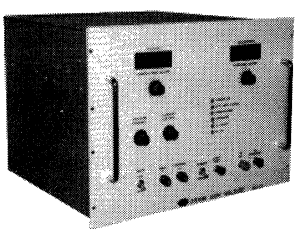
- ☐ Low voltage (up to 1000V DC), high current (up to 5000A).
- ☐ Extremely low ripple with very good regulation and stability.
- ☐ Overcurrent, overvoltage, and overtemperature protection.
- ☐ Available in customer specified enclosures.

Power Packs–P Series



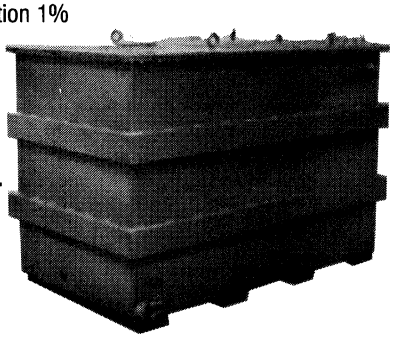
- ☐ Output voltage range from 3KV to 100KV.
- ☐ Output current range from 1mA to 20mA.
- ☐ Single phase input at customer specified input voltage.
- ☐ Fixed output polarity or floating pos-neg output.
- ☐ Oil filled, epoxy filled, or other insulating medium available.
- ☐ Mounting by 1/4-20 mounting studs at bottom of each unit.
- ☐ Surge limiting resistors.
- ☐ Estimated life exceeds 30,000 hours at rated voltage and current.
- ☐ Custom requested features and specifications available.

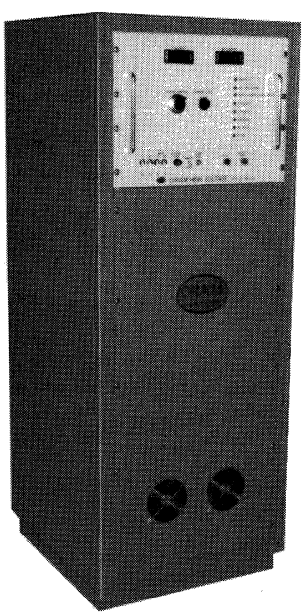
Unregulated High Voltage Power Supplies–DS Series



- ☐ Output voltage range from 1KV to 500KV.
- ☐ Output current range from 1mA to 50A.
- ☐ Adjustable overload and overvoltage trip point.
- ☐ Standard ripple is 2% rms of rated voltage. Ripple reduction of 1/10 or 1/100 is available as an option.
- ☐ Standard enclosure is in a rack mount chassis or customer specified.

Regulated High Voltage Power Supplies–DSR Series





- ☐ Output voltage from 1KV to 500KV.
- ☐ Output current range from 1 milliampere to 50 amperes.
- ☐ Regulated power supply with voltage regulation or current regulation or automatic crossover regulation between voltage and current; regulation 1%
- ☐ Standard is 2% rms of rated voltage. Ripple reduction of 1/10 or 1/100 available as an option.
- ☐ Standard enclosure is in a rack mount chassis or customer specified.

Tube Regulated High Voltage Power Supplies–DTR Series

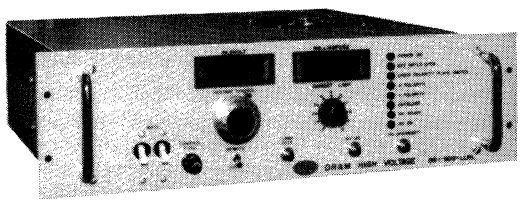
- ☐ Output voltage from 1KV to 500KV; reversible polarity available as an option.
- ☐ Output current range from 1 milliampere to 50 amperes.
- ☐ Standard regulation is ±0.05% for line and load with option for regulation of ±0.01% or ±0.001% for line and load.
- ☐ Standard ripple is 0.05% with option for ripple of 0.01% or 0.001%
- ☐ Stability is 0.02% short term and 0.05% per 8 hour period, better stability available.
- ☐ Standard enclosure is in a rack mount chassis or customer specified.

ORAM HIGH VOLTAGE

P.O. BOX 1176, KLEMP ROAD, DAYTON, TX 77535-1176
Telephone: (409) 258-5553 FAX: (409) 258-5555

Switching Power Supplies–DSF Series

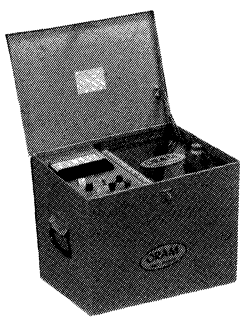
- ☐ Output power level to 10KW; output voltage to 200KV with higher voltage available, please consult factory.
- ☐ Precise regulation with automatic crossover between voltage and current regulation.
- ☐ Standard regulation is ±0.05% for line and load, better regulation available.
- ☐ Ripple is 0.01% rms (0.1% above 100KV).
- ☐ Reversible polarity models available.
- ☐ Remote programming capability.
- ☐ High efficiency at maximum power output.
- ☐ Standard enclosure is in a rack mount chassis or customer specified.



TEST INSTRUMENTS

Liquid Dielectric Testers

- ☐ Voltage Range from 50KV to 90KV.
- ☐ Memory meter to record breakdown voltage.
- ☐ Automatic motorized rise rate with manual dwell at any voltage.
- ☐ Accurately test for breakdown voltage of insulation oils in accordance with ASTM specifications.
- ☐ Customized units Features.



Non-Destructive AC/DC Hipot and Insulation Tester

- ☐ Selectable AC (15KV) or DC (40KV) output with function indicator.
- ☐ Audible failure signal.
- ☐ Continuously adjustable overload sensitivity control from 50μA to 5mA for non-destructive testing.
- ☐ Gravity operated output shorting solenoid.
- ☐ Enclosed in either bench top or 19″ rack mount.
- ☐ Customized units Features.

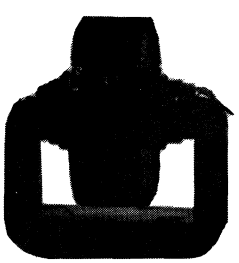
Resistive Voltage Divider

- ☐ High input impedance precision resistive divider network.
- ☐ Wide range of rated voltage, corona free.
- ☐ Accuracy of 0.5%, 0.25% or 0.1% available.
- ☐ Portable compact construction with BNC connectors.
- ☐ Custom division ratios.
- ☐ Digital or analog meter readout.

Transformers are available with a wide variety of voltage ratings and sizes to suit most customer needs.

- ☐ High Voltage—air or oil or epoxy insulation.
- ☐ High Voltage Isolation—air or oil or epoxy insulation.
- ☐ Filament—isolation with air or oil or epoxy insulation.
- ☐ High Voltage Filter Chokes.
- ☐ Saturable Core Reactors.

Transformers features custom designing with customer specified input and output voltage(s). Operation frequency of 60 hertz or 50 hertz or 50/60 hertz or 400 hertz or customer specified operation frequency are available, specify when inquiring.

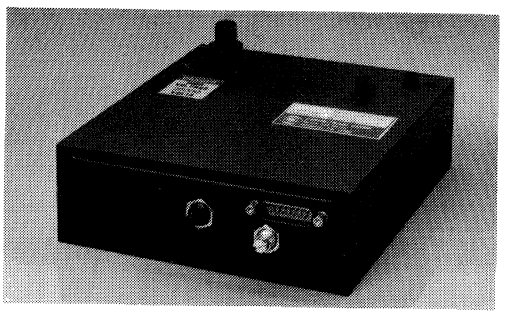


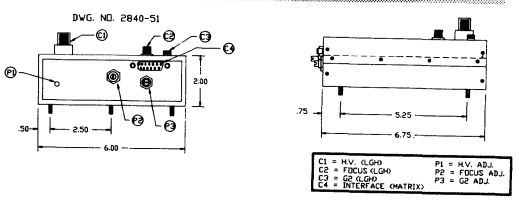
Penn-Tran Corporation

Designers and Manufacturers of CRT Deflection Components

A Spectrum Electronics Corporation

30 Watt High Voltage Power Supply For Military and Airborne Applications MIL HVS 2825





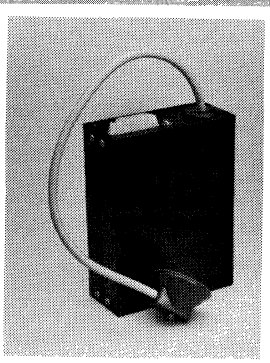
Performance Specifications

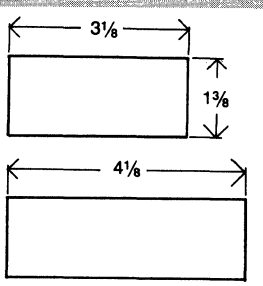
Input	28VDC ± 2 Volts
Anode Voltage	25KV (less than ± 1%)
Anode Current	0-1.2 MA
Ripple (P-P)	7.5 Volts (P-P) @ 1.2 MA
Temperature Coefficient	100 PPM/°C
Line Regulation	.05%
Focus Voltage	5-8 KV
G2 Voltage	200-1000 VDC
G1 Voltage	−150 VDC
Operation Temperature	−55° to 70°C

High Voltage Power Supplies

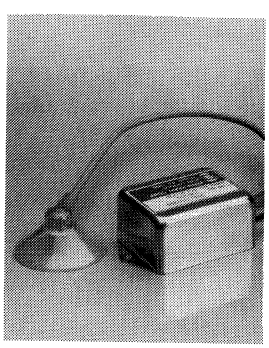
Engineers know us for quality and innovation in the design and manufacture of deflection components for CRT Displays and television cameras. High Voltage Power Supplies are part of the new Penn-Tran's team of deflection components, exactingly designed, manufactured and backed by our 45 years as a pioneer in the field.

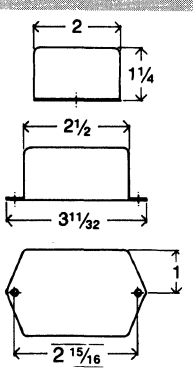
These power supplies are suitable for multiple customer-specified applications, or we will design a prototype to suit your application. UL listed file.



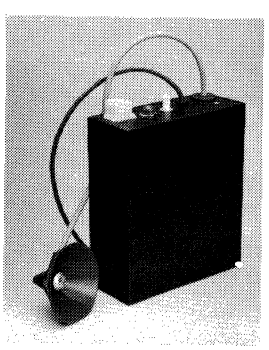


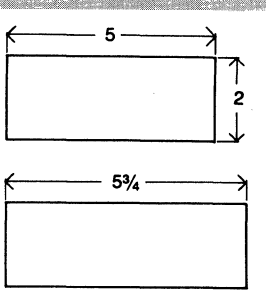
10 Watt -	B+	HV(KV)	SEC	SEC	SEC
HVS 2610	26	10	400	−100	
HVS 2617	26	17	1000	−110	





3 Watt -	B+	HV(KV)	SEC	SEC
HVS 1509	15	9.0	400	−100
HVS 1512	15	12.0	400	−100





30 Watt –	B+	HV(KV)	SEC(KV)	SEC	SEC
HVS 2825	28	25	(5.0-8.0)	(200-1000)	−150
HVS 3625	36	25	(5.5-8.5)	(200-700)	−200

Penn-Tran Corporation Route 144 North, P.O. Box 1321, Wingate, PA 16880
814-355-1521 Fax 814-355-1524

PICO Electronics, Inc.

For engineering assistance or to place an order- Call Toll Free 800-431-1064 • In New York 914-699-5514
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Hi-Reliability Ultra-Miniature DC-DC Converters

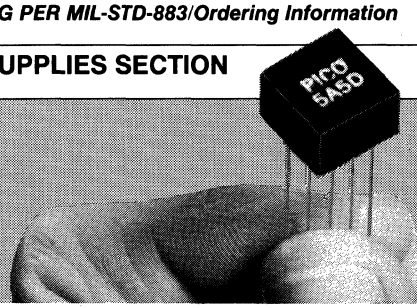
New Series AV
up to 1000 VDC Output
See pages 1922 & 1923

New Series AT
.200 height—
Up to .75 Watts
See pages 1924 & 1925

OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

New Series HVA
70-170V DC Input,
3 Watts
See page 1951

	Page
DC-DC CONVERTERS . . . Series A ***Single and Dual, .5″ × .5″ × .3″ ht., up to 1.25 Watts***	1920 1921
DC-DC CONVERTERS . . . Series AV ***Up to 1000 Volts DC Output 1.25 Watts***	1922 1923
DC-DC CONVERTERS . . . Series AT ***Single and Dual, .200″ ht., up to .75 Watts***	1924 1925
DC-DC CONVERTERS . . . Series B ***Single and Dual, .7″ × 1.12″ × .3″ ht., up to 2.5 Watts***	1926 1927
DC-DC CONVERTERS . . . Series C ***Single and Dual, 1.12″ × 1.24″ × .3″ ht., up to 4 Watts***	1928 1929
DC-DC CONVERTERS . . . Series E ***Single 1.24″ × 1.43″ × .4″ ht.-Dual 1.12″ × 2″ × .4″ ht., up to 7 Watts***	1930 1931
DC-DC CONVERTERS . . . Series FR, Regulated ***Single and Dual .5″ × 1″ × .3″ ht. up to 1 Watt***	1932
DC-DC CONVERTERS . . . Series GR, Regulated ***Single and Dual 1.125″ × 2.25″ × .350″ ht. up to 3.5 Watts***	1933
MILITARY DC-DC CONVERTERS . . . Series M ***Single and Dual, up to 1.25 Watts***	1934 1935
MILITARY DC-DC CONVERTERS . . . Series MR ***Wide Input Voltage, Single and Dual Ouputs***	1936 1937
DC-DC CONVERTERS . . . Series LR, Regulated, Isolated ***Single and Dual, Wide Input Range 5 to 60 Volts, up to 5 Watts***	1938 1939
DC-DC CONVERTERS . . . Series PLR Regulated ***Single and Dual, Wide Input Range up to 5 Watts, .300″ max. ht.***	1940 1941
DC-DC CONVERTERS . . . Series IR, Regulated, Isolated ***Single and Dual, Wide Input Range 5 to 60 Volts, up to 10 Watts***	1942 1943
DC-DC CONVERTERS . . . Series JR, Regulated, Isolated ***Single and Dual, Wide Input Range 18 to 60 Volts, up to 15 Watts***	1944 1945
DC-DC CONVERTERS . . . Series KR, Regulated, Isolated ***Single and Dual, Wide Input Range 18 to 60 Volts, up to 20 Watts***	1946 1947
DC-DC CONVERTERS . . . Series NR, Regulated ***Single, Dual and New Triple Wide Input 18 to 72 Volts, up to 30 Watts***	1948 1949
DC-DC CONVERTERS . . . Series HR, and HRL, Regulated ***Single output up to 12 Watts***	1950
DC-DC CONVERTERS . . . Series HVA, Regulated, Isolated ***70-170VDC Input, 3 Watts***	1951
OPTIONAL SCREENING PER MIL-STD-883/Ordering Information	1952
AC-DC POWER SUPPLIES SECTION	1953 through 1959



SERIES A

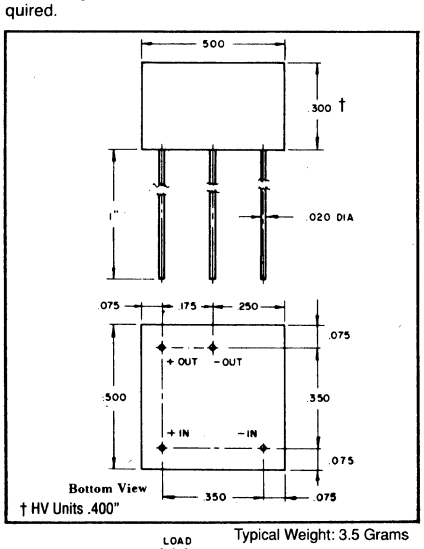
OPTIONS AVAILABLE
- *Expanded operating temp (−55°C to +85°C)*
- *Stabilization Bake (125°C ambient)*
- *Temperature Cycle (−55°C to +125°C)*
- *Hi Temp, full power burn in (100% power, 125°C case temp)*

Hi Reliability Ultra-Miniature DC-DC Converters

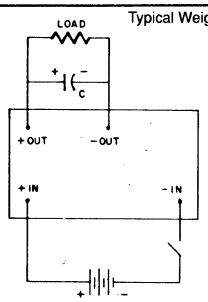
FEATURES
- Up to 1.25 watt output at 70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size (0.3" Height)
- 5 input voltage ranges 5, 12, 24, 28 and 48V DC
- 100 megohm @ 500V DC isolation
- Input/output isolation
- Single and dual output
- No heat sink required
- Up to 250V Output

New Series AT .200 height— Up to .75 Watts See Pages 1924-1925

This series of unregulated DC-DC converters are produced in an ultra-miniature encapsulated package. 84 different models are available. The units feature single and dual outputs. They will operate over the temperature range of −25°C to +70°C. No heat sink is required.



Typical Weight: 3.5 Grams

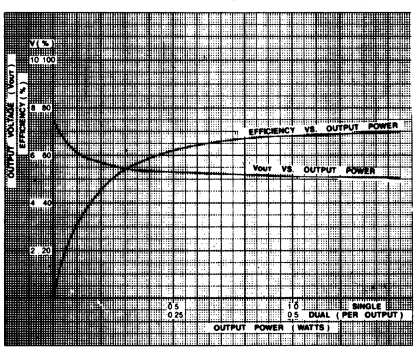


SERIES A - SINGLE OUTPUT

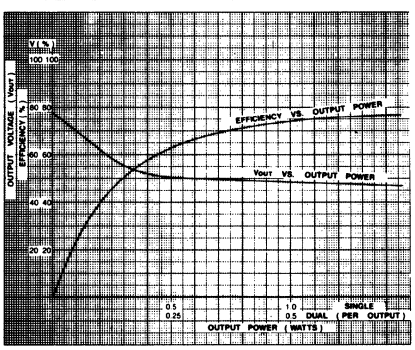
PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1–24
5A5S	5	5	200	1	66	303	0.20	65	±0.25	56.55
5A9S	5	9	139	1.25	73	342	0.15	80	±0.3	56.55
5A12S	5	12	104	1.25	73	342	0.15	80	±0.4	56.55
5A15S	5	15	83	1.25	75	333	0.12	90	±0.4	56.55
5A24S	5	24	52	1.25	75	333	0.10	90	±0.5	56.55
5A28S	5	28	45	1.25	74	338	0.10	90	±0.5	56.55
5A48S	5	48	26	1.25	77	325	0.10	90	±0.7	56.55
5A100S	5	100	12.5	1.25	78	321	0.90	90	±3.0	80.12 †
5A150S	5	150	8.3	1.25	76	329	0.90	100	±3.0	80.12 †
5A200S	5	200	6.25	1.25	75	333	0.90	100	±3.0	80.12 †
5A250S	5	250	5	1.25	75	333	0.90	100	±3.0	80.12 †
12A5S	12	5	200	1	66	126	0.20	24	±0.25	56.55
12A9S	12	9	139	1.25	74	141	0.15	26	±0.3	56.55
12A12S	12	12	104	1.25	76	137	0.15	26	±0.4	56.55
12A15S	12	15	83	1.25	78	134	0.15	26	±0.4	56.55
12A24S	12	24	52	1.25	78	134	0.15	26	±0.5	56.55
12A28S	12	28	45	1.25	77	135	0.15	26	±0.5	56.55
12A48S	12	48	26	1.25	80	130	0.20	26	±0.7	56.55
12A100S	12	100	12.5	1.25	80	130	0.90	30	±3.0	80.12 †
12A150S	12	150	8.3	1.25	79	132	0.90	35	±3.0	80.12 †
12A200S	12	200	6.25	1.25	78	134	0.90	35	±3.0	80.12 †
12A250S	12	250	5	1.25	75	139	0.90	40	±3.0	80.12 †
24A5S	24	5	200	1	66	63	0.20	13	±0.25	56.55
24A9S	24	9	139	1.25	72	72	0.20	15	±0.3	56.55
24A12S	24	12	104	1.25	75	69	0.20	15	±0.4	56.55
24A15S	24	15	83	1.25	75	69	0.20	15	±0.4	56.55
24A24S	24	24	52	1.25	78	67	0.20	15	±0.5	56.55
24A28S	24	28	45	1.25	77	68	0.20	15	±0.5	56.55
24A48S	24	48	26	1.25	78	67	0.25	16	±0.7	56.55
24A100S	24	100	12.5	1.25	76	69	0.90	20	±3.0	80.12 †
24A150S	24	150	8.3	1.25	73	71	0.90	25	±3.0	80.12 †
24A200S	24	200	6.25	1.25	73	71	0.90	25	±3.0	80.12 †
24A250S	24	250	5	1.25	70	74	0.90	25	±3.0	80.12 †
28A5S	28	5	200	1	66	54	0.20	12	±0.25	56.55
28A9S	28	9	139	1.25	72	62	0.20	14	±0.3	56.55
28A12S	28	12	104	1.25	72	62	0.20	14	±0.4	56.55
28A15S	28	15	83	1.25	73	61	0.20	14	±0.4	56.55
28A24S	28	24	52	1.25	76	59	0.20	14	±0.5	56.55
28A28S	28	28	45	1.25	76	59	0.20	14	±0.5	56.55
28A48S	28	48	26	1.25	77	58	0.25	15	±0.7	56.55
28A100S	28	100	12.5	1.25	75	60	0.90	20	±3.0	80.12 †
28A150S	28	150	8.3	1.25	76	59	0.90	25	±3.0	80.12 †
28A200S	28	200	6.25	1.25	75	60	0.90	25	±3.0	80.12 †
28A250S	28	250	5	1.25	70	64	0.90	25	±3.0	80.12 †
48A5S	48	5	200	1	66	32	0.25	6	±0.25	60.70
48A9S	48	9	139	1.25	72	36	0.25	8	±0.3	60.70
48A12S	48	12	104	1.25	73	36	0.25	8	±0.4	60.70
48A15S	48	15	83	1.25	72	36	0.25	8	±0.4	60.70
48A24S	48	24	52	1.25	76	34	0.25	9	±0.5	60.70
48A28S	48	28	45	1.25	76	34	0.25	9	±0.5	60.70

*FOR UNITS WITH OUTPUT VOLTAGES UP TO 48 VOLTS, RIPPLE IS MEASURED WITH 10µF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR ACROSS THE OUTPUT.
FOR UNITS WITH OUTPUT VOLTAGE OF 100-250 VOLTS USE A 0.1µF, 300 VOLT CAPACITOR ACROSS OUTPUT, AND MAINTAIN AT LEAST 10% OF RATED LOAD TO PREVENT A VOLTAGE SURGE.
† HV Units .400"

SERIES A SINGLE & DUAL 12V-5V



SERIES A SINGLE & DUAL 5V-48V



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FAX 914-699-5565
PICO Electronics, Inc.

Low Profile .5"×.5"×.3" Height! . . . up to 1.25 Watts

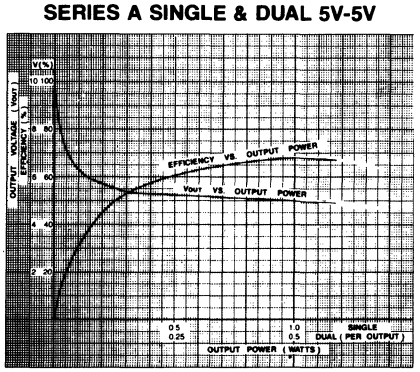
SERIES A - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5A5D	5	±5	100	0.5	66	303	0.20	65	±0.25	63.93
5A9D	5	±9	69	0.625	73	342	0.15	80	±0.3	63.93
5A12D	5	±12	52	0.625	73	342	0.15	80	±0.4	63.93
5A15D	5	±15	42	0.625	75	333	0.12	90	±0.4	63.93
5A24D	5	±24	26	0.625	75	333	0.10	90	±0.5	63.93
5A28D	5	±28	22	0.625	74	338	0.10	90	±0.5	63.93
5A48D	5	±48	13	0.625	77	325	0.10	90	±0.7	63.93
12A5D	12	±5	100	0.5	66	126	0.20	24	±0.25	63.93
12A9D	12	±9	69	0.625	74	141	0.15	26	±0.3	63.93
12A12D	12	±12	52	0.625	76	137	0.15	26	±0.4	63.93
12A15D	12	±15	42	0.625	78	134	0.15	26	±0.4	53.35
12A24D	12	±24	26	0.625	78	134	0.15	26	±0.5	53.35
12A28D	12	±28	22	0.625	77	135	0.15	26	±0.5	63.93
12A48D	12	±48	13	0.625	80	130	0.20	26	±0.7	63.93
24A5D	24	±5	100	0.5	66	63	0.20	13	±0.25	63.93
24A9D	24	±9	69	0.625	72	72	0.20	15	±0.3	63.93
24A12D	24	±12	52	0.625	75	69	0.20	15	±0.4	63.93
24A15D	24	±15	42	0.625	75	69	0.20	15	±0.4	63.93
24A24D	24	±24	26	0.625	78	67	0.20	15	±0.5	63.93
24A28D	24	±28	22	0.625	77	68	0.20	15	±0.5	63.93
24A48D	24	±48	13	0.625	78	67	0.25	16	±0.7	63.93
28A5D	28	±5	100	0.5	66	54	0.20	12	±0.25	63.93
28A9D	28	±9	69	0.625	72	62	0.20	14	±0.3	63.93
28A12D	28	±12	52	0.625	72	62	0.20	14	±0.4	63.93
28A15D	28	±15	42	0.625	73	61	0.20	14	±0.4	63.93
28A24D	28	±24	26	0.625	76	59	0.20	14	±0.5	63.93
28A28D	28	±28	22	0.625	76	59	0.20	14	±0.5	63.93
28A48D	28	±48	13	0.625	77	58	0.25	15	±0.7	63.93
48A5D	48	±5	100	0.5	66	32	0.25	6	±0.25	68.63
48A9D	48	±9	69	0.625	72	36	0.25	8	±0.3	68.63
48A12D	48	±12	52	0.625	73	36	0.25	8	±0.4	68.63
48A15D	48	±15	42	0.625	72	36	0.25	8	±0.4	68.63
48A24D	48	±24	26	0.625	76	34	0.25	9	±0.5	68.63
48A28D	48	±28	22	0.625	76	34	0.25	9	±0.5	68.63

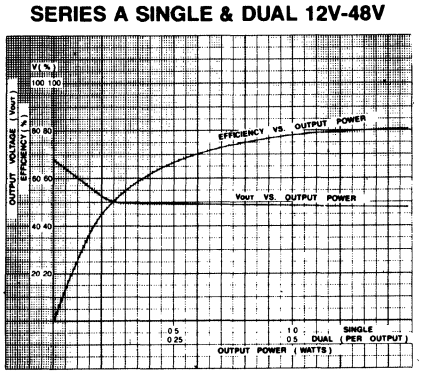
*FOR UNITS WITH OUTPUT VOLTAGES UP TO 48 VOLTS, RIPPLE IS MEASURED WITH 10μF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR ACROSS EACH OUTPUT.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

SERIES A SINGLE & DUAL 5V-5V



SERIES A SINGLE & DUAL 12V-48V



TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT*

Input voltage range: 5V models 4 to 6.5V DC
12V models 9 to 15V DC
24V models 17 to 28V DC
28V models 21 to 32V DC
48V models 25 to 50V DC

Output voltage tolerance at full load:
5V models ± 0.25V
9V models ± 0.3V
12V & 15V models ± 0.4V
24V & 28V models ± 0.5V
48V models ± 0.7V
100V, 150V, 200V & 250V models ± 3.0V

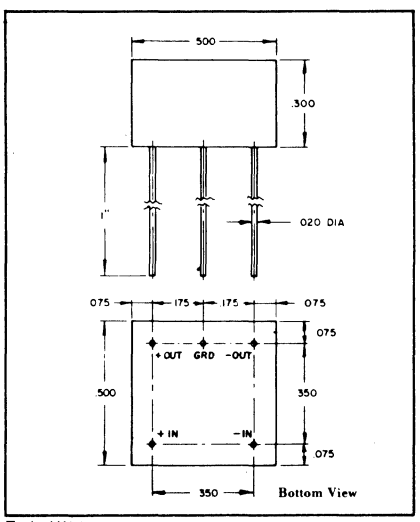
Converter frequency: 20 – 40 KHz

Output temperature coefficient:
0.05%/°C for 5V output.
0.04%/°C for 12 & 15V output.
0.02%/°C for 24, 28, 48, 100, 150, 200 and 250 volt outputs

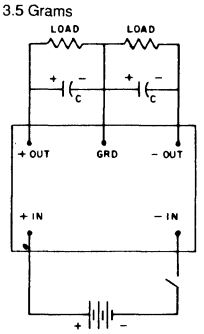
Operating temperature: –25°C to +70°C ambient. No heat sink is required.

Storage temperature: –55°C to +125°C

Isolation: 100 megohms min. @ 500V DC



Typical Weight: 3.5 Grams



PICO Electronics, Inc.
453 North Mac Questen Pkwy.
Mt. Vernon, New York 10552

Delivery— stock to one week

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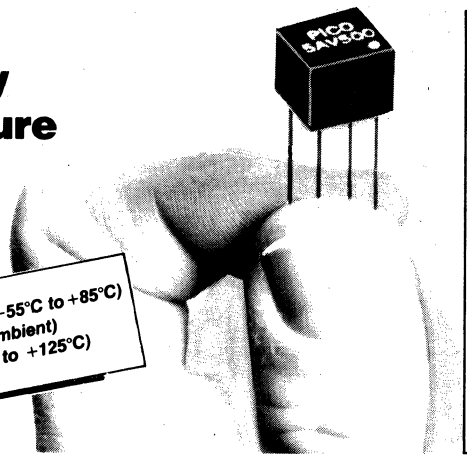
SERIES AV

Hi Voltage Hi Reliability Ultra-Miniature DC-DC Converters

.400 ht. up to 500 VDC output



OPTIONS AVAILABLE
- Expanded operating temp (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, burn in

- 1.25 watt output at 70° ambient
- Ultra-miniature size 0.400" height, 4.0 grams weight, 0.1 cubic inches volume
- 4 input voltage ranges 5, 12, 24 and 28 VDC
- 100 megohm @ 1000 VDC input/output isolation
- MIL-STD 883 options available
- No heat sink or electrical derating required

This series of unregulated high voltage DC-DC converters are produced in an ultra-miniature encapsulated package. 36 different models are available. These single output isolated units will operate over the temperature range of −25° to +70°C with no heat sink or electrical derating. For military applications an operating temperature range −55°C to +85°C is available. An optional environmental screening package per MIL-STD-883 is also available.

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT*

Input voltage range: ±10% all models

Output voltage tolerance at full load–nominal input: See chart for specific model. Please keep loaded to minimum of 10% at all times.

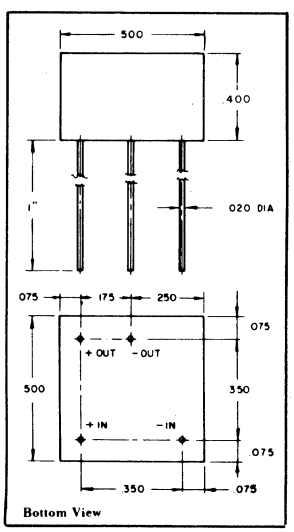
Converter frequency: 20 – 40 KHz

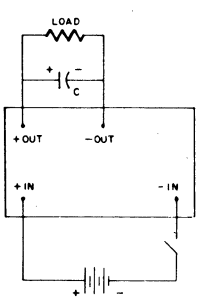
Output temperature coefficient: 0.02%/°C for all models

Operating temperature: −25°C to + 70°C ambient. No heat sink.

Storage temperature: −55°C to +125°C

Isolation: 100 megohms min. @ 1000V DC



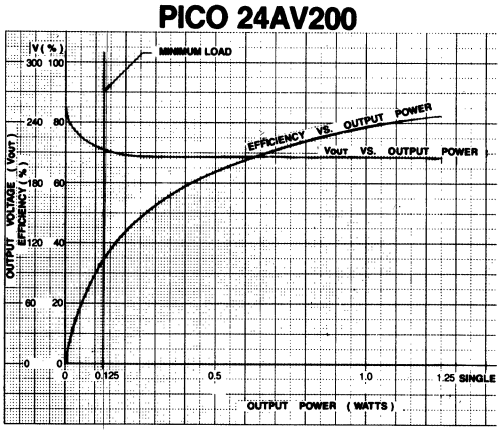


SERIES AV - SINGLE OUTPUT

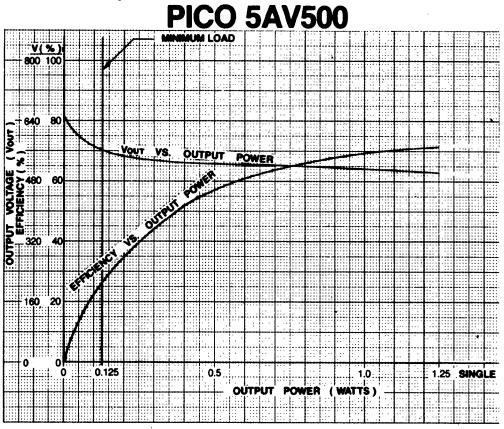
PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (Vp-p max)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5AV100	5	100	12.50	1.25	78	321	0.90	±3.0	80.12
5AV150	5	150	8.30	1.25	76	329	0.90	±3.0	80.12
5AV200	5	200	6.25	1.25	75	333	0.90	±3.0	80.12
5AV250	5	250	5.00	1.25	75	333	0.90	±3.0	80.12
5AV300	5	300	4.16	1.25	70	357	1.20	±5.0	99.00
5AV350	5	350	3.57	1.25	70	357	1.20	±5.0	99.00
5AV400	5	400	3.12	1.25	70	357	1.20	±5.0	99.00
5AV450	5	450	2.77	1.25	70	357	1.50	±5.0	99.00
5AV500	5	500	2.50	1.25	70	285	1.50	±5.0	99.00
12AV100	12	100	12.50	1.25	80	130	0.90	±3.0	80.12
12AV150	12	150	8.30	1.25	79	132	0.90	±3.0	80.12
12AV200	12	200	6.25	1.25	78	134	0.90	±3.0	80.12
12AV250	12	250	5.00	1.25	75	139	0.90	±3.0	80.12
12AV300	12	300	4.16	1.25	75	139	1.20	±5.0	99.00
12AV350	12	350	3.57	1.25	75	139	1.20	±5.0	99.00
12AV400	12	400	3.12	1.25	75	139	1.20	±5.0	99.00
12AV450	12	450	2.77	1.25	75	139	1.50	±5.0	99.00
12AV500	12	500	2.50	1.25	75	111	1.50	±5.0	99.00
24AV100	24	100	12.50	1.25	76	69	0.90	±3.0	80.12
24AV150	24	150	8.30	1.25	73	71	0.90	±3.0	80.12
24AV200	24	200	6.25	1.25	73	71	0.90	±3.0	80.12
24AV250	24	250	5.00	1.25	70	74	0.90	±3.0	80.12
24AV300	24	300	4.16	1.25	73	71	1.20	±5.0	99.00
24AV350	24	350	3.57	1.25	73	71	1.20	±5.0	99.00
24AV400	24	400	3.12	1.25	73	71	1.20	±5.0	99.00
24AV450	24	450	2.77	1.25	73	71	1.50	±5.0	99.00
24AV500	24	500	2.50	1.25	73	57	1.50	±5.0	99.00
28AV100	28	100	12.50	1.25	75	60	0.90	±3.0	80.12
28AV150	28	150	8.30	1.25	76	59	0.90	±3.0	80.12
28AV200	28	200	6.25	1.25	75	60	0.90	±3.0	80.12
28AV250	28	250	5.00	1.25	70	64	0.90	±3.0	80.12
28AV300	28	300	4.16	1.25	73	61	1.20	±5.0	99.00
28AV350	28	350	3.57	1.25	73	61	1.20	±5.0	99.00
28AV400	28	400	3.12	1.25	73	61	1.20	±5.0	99.00
28AV450	28	450	2.77	1.25	73	61	1.50	±5.0	99.00
28AV500	28	500	2.50	1.25	73	49	1.50	±5.0	99.00

*Measured using 0.1μf, 1000 Volt DC capacitor across output and maintain at least 10% of load at all times to prevent voltage surge.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

PICO 24AV200



PICO 5AV500



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PICO Electronics, Inc.

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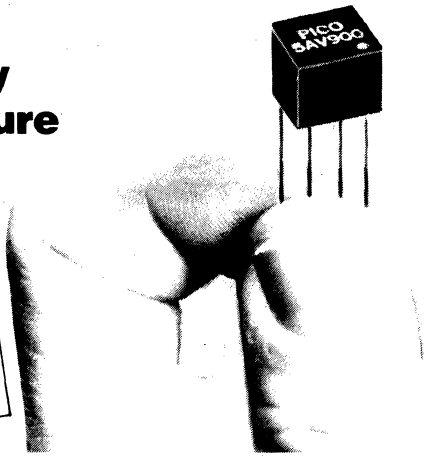
SERIES AV

Hi Voltage
Hi Reliability
Ultra-Miniature
DC-DC
Converters

.500 ht. up to 1000 VDC output



OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, burn in

- 1.25 watt output at 70° ambient
- Ultra-miniature size 0.500″ height, 4.0 grams weight, .125 cubic inches volume
- 4 input voltage ranges 5, 12, 24 and 28 VDC
- 100 megohm @ 1500 VDC input/output isolation
- MIL-STD 883 options available
- No heat sink or electrical derating available

This series of unregulated high voltage DC-DC converters are produced in an ultra-miniature encapsulated package. 20 different models are available. These single output isolated units will operate over the temperature range of −25° to +70°C with no heat sink or electrical derating. For military applications an operating temperature range −55°C to +85°C is available. An optional environmental screening package per MIL-STD-883 is also available.

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT*

Input voltage range: ±10% all models

Output voltage tolerance at full load–nominal input:- See chart for specific model. Please keep loaded to minimum of 10% at all times.

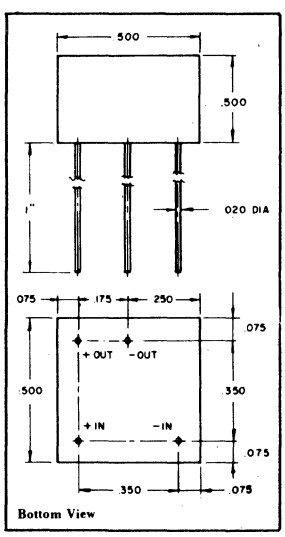
Converter frequency: 20 – 40 KHz

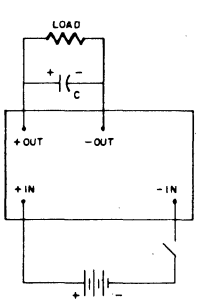
Output temperature coefficient: 0.02%/°C for all models

Operating temperature: −25°C to + 70°C ambient. No heat sink.

Storage temperature: −55°C to +125°C

Isolation: 100 megohms min. @ 1500V DC



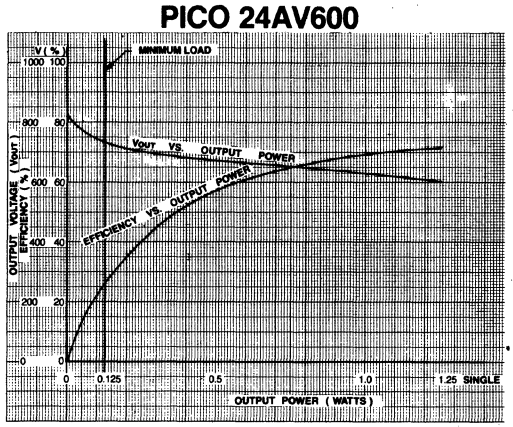


SERIES AV - SINGLE OUTPUT

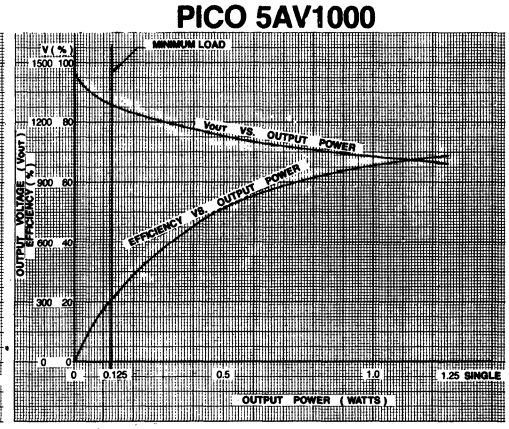
PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (Vp-p max)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1–24
5AV600	5	600	2.08	1.25	70	357	3.0	±10V	120.00
5AV700	5	700	1.79	1.25	70	357	3.0	±15V	120.00
5AV800	5	800	1.56	1.25	70	357	3.0	±15V	120.00
5AV900	5	900	1.39	1.25	70	357	3.0	±20V	120.00
5AV1000	5	1000	1.25	1.25	70	357	3.0	±20V	120.00
12AV600	12	600	2.08	1.25	70	149	3.0	±10V	120.00
12AV700	12	700	1.79	1.25	70	149	3.0	±15V	120.00
12AV800	12	800	1.56	1.25	70	149	3.0	±15V	120.00
12AV900	12	900	1.39	1.25	70	149	3.0	±20V	120.00
12AV1000	12	1000	1.25	1.25	70	149	3.0	±20V	120.00
24AV600	24	600	2.08	1.25	70	74	3.0	±10V	120.00
24AV700	24	700	1.79	1.25	70	74	3.0	±15V	120.00
24AV800	24	800	1.56	1.25	70	74	3.0	±15V	120.00
24AV900	24	900	1.39	1.25	70	74	3.0	±20V	120.00
24AV1000	24	1000	1.25	1.25	70	74	3.0	±20V	120.00
28AV600	28	600	2.08	1.25	70	64	3.0	±10V	120.00
28AV700	28	700	1.79	1.25	70	64	3.0	±15V	120.00
28AV800	28	800	1.56	1.25	70	64	3.0	±15V	120.00
28AV900	28	900	1.39	1.25	70	64	3.0	±20V	120.00
28AV1000	28	1000	1.25	1.25	70	64	3.0	±20V	120.00

*Measured using 0.01 μf, 3000 Volt DC capacitor across output and maintain at least 10% of load at all times to prevent voltage surge.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

PICO 24AV600



PICO 5AV1000



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PICO Electronics, Inc.

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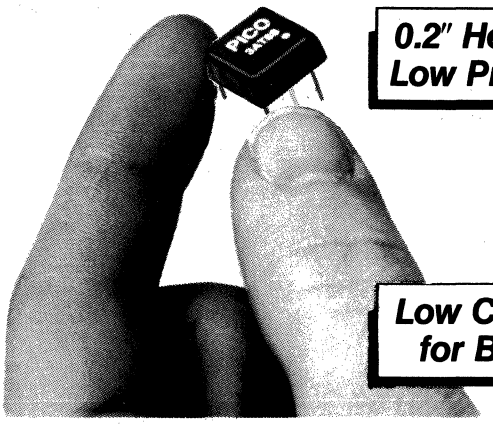
SERIES AT

High Reliability Ultra-Miniature, 0.2″ ht. DC-DC Converters

OPTIONS AVAILABLE
- Expanded operating temp (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)



0.2″ Height Low Profile

No External Components Required

Low Current Consumption for Battery Applications

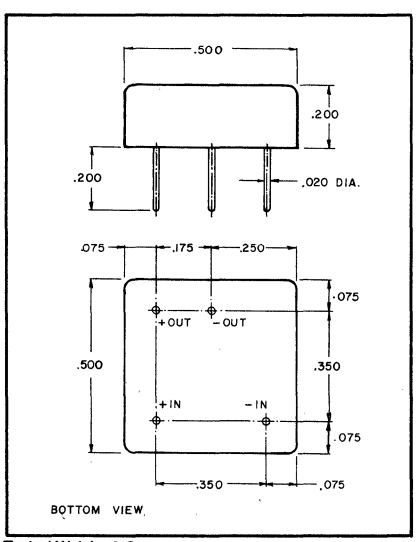
FEATURES
- Ultra-miniature, 0.200″ height
- Low current consumption
- No external components required
- 4 convenient input voltages, 3-5-9-12V DC
- Up to 0.75 watt output at 20°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Single and dual outputs
- Isolated: 100 megohms at 500V DC
- No heat sink required

This series of unregulated DC-DC converters offer you a 0.200″ tall, package. 24 different models are available and all offer very low current consumption to operate in battery driven circuits. Isolated, single and dual outputs will operate from −25°C to +70°C with no heat sink or derating required. Built-in output capacitors and 4 convenient input voltages also help in simplifying your design.

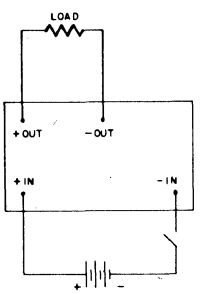
SERIES AT-SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
3AT5S	3	5	130	0.65	66	328	0.15	35	±0.25	84.82
3AT12S	3	12	63	0.75	72	347	0.15	35	±0.40	84.82
3AT15S	3	15	50	0.75	73	342	0.15	35	±0.40	84.82
5AT5S	5	5	150	0.75	69	217	0.15	25	±0.25	84.82
5AT12S	5	12	63	0.75	75	200	0.15	25	±0.40	84.82
5AT15S	5	15	50	0.75	76	197	0.15	25	±0.40	84.82
9AT5S	9	5	150	0.75	70	119	0.15	8	±0.25	84.25
9AT12S	9	12	63	0.75	78	107	0.15	8	±0.40	84.82
9AT15S	9	15	50	0.75	80	104	0.15	8	±0.40	84.82
12AT5S	12	5	150	0.75	71	88	0.15	8	±0.25	84.82
12AT12S	12	12	63	0.75	78	80	0.15	8	±0.40	84.82
12AT15S	12	15	50	0.75	80	78	0.15	8	±0.40	84.82

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

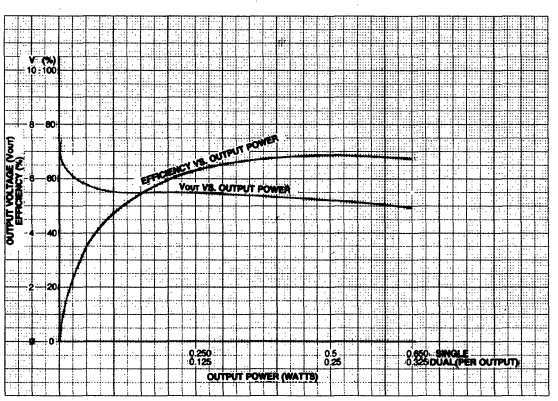


Typical Weight: 3 Grams

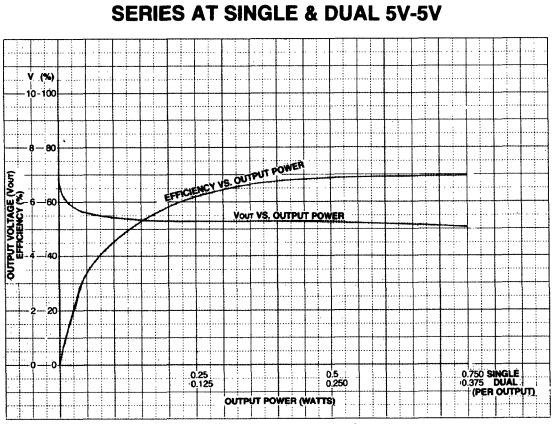


Delivery— stock to one week

SERIES AT SINGLE & DUAL 3V-5V

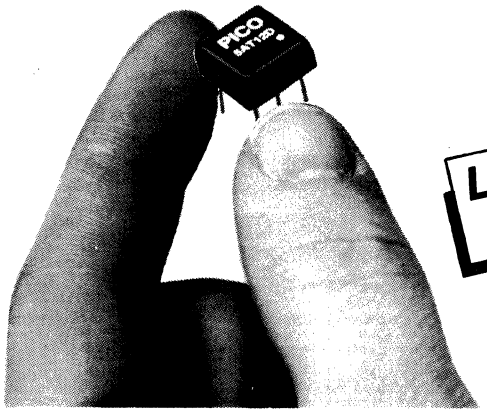


SERIES AT SINGLE & DUAL 5V-5V



For immediate engineering assistance or to place an order—
Call Toll Free 800-431-1064

PICO Electronics, Inc.
453 North MacQuesten Pkwy., Mt. Vernon, N.Y. 10552
914-699-5514 • FAX 914-699-5565



Low Profile .5″ × .5″ × .2″ Height!
. . . up to 0.75 Watts

No External Components Required

SERIES AT-DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
3AT5D	3	±5	65	0.325	66	328	0.15	35	±0.25	95.89
3AT12D	3	±12	31	0.375	72	347	0.15	35	±0.40	95.89
3AT15D	3	±15	25	0.375	73	342	0.15	35	±0.40	95.89
5AT5D	5	±5	75	0.375	69	217	0.15	25	±0.25	95.89
5AT12D	5	±12	31	0.375	75	200	0.15	25	±0.40	95.89
5AT15D	5	±15	25	0.375	76	197	0.15	25	±0.40	95.89
9AT5D	9	±5	75	0.375	70	119	0.15	8	±0.25	95.89
9AT12D	9	±12	31	0.375	78	107	0.15	8	±0.40	95.89
9AT15D	9	±15	25	0.375	80	104	0.15	8	±0.40	95.89
12AT5D	12	±5	75	0.375	71	88	0.15	8	±0.25	95.89
12AT12D	12	±12	31	0.375	78	80	0.15	8	±0.40	95.89
12AT15D	12	±15	25	0.375	80	78	0.15	8	±0.40	95.89

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: OUTPUT VOLTAGE IS DIRECTLY PROPORTIONAL TO THE INPUT VOLTAGE.

Input voltage range: 3V models 2.5 to 3.5V DC
5V models 4 to 6V DC
9V models 7 to 11V DC
12V models 9 to 14V DC

Converter frequency: 50 to 70 KHz

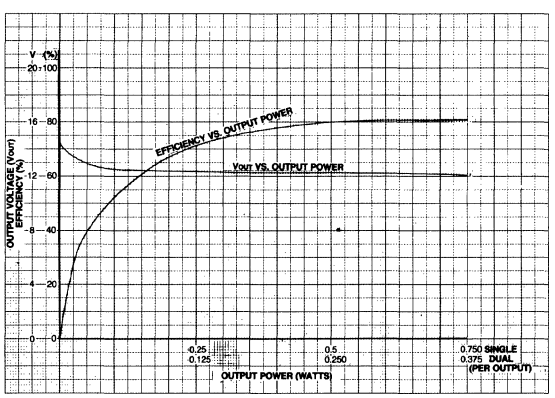
Output temperature coefficient: 0.05% per °C all models

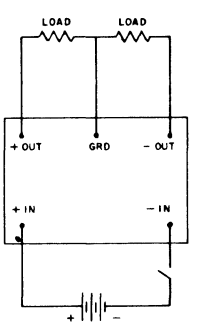
Operating temperature: −25°C to +70°C ambient. No heat sink or derating required.

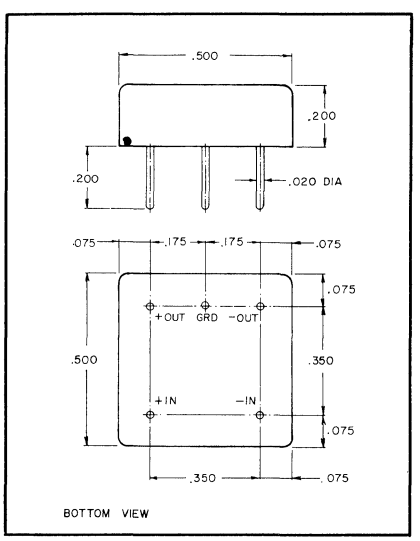
Storage temperature: −55°C to +125°C

Isolation: 100 megohms min. @ 500V DC

SERIES AT SINGLE & DUAL 9V-12V

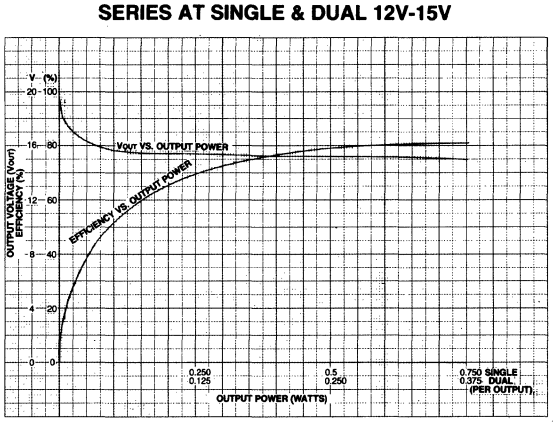






Typical Weight: 3 Grams

SERIES AT SINGLE & DUAL 12V-15V



Delivery— stock to one week

For immediate engineering assistance or to place an order—
Call Toll Free 800-431-1064

PICO Electronics, Inc.
453 North MacQuesten Pkwy., Mt. Vernon, N.Y. 10552
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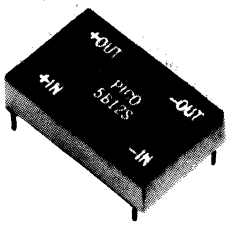
SERIES B
Hi Reliability Ultra-Miniature DC-DC Converters Up to 2.5 Watts

FEATURES

- Up to 2.5 watt output at 70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size (0.3" Height)
- 5 input voltage ranges 5, 12, 24, 28 and 48V DC
- 100 megohm @ 500V DC isolation
- Single and dual isolated output
- No heat sink required

This series of unregulated DC-DC converters comes in a miniaturized encapsulated package. 68 different models are available. The units feature single and isolated dual outputs. They will operate over the temperature range of −25°C to +70°C. No heat sink is required.

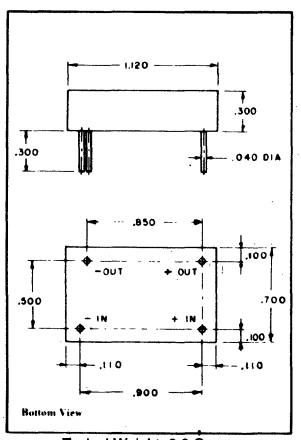


OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

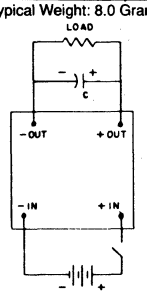
SERIES B - SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5B5S	5	5	300	1.5	67	447	0.15	90	±0.25	48.19
5B9S	5	9	167	1.5	73	411	0.15	90	±0.3	48.19
5B12S	5	12	125	1.5	75	400	0.15	90	±0.4	48.19
5B15S	5	15	100	1.5	75	400	0.15	90	±0.4	48.19
5B24S	5	24	63	1.5	78	385	0.15	90	±0.5	48.19
5B28S	5	28	54	1.5	78	385	0.15	90	±0.5	48.19
5B48S	5	48	31	1.5	79	380	0.15	90	±0.7	48.19
12B5S	12	5	300	1.5	69	182	0.15	40	±0.25	48.19
12B9S	12	9	222	2.0	76	219	0.15	40	±0.3	48.19
12B12S	12	12	167	2.0	78	214	0.15	40	±0.4	48.19
12B15S	12	15	133	2.0	78	214	0.15	40	±0.4	48.19
12B24S	12	24	83	2.0	80	208	0.15	40	±0.5	48.19
12B28S	12	28	71	2.0	80	208	0.15	40	±0.5	48.19
12B48S	12	48	42	2.0	80	208	0.15	40	±0.7	48.19
24B5S	24	5	300	1.5	69	91	0.15	10	±0.25	48.19
24B9S	24	9	222	2.0	76	110	0.15	15	±0.3	48.19
24B12S	24	12	167	2.0	78	107	0.15	15	±0.4	48.19
24B15S	24	15	133	2.0	78	107	0.15	15	±0.4	48.19
24B24S	24	24	104	2.5	82	127	0.15	15	±0.5	48.19
24B28S	24	28	89	2.5	81	129	0.15	15	±0.5	48.19
24B48S	24	48	52	2.5	82	127	0.15	15	±0.7	48.19
28B5S	28	5	300	1.5	67	80	0.15	15	±0.25	48.19
28B9S	28	9	222	2.0	75	95	0.15	15	±0.3	48.19
28B12S	28	12	167	2.0	77	93	0.15	15	±0.4	48.19
28B15S	28	15	133	2.0	77	93	0.15	15	±0.4	48.19
28B24S	28	24	104	2.5	81	110	0.15	15	±0.5	48.19
28B28S	28	28	89	2.5	81	110	0.15	15	±0.5	48.19
28B48S	28	48	52	2.5	82	109	0.15	15	±0.7	48.19
48B5S	48	5	300	1.5	71	44	0.20	3	±0.25	51.70
48B9S	48	9	222	2.0	76	55	0.20	3	±0.3	51.70
48B12S	48	12	167	2.0	82	51	0.20	3	±0.4	51.70
48B15S	48	15	133	2.0	82	51	0.20	3	±0.4	51.70
48B24S	48	24	104	2.5	84	62	0.20	3	±0.5	51.70
48B28S	48	28	89	2.5	83	63	0.20	3	±0.5	51.70

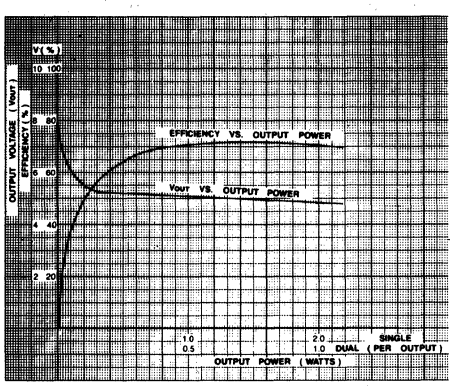
*THE RIPPLE IS MEASURED WITH A 22 µF 75 VOLT HIGH QUALITY TANTALUM CAPACITOR CONNECTED ACROSS THE OUTPUT.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York



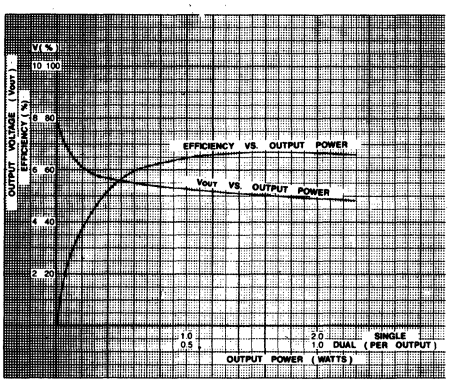
Typical Weight: 8.0 Grams



SERIES B SINGLE & DUAL 48V-5V



SERIES B SINGLE & DUAL 5V-5V



Delivery— stock to one week

453 N. MacQuesten Pkwy., Mt. Vernon, N.Y. 10552
914-699-5514 • FAX 914-699-5565

PICO Electronics, Inc.

TYPICAL CHARACTERISTICS: **Test conditions:** 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT.*

Input voltage range: 5V models 4 to 6.5V DC
12V models 9 to 15V DC
24V models 17 to 28V DC
28V models 21 to 32V DC
48V models 25 to 50V DC

Output voltage tolerance at full load:
5V models ± 0.25V
9V models ± 0.3V
12V & 15V models ± 0.4V
24V & 28V models ± 0.5V
48V models ± 0.7V

Converter frequency: 20 to 40 KHz

Output temperature coefficient: 0.02%/°C

Operating temperature: −25°C to +70°C ambient. No heat sink is required.

Storage temperature: −55°C to +125°C

Isolation: 100 megohms min. @ 500V DC

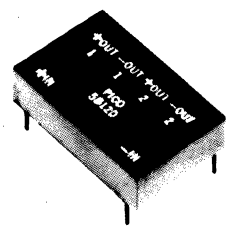
Short circuit protection: Temporary

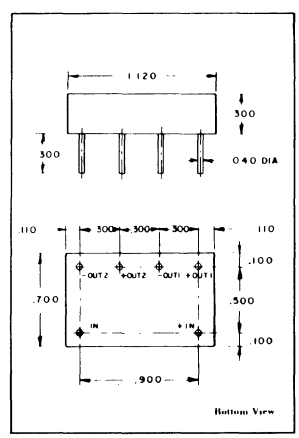
SERIES B - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5B5D	5	5	150	0.75	68	441	0.15	90	±0.25	54.46
5B9D	5	9	83	0.75	73	411	0.15	90	±0.3	54.46
5B12D	5	12	62	0.75	76	394	0.15	90	±0.4	54.46
5B15D	5	15	50	0.75	78	384	0.15	90	±0.4	54.46
5B24D	5	24	31	0.75	80	375	0.15	90	±0.5	54.46
5B28D	5	28	27	0.75	78	385	0.15	90	±0.5	54.46
5B48D	5	48	15	0.75	79	380	0.15	90	±0.7	54.46
12B5D	12	5	150	0.75	71	176	0.15	40	±0.25	54.46
12B9D	12	9	111	1.0	76	219	0.15	40	±0.3	54.46
12B12D	12	12	83	1.0	81	205	0.15	40	±0.4	54.46
12B15D	12	15	66	1.0	81	205	0.15	40	±0.4	54.46
12B24D	12	24	41	1.0	83	200	0.15	40	±0.5	54.46
12B28D	12	28	35	1.0	80	208	0.15	40	±0.5	54.46
12B48D	12	48	21	1.0	80	208	0.15	40	±0.7	54.46
24B5D	24	5	150	0.75	71	88	0.15	10	±0.25	54.46
24B9D	24	9	111	1.0	76	110	0.15	15	±0.3	54.46
24B12D	24	12	83	1.0	80	104	0.15	15	±0.4	54.46
24B15D	24	15	66	1.0	81	102	0.15	15	±0.4	54.46
24B24D	24	24	52	1.25	82	127	0.15	15	±0.5	54.46
24B28D	24	28	45	1.25	81	129	0.15	15	±0.5	54.46
24B48D	24	48	26	1.25	82	127	0.15	15	±0.7	54.46
28B5D	28	5	150	0.75	67	80	0.15	15	±0.25	54.46
28B9D	28	9	111	1.0	75	95	0.15	15	±0.3	54.46
28B12D	28	12	83	1.0	77	93	0.15	15	±0.4	54.46
28B15D	28	15	66	1.0	77	93	0.15	15	±0.4	54.46
28B24D	28	24	52	1.25	81	110	0.15	15	±0.5	54.46
28B28D	28	28	45	1.25	81	110	0.15	15	±0.5	54.46
28B48D	28	48	26	1.25	82	109	0.15	15	±0.7	54.46
48B5D	48	5	150	0.75	71	44	0.20	3	±0.25	58.45
48B9D	48	9	111	1.0	76	55	0.20	3	±0.3	58.45
48B12D	48	12	83	1.0	82	51	0.20	3	±0.4	58.45
48B15D	48	15	67	1.0	82	51	0.20	3	±0.4	58.45
48B24D	48	24	52	1.25	84	62	0.20	3	±0.5	58.45
48B28D	48	28	45	1.25	83	63	0.20	3	±0.7	58.45

*THE RIPPLE IS MEASURED WITH A 22 µF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR CONNECTED ACROSS EACH OUTPUT.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

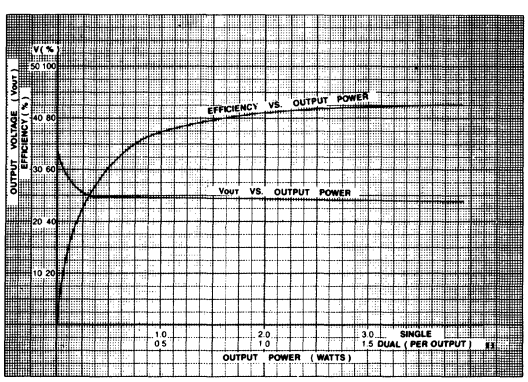
Low Profile 0.3" Height! Up to 2.5 Watts





Typical Weight: 8.5 Grams

SERIES B SINGLE & DUAL 24V-24V



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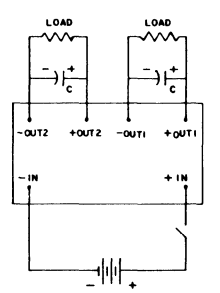


For immediate engineering assistance or to place an order— ***Call Toll Free 800-431-1064***

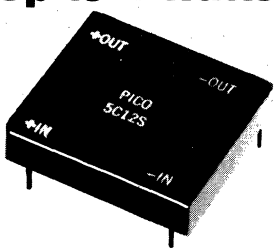
Delivery— stock to one week

SERIES C Hi Reliability Miniature DC-DC Converters Up to 4 Watts

FEATURES

- Up to 4 watts output at 70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Miniature-size (0.3" Height)
- 5 input voltage ranges 5, 12, 24, 28 and 48V DC
- 100 megohm @ 500V DC
- Single and dual isolated outputs
- No heat sink required

This series of unregulated DC-DC converters are produced in an miniaturized encapsulated package. 68 different models are available. The units feature single and isolated dual outputs. They will operate over the temperature range of −25°C to +70°C. No heat sink is required.

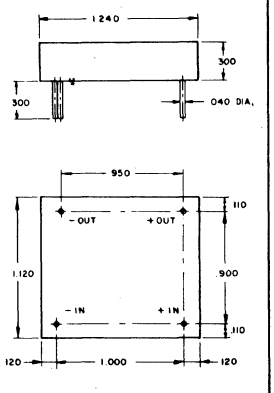


OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

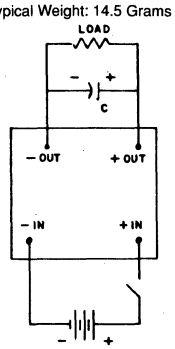
SERIES C - SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5C5S	5	5	500	2.5	68	735	0.20	90	±0.25	54.46
5C9S	5	9	333	3.0	72	833	0.20	100	±0.3	54.46
5C12S	5	12	250	3.0	75	800	0.20	100	±0.4	54.46
5C15S	5	15	200	3.0	77	779	0.15	100	±0.4	54.46
5C24S	5	24	125	3.0	76	789	0.15	120	±0.5	54.46
5C28S	5	28	107	3.0	76	789	0.15	120	±0.5	54.46
5C48S	5	48	63	3.0	76	789	0.15	120	±0.7	54.46
12C5S	12	5	500	2.5	67	311	0.20	45	±0.25	54.46
12C9S	12	9	333	3.0	75	333	0.20	45	±0.3	54.46
12C12S	12	12	290	3.5	77	379	0.20	40	±0.4	54.46
12C15S	12	15	266	4.0	84	396	0.15	40	±0.4	54.46
12C24S	12	24	166	4.0	81	411	0.15	45	±0.5	54.46
12C28S	12	28	143	4.0	82	407	0.15	45	±0.5	54.46
12C48S	12	48	83	4.0	81	412	0.15	45	±0.7	54.46
24C5S	24	5	500	2.5	67	155	0.20	25	±0.25	54.46
24C9S	24	9	333	3.0	73	171	0.20	25	±0.3	54.46
24C12S	24	12	290	3.5	75	194	0.20	25	±0.4	54.46
24C15S	24	15	235	3.5	79	184	0.20	25	±0.4	54.46
24C24S	24	24	166	4.0	83	200	0.20	25	±0.5	54.46
24C28S	24	28	143	4.0	83	201	0.20	25	±0.5	54.46
24C48S	24	48	83	4.0	83	201	0.20	25	±0.7	54.46
28C5S	28	5	500	2.5	67	133	0.20	25	±0.25	54.46
28C9S	28	9	333	3.0	73	147	0.20	25	±0.3	54.46
28C12S	28	12	290	3.5	75	167	0.20	25	±0.4	54.46
28C15S	28	15	235	3.5	78	160	0.20	25	±0.4	54.46
28C24S	28	24	166	4.0	82	174	0.20	25	±0.5	54.46
28C28S	28	28	143	4.0	83	172	0.20	25	±0.5	54.46
28C48S	28	48	83	4.0	83	172	0.20	25	±0.7	54.46
48C5S	48	5	500	2.5	75	69	0.25	3	±0.25	58.45
48C9S	48	9	333	3.0	76	82	0.25	3	±0.3	58.45
48C12S	48	12	290	3.5	81	90	0.25	3	±0.4	58.45
48C15S	48	15	235	3.5	81	90	0.25	3	±0.4	58.45
48C24S	48	24	166	4.0	85	98	0.25	3	±0.5	58.45
48C28S	48	28	143	4.0	83	100	0.25	3	±0.5	58.45

*THE RIPPLE IS MEASURED WITH A 22 μF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR CONNECTED ACROSS THE OUTPUT.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

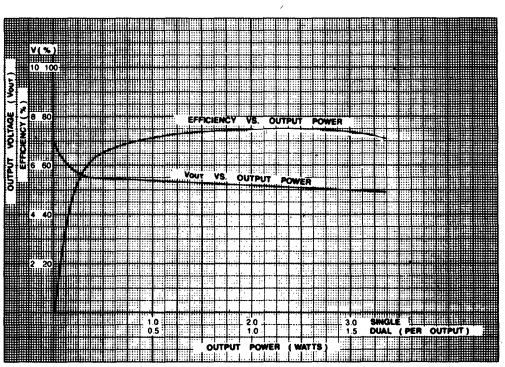


Typical Weight: 14.5 Grams



Delivery— stock to one week

SERIES C SINGLE & DUAL 48V-5V



PICO Electronics, Inc.
453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552
914-699-5514
FAX 914-699-5565

*For immediate engineering assistance or to place an order—**Call Toll Free 800-431-1064***

TYPICAL CHARACTERISTICS: **Test conditions:** 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT.*

Input voltage range: 5V models 4 to 6.5V DC
12V models 9 to 15V DC
24V models 17 to 28V DC
28V models 21 to 31V DC
48V models 25 to 50V DC

Output voltage tolerance at full load:
5V models ± 0.25V
9V models ± 0.3V
12V & 15V models ± 0.4V
24V & 28V models ± 0.5V
48V models ± 0.7V

Converter frequency: 20 to 40 KHz

Output temperature coefficient: 0.02%/°C

Operating temperature: −25°C to +70°C ambient. No heat sink is required.

Storage temperature: −55°C to +125°C

Isolation: 100 megohms min. @ 500V DC

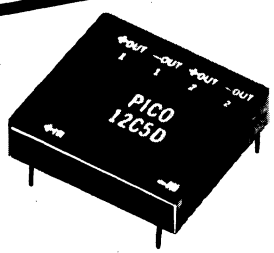
Short circuit protection: Temporary

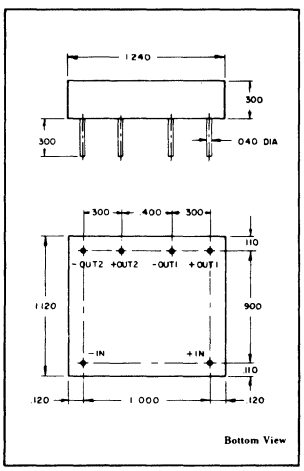
SERIES C - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5C5D	5	5	250	1.25	71	704	0.20	90	±0.25	62.04
5C9D	5	9	166	1.5	72	833	0.20	100	±0.3	62.04
5C12D	5	12	125	1.5	75	800	0.20	100	±0.4	62.04
5C15D	5	15	100	1.5	77	779	0.15	110	±0.4	62.04
5C24D	5	24	62	1.5	78	769	0.15	120	±0.5	62.04
5C28D	5	28	53	1.5	76	789	0.15	120	±0.5	62.04
5C48D	5	48	31	1.5	76	789	0.15	120	±0.7	62.04
12C5D	12	5	250	1.25	69	302	0.20	45	±0.25	62.04
12C9D	12	9	166	1.5	75	333	0.20	45	±0.3	62.04
12C12D	12	12	145	1.75	80	364	0.20	40	±0.4	62.04
12C15D	12	15	133	2.0	82	406	0.15	40	±0.4	62.04
12C24D	12	24	83	2.0	83	401	0.15	45	±0.5	62.04
12C28D	12	28	71	2.0	82	407	0.15	45	±0.5	62.04
12C48D	12	48	41	2.0	81	412	0.15	45	±0.7	62.04
24C5D	24	5	250	1.25	67	155	0.20	30	±0.25	62.04
24C9D	24	9	166	1.5	73	171	0.20	30	±0.3	62.04
24C12D	24	12	145	1.75	78	186	0.20	30	±0.4	62.04
24C15D	24	15	117	1.75	79	184	0.20	25	±0.4	62.04
24C24D	24	24	83	2.0	82	203	0.20	25	±0.5	62.04
24C28D	24	28	71	2.0	83	201	0.20	25	±0.5	62.04
24C48D	24	48	41	2.0	83	201	0.20	25	±0.7	62.04
28C5D	28	5	250	1.25	67	133	0.20	30	±0.25	62.04
28C9D	28	9	166	1.5	73	147	0.20	30	±0.3	62.04
28C12D	28	12	145	1.75	75	167	0.20	30	±0.4	62.04
28C15D	28	15	117	1.75	78	160	0.20	25	±0.4	62.04
28C24D	28	24	83	2.0	82	174	0.20	25	±0.5	62.04
28C28D	28	28	71	2.0	83	172	0.20	25	±0.5	62.04
28C48D	28	48	41	2.0	83	172	0.20	25	±0.7	62.04
48C5D	48	5	250	1.25	74	70	0.25	3	±0.25	66.52
48C9D	48	9	166	1.5	76	82	0.25	3	±0.3	66.52
48C12D	48	12	145	1.75	82	89	0.25	3	±0.4	66.52
48C15D	48	15	117	1.75	82	89	0.25	3	±0.4	66.52
48C24D	48	24	83	2.0	85	98	0.25	3	±0.5	66.52
48C28D	48	28	71	2.0	83	100	0.25	3	±0.7	66.52

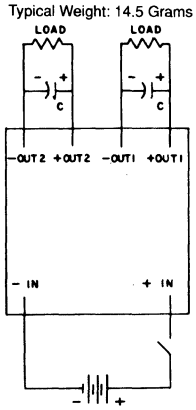
*THE RIPPLE IS MEASURED WITH A 22 µF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR CONNECTED ACROSS EACH OUTPUT.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Low Profile 0.3" Height! Up to 4 Watts

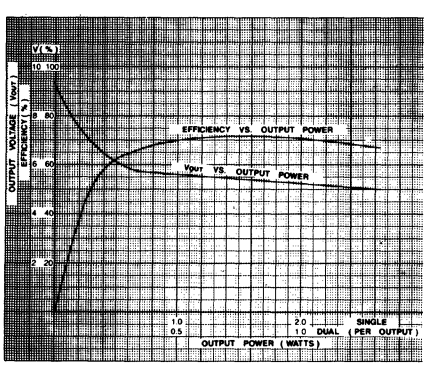




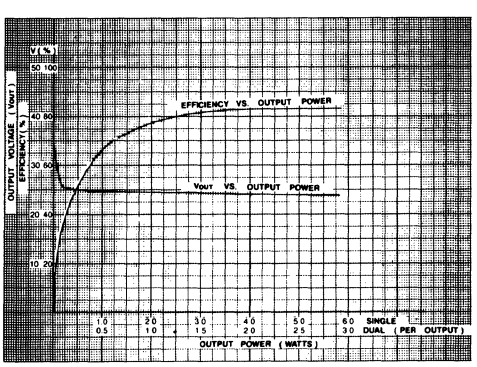
Typical Weight: 14.5 Grams



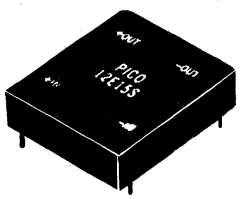
SERIES C SINGLE & DUAL 5V-5V



SERIES C SINGLE & DUAL 24V-24V



SERIES E Hi Reliability Miniature DC-DC Converters Up to 7 Watts



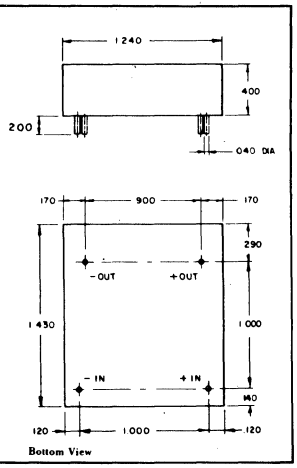
FEATURES

- Up to 7 watt output at 70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- 5 input voltage ranges 5, 12, 24, 28 and 48V DC
- 100 megohm @ 500V DC isolation
- Single and dual isolated outputs
- No heat sink required
- Output filter included (No external capacitors required)

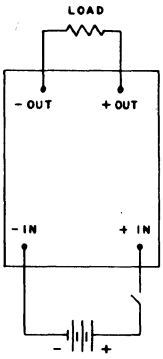
This series of unregulated DC-DC converters are produced in an ultra-miniature encapsulated package. 68 different models are available. The units feature single and isolated dual outputs. They will operate over the temperature range of −25°C to +70°C. No heat sink is required.

OPTIONS AVAILABLE

- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)



Typical Weight: 25 Grams



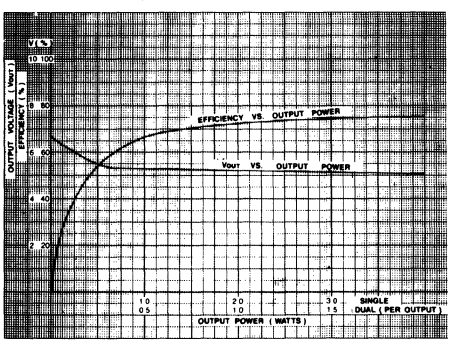
Delivery— stock to one week

SERIES E - SINGLE OUTPUT

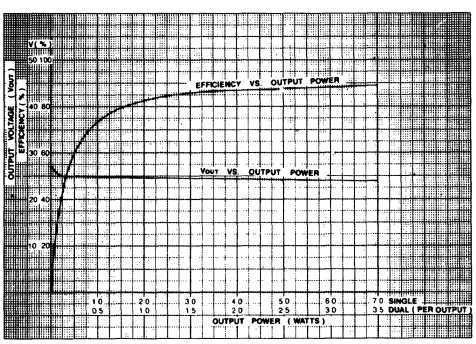
PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5E5S	5	5	800	4	68	1176	0.3	140	±0.25	89.62
5E9S	5	9	500	4.5	73	1233	0.3	200	±0.3	89.62
5E12S	5	12	375	4.5	75	1200	0.25	200	±0.4	89.62
5E15S	5	15	300	4.5	78	1154	0.25	190	±0.4	89.62
5E24S	5	24	187	4.5	80	1125	0.25	190	±0.5	89.62
5E28S	5	28	161	4.5	79	1139	0.25	190	±0.5	89.62
5E48S	5	48	93	4.5	80	1125	0.25	190	±0.7	89.62
12E5S	12	5	800	4.0	73	456	0.3	40	±0.25	89.62
12E9S	12	9	666	6.0	80	625	0.3	45	±0.3	89.62
12E12S	12	12	541	6.5	82	660	0.25	45	±0.4	89.62
12E15S	12	15	433	6.5	83	652	0.25	40	±0.4	89.62
12E24S	12	24	281	6.75	86	654	0.25	40	±0.5	89.62
12E28S	12	28	241	6.75	86	654	0.25	40	±0.5	89.62
12E48S	12	48	141	6.75	86	654	0.25	40	±0.7	89.62
24E5S	24	5	800	4.0	69	241	0.3	22	±0.25	89.62
24E9S	24	9	666	6.0	79	316	0.3	22	±0.3	89.62
24E12S	24	12	541	6.5	81	334	0.25	22	±0.4	89.62
24E15S	24	15	433	6.5	82	330	0.25	22	±0.4	89.62
24E24S	24	24	291	7.0	88	331	0.25	17	±0.5	89.62
24E28S	24	28	250	7.0	88	331	0.25	17	±0.5	89.62
24E48S	24	48	146	7.0	88	331	0.25	17	±0.7	89.62
28E5S	28	5	800	4.0	69	207	0.3	22	±0.25	89.62
28E9S	28	9	666	6.0	80	268	0.3	22	±0.3	89.62
28E12S	28	12	540	6.5	80	290	0.25	22	±0.4	89.62
28E15S	28	15	433	6.5	82	283	0.25	22	±0.4	89.62
28E24S	28	24	291	7.0	88	284	0.25	22	±0.5	89.62
28E28S	28	28	250	7.0	88	284	0.25	20	±0.5	89.62
28E48S	28	48	146	7.0	88	284	0.25	20	±0.7	89.62
48E5S	48	5	800	4.0	75	111	0.3	6	±0.25	96.45
48E9S	48	9	666	6.0	80	156	0.3	6	±0.3	96.45
48E12S	48	12	541	6.5	84	161	0.3	6	±0.4	96.45
48E15S	48	15	433	6.5	84	161	0.3	6	±0.4	96.45
48E24S	48	24	291	7.0	89	164	0.3	6	±0.5	96.45
48E28S	48	28	250	7.0	89	164	0.3	6	±0.5	96.45

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

SERIES E SINGLE & DUAL 48V-5V



SERIES E SINGLE & DUAL 48V-24V



*For immediate engineering assistance or to place an order—**Call Toll Free 800-431-1064*** • FAX 914-699-5565

TYPICAL CHARACTERISTICS: **Test conditions:** 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT.*

Input voltage range: 5V models 4 to 6.5V DC
12V models 9 to 15V DC
24V models 17 to 28V DC
28V models 21 to 32V DC
48V models 25 to 50V DC

Output voltage tolerance at full load:
5V models ± 0.25V
9V models ± 0.3V
12V & 15V models ± 0.4V
24V & 28V models ± 0.5V
48V models ± 0.7V

Converter frequency: 20 to 40 KHz

Output temperature coefficient: 0.02%/°C

Operating temperature: −25°C to +70°C ambient. No heat sink is required.

Storage temperature: −55°C to +125°C

Isolation: 100 megohms min. @ 500V DC

Short circuit protection: Temporary

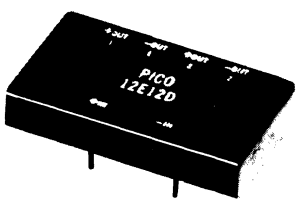
SERIES E - DUAL OUTPUT

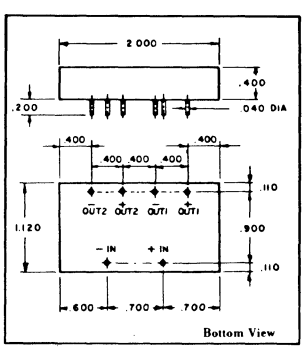
PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5E5D	5	5	400	2.0	68	1176	0.3	200	±0.25	97.91
5E9D	5	9	250	2.25	74	1216	0.3	200	±0.3	97.91
5E12D	5	12	187	2.25	77	1168	0.25	220	±0.4	97.91
5E15D	5	15	150	2.25	79	1139	0.25	200	±0.4	97.91
5E24D	5	24	93	2.25	80	1125	0.25	200	±0.5	97.91
5E28D	5	28	80	2.25	80	1139	0.25	200	±0.5	97.91
5E48D	5	48	46	2.25	80	1125	0.25	200	±0.7	97.91
12E5D	12	5	400	2.0	75	444	0.3	40	±0.25	97.91
12E9D	12	9	333	3.0	80	625	0.3	40	±0.3	97.91
12E12D	12	12	270	3.25	83	652	0.25	40	±0.4	97.91
12E15D	12	15	217	3.25	85	637	0.25	40	±0.4	97.91
12E24D	12	24	140	3.375	86	654	0.25	40	±0.5	97.91
12E28D	12	28	121	3.375	86	654	0.25	40	±0.5	97.91
12E48D	12	48	70	3.5	88	654	0.25	40	±0.7	97.91
24E5D	24	5	400	2.0	72	231	0.3	22	±0.25	97.91
24E9D	24	9	333	3.0	79	316	0.3	22	±0.3	97.91
24E12D	24	12	270	3.25	82	330	0.25	22	±0.4	97.91
24E15D	24	15	217	3.25	85	318	0.25	22	±0.4	97.91
24E24D	24	24	145	3.5	88	331	0.25	18	±0.5	97.91
24E28D	24	28	125	3.5	88	331	0.25	18	±0.5	97.91
24E48D	24	48	73	3.5	88	331	0.25	18	±0.7	97.91
28E5D	28	5	400	2.0	69	207	0.3	25	±0.25	97.91
28E9D	28	9	333	3.0	80	268	0.3	25	±0.3	97.91
28E12D	28	12	270	3.25	80	290	0.25	22	±0.4	97.91
28E15D	28	15	217	3.25	82	283	0.25	22	±0.4	97.91
28E24D	28	24	145	3.5	88	284	0.25	20	±0.5	97.91
28E28D	28	28	125	3.5	88	284	0.25	20	±0.5	97.91
28E48D	28	48	73	3.5	88	284	0.25	20	±0.7	97.91
48E5D	48	5	400	2.0	74	113	0.3	6	±0.25	104.72
48E9D	48	9	333	3.0	80	156	0.3	6	±0.3	104.72
48E12D	48	12	270	3.25	85	160	0.3	6	±0.4	104.72
48E15D	48	15	217	3.25	85	160	0.3	6	±0.4	104.72
48E24D	48	24	145	3.5	88	166	0.3	6	±0.5	104.72
48E28D	48	28	125	3.5	89	164	0.3	6	±0.5	104.72

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Low Profile 0.4" Height! Up to 7 Watts

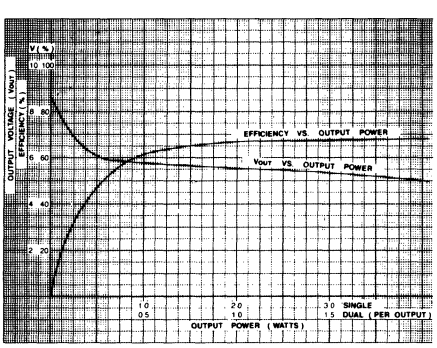
NO EXTERNAL CAPACITORS REQUIRED



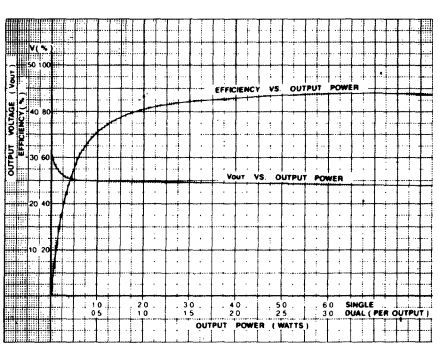


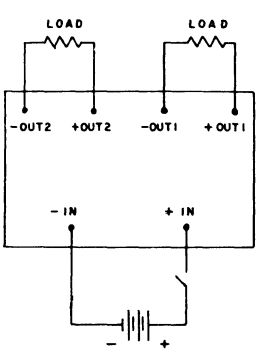
Typical Weight: 33 Grams

SERIES E SINGLE & DUAL 5V-5V



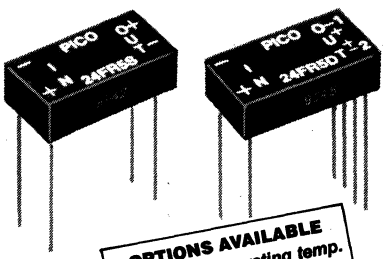
SERIES E SINGLE & DUAL 24V-24V





PICO Electronics, Inc. 453 N. MacQuesten Pkwy., Mt. Vernon, N.Y. 10552 • 914-699-5514 • FAX 914-699-5565

SERIES FR Hi Reliability Isolated Regulated DC-DC Converters



FEATURES:
- Excellent voltage regulations ±0.1% single/±0.2% dual
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Excellent load regulations 0.2% single/0.4% dual
- Up to 1.0 watts output power at 70°C ambient
- Low output ripple
- 100 megohm 500V DC isolation
- Single and dual isolated outputs
- Low profile, ultra-miniature size
- No output capacitor required • No heat sink required

Low Profile .5" × 1" × .3" ht. up to 1 Watt

This series of encapsulated converters come in 24 different models. The highly regulated output is isolated from the input. The units will operate over the temperature range of −25°C to +70°C. No heat sink is required. These units are excellent for applications where the input voltage varies ±10% and the output must be held to ±0.1% single/and ±0.2% dual. The output voltage is maintained to within 0.2% from no load to full load for single and 0.4% for dual.

OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

TYPICAL CHARACTERISTICS FOR ALL MODELS:

Test conditions: 25°C ambient
Output voltage tolerance: ±1% on all single/±2% dual
Line regulations: ±0.1% single/±0.2% dual
Load regulation: 0.2% single/0.4% dual
Converter frequency: 20-40K Hz.
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.01%/°C
Storage temperature: −55°C to +125°C
Isolation: 100 megohms minimum at 500 volts DC
Short circuit protection: Temporary

SERIES FR - SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V dc)	OUTPUT VOLTAGE (V dc)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD AT NOMINAL INPUT VOLTAGE TYPICAL (%)	INPUT CURRENT @ FULL LOAD TYPICAL (mA) AT NOMINAL INPUT VOLTAGE	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (mVp-p) max.	INPUT CURRENT @ NO LOAD TYPICAL AT NOMINAL INPUT VOLTAGE (mA)	EFF. @ FULL LOAD TYPICAL (%) HIGH LINE	EFF. @ FULL LOAD TYPICAL (%) LOW LINE	PRICE 1-24
5FR5S	5	5	150	0.75	37	405	75	88	34	42	72.09
5FR12S	5	12	83	1.00	50	400	50	88	45	56	72.09
5FR15S	5	15	67	1.00	51	392	50	86	45	57	72.09
12FR5S	12	5	150	0.75	42	149	75	27	38	48	72.09
12FR12S	12	12	83	1.00	53	157	50	32	47	60	72.09
12FR15S	12	15	67	1.00	55	152	50	34	49	62	72.09
24FR5S	24	5	150	0.75	41	76	75	16	37	47	72.09
24FR12S	24	12	83	1.00	51	82	50	19	45	58	72.09
24FR15S	24	15	67	1.00	54	77	50	19	47	61	72.09
28FR5S	28	5	150	0.75	35	76	75	16	32	40	72.09
28FR12S	28	12	83	1.00	44	82	50	19	40	50	72.09
28FR15S	28	15	67	1.00	46	77	50	19	41	52	72.09

SERIES FR - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V dc)	DUAL OUTPUT VOLTAGE ISOLATED (V dc)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD AT NOMINAL INPUT VOLTAGE TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL AT NOMINAL INPUT VOLTAGE (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD PER OUTPUT (mVp-p max.)	INPUT CURRENT @ NO LOAD TYPICAL AT NOMINAL INPUT VOLTAGE (mA)	EFF. @ FULL LOAD TYPICAL (%) HIGH LINE	EFF. @ FULL LOAD TYPICAL (%) LOW LINE	PRICE 1-24
5FR5D	5	5	50	0.25	37	270	50	100	34	42	96.30
5FR12D	5	12	29	0.35	42	333	50	100	38	48	96.30
5FR15D	5	15	23	0.35	45	311	50	120	41	52	96.30
12FR5D	12	5	50	0.25	40	104	50	32	36	45	96.30
12FR12D	12	12	29	0.35	49	119	50	39	44	55	96.30
12FR15D	12	15	23	0.35	49	119	50	35	44	55	96.30
24FR5D	24	5	50	0.25	39	53	50	18	35	44	96.30
24FR12D	24	12	29	0.35	46	63	50	22	41	52	96.30
24FR15D	24	15	23	0.35	47	62	50	22	42	53	96.30
28FR5D	28	5	50	0.25	34	53	50	18	31	39	96.30
28FR12D	28	12	29	0.35	40	63	50	22	36	45	96.30
28FR15D	28	15	23	0.35	40	62	50	22	36	45	96.30

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

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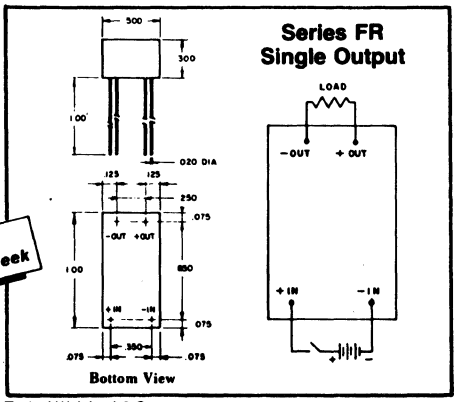
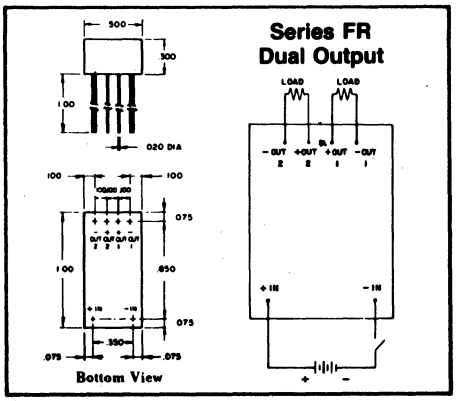
For immediate engineering assistance or to place an order— Call Toll Free 800-431-1064

Delivery— stock to one week



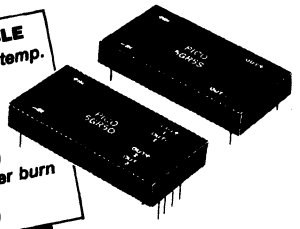
Typical Weight: 6.0 Grams



Typical Weight: 5.5 Grams

SERIES GR Hi Reliability Isolated Regulated DC-DC Converters

OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- HI Temp, full power burn in (100% power, 125°C case temp)



Low Profile 0.35" Height! Up to 3.5 Watts

FEATURES:
- Excellent voltage regulation ±0.1%
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Excellent load regulation 0.2%
- Up to 3.5 watts output power at 70°C ambient
- Low output ripple
- 100 meghom 500V DC isolation
- Single and dual isolated outputs
- No heat sink required
- Miniature size
- No output capacitor required

This series of encapsulated converters come in 24 different models. The units feature single and isolated dual outputs. They will operate over a temperature range of −25°C to +70°C. No heat sink is required. These units are excellent for applications where the input voltage varies ±10% and the output must be held to ±0.1%. The output voltage is maintained to within 0.2% from no load to full load.

TYPICAL CHARACTERISTICS FOR ALL MODELS:

Test conditions: 25°C ambient
Output voltage tolerance: ±1% on all units
Line regulation: ±0.1% (for the input voltage range of ±10%)
Load regulation: 0.2% (from full load to no load)
Converter frequency: 20-40K Hz.
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.005%/°C
Storage temperature: −55°C to +125°C
Isolation: 100 megohms minimum at 500 volts DC
Short circuit protection: Temporary

SERIES GR - SINGLE OUTPUT

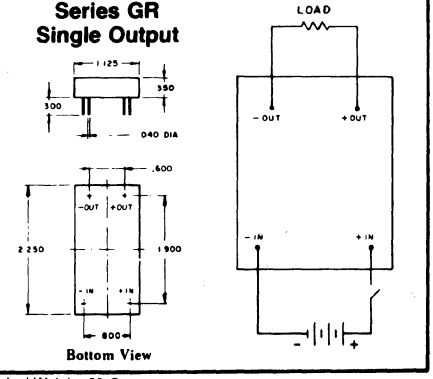
PICO PART NUMBER	INPUT VOLTAGE (V dc)	OUTPUT VOLTAGE (V dc)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD AT NOMINAL INPUT VOLTAGE TYPICAL (%)	INPUT CURRENT @ FULL LOAD TYPICAL (mA) AT NOMINAL INPUT VOLTAGE	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (mVp-p) max.	INPUT CURRENT @ NO LOAD TYPICAL AT NOMINAL INPUT VOLTAGE (mA)	EFF. @ FULL LOAD TYPICAL % HIGH LINE	EFF. @ FULL LOAD TYPICAL % LOW LINE	PRICE 1-24
5GR5S	5	5	300	1.5	43	698	50	85	39	48	75.14
5GR12S	5	12	208	2.5	56	893	50	90	51	63	75.14
5GR15S	5	15	167	2.5	57	877	50	100	52	64	75.14
12GR5S	12	5	300	1.5	46	272	50	12	42	52	75.14
12GR12S	12	12	292	3.5	60	486	50	29	54	67	75.14
12GR15S	12	15	233	3.5	62	470	50	31	56	69	75.14
24GR5S	24	5	400	2.0	46	181	50	7	42	52	75.14
24GR12S	24	12	292	3.5	58	251	50	17	53	65	75.14
24GR15S	24	15	233	3.5	64	228	50	25	57	71	75.14
28GR5S	28	5	400	2.0	39	181	50	7	35	44	75.14
28GR12S	28	12	292	3.5	50	251	50	17	45	56	75.14
28GR15S	28	15	233	3.5	55	228	50	25	49	62	75.14

SERIES GR - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V dc)	DUAL OUTPUT VOLTAGE ISOLATED (V dc)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD AT NOMINAL INPUT VOLTAGE TYPICAL (%)	INPUT CURRENTFULL LOAD TYPICAL (mA) AT NOMINAL INPUT VOLTAGE	OUTPUT VOLTAGE RIPPLE @ FULL LOAD (mVp-p) max.	INPUT CURRENT @ NO LOAD TYPICAL AT NOMINAL INPUT VOLTAGE (mA)	EFF. @ FULL LOAD TYPICAL % HIGH LINE	EFF. @ FULL LOAD TYPICAL % LOW LINE	PRICE 1-24
5GR5D	5	5	150	0.75	43	698	50	102	39	49	89.62
5GR12D	5	12	104	1.25	55	909	50	120	50	62	89.62
5GR15D	5	15	83	1.25	56	893	50	128	50	63	89.62
12GR5D	12	5	150	0.75	46	272	50	33	41	51	89.62
12GR12D	12	12	146	1.75	59	494	50	35	53	66	89.62
12GR15D	12	15	117	1.75	61	478	50	37	55	68	89.62
24GR5D	24	5	200	1.00	46	181	50	15	42	52	89.62
24GR12D	24	12	146	1.75	58	251	50	18	52	65	89.62
24GR15D	24	15	117	1.75	64	228	50	21	58	72	89.62
28GR5D	28	5	200	1.00	39	181	50	15	35	44	89.62
28GR12D	28	12	146	1.75	50	251	50	18	45	56	89.62
28GR15D	28	15	117	1.75	55	228	50	21	49	62	89.62

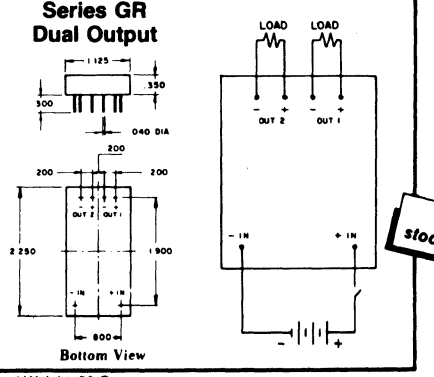
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Series GR Single Output



Typical Weight: 29 Grams

Series GR Dual Output



Typical Weight: 29 Grams

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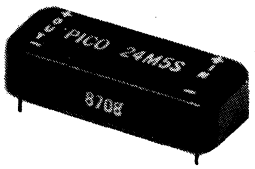
For immediate engineering assistance or to place an order—
Call Toll Free 800-431-1064
Delivery— stock to one week

SERIES M PICO MILITARY DC-DC CONVERTERS

Hi Reliability Ultra-Miniature DC-DC Converters -55°C + 85°C

- *Diodes JAN TX*
- *Transformers Manufactured to MIL-T-27 (TF5S40ZZ)*
- *Capacitors MIL-C-39003; MIL-C-55681*
- *Resistors MIL-R-39008*
- *Transistors Hermetically Sealed*



OPTIONS AVAILABLE PER MIL-STD-883
- Stabilization Bake
- Temperature Cycle
- Hi Temperature Burn In 160 Hours at Full Power

FEATURES
- Up to 1.25 watt output at 85°C ambient
- Ultra-miniature size (0.3" Height)
- 4 input voltage ranges 5, 12, 24 and 28 V DC
- 100 megohm @ 500V DC isolation
- Input/output isolation
- Single and dual output
- No heat sink required
- Shielded
- 24 Pin Dip compatible

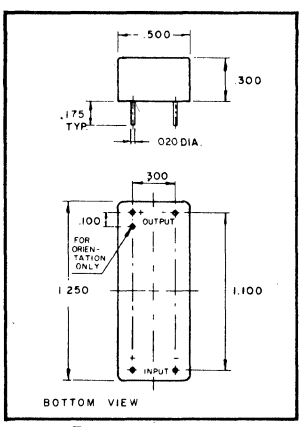
This series of unregulated DC-DC converters are encapsulated in an ultra-miniature 5 sided shielding package. 54 different models are available. The units feature single and dual outputs. They will operate over the temperature range of −55°C to +85°C. No heat sink is required.

SERIES M - SINGLE OUTPUT

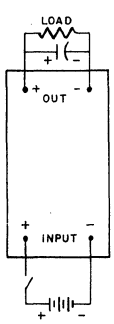
PICO PART NUMBER	INPUT VOLTAGE (V DC)	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1–24
5M5S	5	5	200	1.00	65	308	0.20	65	±0.25	315.65
5M9S	5	9	139	1.25	71	352	0.15	80	±0.3	315.65
5M12S	5	12	104	1.25	74	338	0.15	80	±0.4	315.65
5M15S	5	15	83	1.25	74	338	0.12	90	±0.4	315.65
5M24S	5	24	52	1.25	77	325	0.10	90	±0.5	315.65
5M28S	5	28	45	1.25	76	329	0.10	90	±0.5	315.65
12M5S	12	5	200	1.00	67	124	0.15	40	±0.25	315.65
12M9S	12	9	139	1.25	74	141	0.15	40	±0.3	315.65
12M12S	12	12	104	1.25	76	137	0.12	40	±0.4	315.65
12M15S	12	15	83	1.25	76	137	0.12	40	±0.4	315.65
12M24S	12	24	52	1.25	78	134	0.08	40	±0.5	315.65
12M28S	12	28	45	1.25	80	130	0.08	40	±0.5	315.65
12M48S	12	48	26	1.25	80	130	0.08	40	±0.7	315.65
24M5S	24	5	200	1.00	67	62	0.15	13	±0.25	315.65
24M9S	24	9	139	1.25	74	70	0.15	15	±0.3	315.65
24M12S	24	12	104	1.25	75	69	0.10	15	±0.4	315.65
24M15S	24	15	83	1.25	78	67	0.10	15	±0.4	315.65
24M24S	24	24	52	1.25	82	64	0.10	15	±0.5	315.65
24M28S	24	28	45	1.25	79	66	0.10	15	±0.5	315.65
24M48S	24	48	26	1.25	80	65	0.07	16	±0.7	315.65
28M5S	28	5	200	1.00	68	53	0.15	12	±0.25	315.65
28M9S	28	9	139	1.25	76	59	0.15	14	±0.3	315.65
28M12S	28	12	104	1.25	78	57	0.12	14	±0.4	315.65
28M15S	28	15	83	1.25	79	57	0.10	14	±0.4	315.65
28M24S	28	24	52	1.25	81	55	0.09	14	±0.5	315.65
28M28S	28	28	45	1.25	81	55	0.09	14	±0.5	315.65
28M48S	28	48	26	1.25	80	56	0.09	15	±0.7	315.65

*RIPPLE IS MEASURED WITH 10μF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR CONNECTED ACROSS THE OUTPUT.

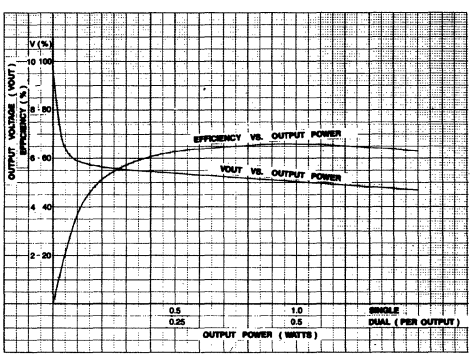
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.



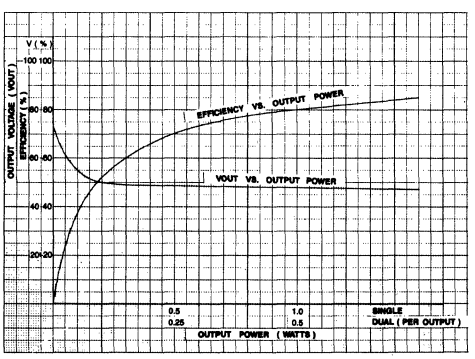
Typical Weight: 9.0 Grams



SERIES M SINGLE & DUAL 5V-5V



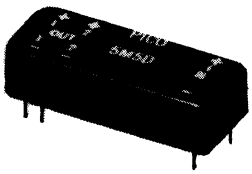
SERIES M SINGLE & DUAL 12V-48V



453 N. MacQuesten Pkwy., Mt. Vernon, N.Y. 10552 • 914-699-5514 • FAX 914-699-5565 **PICO Electronics, Inc.**

PICO's MILITARY DC-DC CONVERTERS

Low Profile 1.250" x .5" x .3" ht. up to 1.25 Watts



OPTIONS AVAILABLE PER MIL-STD-883
- Stabilization Bake
- Temperature Cycle
- Hi Temperature Burn In 160 Hours at Full Power

SERIES M - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE (V DC)	DUAL OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT PER OUTPUT (mA)	MAX. OUTPUT POWER PER OUTPUT (watts)	EFF. @ FULL LOAD TYPICAL (%)	INPUT CURRENT FULL LOAD TYPICAL (mA)	OUTPUT VOLTAGE RIPPLE @ FULL LOAD* (Vp-p max)	NO LOAD CURRENT TYPICAL (mA)	FULL LOAD OUTPUT VOLTAGE TOLERANCE (V DC)	PRICE 1-24
5M5D	5	±5	100	0.5	65	308	0.20	65	±0.25	373.43
5M9D	5	±9	69	0.625	71	352	0.15	80	±0.3	373.43
5M12D	5	±12	52	0.625	74	338	0.15	80	±0.4	373.43
5M15D	5	±15	42	0.625	74	338	0.12	90	±0.4	373.43
5M24D	5	±24	26	0.625	77	325	0.10	90	±0.5	373.43
5M28D	5	±28	22	0.625	76	329	0.10	90	±0.5	373.43
12M5D	12	±5	100	0.5	67	124	0.15	40	±0.25	373.43
12M9D	12	±9	69	0.625	74	141	0.15	40	±0.3	373.43
12M12D	12	±12	52	0.625	76	137	0.12	40	±0.4	373.43
12M15D	12	±15	42	0.625	76	137	0.12	40	±0.4	373.43
12M24D	12	±24	26	0.625	78	134	0.08	40	±0.5	373.43
12M28D	12	±28	22	0.625	80	130	0.08	40	±0.5	373.43
12M48D	12	±48	13	0.625	80	130	0.05	40	±0.7	373.43
24M5D	24	±5	100	0.5	67	62	0.15	13	±0.25	373.43
24M9D	24	±9	69	0.625	74	70	0.15	15	±0.3	373.43
24M12D	24	±12	52	0.625	75	69	0.10	15	±0.4	373.43
24M15D	24	±15	42	0.625	78	67	0.10	15	±0.4	373.43
24M24D	24	±24	26	0.625	82	64	0.10	15	±0.5	373.43
24M28D	24	±28	22	0.625	79	66	0.10	15	±0.5	373.43
24M48D	24	±48	13	0.625	80	65	0.07	16	±0.7	373.43
28M5D	28	±5	100	0.5	68	53	0.15	12	±0.25	373.43
28M9D	28	±9	69	0.625	76	59	0.15	14	±0.3	373.43
28M12D	28	±12	52	0.625	78	57	0.12	14	±0.4	373.43
28M15D	28	±15	42	0.625	79	57	0.10	14	±0.4	373.43
28M24D	28	±24	26	0.625	81	55	0.09	14	±0.5	373.43
28M28D	28	±28	22	0.625	81	55	0.09	14	±0.5	373.43
28M48D	28	±48	13	0.625	80	56	0.09	15	±0.7	373.43

*RIPPLE IS MEASURED WITH 10µF, 75 VOLT HIGH QUALITY TANTALUM CAPACITOR CONNECTED ACROSS EACH OUTPUT.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient and input voltage at nominal value unless otherwise specified.

LINE REGULATION: *OUTPUT IS DIRECTLY PROPORTIONAL TO THE INPUT*

Input voltage range: 5V models 4 to 6.5V DC
12V models 9 to 15V DC
24V models 17 to 28V DC
28V models 21 to 32V DC

Output voltage tolerance at full load:
5V models ± 0.25V
9V models ± 0.3V
12V & 15V models ± 0.4V
24V & 28V models ± 0.5V
48V models ± 0.7V

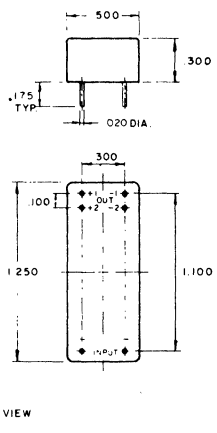
Converter frequency: 20 – 40 KHz

Output temperature coefficient:
0.05%/°C for 5V and 9V outputs.
0.02%/°C for 12, 15, 24, 28, 48V outputs.

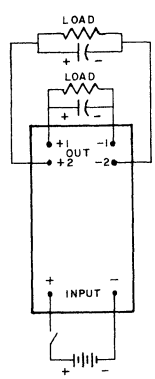
Operating temperature: –55°C to +85°C ambient.
No heat sink is required.
No electrical derating required.

Storage temperature: –55°C to +125°C

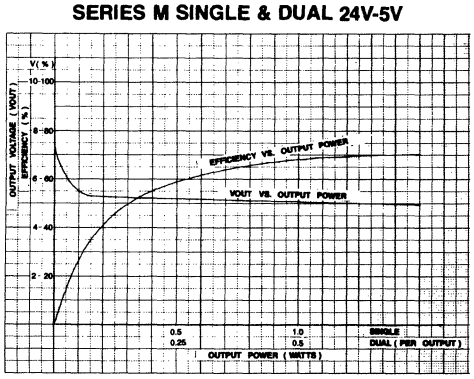
Isolation: 100 megohms min. @ 500V DC



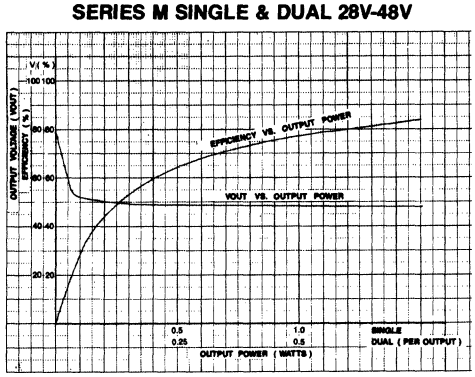
Typical Weight: 9.0 Grams



SERIES M SINGLE & DUAL 24V-5V



SERIES M SINGLE & DUAL 28V-48V



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453 North Mac Questen Pkwy.
Mt. Vernon, New York 10552
914-699-5514

Delivery— stock to one week

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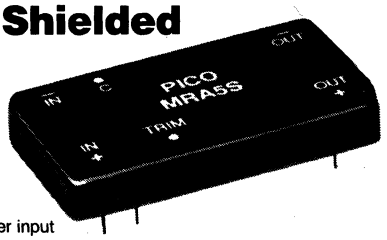
SERIES MR

Hi Reliability Ultra-Miniature Fully Regulated 2.5 Watts DC-DC Converters −55°C to +85°C Wide Input Range All Units Shielded

Wide Input–Low Profile .300"

MILITARY DC-DC CONVERTERS

- *Diodes JAN TX*
- *Transformers Manufactured to MIL-T-27 (TF5S03ZZ)*
- *Capacitors MIL-C 55365/4 MIL-C 39003/03 MIL-C 20/27E MIL-C 39014/05*
- *Resistors MIL-R-39017 MIL-R-22097*
- *IC Hermetically Sealed (MIL-STD-883 Screened)*



FEATURES:

- Voltage regulation over input of

	LOW	HI
MRE	5V	15V
MRF	8V	24V
MRA	18V	36V

- Load regulation (see table for typical variation at different loads
- Line regulation = Typical values
  5-15V DC = ±1.0%
  8-24V DC = ±1.0%
  18-36V DC = ±2.0%
- High efficiency—up to 78%
- Will operate over a temperature range of −55°C to +85°C with no heat sink or electrical derating
- 6 sided shielding
- Isolation—100 megohms at 500 Volts DC
- External output trimming pin standard, +5%
- Single and dual isolated outputs
- Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

SERIES MR-SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC	MAX. LOAD CURRENT (mA)	MAX OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD‡ (±%)*	LINE REGU-LATION (±%)*	PRICE 1-24
MRE5S	5–15	5	300	1.5	70	214	200	0.75	1.75	1.75	525.50
MRE9S	5–15	9	167	1.5	75	200	150	0.50	1.25	1.50	525.50
MRE12S	5–15	12	125	1.5	75	200	150	0.50	1.00	1.25	525.50
MRE15S	5–15	15	100	1.5	76	197	150	0.50	1.00	1.25	525.50
MRE24S	5–15	24	63	1.5	77	195	150	0.50	0.75	1.00	525.50
MRE28S	5–15	28	54	1.5	78	192	200	0.50	0.75	0.75	525.50
MRF5S	8–24	5	400	2.0	70	179	200	0.75	1.75	1.50	525.50
MRF9S	8–24	9	222	2.0	75	167	150	0.50	1.25	1.25	525.50
MRF12S	8–24	12	167	2.0	75	167	150	0.50	1.00	1.00	525.50
MRF15S	8–24	15	133	2.0	76	164	150	0.50	1.00	1.00	525.50
MRF24S	8–24	24	83	2.0	77	162	150	0.50	0.75	1.00	525.50
MRF28S	8–24	28	71	2.0	78	160	200	0.50	0.75	0.75	525.50
MRA5S	18–36	5	400	2.0	70	106	200	0.75	1.75	1.00	525.50
MRA9S	18–36	9	278	2.5	75	123	150	0.50	1.25	0.75	525.50
MRA12S	18–36	12	208	2.5	75	123	150	0.50	1.00	0.75	525.50
MRA15S	18–36	15	167	2.5	76	122	150	0.50	1.00	0.75	525.50
MRA24S	18–36	24	104	2.5	77	120	150	0.50	0.75	0.75	525.50
MRA28S	18–36	28	89	2.5	78	119	200	0.50	0.75	0.50	525.50

*Measurements taken with input voltage set at mid value.

‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York

For immediate engineering assistance or to place an order—

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PICO Electronics, Inc.

453 North MacQuesten Pkwy.,
Mt. Vernon, New York 10552

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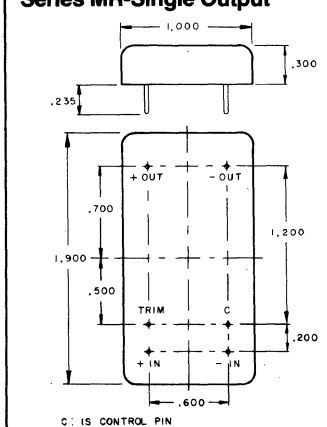
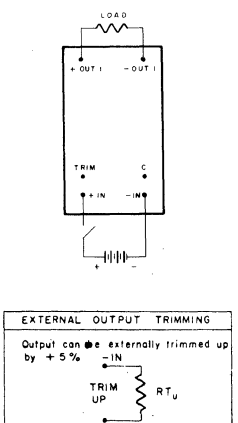
Delivery—stock to one week

Series MR-Single Output



TYPICAL. WEIGHT. 26 Grams



Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

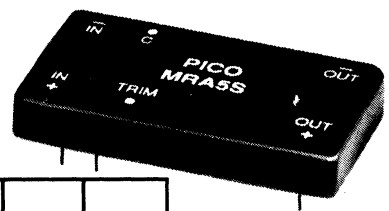
This series of high efficiency wide input range, encapsulated regulators come in 36 different models. Manufactured using high grade military components, this unit will operate from −55°C to +85°C with no heat sink or electrical derating required. The 6 sided shielding and 32 pin DIP compatability combined with input/output isolation and the wide input range capabilities will meet your most stringent military requirements.

Wide Input Range Isolated – Regulated MILITARY DC-DC CONVERTERS

Low Profile .300" up to 2.5 Watts

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient
Operating temperature: −55°C to 85°C
Output voltage tolerance: ±1% at typical input voltage
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: −55°C to +125°C
Short circuit protection: Temporary



(1.9" x 1.0" x .300")

SERIES MR-DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT (mA) PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD ‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
MRE5D	5–15	5	150	.75	70	214	200	0.75	1.75	1.75	595.00
MRE9D	5–15	9	84	.75	75	200	150	0.50	1.25	1.50	595.00
MRE12D	5–15	12	63	.75	75	200	150	0.50	1.00	1.25	595.00
MRE15D	5–15	15	50	.75	76	197	150	0.50	1.00	1.25	595.00
MRE24D	5–15	24	32	.75	77	195	150	0.50	0.75	1.00	595.00
MRE28D	5–15	28	27	.75	78	192	200	0.50	0.75	0.75	595.00
MRF5D	8–24	5	200	1.00	70	179	200	0.75	1.75	1.50	595.00
MRF9D	8–24	9	111	1.00	75	167	150	0.50	1.25	1.25	595.00
MRF12D	8–24	12	84	1.00	75	167	150	0.50	1.00	1.00	595.00
MRF15D	8–24	15	67	1.00	76	164	150	0.50	1.00	1.00	595.00
MRF24D	8–24	24	42	1.00	77	162	150	0.50	0.75	1.00	595.00
MRF28D	8–24	28	36	1.00	78	160	200	0.50	0.75	0.75	595.00
MRA5D	18–36	5	200	1.00	70	106	200	0.75	1.75	1.00	595.00
MRA9D	18–36	9	139	1.25	75	123	150	0.50	1.25	0.75	595.00
MRA12D	18–36	12	104	1.25	75	123	150	0.50	1.00	0.75	595.00
MRA15D	18–36	15	84	1.25	76	122	150	0.50	1.00	0.75	595.00
MRA24D	18–36	24	52	1.25	77	120	150	0.50	0.75	0.75	595.00
MRA28D	18–36	28	45	1.25	78	119	200	0.50	0.75	0.50	595.00

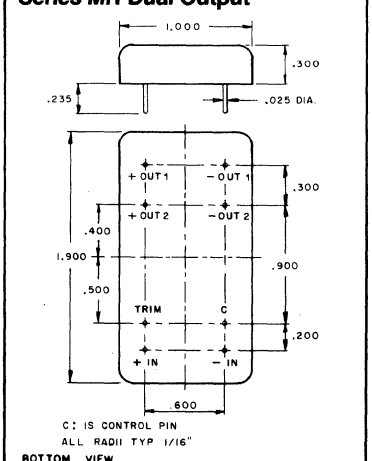
‡ 10% minimum load required.

*Measdrements taken with input voltage set at mid value.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

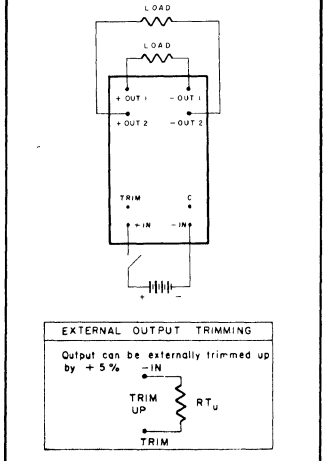
OPTIONS AVAILABLE PER MIL-STD-883
- Stabilization Bake
- Temperature Cycle
- Hi Temperature Burn In 160 Hours at Full Power

Standard Operating Temperature −55°C to +85°C

Series MR-Dual Output



TYPICAL. WEIGHT. 26 Grams



Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

PICO Electronics, Inc.

453 North MacQuesten Pkwy.,
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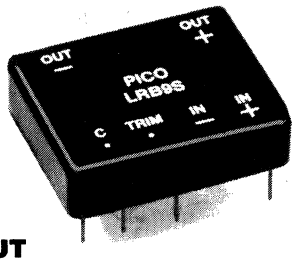
Delivery— stock to one week

SERIES LR

Regulated up to 5 Watt DC-DC Converters
Wide Input Range/up to 3.33:1
Fully Regulated
All Units Shielded



New 100 VDC Output Models

FEATURES:

- Voltage regulation over input of

	LOW	HI
LRE	5V	15V
LRF	8V	24V
LRA	18V	36V
LRB	36V	60V
LRC	18V	60V

- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Load regulation (see table for typical variation at different loads)
- Line regulation = Typical values
  - 5-15 V DC = ± 1.5%
  - 8-24 V DC = ± 1.5%
  - 18-36 V DC = ± 1.0%
  - 36-60 V DC = ± 1.0%
  - 18-60 V DC = ± 1.5%
- High efficiency—up to 80%
- Will operate over a temperature range of −25°C to +70°C with no heat sink or electrical derating
- 6 sided shielding
- Isolation—100 megohms at 500 volts DC
- External output trimming pin standard, + 5%
- Single and dual isolated outputs
- Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

Low Profile Less Than 0.5" ht.
For 0.3" ht. see pages 1940 & 1941

SERIES LR SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	VLD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
LRE5S	5-15	5	600	3	78	385	150	0.75	1.50	2.00	117.70
LRE9S	5-15	9	444	4	78	515	125	0.50	1.25	1.50	117.70
LRE12S	5-15	12	333	4	79	505	125	0.50	1.25	1.25	117.70
LRE15S	5-15	15	267	4	79	505	125	0.50	1.25	1.25	117.70
LRE24S	5-15	24	167	4	80	500	125	0.50	1.00	1.25	117.70
LRE28S	5-15	28	143	4	80	500	125	0.50	1.00	1.00	117.70
LRE48S	5-15	48	83	4	80	500	175	0.50	1.00	1.00	117.70
LRE100S	5-15	100	40	4	80	500	200	0.50	1.00	1.00	147.13
LRF5S	8-24	5	1000	5	78	400	150	0.75	1.50	2.00	117.70
LRF9S	8-24	9	556	5	78	400	125	0.50	1.25	1.50	117.70
LRF12S	8-24	12	417	5	79	395	125	0.50	1.25	1.25	117.70
LRF15S	8-24	15	333	5	79	395	125	0.50	1.25	1.25	117.70
LRF24S	8-24	24	208	5	80	390	125	0.50	1.00	1.25	117.70
LRF28S	8-24	28	179	5	80	390	125	0.50	1.00	1.00	117.70
LRF48S	8-24	48	104	5	80	390	175	0.50	1.00	1.00	117.70
LRF100S	8-24	100	50	5	80	390	200	0.50	1.00	1.00	147.13
LRA5S	18-36	5	1000	5	76	245	100	0.75	2.00	0.75	117.70
LRA9S	18-36	9	556	5	76	245	100	0.50	2.00	0.50	117.70
LRA12S	18-36	12	417	5	77	240	100	0.50	2.00	0.50	117.70
LRA15S	18-36	15	333	5	79	235	100	0.50	1.50	0.50	117.70
LRA24S	18-36	24	208	5	80	230	100	0.50	1.50	0.25	117.70
LRA28S	18-36	28	179	5	80	230	100	0.50	1.50	0.25	117.70
LRA48S	18-36	48	104	5	80	230	150	0.50	1.00	0.25	117.70
LRA100S	18-36	100	50	5	80	230	200	0.50	1.00	0.50	147.13
LRB5S	36-60	5	1000	5	74	140	100	0.75	1.25	0.50	139.10
LRB9S	36-60	9	556	5	74	140	100	0.50	1.00	0.25	139.10
LRB12S	36-60	12	417	5	74	140	100	0.50	1.00	0.25	139.10
LRB15S	36-60	15	333	5	76	135	100	0.50	1.00	0.25	139.10
LRB24S	36-60	24	208	5	76	135	100	0.50	0.75	0.25	139.10
LRB28S	36-60	28	179	5	76	135	100	0.50	0.75	0.25	139.10
LRB48S	36-60	48	104	5	76	135	150	0.50	0.75	0.25	139.10
LRB100S	36-60	100	50	5	76	135	200	0.50	1.00	0.50	173.88
LRC5S	18-60	5	1000	5	75	170	100	0.75	2.00	1.25	149.80
LRC9S	18-60	9	556	5	75	170	100	0.50	1.00	0.75	149.80
LRC12S	18-60	12	417	5	75	170	100	0.50	1.00	0.75	149.80
LRC15S	18-60	15	333	5	77	165	100	0.50	1.00	0.75	149.80
LRC24S	18-60	24	208	5	78	165	100	0.50	0.75	0.50	149.80
LRC28S	18-60	28	179	5	78	165	100	0.50	0.75	0.50	149.80
LRC48S	18-60	48	104	5	78	165	150	0.50	0.75	0.50	149.80
LRC100S	18-60	100	50	5	78	165	200	0.50	1.00	0.50	187.50

*Measurements taken with input voltage set at mid value.

‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

For immediate engineering assistance or to place an order—

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PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

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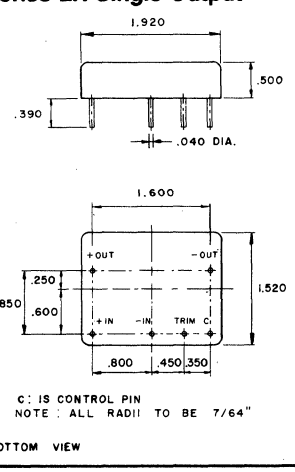
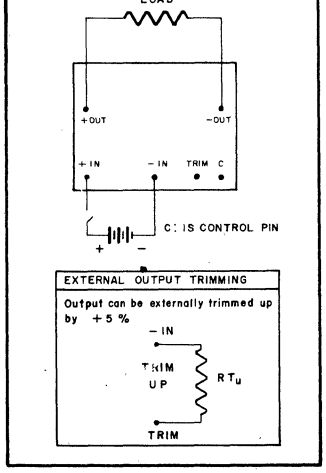
FAX 914-699-5565

Delivery—stock to one week

Series LR-Single Output

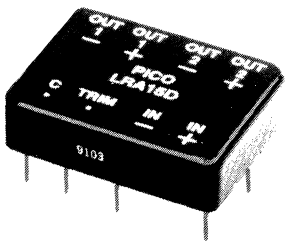




Typical Weight: 65 Grams

This series of high efficiency, wide input range, encapsulated regulators come in 75 different models. These units feature a 500 VOLT DC input to output isolation in both single and dual output models. The LR Series will operate over a temperature range of −25°C TO +70°C with no heat sink or electrical derating. These units are excellent for applications where input voltage varies dramatically, yet a high efficiency and output voltage regulation must be maintained.

TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Operating temperature: −25° C to +70° C
Output voltage tolerance: ± 1% at typical input voltage
Output voltage temperature coefficient: 0.02%°C
Storage temperature: −55°C to 125°C
Short circuit protection: Temporary



SERIES LR - DUAL OUTPUT

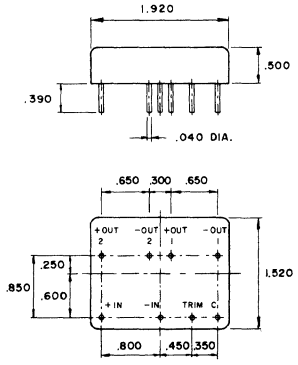
PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT (mA) PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
LRE5D	5–15	5	300	1.5	78	385	150	0.75	1.50	2.00	144.45
LRE9D	5–15	9	222	2.0	78	515	125	0.50	1.25	1.50	144.45
LRE12D	5–15	12	167	2.0	79	505	125	0.50	1.25	1.25	144.45
LRE15D	5–15	15	134	2.0	79	505	125	0.50	1.25	1.25	144.45
LRE24D	5–15	24	84	2.0	80	500	125	0.50	1.00	1.25	144.45
LRE28D	5–15	28	72	2.0	80	500	125	0.50	1.00	1.00	144.45
LRE48D	5–15	48	42	2.0	80	500	175	0.50	1.00	1.00	144.45
LRF5D	8–24	5	500	2.5	78	400	150	0.75	1.50	2.00	144.45
LRF9D	8–24	9	278	2.5	78	400	125	0.50	1.25	1.50	144.45
LRF12D	8–24	12	208	2.5	79	395	125	0.50	1.25	1.25	144.45
LRF15D	8–24	15	167	2.5	79	395	125	0.50	1.25	1.25	144.45
LRF24D	8–24	24	104	2.5	80	390	125	0.50	1.00	1.25	144.45
LRF28D	8–24	28	89	2.5	80	390	125	0.50	1.00	1.00	144.45
LRF48D	8–24	48	52	2.5	80	390	175	0.50	1.00	1.00	144.45
LRA5D	18–36	5	500	2.5	76	245	100	0.75	2.00	0.75	144.45
LRA9D	18–36	9	278	2.5	76	245	100	0.50	2.00	0.50	144.45
LRA12D	18–36	12	208	2.5	77	240	100	0.50	2.00	0.50	144.45
LRA15D	18–36	15	167	2.5	79	235	100	0.50	1.50	0.50	144.45
LRA24D	18–36	24	104	2.5	80	230	100	0.50	1.50	0.25	144.45
LRA28D	18–36	28	89	2.5	80	230	100	0.50	1.50	0.25	144.45
LRA48D	18–36	48	52	2.5	80	230	150	0.50	1.0	0.25	144.45
LRB5D	36–60	5	500	2.5	74	140	100	0.75	1.25	0.50	165.85
LRB9D	36–60	9	278	2.5	74	140	100	0.50	1.00	0.25	165.85
LRB12D	36–60	12	208	2.5	74	140	100	0.50	1.00	0.25	165.85
LRB15D	36–60	15	167	2.5	76	135	100	0.50	1.00	0.25	165.85
LRB24D	36–60	24	104	2.5	76	135	100	0.50	0.75	0.25	165.85
LRB28D	36–60	28	89	2.5	76	135	100	0.50	0.75	0.25	165.85
LRB48D	36–60	48	52	2.5	76	135	150	0.50	0.75	0.25	165.85
LRC5D	18–60	5	500	2.5	75	170	100	0.75	2.00	1.25	176.55
LRC9D	18–60	9	278	2.5	75	170	100	0.50	1.00	0.75	176.55
LRC12D	18–60	12	208	2.5	75	170	100	0.50	1.00	0.75	176.55
LRC15D	18–60	15	167	2.5	77	165	100	0.50	1.00	0.75	176.55
LRC24D	18–60	24	104	2.5	78	165	100	0.50	0.75	0.50	176.55
LRC28D	18–60	28	89	2.5	78	165	100	0.50	0.75	0.50	176.55
LRC48D	18–60	48	52	2.5	78	165	150	0.50	0.75	0.50	176.55

*Measurements taken with input voltage set at mid value.
‡ 10% minimum load required.
Ordering Instructions: No minimum.
Net 30 days F.O.B. Mt. Vernon, New York.

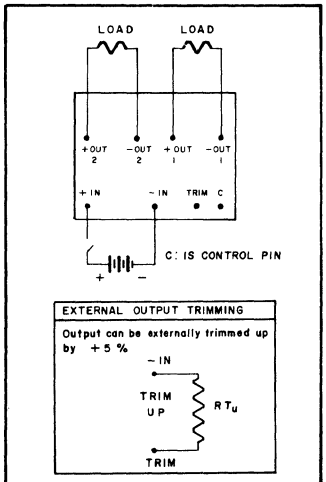
OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

Low Profile
Less Than 0.5" ht.
For 0.3" ht. see pages 1940 & 1941

Series LR-Dual Output



Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.



Typical Weight: 65 Grams

For immediate engineering assistance or to place an order—
Call Toll Free 800-431-1064

PICO Electronics, Inc.
453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552
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Delivery— stock to one week

SERIES PLR- Lowest Profile Series 0.300"

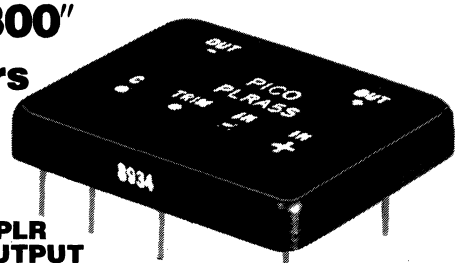
Regulated up to 5 Watt DC-DC Converters

Wide Input Range/up to 3.33:1

Fully Regulated

All Units Shielded

New 100 VDC Output Models



FEATURES:

- Voltage regulation over input of LOW HI
  PLRE 5V 15V
  PLRF 8V 24V
  PLRA 18V 36V
  PLRB 36V 60V
  PLRC 18V 60V
- .300" Height
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Load regulation (see table for typical variation at different loads)
- Line regulation = Typical values
  5–15 V DC = ± 1.5%
  8–24 V DC = ± 1.5%
  18–36 V DC = ± 1.0%
  36–60 V DC = ± 1.0%
  18–60 V DC = ± 1.5%
- High efficiency—up to 80%
- Will operate over a temperature range of –25°C to +70°C with no heat sink or electrical derating
- 6 sided shielding
- Isolation—100 megohms at 500 volts DC
- External output trimming pin standard, +5%
- Single and dual isolated outputs
- Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.

OPTIONS AVAILABLE
- Expanded operating temp (–55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (–55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

Low Profile 0.3" Height

SERIES PLR SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	VLD. REG. 25%-100% LOAD‡ (±%)*	LINE REGU-LATION (±%)*	PRICE 1-24
PLRE5S	5–15	5	600	3	78	385	175	0.75	1.75	2.00	176.55
PLRE9S	5–15	9	444	4	78	515	125	0.50	1.50	1.50	176.55
PLRE12S	5–15	12	333	4	79	505	125	0.50	1.25	1.25	176.55
PLRE15S	5–15	15	267	4	79	505	125	0.50	1.25	1.25	176.55
PLRE24S	5–15	24	167	4	80	500	125	0.50	1.00	1.25	176.55
PLRE28S	5–15	28	143	4	80	500	125	0.50	1.00	1.00	176.55
PLRE48S	5–15	48	83	4	80	500	300	0.50	1.00	1.00	176.55
PLRE100S	5–15	100	40	4	80	500	300	0.50	1.0	1.0	220.69
PLRF5S	8–24	5	1000	5	78	400	150	0.75	1.75	2.00	176.55
PLRF9S	8–24	9	556	5	78	400	125	0.50	1.50	1.50	176.55
PLRF12S	8–24	12	417	5	79	395	125	0.50	1.25	1.25	176.55
PLRF15S	8–24	15	333	5	79	395	125	0.50	1.25	1.25	176.55
PLRF24S	8–24	24	208	5	80	390	125	0.50	1.00	1.25	176.55
PLRF28S	8–24	28	179	5	80	390	125	0.50	1.00	1.00	176.55
PLRF48S	8–24	48	104	5	80	390	250	0.50	1.00	1.00	176.55
PLRF100S	8–24	100	50	5	80	390	300	0.50	1.0	1.0	220.69
PLRA5S	18–36	5	1000	5	76	245	100	0.75	2.00	1.00	176.55
PLRA9S	18–36	9	556	5	76	245	100	0.50	2.00	0.50	176.55
PLRA12S	18–36	12	417	5	77	240	100	0.50	2.00	0.50	176.55
PLRA15S	18–36	15	333	5	79	235	100	0.50	1.50	0.50	176.55
PLRA24S	18–36	24	208	5	80	230	100	0.50	1.50	0.50	176.55
PLRA28S	18–36	28	179	5	80	230	100	0.50	1.50	0.50	176.55
PLRA48S	18–36	48	104	5	80	230	250	0.50	1.00	0.50	176.55
PLRA100S	18–36	100	50	5	80	230	300	0.50	1.0	1.0	220.69
PLRB5S	36–60	5	1000	5	74	140	100	0.75	1.75	0.50	208.65
PLRB9S	36–60	9	556	5	74	140	100	0.50	1.50	0.50	208.65
PLRB12S	36–60	12	417	5	74	140	100	0.50	1.00	0.25	208.65
PLRB15S	36–60	15	333	5	76	135	100	0.50	1.00	0.25	208.65
PLRB24S	36–60	24	208	5	76	135	100	0.50	0.75	0.25	208.65
PLRB28S	36–60	28	179	5	76	135	100	0.50	0.75	0.25	208.65
PLRB48S	36–60	48	104	5	76	135	200	0.50	0.75	0.25	208.65
PLRB100S	36-60	100	50	5	76	135	300	0.50	1.0	1.0	260.81
PLRC5S	18–60	5	1000	5	75	170	100	0.75	2.00	1.50	224.70
PLRC9S	18–60	9	556	5	75	170	100	0.50	1.50	1.00	224.70
PLRC12S	18–60	12	417	5	75	170	100	0.50	1.00	0.75	224.70
PLRC15S	18–60	15	333	5	77	165	100	0.50	1.00	0.75	224.70
PLRC24S	18–60	24	208	5	78	165	100	0.50	0.75	0.75	224.70
PLRC28S	18–60	28	179	5	78	165	100	0.50	0.75	0.75	224.70
PLRC48S	18–60	48	104	5	78	165	225	0.50	0.75	0.75	224.70
PLRC100S	18-60	100	50	5	78	165	300	0.50	1.0	1.0	280.88

** Measurements taken with input voltage set at mid value.*

‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

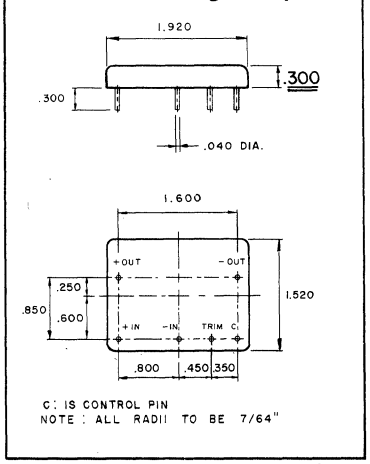
PICO Electronics, Inc.

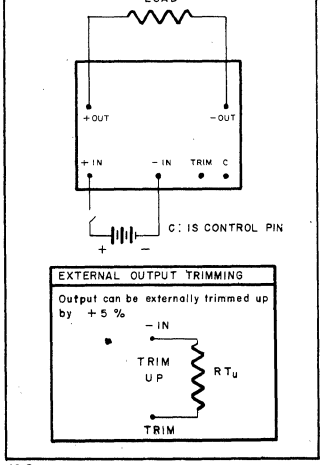
453 North MacQuesten Pkwy.,
Mt. Vernon, New York 10552

914-699-5514 • FAX 914-699-5565

Delivery— stock to one week

Series PLR-Single Output





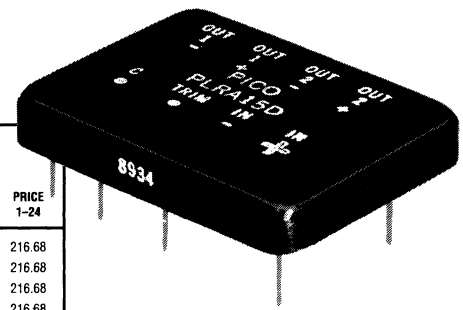
Typical Weight: 40 Grams

This series of Low Profile 0.300, high efficiency, wide input range, encapsulated regulators come in 75 different models. These units feature a 500 VOLT DC input to output isolation in both single and dual output models. The PLR Series will operate over a temperature range of –25°C TO +70°C with no heat sink or electrical derating. These units are excellent for applications where input voltage varies dramatically, yet a high efficiency and output voltage regulation must be maintained.

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient
Operating temperature: –25°C to +70°C
Output voltage tolerance: ± 1% at typical input voltage
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: –55°C to +125°C
Short circuit protection: Temporary

Lowest Profile Series 0.300"



SERIES PLR - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT (mA) PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1–24
PLRE5D	5–15	5	300	1.5	78	385	175	0.75	1.75	2.00	216.68
PLRE9D	5–15	9	222	2.0	78	515	125	0.50	1.50	1.50	216.68
PLRE12D	5–15	12	167	2.0	79	505	125	0.50	1.25	1.25	216.68
PLRE15D	5–15	15	134	2.0	79	505	125	0.50	1.25	1.25	216.68
PLRE24D	5–15	24	84	2.0	80	500	125	0.50	1.00	1.25	216.68
PLRE28D	5–15	28	72	2.0	80	500	125	0.50	1.00	1.00	216.68
PLRE48D	5–15	48	42	2.0	80	500	300	0.50	1.00	1.00	216.68
PLRF5D	8–24	5	500	2.5	78	400	100	0.75	1.75	2.00	216.68
PLRF9D	8–24	9	278	2.5	78	400	125	0.50	1.50	1.50	216.68
PLRF12D	8–24	12	208	2.5	79	395	125	0.50	1.25	1.25	216.68
PLRF15D	8–24	15	167	2.5	79	395	125	0.50	1.25	1.25	216.68
PLRF24D	8–24	24	104	2.5	80	390	125	0.50	1.00	1.25	216.68
PLRF28D	8–24	28	89	2.5	80	390	125	0.50	1.00	1.00	216.68
PLRF48D	8–24	48	52	2.5	80	390	250	0.50	1.00	1.00	216.68
PLRA5D	18–36	5	500	2.5	76	245	100	0.75	2.00	1.00	216.68
PLRA9D	18–36	9	278	2.5	76	245	100	0.50	2.00	0.50	216.68
PLRA12D	18–36	12	208	2.5	77	240	100	0.50	2.00	0.50	216.68
PLRA15D	18–36	15	167	2.5	79	235	100	0.50	1.50	0.50	216.68
PLRA24D	18–36	24	104	2.5	80	230	100	0.50	1.50	0.50	216.68
PLRA28D	18–36	28	89	2.5	80	230	100	0.50	1.50	0.50	216.68
PLRA48D	18–36	48	52	2.5	80	230	250	0.50	1.00	0.50	216.68
PLRB5D	36–60	5	500	2.5	74	140	100	0.75	1.75	0.50	248.78
PLRB9D	36–60	9	278	2.5	74	140	100	0.50	1.50	0.50	248.78
PLRB12D	36–60	12	208	2.5	74	140	100	0.50	1.00	0.25	248.78
PLRB15D	36–60	15	167	2.5	76	135	100	0.50	1.00	0.25	248.78
PLRB24D	36–60	24	104	2.5	76	135	100	0.50	0.75	0.25	248.78
PLRB28D	36–60	28	89	2.5	76	135	100	0.50	0.75	0.25	248.78
PLRB48D	36–60	48	52	2.5	76	135	200	0.50	0.75	0.25	248.78
PLRC5D	18–60	5	500	2.5	75	170	100	0.75	2.00	1.50	264.83
PLRC9D	18–60	9	278	2.5	75	170	100	0.50	1.50	1.00	264.83
PLRC12D	18–60	12	208	2.5	75	170	100	0.50	1.00	0.75	264.83
PLRC15D	18–60	15	167	2.5	77	165	100	0.50	1.00	0.75	264.83
PLRC24D	18–60	24	104	2.5	78	165	100	0.50	0.75	0.75	264.83
PLRC28D	18–60	28	89	2.5	78	165	100	0.50	0.75	0.75	264.83
PLRC48D	18–60	48	52	2.5	78	165	225	0.50	0.75	0.75	264.83

OPTIONS AVAILABLE
- Expanded operating temp. (–55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (–55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

Low Profile 0.3" Height

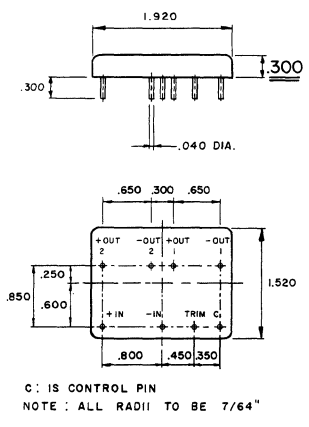
** Measurements taken with input voltage set at mid value.*

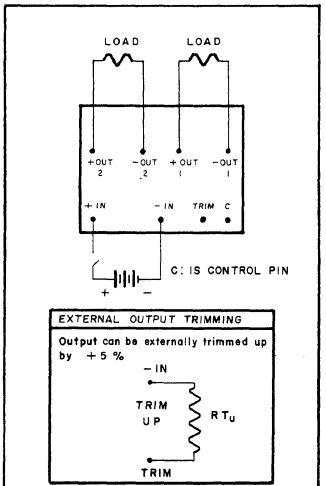
‡ 10% minimum load required.

Ordering Instructions:
No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.

Series PLR-Dual Output





Typical Weight: 40 Grams

For immediate engineering assistance or to place an order—

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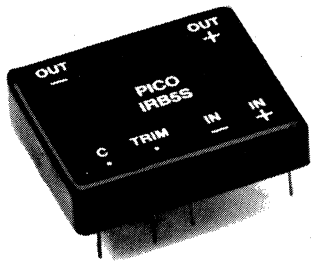
SERIES IR

Regulated up to 10 Watt DC-DC Converters
Wide Input Range/up to 3.33:1
Fully Regulated
All Units Shielded



New 100 VDC Output Models

FEATURES:

- Voltage regulation over input of

	LOW	HI
IRE	5V	15V
IRF	8V	24V
IRA	18V	36V
IRB	36V	60V
IRC	18V	60V

- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Load regulation (see table for typical variation at different loads)
- Line regulatioin = Typical values
  - 5-15 V DC = ± 1.5%
  - 8-24 V DC = ± 1.5%
  - 18-36 V DC = ± 1.0%
  - 36-60 V DC = ± 1.0%
  - 18-60 V DC = ± 1.5%
- High efficiency—up to 84%
- Will operate over a temperature range of −25°C to +70°C with no heat sink or electrical derating
- 6 sided shielding
- Isolation—100 megohms at 500 volts DC
- External output trimming pin standard, +5%
- Single and dual isolated outputs.
- Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.

OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

Low Profile Less Than 0.5" Height

SERIES IR - SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	VLD. REG. 25%-100% LOAD‡ (±%)*	LINE REGU-LATION (±%)*	PRICE 1-24
IRE5S	5-15	5	1200	6	80	750	175	0.75	2.00	2.00	128.40
IRE9S	5-15	9	889	8	80	1000	150	0.50	1.50	1.00	128.40
IRE12S	5-15	12	667	8	78	1025	150	0.50	1.50	1.00	128.40
IRE15S	5-15	15	533	8	78	1025	150	0.50	1.50	1.00	128.40
IRE24S	5-15	24	333	8	82	975	150	0.50	0.75	1.00	128.40
IRE28S	5-15	28	286	8	83	965	200	0.50	0.50	0.50	128.40
IRE48S	5-15	48	167	8	83	965	250	0.50	0.50	0.50	128.40
IRE100S	5-15	100	60	6	80	750	300	0.50	0.50	0.75	160.50
IRF5S	8-24	5	2000	10	80	780	200	0.75	1.50	1.75	128.40
IRF9S	8-24	9	1111	10	81	770	150	0.50	0.75	1.25	128.40
IRF12S	8-24	12	833	10	78	800	150	0.50	0.75	0.75	128.40
IRF15S	8-24	15	667	10	78	800	150	0.50	0.75	0.75	128.40
IRF24S	8-24	24	417	10	83	755	150	0.50	0.75	0.75	128.40
IRF28S	8-24	28	357	10	83	755	200	0.50	0.50	0.50	128.40
IRF48S	8-24	48	208	10	84	745	250	0.50	0.50	0.50	128.40
IRF100S	8-24	100	100	10	80	780	300	0.50	0.50	0.75	160.50
IRA5S	18-36	5	2000	10	81	455	125	0.75	1.25	0.75	128.40
IRA9S	18-36	9	1111	10	83	445	100	0.50	1.00	0.50	128.40
IRA12S	18-36	12	833	10	78	475	75	0.50	1.00	0.25	128.40
IRA15S	18-36	15	667	10	78	475	75	0.50	0.75	0.25	128.40
IRA24S	18-36	24	417	10	83	445	75	0.50	0.75	0.25	128.40
IRA28S	18-36	28	357	10	83	445	100	0.50	0.75	0.25	128.40
IRA48S	18-36	48	208	10	84	440	150	0.50	0.50	0.25	128.40
IRA100S	18-36	100	100	10	81	455	250	0.50	0.50	0.50	160.50
IRB5S	36-60	5	2000	10	81	255	125	0.75	1.25	0.50	149.80
IRB9S	36-60	9	1111	10	83	250	100	0.50	0.75	0.50	149.80
IRB12S	36-60	12	833	10	83	250	75	0.50	0.75	0.25	149.80
IRB15S	36-60	15	667	10	83	250	75	0.50	0.75	0.25	149.80
IRB24S	36-60	24	417	10	83	250	75	0.50	0.75	0.25	149.80
IRB28S	36-60	28	357	10	83	250	100	0.50	0.50	0.25	149.80
IRB48S	36-60	48	208	10	84	250	150	0.50	0.50	0.25	149.80
IRB100S	36-60	100	100	10	81	255	250	0.50	0.50	0.50	187.25
IRC5S	18-60	5	2000	10	81	320	125	0.75	1.25	1.00	160.50
IRC9S	18-60	9	1111	10	83	310	100	0.50	0.75	0.75	160.50
IRC12S	18-60	12	833	10	83	310	75	0.50	0.75	0.50	160.50
IRC15S	18-60	15	667	10	83	310	75	0.50	0.75	0.50	160.50
IRC24S	18-60	24	417	10	83	310	75	0.50	0.75	0.50	160.50
IRC28S	18-60	28	357	10	83	310	100	0.50	0.50	0.50	160.50
IRC48S	18-60	48	208	10	84	305	150	0.50	0.50	0.50	160.50
IRC100S	18-60	100	100	10	81	310	250	0.50	0.50	0.75	200.63

*Measurements taken with input voltage set at mid value. ‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

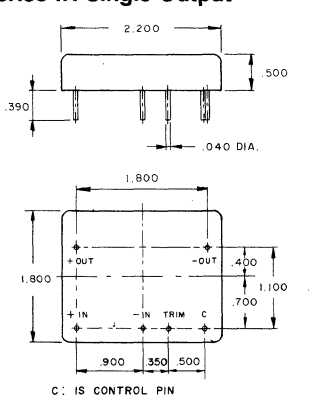
PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

914-699-5514 • FAX 914-699-5565

Delivery— stock to one week

Series IR-Single Output

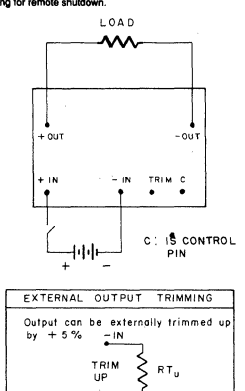


C: IS CONTROL PIN

NOTE: ALL RADII TYP. 7/64"

BOTTOM VIEW

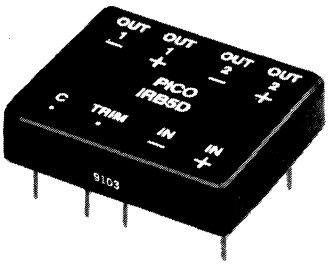
Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.



Typical Weight: 95 Grams

This series of high efficiency, wide input range, encapsulated regulators come in 75 different models. These units feature a 500 VOLT DC input to output isolation in both single and dual output models. The IR Series will operate over a temperature range of −25°C TO +70°C with no heat sink or electrical derating. These units are excellent for applications where input voltage varies dramatically, yet a high efficiency and output voltage regulation must be maintained.

TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Operating temperature: −25° C to +70° C
Output voltage tolerance: ± 1% at typical input voltage
Output voltage temperature coefficient: 0.02%°C
Storage temperature: −55°C to 125°C
Short circuit protection: Temporary



SERIES IR - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	VLD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
IRE5D	5–15	5	600	3	80	750	175	0.75	2.00	2.00	155.15
IRE9D	5–15	9	444	4	80	1000	150	0.50	1.50	1.00	155.15
IRE12D	5–15	12	333	4	78	1025	150	0.50	1.50	1.00	155.15
IRE15D	5–15	15	267	4	78	1025	150	0.50	1.50	1.00	155.15
IRE24D	5–15	24	167	4	82	975	150	0.50	0.75	1.00	155.15
IRE28D	5–15	28	143	4	83	965	200	0.50	0.50	0.50	155.15
IRE48D	5–15	48	83	4	83	965	250	0.50	0.50	0.50	155.15
IRF5D	8–24	5	1000	5	80	780	200	0.75	1.50	1.75	155.15
IRF9D	8–24	9	556	5	81	770	150	0.50	0.75	1.25	155.15
IRF12D	8–24	12	417	5	78	800	150	0.50	0.75	0.75	155.15
IRF15D	8–24	15	333	5	78	800	150	0.50	0.75	0.75	155.15
IRF24D	8–24	24	208	5	83	755	150	0.50	0.75	0.75	155.15
IRF28D	8–24	28	179	5	83	755	200	0.50	0.50	0.50	155.15
IRF48D	8–24	48	104	5	84	745	250	0.50	0.50	0.50	155.15
IRA5D	18–36	5	1000	5	81	455	125	0.75	1.25	0.75	155.15
IRA9D	18–36	9	556	5	83	445	100	0.50	1.00	0.50	155.15
IRA12D	18–36	12	417	5	78	475	75	0.50	1.00	0.25	155.15
IRA15D	18–36	15	333	5	78	475	75	0.50	0.75	0.25	155.15
IRA24D	18–36	24	208	5	83	445	75	0.50	0.75	0.25	155.15
IRA28D	18–36	28	179	5	83	445	100	0.50	0.75	0.25	155.15
IRA48D	18–36	48	104	5	84	440	150	0.50	0.50	0.25	155.15
IRB5D	36–60	5	1000	5	81	255	125	0.75	1.25	0.50	176.55
IRB9D	36–60	9	556	5	83	250	100	0.50	0.75	0.50	176.55
IRB12D	36–60	12	417	5	83	250	75	0.50	0.75	0.25	176.55
IRB15D	36–60	15	333	5	83	250	75	0.50	0.75	0.25	176.55
IRB24D	36–60	24	208	5	83	250	75	0.50	0.75	0.25	176.55
IRB28D	36–60	28	179	5	83	250	100	0.50	0.50	0.25	176.55
IRB48D	36–60	48	104	5	84	250	150	0.50	0.50	0.25	176.55
IRC5D	18–60	5	1000	5	81	320	125	0.75	1.25	1.00	187.25
IRC9D	18–60	9	556	5	83	310	100	0.50	0.75	0.75	187.25
IRC12D	18–60	12	417	5	83	310	75	0.50	0.75	0.50	187.25
IRC15D	18–60	15	333	5	83	310	75	0.50	0.75	0.50	187.25
IRC24D	18–60	24	208	5	83	310	75	0.50	0.75	0.50	187.25
IRC28D	18–60	28	179	5	83	310	100	0.50	0.50	0.50	187.25
IRC48D	18–60	48	104	5	84	305	150	0.50	0.50	0.50	187.25

*Measurements taken with input voltage set at mid value.

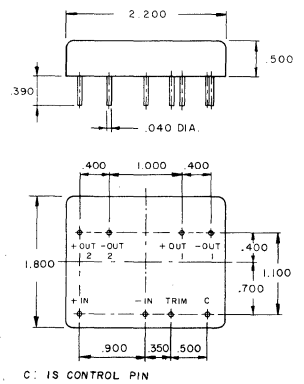
‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

OPTIONS AVAILABLE
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

Low Profile Less Than 0.5" Height

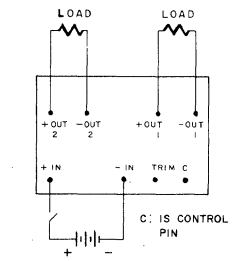
Series IR-Dual Output



NOTE: ALL RADII TYP. 7/64"

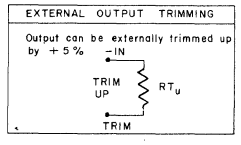
BOTTOM VIEW

Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.



EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed up by +5%



Typical Weight: 95 Grams

For immediate engineering assistance or to place an order—
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PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

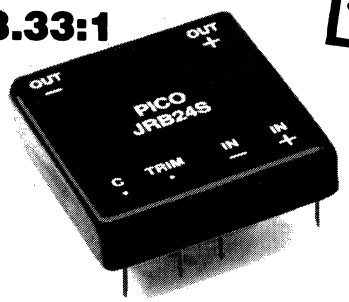
914-699-5514 • FAX 914-699-5565

Delivery— stock to one week

SERIES JR

Regulated 15 Watt DC-DC Converters
Wide Input Range/up to 3.33:1
Fully Regulated
All Units Shielded

OPTIONS AVAILABLE
- Expanded operating temp (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)



New 100 VDC Output Models

Low Profile Less Than 0.5" Height

SERIES JR - SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	VLD. REG. 25%-100% LOAD‡ (±%)*	LINE REGU-LATION (±%)*	PRICE 1-24
JRA5S	18–36	5	3000	15	78	710	50	0.75	2.00	1.50	154.08
JRA9S	18–36	9	1667	15	78	710	40	0.50	1.50	0.50	154.08
JRA12S	18–36	12	1250	15	78	710	40	0.50	1.00	0.50	154.08
JRA15S	18–36	15	1000	15	78	710	40	0.50	1.00	0.50	154.08
JRA24S	18–36	24	625	15	83	670	40	0.50	1.00	0.25	154.08
JRA28S	18–36	28	536	15	84	660	40	0.75	0.50	0.25	154.08
JRA48S	18–36	48	313	15	84	660	50	0.75	0.50	0.25	154.08
JRA100S	18–36	100	150	15	84	660	75	0.50	0.75	0.25	192.60
JRB5S	36–60	5	3000	15	78	400	50	0.75	2.00	0.75	179.76
JRB9S	36–60	9	1667	15	78	400	40	0.50	1.50	0.50	179.76
JRB12S	36–60	12	1250	15	80	390	40	0.50	1.00	0.50	179.76
JRB15S	36–60	15	1000	15	81	385	40	0.50	1.00	0.50	179.76
JRB24S	36–60	24	625	15	83	375	40	0.50	1.00	0.25	179.76
JRB28S	36–60	28	536	15	84	370	40	0.50	0.50	0.25	179.76
JRB48S	36–60	48	313	15	84	370	50	0.50	0.50	0.25	179.76
JRB100S	36-60	100	150	15	84	370	75	0.50	0.50	0.25	224.70
JRC5S	18–60	5	3000	15	78	495	50	0.75	2.00	1.50	192.60
JRC9S	18–60	9	1667	15	78	495	40	0.50	1.50	0.75	192.60
JRC12S	18–60	12	1250	15	80	480	40	0.50	1.00	0.75	192.60
JRC15S	18–60	15	1000	15	81	475	40	0.50	1.00	0.75	192.60
JRC24S	18–60	24	625	15	83	465	40	0.50	1.00	0.50	192.60
JRC28S	18–60	28	536	15	84	460	40	0.50	0.50	0.50	192.60
JRC48S	18–60	48	313	15	84	460	50	0.50	0.50	0.50	192.60
JRC100S	18-60	100	150	15	84	460	75	0.50	0.50	0.50	240.75

*Measurements taken with input voltage set at mid value. ‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

FEATURES:

- Voltage regulation over input of

	LOW	HI
JRA	18V	36V
JRB	36V	60V
JRC	18V	60V

- Encapsulated semi-conductors, conservatively rated for maximum reliability.
- Load regulation (see table for typical variation at different loads
- Line regulation = Typical values
  18–36V DC = ±1.0%
  36–60V DC = ±1.0%
  18–60V DC = ±2.0%
- High efficiency—up to 84%
- Will operate over a temperature range of −25°C to +70°C with no heat sink or electrical derating
- 6 sided shielding
- Isolation—100 megohms at 500 Volts DC
- External output trimming pin standard, +5%
- Single and dual isolated outputs
- Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

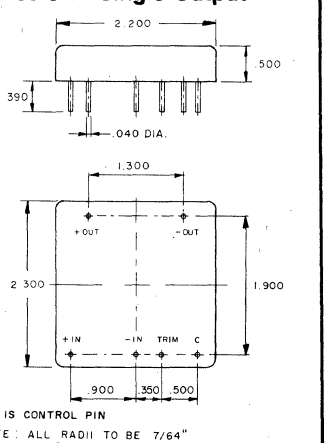
PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

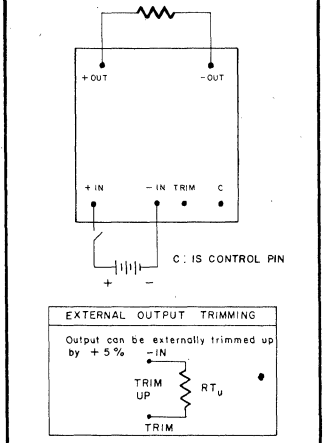
914-699-5514 • FAX 914-699-5565

Delivery— stock to one week

Series JR - Single Output



Typical Weight: 115 Grams



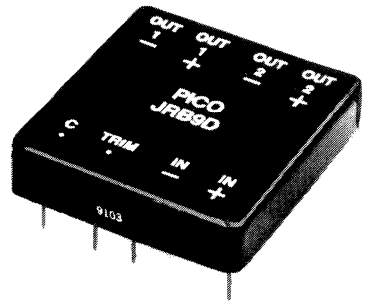
Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

This series of high efficiency, wide input range, encapsulated regulators come in 45 different models. These units feature a 500 Volt DC input to output isolation in both single and dual output models. The JR Series will operate over a temperature range of −25°C to +70°C with no heat sink or electrical derating. These units are excellent for applications where input voltage varies dramatically, yet a high efficiency and output voltage regulation must be maintained.

OPTIONS AVAILABLE
- Expanded operating temp (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient
Operating temperature: −25°C to +70°C
Output voltage tolerance: ±2% at typical input voltage
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: −55°C to +125°C
Short circuit protection: Temporary



SERIES JR - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
JRA5D	18–36	5	1500	7.5	78	710	50	0.75	2.00	1.50	180.83
JRA9D	18–36	9	833	7.5	78	710	40	0.50	1.50	0.50	180.83
JRA12D	18–36	12	625	7.5	78	710	40	0.50	1.00	0.50	180.83
JRA15D	18–36	15	500	7.5	78	710	40	0.50	1.00	0.50	180.83
JRA24D	18–36	24	313	7.5	83	670	40	0.50	1.00	0.25	180.83
JRA28D	18–36	28	268	7.5	84	660	40	0.75	0.75	0.25	180.83
JRA48D	18–36	48	156	7.5	84	660	50	0.75	0.75	0.25	180.83
JRB5D	36–60	5	1500	7.5	78	400	50	0.75	2.00	0.75	206.51
JRB9D	36–60	9	833	7.5	78	400	40	0.50	1.50	0.50	206.51
JRB12D	36–60	12	625	7.5	80	390	40	0.50	1.00	0.50	206.51
JRB15D	36–60	15	500	7.5	81	385	40	0.50	1.00	0.50	206.51
JRB24D	36–60	24	313	7.5	83	375	40	0.50	1.00	0.25	206.51
JRB28D	36–60	28	268	7.5	84	370	40	0.50	0.50	0.25	206.51
JRB48D	36–60	48	156	7.5	84	370	50	0.50	0.50	0.25	206.51
JRC5D	18–60	5	1500	7.5	78	495	50	0.75	2.00	1.50	219.35
JRC9D	18–60	9	833	7.5	78	495	40	0.50	1.50	0.75	219.35
JRC12D	18–60	12	625	7.5	80	480	40	0.50	1.00	0.75	219.35
JRC15D	18–60	15	500	7.5	81	475	40	0.50	1.00	0.75	219.35
JRC24D	18–60	24	313	7.5	83	465	40	0.50	1.00	0.50	219.35
JRC28D	18–60	28	268	7.5	84	460	40	0.50	0.50	0.50	219.35
JRC48D	18–60	48	156	7.5	84	460	50	0.50	0.50	0.50	219.35

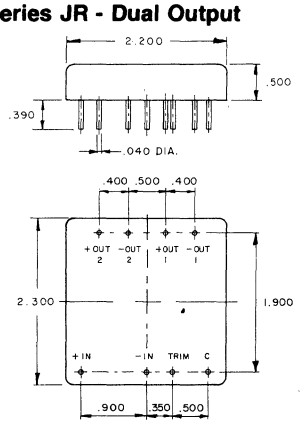
Low Profile Less Than 0.5" Height

*Measurements taken with input voltage set at mid value.

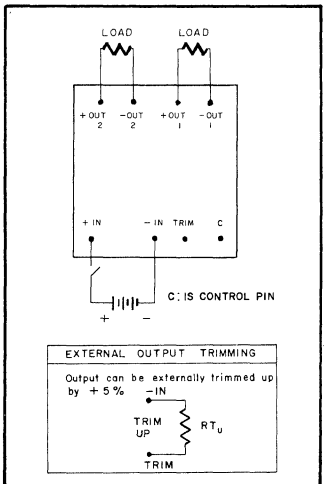
‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Series JR - Dual Output



Typical Weight: 115 Grams



Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

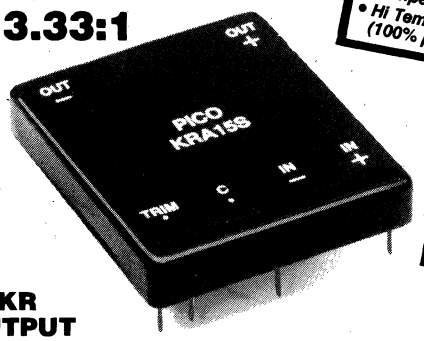
914-699-5514 • FAX 914-699-5565

Delivery— stock to one week

SERIES KR

Regulated 20 Watt DC-DC Converters
Wide Input Range/up to 3.33:1
Fully Regulated
All Units Shielded

OPTIONS AVAILABLE
- Expanded operating temp (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)



Low Profile Less Than 0.5" Height

New 100 VDC Output Models

SERIES KR SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	VLD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1–24
KRA5S	18–36	5	4000	20	78	950	60	0.75	2.50	1.50	185.11
KRA9S	18–36	9	2222	20	80	925	60	0.50	1.25	0.75	185.11
KRA12S	18–36	12	1667	20	78	950	60	0.50	1.00	0.50	185.11
KRA15S	18–36	15	1333	20	78	950	60	0.50	1.00	0.50	185.11
KRA24S	18–36	24	833	20	81	915	60	0.50	0.50	0.25	185.11
KRA28S	18–36	28	714	20	82	905	60	0.50	0.50	0.25	185.11
KRA48S	18–36	48	417	20	83	890	80	0.50	0.50	0.25	185.11
KRA100S	18–36	100	200	20	83	890	100	0.50	0.50	0.25	231.39
KRB5S	36–60	5	4000	20	78	535	60	0.75	2.50	1.00	216.14
KRB9S	36–60	9	2222	20	80	520	60	0.50	1.25	0.50	216.14
KRB12S	36–60	12	1667	20	78	535	60	0.50	1.00	0.50	216.14
KRB15S	36–60	15	1333	20	78	535	60	0.50	1.00	0.50	216.14
KRB24S	36–60	24	833	20	81	515	60	0.50	0.50	0.25	216.14
KRB28S	36–60	28	714	20	82	510	60	0.50	0.50	0.25	216.14
KRB48S	36–60	48	417	20	83	500	80	0.50	0.50	0.25	216.14
KRB100S	36-60	100	200	20	83	500	100	0.50	0.50	0.25	270.18
KRC5S	18–60	5	4000	20	78	660	60	0.75	2.50	2.00	231.12
KRC9S	18–60	9	2222	20	80	640	60	0.50	1.25	1.00	231.12
KRC12S	18–60	12	1667	20	78	660	60	0.50	1.00	0.75	231.12
KRC15S	18–60	15	1333	20	78	660	60	0.50	1.00	0.75	231.12
KRC24S	18–60	24	833	20	81	635	60	0.50	0.50	0.50	231.12
KRC28S	18–60	28	714	20	82	625	60	0.50	0.50	0.50	231.12
KRC48S	18–60	48	417	20	83	615	80	0.50	0.50	0.50	231.12
KRC100S	18-60	100	200	20	83	615	100	0.50	0.50	0.50	288.50

*Measurements taken with input voltage set at mid value. ‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

FEATURES

- Voltage regulation over input of

	LOW	HI
KRA	18V	36V
KRB	36V	60V
KRC	18V	60V

- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Load regulation (see table for typical variation at different loads
- Line regulation = Typical values
  18–36V DC = +1.5%
  36–60V DC = ±1.5%
  18–60V DC = ±3.0%
- High efficiency—up to 84%
- Will operate over a temperature range of −25°C to +70°C with no heat sink or electrical derating
- 6 sided shielding
- Isolation—100 megohms at 500 Volts DC
- External output trimming pin standard, +5%
- Single and dual isolated outputs
- Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

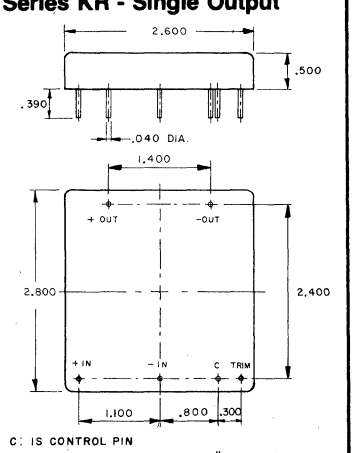
PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

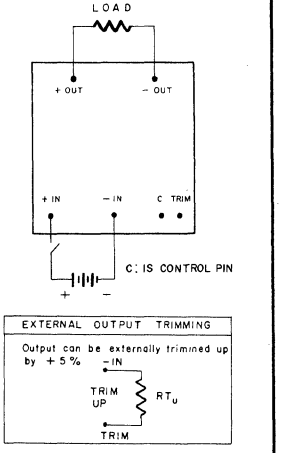
914-699-5514 • FAX 914-699-5565

Delivery— stock to one week

Series KR - Single Output



Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (–) input, will disable the unit, allowing for remote shutdown.



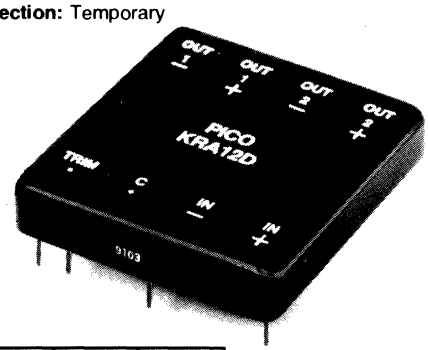
Typical Weight: 165 Grams

This series of high efficiency, wide input range, encapsulated regulators come in 45 different models. These units feature a 500 Volt DC input to output isolation in both single and dual output models. The KR Series will operate over a temperature range of −25°C to +70°C with no heat sink or electrical derating. These units are excellent for applications where input voltage varies dramatically, yet a high efficiency and output voltage regulation must be maintained.

OPTIONS AVAILABLE
- Expanded operating temp (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, full power burn in (100% power, 125°C case temp)

TYPICAL CHARACTERISTICS:

Test conditions: 25°C ambient
Operating temperature: −25°C to +70°C
Output voltage tolerance: ±3% at typical input voltage
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: −55°C to +125°C
Short circuit protection: Temporary



SERIES KR - DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
KRA5D	18–36	5	2000	10	78	950	60	0.75	2.50	1.50	211.86
KRA9D	18–36	9	1111	10	80	925	60	0.50	1.25	0.75	211.86
KRA12D	18–36	12	833	10	78	950	60	0.50	1.00	0.50	211.86
KRA15D	18–36	15	667	10	78	950	60	0.50	1.00	0.50	211.86
KRA24D	18–36	24	417	10	81	915	60	0.50	0.50	0.25	211.86
KRA28D	18–36	28	357	10	82	905	60	0.50	0.50	0.25	211.86
KRA48D	18–36	48	208	10	83	890	80	0.50	0.50	0.25	211.86
KRB5D	36–60	5	2000	10	78	535	60	0.75	2.50	1.00	242.89
KRB9D	36–60	9	1111	10	80	520	60	0.50	1.25	0.50	242.89
KRB12D	36–60	12	833	10	78	535	60	0.50	1.00	0.50	242.89
KRB15D	36–60	15	667	10	78	535	60	0.50	1.00	0.50	242.89
KRB24D	36–60	24	417	10	81	515	60	0.50	0.50	0.25	242.89
KRB28D	36–60	28	357	10	82	510	60	0.50	0.50	0.25	242.89
KRB48D	36–60	48	208	10	83	500	80	0.50	0.50	0.25	242.89
KRC5D	18–60	5	2000	10	78	660	60	0.75	2.50	2.00	257.87
KRC9D	18–60	9	1111	10	80	640	60	0.50	1.25	1.00	257.87
KRC12D	18–60	12	833	10	78	660	60	0.50	1.00	0.75	257.87
KRC15D	18–60	15	667	10	78	660	60	0.50	1.00	0.75	257.87
KRC24D	18–60	24	417	10	81	635	60	0.50	0.50	0.50	257.87
KRC28D	18–60	28	357	10	82	625	60	0.50	0.50	0.50	257.87
KRC48D	18–60	48	208	10	83	615	80	0.50	0.50	0.50	257.87

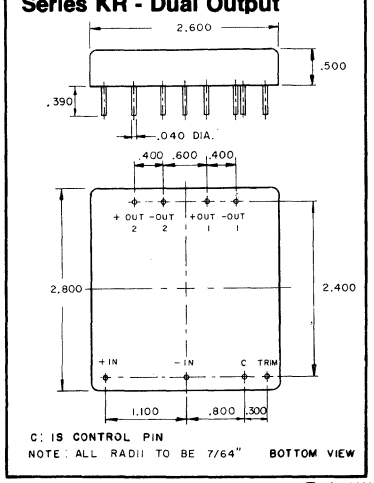
Low Profile Less Than 0.5" Height

*Measurements taken with input voltage set at mid value.

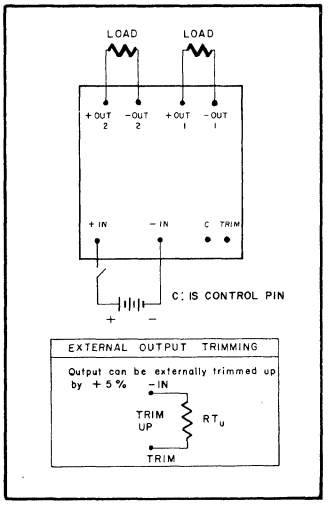
‡ 10% minimum load required.

Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Series KR - Dual Output



Each unit is supplied with an external control pin. This "C" pin, when connected to the negative (−) input, will disable the unit, allowing for remote shutdown.



Typical Weight: 165 Grams

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PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

914-699-5514 • FAX 914-699-5565

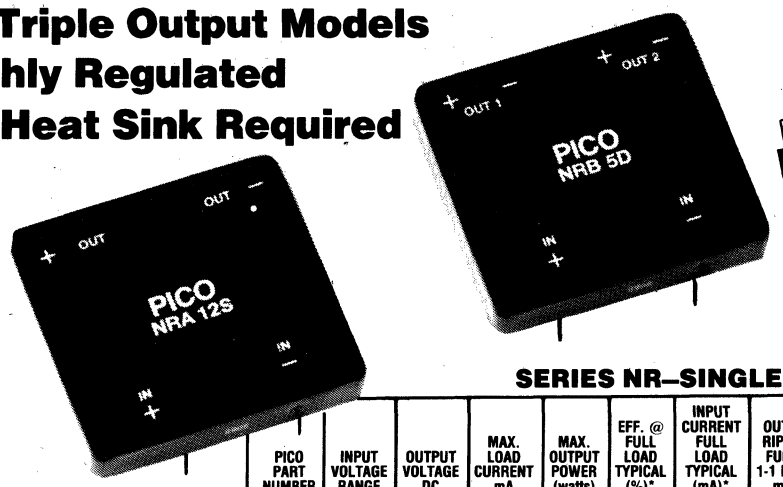
Delivery— stock to one week

SERIES NR

Regulated up to 30 Watt DC-DC Converters
Wide Input Range/up to 72V DC
30 Triple Output Models
Highly Regulated
No Heat Sink Required

Low Profile Less Than 0.5" Height

- 30 Triple Output Models
- 72 V Input Voltage
- 0.2% Line Regulation
- Continuous Short Circuit Protection



SERIES NR–SINGLE OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%–100% LOAD ‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
NRA5S	18–36	5	4000	20	78	1068	50	0.5	0.3	0.2	260.00
NRA9S	18–36	9	2777	25	80	1302	50	0.5	0.2	0.2	260.00
NRA12S	18–36	12	2083	25	81	1286	50	0.5	0.2	0.2	260.00
NRA15S	18–36	15	1666	25	83	1255	50	0.5	0.2	0.2	260.00
NRA24S	18–36	24	1042	25	84	1240	50	0.5	0.2	0.2	260.00
NRA28S	18–36	28	893	25	85	1225	50	0.5	0.2	0.2	260.00
NRB5S	36–72	5	4400	22	78	588	50	0.5	0.3	0.2	289.00
NRB9S	36–72	9	2777	25	83	628	50	0.5	0.2	0.2	289.00
NRB12S	36–72	12	2083	25	83	628	50	0.5	0.2	0.2	289.00
NRB15S	36–72	15	2000	30	85	735	50	0.5	0.2	0.2	289.00
NRB24S	36–72	24	1250	30	86	727	50	0.5	0.2	0.2	289.00
NRB28S	36–72	28	1071	30	87	718	50	0.5	0.2	0.2	289.00

‡ 10% minimum load required.

SERIES NR–DUAL OUTPUT

PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%–100% LOAD ‡ (±%)*	LINE REGULATION (±%)*	PRICE 1-24
NRA5D	18–36	± 5	2000	10.0	78	1068	50	0.5	0.3	0.2	310.00
NRA9D	18–36	± 9	1390	12.5	80	1302	50	0.5	0.2	0.2	310.00
NRA12D	18–36	±12	1042	12.5	81	1286	50	0.5	0.2	0.2	310.00
NRA15D	18–36	±15	833	12.5	83	1255	50	0.5	0.2	0.2	310.00
NRB5D	36–72	± 5	2200	11.0	78	588	50	0.5	0.3	0.2	339.00
NRB9D	36–72	± 9	1390	12.5	80	651	50	0.5	0.2	0.2	339.00
NRB12D	36–72	±12	1042	12.5	82	635	50	0.5	0.2	0.2	339.00
NRB15D	36–72	±15	833	12.5	84	620	50	0.5	0.2	0.2	339.00

**Measurements taken with input voltage set at mid value.*

‡ 10% minimum load required.

FEATURES:

- 30 triple output models
- Voltage regulation over input of

	LOW	HI
NRA	18V	36V
NRB	36V	72V

- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Load regulation (see table for typical variation at different loads
- Line regulation = Typical values
  18 – 36V DC = 0.2%
  36 – 72V DC = 0.2%
- High efficiency—up to 87%
- Will operate over a ambient temperature range of – 25°C to + 70°C with no heat sink or electrical derating required.
- Short circuit protection
- Current limited
- 6 sided shielding
- Isolation–100 megohms at 500 Volts DC
- Screw inserts for mounting

Delivery— stock to one week

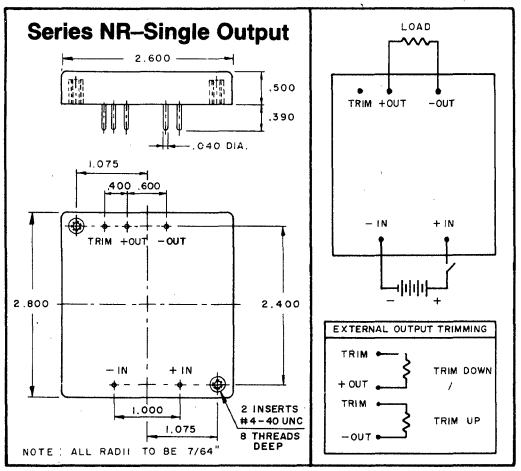
PICO Electronics, Inc.

453 N. MacQuesten Pkwy.
Mt. Vernon, N.Y. 10552

914-699-5514

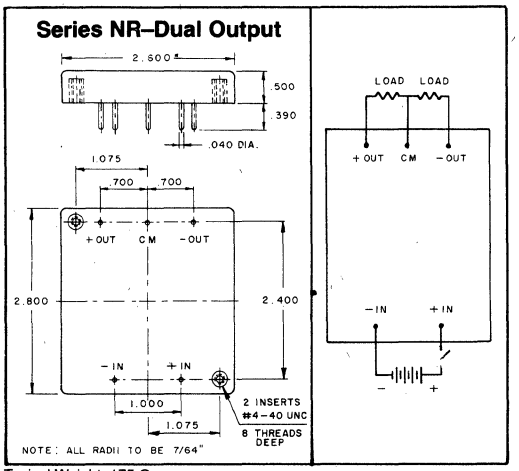
FAX 914-699-5565

Series NR–Single Output



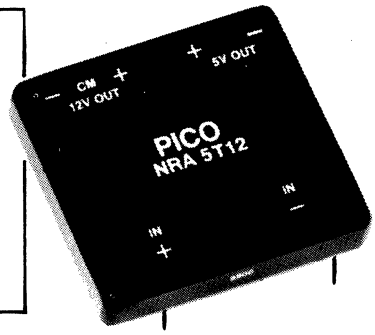
Typical Weight: 175 Grams

Series NR–Dual Output



Typical Weight: 175 Grams

This series of high efficiency wide input range, encapsulated regulators come in 50 different models including 30 Triple Output Models to ease board designs. These units feature a 500 Volt DC input to output isolation in both single, dual and triple output models. The NR Series will operate over an ambient temperature range of −25°C to +70°C with no heat sink or electrical derating. These units are excellent for applications where input voltage varies dramatically, yet a high efficiency and output voltage regulation must be maintained.



SERIES NR

TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Operating temperature: −25°C to +70°C
Output voltage tolerance:
0.5% main outputs
Output voltage temperature coefficient:
0.01%/°C
Storage temperature: −55°C to 125°C
Short circuit protection: Continuous

SERIES NR TRIPLE OUTPUT

		MAIN OUTPUT VOLTAGE					AUXILIARY OUTPUT VOLTAGE							
PICO PART NUMBER	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE DC OUTPUT	MAX. LOAD CURRENT mA OUTPUT	MAX. OUTPUT POWER (watts) OUTPUT	V LD. REG. 25%–100% LOAD ‡ (±%)*	OUT VOLT RIPPLE @ FULL LD. 1-1MHz BW mv p-p	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	VOLT. LOAD REG. 25%–100% LOAD ‡ (±%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	EFF. @ FULL LOAD TYPICAL (%)*	INPUT CURRENT FULL LOAD TYPICAL (mA)*	PRICE 1-24
NRA5T12	18–36	5	3000	15	0.2	50	±12	208	2.5	5	50	78	1068	360.00
NRA5T15	18–36	5	3000	15	0.2	50	±15	167	2.5	5	50	78	1068	360.00
NRA9T5	18–36	9	2220	20	0.2	50	± 5	500	2.5	5	50	80	1302	360.00
NRA9T12	18–36	9	2220	20	0.2	50	±12	208	2.5	5	50	80	1302	360.00
NRA9T15	18–36	9	2220	20	0.2	50	±15	167	2.5	5	50	80	1302	360.00
NRA12T5	18–36	12	1660	20	0.2	50	± 5	500	2.5	5	50	81	1286	360.00
NRA12T15	18–36	12	1660	20	0.2	50	±15	167	2.5	5	50	81	1286	360.00
NRA15T5	18–36	15	1330	20	0.2	50	± 5	500	2.5	5	50	83	1255	360.00
NRA15T12	18–36	15	1330	20	0.2	50	±12	208	2.5	5	50	83	1255	360.00
NRA24T5	18–36	24	830	20	0.2	50	± 5	500	2.5	5	50	84	1240	360.00
NRA24T12	18–36	24	830	20	0.2	50	±12	208	2.5	5	50	84	1240	360.00
NRA24T15	18–36	24	830	20	0.2	50	±15	167	2.5	5	50	84	1240	360.00
NRA28T5	18–36	28	714	20	0.2	50	± 5	500	2.5	5	50	85	1225	360.00
NRA28T12	18–36	28	714	20	0.2	50	±12	208	2.5	5	50	85	1225	360.00
NRA28T15	18–36	28	714	20	0.2	50	±15	167	2.5	5	50	85	1225	360.00
NRB5T12	36–72	5	3400	17	0.2	50	±12	208	2.5	5	50	78	588	389.00
NRB5T15	36–72	5	3400	17	0.2	50	±15	167	2.5	5	50	78	588	389.00
NRB9T5	36–72	9	2220	20	0.2	50	± 5	500	2.5	5	50	80	651	389.00
NRB9T12	36–72	9	2220	20	0.2	50	±12	208	2.5	5	50	80	651	389.00
NRB9T15	36–72	9	2220	20	0.2	50	±15	167	2.5	5	50	80	651	389.00
NRB12T5	36–72	12	1660	20	0.2	50	± 5	500	2.5	5	50	84	620	389.00
NRB12T15	36–72	12	1660	20	0.2	50	±15	167	2.5	5	50	84	620	389.00
NRB15T5	36–72	15	1667	25	0.2	50	± 5	500	2.5	5	50	85	735	389.00
NRB15T12	36–72	15	1667	25	0.2	50	±12	208	2.5	5	50	85	735	389.00
NRB24T5	36–72	24	1042	25	0.2	50	± 5	500	2.5	5	50	86	727	389.00
NRB24T12	36–72	24	1042	25	0.2	50	±12	208	2.5	5	50	86	727	389.00
NRB24T15	36–72	24	1042	25	0.2	50	±15	167	2.5	5	50	86	727	389.00
NRB28T5	36–72	28	893	25	0.2	50	± 5	500	2.5	5	50	87	718	389.00
NRB28T12	36–72	28	893	25	0.2	50	±12	208	2.5	5	50	87	718	389.00
NRB28T15	36–72	28	893	25	0.2	50	±15	167	2.5	5	50	87	718	389.00

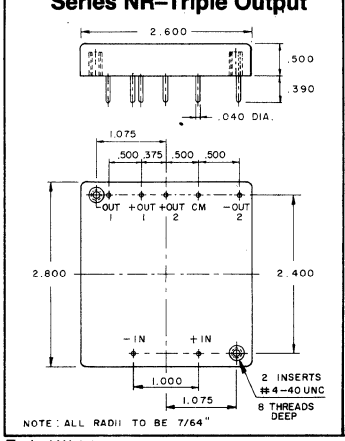
Common Characteristics
Main Output Voltage Tolerance ±0.5%*
Main Line Regulation ±0.2%*

Common Characteristics
Auxiliary Output Voltage Tolerance ±4%*
Auxiliary Line Regulation ±0.2%*

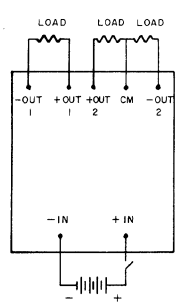
‡ 10% minimum load required.

Measurements taken with input voltage set at mid value.

Series NR–Triple Output



Typical Weight: 175 Grams



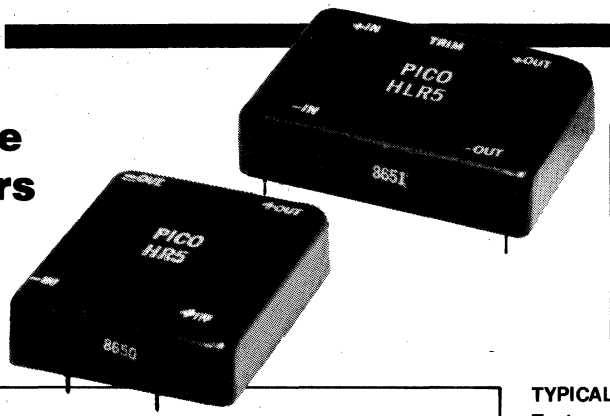
30 Triple Output Models

Delivery— stock to one week

For immediate engineering assistance or to place an order—
Call Toll Free 800-431-1064

PICO Electronics, Inc.
453 North MacQuesten Pkwy.
Mt. Vernon, New York 10552
914-699-5514 ● FAX 914-699-5565

SERIES HR/HRL
Hi Reliability
Wide Input Range
DC-DC Converters
up to 12 Watts



OPTIONS AVAILABLE
- *Expanded operating temp. (−55°C to +85°C)*
- *Stabilization Bake (125°C ambient)*
- *Temperature Cycle (−55°C to +125°C)*
- *Hi Temp, full power burn in (100% power, 125°C case temp)*

FEATURES:
- Excellent voltage regulation.
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Excellent load regulation
- Up to 12 watts output power at 70°C ambient.
- No heat sink required
- 6 sided shielding
- High efficiency (up to 90%)
- Low no load currents

This series of non-isolated encapsulated converters come in 6 different models. The units are single output and will operate over a temperature range of −25°C to +70°C. No heat sink is required. These units are excellent for applications where the input voltages varies over a wide range, yet they maintain a high efficiency and offer low no load currents.

TYPICAL CHARACTERISTICS:
Test conditions: = 25°C ambient
Output voltage tolerance: ±1% on all units
Line regulation: (see table below)
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.01% HRL 9 volt unit
0.005% all other models
Storage temperature: −55°C to +125°C
Short circuit protection: Temporary

PICO PART NUMBER		HR 5	HR 12	HR 15	HRL 9	HRL 12	HRL 15
OUTPUT VOLTAGE (VOLTS)		5	12	15	9	12	15
INPUT VOLTAGE RANGE (VOLTS)		17 to 35	17 to 35	17 to 35	5 to 9	5 to 12	5 to 15
TYPICAL INPUT CURRENT AT FULL LOAD (mA)	LOW LINE	475	560	785	2600	2600	2600
	HIGH LINE	245	285	408	1250	930	740
TYPICAL INPUT CURRENT AT NO LOAD (mA)		8.5	8.5	8.5	10	10	10
OUTPUT POWER (WATTS)		6	8	12	10	10	10
TYPICAL LINE REGULATION LOW LINE TO HIGH LINE (%)		0.5	0.2	0.2	.7	.7	.5
TYPICAL LOAD REGULATION NO LOAD TO FULL LOAD (%)		1.0	0.5	0.5	2	3	1.5
TYPICAL EFFICIENCY AT FULL LOAD (%)	LOW LINE	75	84	90	77	77	77
	HIGH LINE	70	80	84	88	89	90
OUTPUT RIPPLE PEAK TO PEAK MAXIMUM (mV)		200	200	200	100*	100*	100*
PRICE (1–24)		117.70	117.70	117.70	117.70	117.70	117.70

*The ripple is measured with a 10μf, 35 volt tantalum capacitor connected across the output.
Ordering Instructions: No minimum. Net 30 days F.O.B. Mt. Vernon, New York.

Delivery— stock to one week

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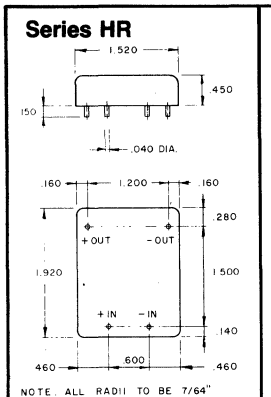
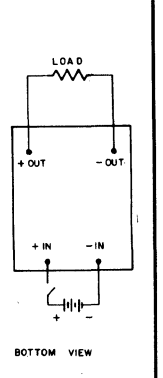
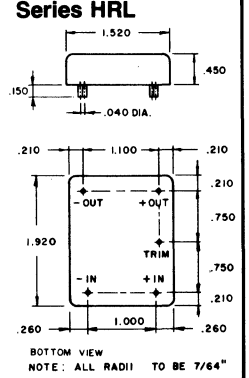
Series HR



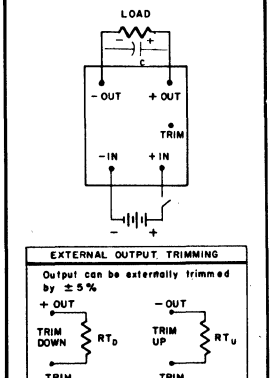
Typical Weight: 60 Grams



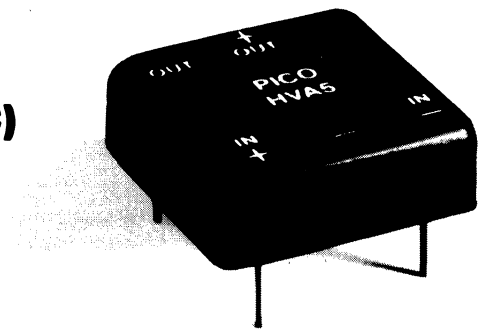
Series HRL



Typical Weight: 60 Grams



Series HVA
Hi Reliability
Hi Input Voltage (70–170 VDC)
Isolated 1000 VDC
Fully Regulated—3 Watts
Short Circuit Protected



FEATURES:

- Excellent line regulation ±0.5% (70 VAC–170 VAC)
- Excellent load regulation, from 25% to 100%, ±2%
- Continuous short circuit protection
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Isolation: 100 megohms at 1000 VDC, 6 sided shielding
- Wide input 70 VDC to 170 VDC

PICO's Series HVA of isolated, encapsulated converters offer you the opportunity to convert a 70 volt DC thru 170 volt DC input into 3 different output voltages. Rated for 3 watts, these units will operate from −25°C to +70°C with no heat sink or electrical derating required, while still maintaining excellent line and load regulation. These units are excellent for application where you have a rectified output from a 110 VAC source.

TYPICAL CHARACTERISTICS:

Test conditions: = 25°C ambient
Output voltage tolerance: ±2%, on all units
Line regulation: ±5%, on all units
Load regulation: ±2%, from 25% to full load, minimum load 10%
Operating temperature: −25°C to +71°C
Storage temperature: −55°C to +125°C
Output voltage temperature coefficient: 0.02% per °C
Short circuit protection: Continuous
Operating frequency: 1 MHz
Input voltage range: 70 VDC–170 VDC

PICO PART NUMBER	OUTPUT VOLTAGE (V DC)	MAX. LOAD CURRENT (VmA)	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD (%)	OUT VOLT TOLERANCE (±%)*	LOAD REGULATION 25%-100% LOAD (±%)**	LINE REGULATION @ FULL LOAD (±%)	OUTPUT VOLTAGE RIPPLE (mv p-p)	PRICE 1–24
HVA5	5	600	3	65	2	2	0.5	50	85.00
HVA12	12	250	3	67	2	2	0.5	25	85.00
HVA15	15	200	3	67	2	2	0.5	25	85.00

* AT 120VDC INPUT, FULL LOAD
** AT 120VDC

Delivery—
stock to one week

For immediate engineering assistance
or to place an order—
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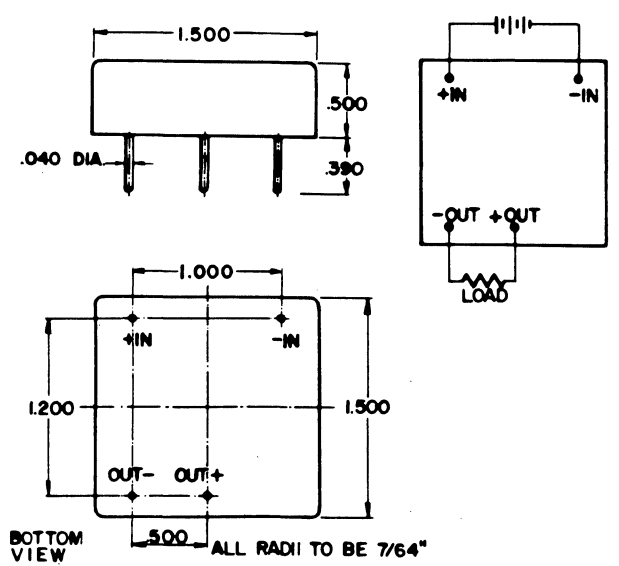

DC-DC Converters & AC-DC Power Supplies

OPTIONAL ENVIRONMENTAL SCREENING

All Pico DC-DC Converters and AC-DC Power Supplies are available with high reliability Screening options to insure the maximum quality unit for your system. Select from the list below or call factory for review of your specific applications.

OPTIONS AVAILABLE

Operating Temperature: expanded −55°C to +85°C

Reduced QA Lot Acceptance: 0.25 AQL per MIL-STD-105D

Stabilization Bake: per MIL-STD-883, method 1008, 24 hours TA = 125°C

Burn In: per MIL-STD-883, method 1015, 160 hours at 125°C (case temperature of unit 125°C)

Isolation between input and output: 100 megohms at 1000V D.C.

Temperature Cycle: per MIL-STD-883, method 1010, Cond. B. (−55C to +125°C)

All Transformers manufactured to MIL-T-27. All assembly and testing done in U.S.A.

Call today for price and delivery of your custom screened unit. Call factory to review any of your other military requirements

ORDERING INFORMATION

GENERAL: PICO ELECTRONICS Transformers, Inductors, DC-DC Converters and AC-DC Power Supplies are marketed on a direct factory basis and through authorized independent sales representatives in the United States and overseas. Our Sales and Engineering Departments will be pleased to assist you in choosing the correct unit for your particular application and in placing a purchase order. Call factory to review any of your other military requirements.

TRANSFORMER DISCOUNTS: 1-9 net, 10-24 net less 10%, 25-49 net less 16%, 50-99 net less 23%, 100-499 net less 30%. Contact factory for quantities over 499 pieces.

NO MINIMUM BILLING: PICO will be glad to accept your order for one unit.

DELIVERY: Most Transformers, Inductors, DC-DC Converters and AC-DC Power Supplies are in stock for same day delivery. If unit is not in stock, shipment will be made in one week or sooner.

TERMS: Net, 30 days. FOB Mount Vernon, N.Y.

GUARANTEE: We warrant each product manufactured by us and sold by us or our authorized agents, to be free from defects in material and workmanship and that, if operated properly, it will perform within applicable specifications for a period of one year after original shipment. Our obligation under this guarantee is limited to repairing or replacing our product within one year of delivery to the original purchaser.

This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of all our liabilities to purchaser. We do not warrant that the products can be used for any particular purpose other than those covered by the applicable specifications. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by purchaser or any third party in connection with products covered by this warranty or otherwise.

We reserve the right to discontinue products without notice, and to make modifications in design without incurring any obligation to make such modifications to products previously sold.

SPECIAL DESIGNS: Custom designed transformers and inductors are available for delivery in 9 days. Special designed features that are available include multiple magnetic shields, silicone rubber construction, electrostatic shielding, modification of turns ratio for better impedance match, addition of extra windings and taps, extended frequency range, broader temperature range, smaller size. Check with factory for delivery of custom designed DC-DC Converters and AC-DC Power Supplies.

For immediate engineering assistance or to place an order—

Call Toll Free 800-431-1064

In New York Phone 914-699-5514

FAX 914-699-5565

PICO Electronics, Inc.

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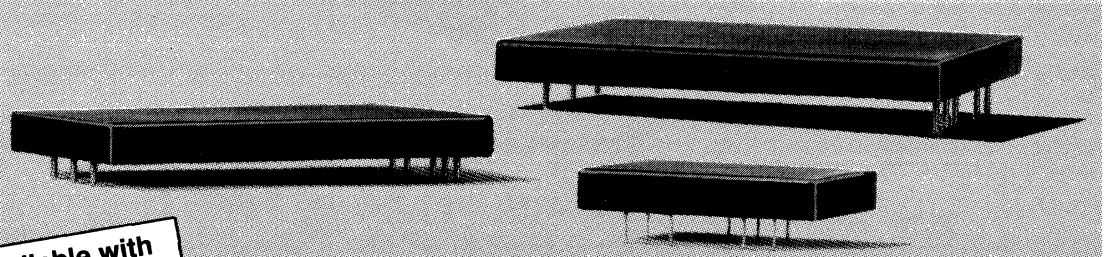
PICO

Lowest Profile 0.5" ht., up to 55 Watts

Hi-Reliability Ultra-Miniature AC-DC Power Supplies



Now available with 170 VAC to 240 VAC Input Voltage

	Page
AC-DC LINEAR MODULES . . . Series LAC, Regulated, Isolated ***Single, Dual and Triple, Wide Input Range up to 10 Watts***	**1954 1955**
AC-DC SWITCHERS . . . Series 5AC, Regulated, Isolated ***Single and Dual, Lowest Profile, 0.5" ht., up to 5 Watts***	**1956**
AC-DC SWITCHERS . . . Series 10AC, Regulated, Isolated ***Single, Dual and Triple, Lowest Profile, 0.5" ht., up to 10 Watts***	**1957**
AC-DC SWITCHERS . . . Series 30AC, Regulated, Isolated ***Single, Dual and Triple, Lowest Profile, 0.5" ht., up to 30 Watts***	**1958**
AC-DC SWITCHERS . . . Series 50AC, Regulated, Isolated ***Single, Dual and Triple, Lowest Profile, 0.5" ht., up to 55 Watts***	**1959**

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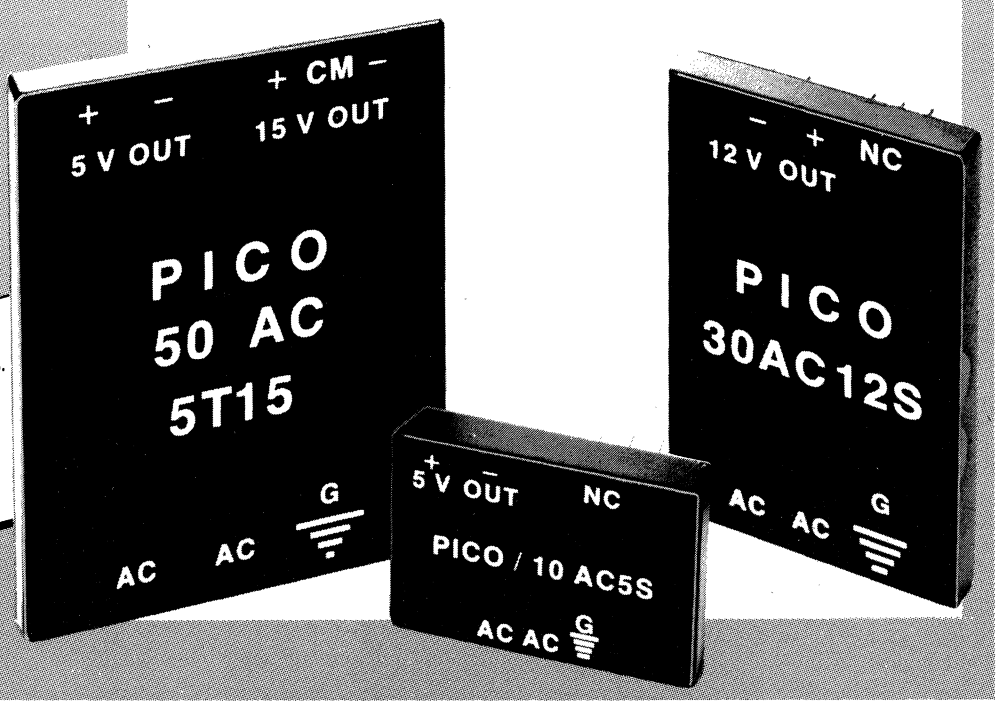
OPTIONS AVAILABLE PER MIL-STD-883
- Expanded operating temp. (−55°C to +85°C)
- Stabilization Bake (125°C ambient)
- Temperature Cycle (−55°C to +125°C)
- Hi Temp, burn in



SERIES LAC

Hi Reliability Isolated Regulated AC-DC Linear Modules

Single, Dual & Triple Outputs Up to 10 Watts

TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Input voltage: 105-125 VAC
Input frequency: 50 to 440 Hz
Line/load regulation: Consult chart
Output voltage tolerance: ±1.0%
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.02% 1°C
Storage temperature: −55°C to +85°C
Typical isolation: 100 megohms
Short circuit protection: Continuous

Series LAC AC-DC Linear Modules

FEATURES:

- Low output ripple = 1 to 2 MV RMS
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Excellent voltage regulation
- Excellent load regulation
- Up to 9 watts output power at 70°C ambient
- Typical isolation 100 megohms
- Single, dual and triple outputs
- No heat sink required
- Terminal strips available
- No output capacitor required

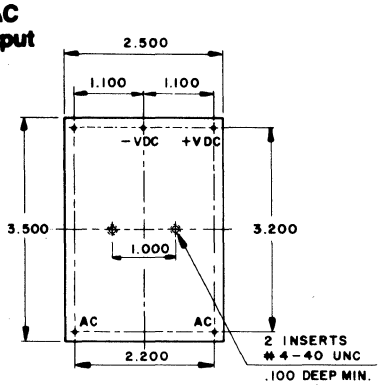
This series of linear AC to DC Power Supplies are available in 19 different models. All single, dual and triple output models offer excellent line and load regulation, while maintaining the output voltage ripple at a minimum. Continuous short-circuit protection and isolation are also standard on all models. The convenience of PC mounting, with mounting inserts, allows the use of this encapsulated unit in harsh environments.

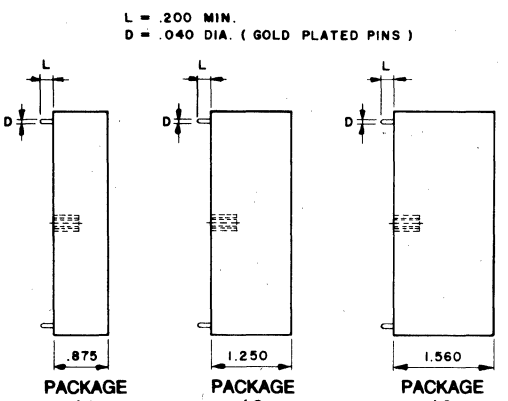
SERIES LAC SINGLE OUTPUT

PICO PART NUMBER	OUTPUT VOLTAGE (V dc)	MAX. LOAD CURRENT (mA)	MAX. OUTPUT POWER (watts)	OUT VOLT TOLERANCE (±%)*	V LD. REG. LOAD	LINE REGU-LATION	OUTPUT VOLTAGE RIPPLE @ FULL LOAD MV RMS	PACKAGE NUMBER	HEIGHT INCHES	PRICE 1–24
LAC 5/500S	5	500	2.5	1.0	0.2	0.05	1	L1	.875	$69.00
LAC 5/1000S	5	1000	5	1.0	0.2	0.05	1	L2	1.250	$85.00
LAC 5/2000S	5	2000	10	1.0	0.2	0.05	1	L3	1.560	$99.00
LAC 12/120S	12	120	1.44	1.0	0.1	0.10	1	L1	.875	$69.00
LAC 12/200S	12	200	2.4	1.0	0.1	0.10	1	L2	1.250	$85.00
LAC 12/500S	12	500	6.0	1.0	0.1	0.10	1	L3	1.560	$99.00
LAC 15/120S	15	120	1.8	1.0	0.1	0.10	1	L1	.875	$69.00
LAC 15/200S	15	200	3.0	1.0	0.1	0.10	1	L2	1.250	$85.00
LAC 15/500S	15	500	7.5	1.0	0.1	0.10	1	L3	1.560	$99.00

Consult factory for special voltage requirements

Series LAC Single Output





*For immediate engineering assistance or to place an order—**Call Toll Free 800-431-1064***

Delivery—stock to one week

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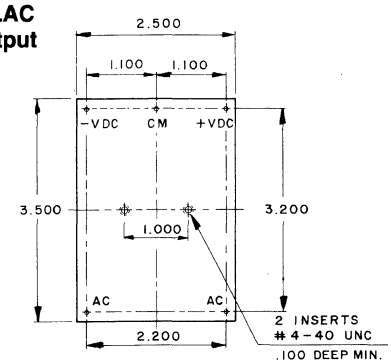
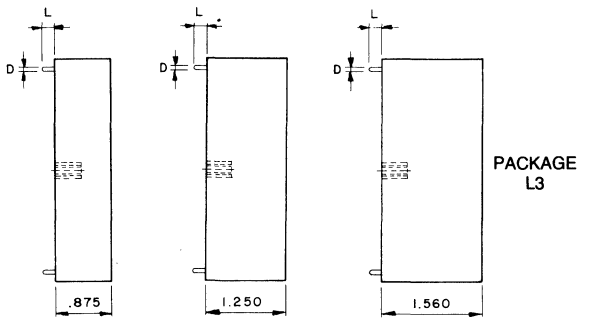
SERIES LAC DUAL OUTPUT

PICO PART NUMBER	± OUTPUT VOLTAGE (V dc)	MAX. LOAD CURRENT (mA) EACH OUTPUT	MAX. OUTPUT POWER (watts) EACH OUTPUT	OUT VOLT TOLERANCE (±%)	V LD. REG. LOAD	LINE REGU-LATION	OUTPUT VOLTAGE RIPPLE @ FULL LOAD MV RMS	PACKAGE NUMBER	HEIGHT INCHES	PRICE 1–24
LAC 5/200D	5	200	1.0	1%	0.1%	.05%	1	L2	1.250	$ 95.00
LAC 5/300D	5	300	1.5	1%	0.1%	.05%	1	L3	1.560	$110.00
LAC 12/100D	12	100	1.2	1%	0.1%	.02%	2	L1	.875	$ 95.00
LAC 12/300D	12	300	3.6	1%	0.1%	.02%	2	L3	1.560	$110.00
LAC 15/100D	15	100	1.5	1%	0.1%	.02%	2	L1	.875	$ 95.00
LAC 15/300D	15	300	4.5	1%	0.1%	.02%	2	L3	1.560	$110.00

Consult factory for special voltage requirements

Series LAC Dual Output





SERIES LAC TRIPLE OUTPUT

	MAIN OUTPUT VOLTAGE					AUXILIARY OUTPUT VOLTAGE							
PICO PART NUMBER	OUTPUT VOLTAGE DC OUTPUT	MAX. LOAD CURRENT mA OUTPUT	MAX. OUTPUT POWER (watts) OUTPUT	V LD. REG. LOAD %	OUTPUT VOLTAGE RIPPLE @ FULL LOAD MV RMS	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	VOLT. LOAD REG. LOAD %	OUTPUT VOLTAGE RIPPLE @ FULL LOAD MV RMS	PACKAGE NUMBER	HEIGHT INCHES	PRICE 1–24
LAC 512A	5	250	1.25	0.2	1.0	12	120	1.44	0.1	1.0	L3	1.56	$115.00
LAC 512B	5	500	2.5	0.2	1.0	12	120	1.44	0.1	1.0	L3	1.56	$130.00
LAC 515A	5	250	1.25	0.2	1.0	15	100	1.50	0.1	1.0	L3	1.56	$115.00
LAC 515B	5	500	2.5	0.2	1.0	15	100	1.50	0.1	1.0	L3	1.56	$130.00

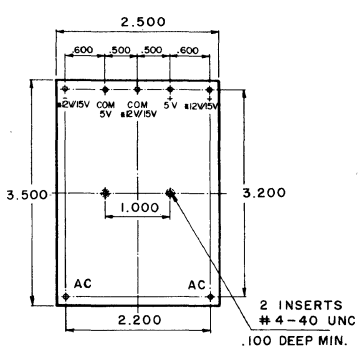
Common Characteristics
Main Output Voltage Tolerance ±1%
Main Line Regulation .02%

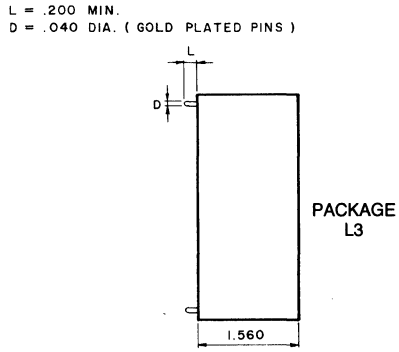
Common Characteristics
Auxiliary Output Voltage Tolerance ±1%
Auxiliary Line Regulation .02%

*Measurements taken at 115VAC-60Hz

Consult factory for special voltage requirements

Series LAC Triple Output





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Delivery—stock to one week

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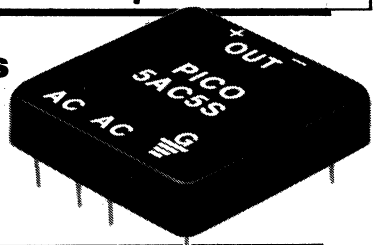
SERIES 5AC

Hi Reliability
Hi Efficiency/Isolated
Single and Dual Outputs
Regulated
5 Watt AC-DC Switchers

Lowest Profile!
0.5"ht. up to 5 Watts



TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Input voltage: 90-130VAC (47-440Hz)
Line/load Regulation: See specifications below
Converter frequency: 25-35 KHz typ.
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: −55°C to +125°C
Isolation: 1200V RMS
Short circuit protection: Continuous

OPTIONS AVAILABLE
- *Expanded operating temp (−55°C to +85°C)*
- *Stabilization Bake (125°C ambient)*
- *Temperature Cycle (−55°C to +125°C)*
- *Hi Temp, burn in*

Low Capacity Option
All units can be manufactured with isolation capacity of 50pF. Contact factory.

5 Watt AC-DC Switchers

FEATURES:
- Low profile 0.500"
- Low weight
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Excellent voltage regulation
- Excellent load regulation
- Up to 5 watts output power at 70°C ambient
- Low output ripple
- Isolation 1200V RMS
- Single and dual outputs
- No heat sink required
- Miniature size
- No output capacitor required
- Shielding

This series of low profile, 5 Watt AC to DC switchers come in 7 different models. These units offer high efficiency and precise regulation throughout the operating temperature range of −25°C to +70°C ambient, with no heat sink or electrical derating required. The 5 AC series keeps a maximum *0.500"* height while still offering you 1200 volts RMS isolation in a rugged encapsulated case. The convenience of PC mounting and the availability of three outputs should aid your circuit design.

SERIES 5AC SINGLE OUTPUT/INPUT VOLTAGE 90-130VAC (47-440Hz) (OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE RANGE	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
5AC5S	5	1000	5	72	50	0.5	0.5	0.2	189.00
5AC12S	12	417	5	75	50	0.5	0.5	0.2	189.00
5AC15S	15	333	5	75	50	0.5	0.5	0.2	189.00
5AC24S	24	208	5	76	50	0.5	0.5	0.2	189.00

*Readings taken at 115VAC-60Hz

**All units available with 170-240VAC input. Add H, prefix to part number-$40 per unit cost added.

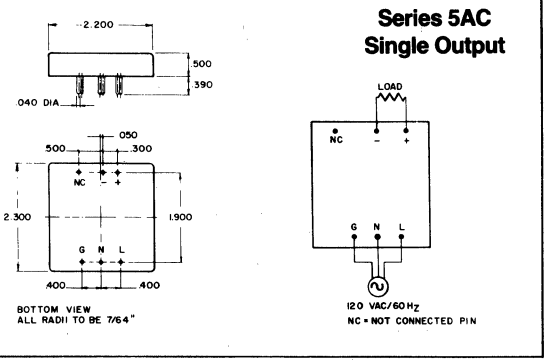
SERIES 5AC DUAL OUTPUT/INPUT VOLTAGE 90-130VAC (47-440Hz) (OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE RANGE	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 25%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
5AC5D	±5	500	2..5	72	50	0.5	0.5	0.2	214.00
5AC12D	±12	209	2.5	75	50	0.5	0.5	0.2	214.00
5AC15D	±15	167	2.5	75	50	0.5	0.5	0.2	214.00

*Readings taken at 115VAC-60Hz

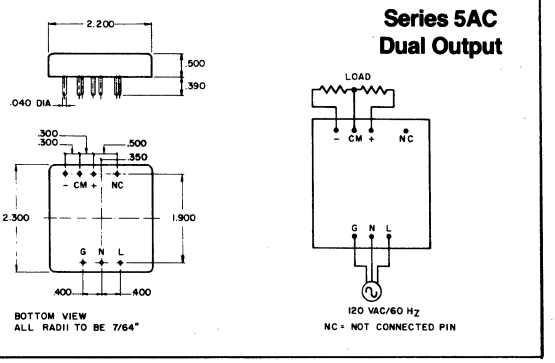
**All units available with 170-240VAC input. Add H, prefix to part number-$40 per unit cost added.

Series 5AC Single Output



Typical Weight: 130 Grams

Series 5AC Dual Output



Typical Weight: 145 Grams

Delivery— stock to one week

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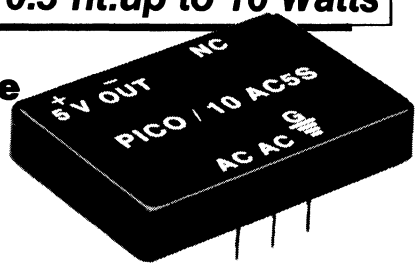
PICO Electronics, Inc.

453 N. MacQuesten Pkwy., Mt. Vernon, N.Y. 10552 • 914-699-5514 • FAX 914-699-5565

SERIES 10AC

Hi Reliability
Hi Efficiency/Isolated
Single, Dual and Triple Outputs
Regulated
10 Watt AC-DC Switchers

Lowest Profile!
0.5"ht.up to 10 Watts



TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Input voltage: 90-130VAC (47-440Hz)
Line/load Regulation: See specifications below
Converter frequency: 25-35 KHz typ.
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: −55°C to +125°C
Isolation: 1200V RMS
Short circuit protection: Continuous

OPTIONS AVAILABLE PER MIL-STD-883
- *Expanded operating temp (−55°C to +85°C)*
- *Stabilization Bake (125°C ambient)*
- *Temperature Cycle (−55°C to +125°C)*
- *Hi Temp, burn in*

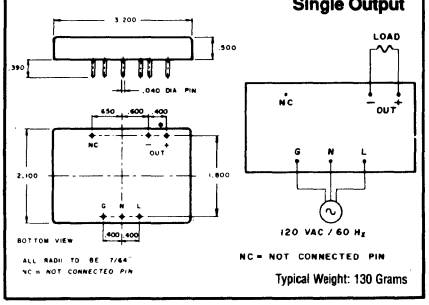
Low Capacity Option
All units can be manufactured with isolation capacity of 50pF. Contact factory.

10 Watt AC-DC Switchers

FEATURES:
- Low Profile *0.500"*
- Low weight
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Excellent voltage regulation
- Excellent load regulation
- Up to 10 watts output power at 70°C ambient
- Low output ripple
- Isolation 1200V RMS
- Single, Dual and Triple Outputs
- No heat sink required
- Miniature size
- No output capacitor required
- Shielding

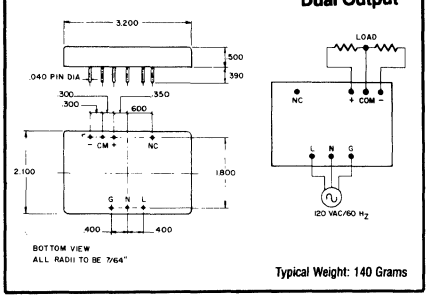
This series of low profile, 10 Watt AC to DC switchers come in 11 different models. These units offer high efficiency and precise regulation throughout the operating temperature range of -25°C to + 70°C ambient, with no heat sink or electrical derating required. The 10AC series keeps a maximum 0.500" height while still offering you 1200 volts RMS isolation in a rugged encapsulated case. The convenience of PC mounting and the availability of three outputs should aid your circuit design.

Series 10AC
Single Output



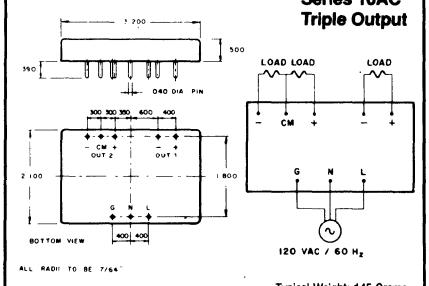
Typical Weight: 130 Grams

Series 10AC
Dual Output



Typical Weight: 140 Grams

Series 10AC
Triple Output



Typical Weight: 145 Grams

SERIES 10AC SINGLE OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE VDC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
10AC5S	5	2000	10	75	50	0.5	0.5	0.2	199.00
10AC12S	12	833	10	77	50	0.5	0.5	0.2	199.00
10AC15S	15	666	10	79	50	0.5	0.5	0.2	199.00
10AC24S	24	416	10	80	50	0.5	0.5	0.2	199.00

*Readings taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

SERIES 10AC DUAL OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE VDC	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
10AC5D	±5	1000	5	75	50	0.5	0.5	0.2	224.00
10AC12D	±12	417	5	77	50	0.5	0.5	0.2	224.00
10AC15D	±15	333	5	80	50	0.5	0.5	0.2	224.00

*Readings taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

SERIES 10AC TRIPLE OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

	MAIN OUTPUT VOLTAGE					AUXILIARY OUTPUT VOLTAGE						
PICO PART NUMBER	OUTPUT VOLTAGE DC VDC	MAX LOAD CURRENT mA OUTPUT	MAX OUTPUT POWER (watts) OUTPUT	V LD.REG. 25-100% LOAD (±%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p*	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	VOLT. LOAD REG. 25-100% LOAD (±%)*	OUTPUT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p*	EFF. @ FULL LOAD TYPICAL (%)	PRICE 1-24
10AC5T12	5	1400	7	0.5	50	±12	125	1.5	5	50	77	249.00
10AC5T15	5	1400	7	0.5	50	±15	100	1.5	5	50	77	249.00
10AC12T5	12	583	7	0.5	50	±5	300	1.5	5	50	77	249.00
10AC15T5	15	466	7	0.5	50	±5	300	1.5	5	50	79	249.00

Common Characteristics
Main Output Voltage Tolerance ±0.5%*
Main Line Regulation ±0.2%

Common Characteristics
Auxiliary Output Voltage Tolerance ±0.5%*
Auxiliary Line Regulation ±0.2%

*Measurements taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

Delivery— stock to one week

For immediate engineering assistance or to place an order— ***Call Toll Free 800-431-1064***

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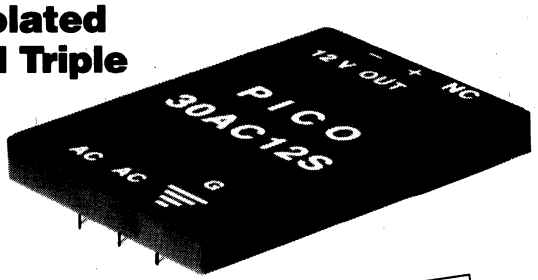
SERIES 30AC

Hi Reliability
Hi Efficiency/Isolated
Single, Dual and Triple Outputs
Regulated
30 Watt AC-DC Switchers

Lowest Profile!
0.5" ht. up to 30 Watts



TYPICAL CHARACTERISTICS
Test conditions: 25°C ambient
Input voltage: 90-130VAC (47-440Hz)
Line/load regulation: See specifications below
Converter frequency: 25-35 KHz typ.
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.02%/°C
Storage temperature: −55°C to +125°C
Isolation: 1200V RMS
Short circuit protection: Continuous

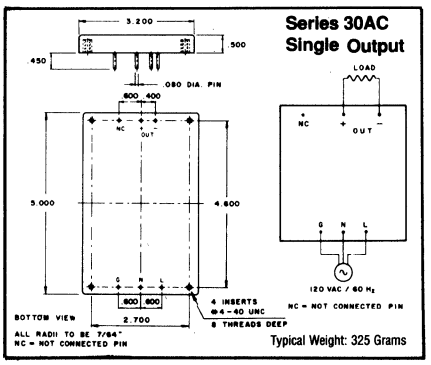
Low Capacity Option
All units can be manufactured with isolation capacity of 70pF. Contact factory.

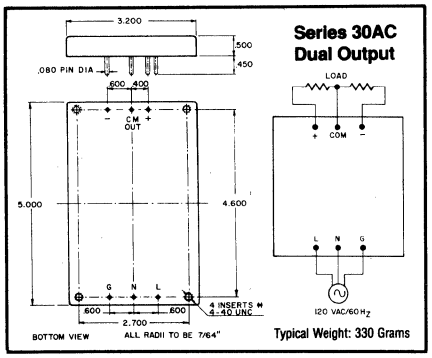
30 Watt AC-DC Switchers

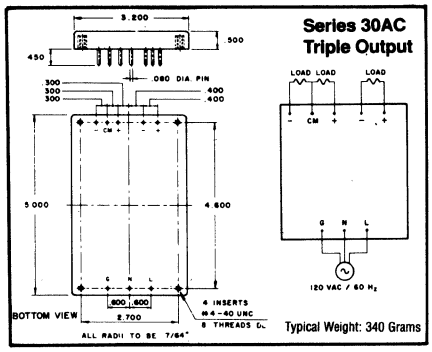
FEATURES:
- Low Profile *0.500"*
- Low weight
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Excellent voltage regulation
- Excellent load regulation
- Up to 30 watts output power at 70°C ambient
- Low output ripple
- Isolation 1200V RMS
- Single, Dual and Triple Outputs
- No heat sink required
- Miniature size
- No output capacitor required
- Shielding

OPTIONS AVAILABLE PER MIL-STD-883
- *Expanded operating temp. (−55°C to +85°C)*
- *Stabilization Bake (125°C ambient)*
- *Temperature Cycle (−55°C to +125°C)*
- *Hi Temp, burn in*

This series of low profile, 25-30 Watt AC to DC switchers come in 11 different models. These units offer high efficiency and precise regulation throughout the operating temperature range of -25°C to + 70°C ambient, with no heat sink or electrical derating required. The 30AC series keeps a maximum 0.500" height while still offering you 1200 volts RMS isolation in a rugged encapsulated case. The convenience of PC mounting and the availability of three outputs should aid your circuit design.







SERIES 30AC SINGLE OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-440Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE VDC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
30AC5S	5	5000	25	75	50	0.5	0.5	0.2	299.00
30AC12S	12	2500	30	81	50	0.5	0.5	0.2	299.00
30AC15S	15	2000	30	82	50	0.5	0.5	0.2	299.00
30AC24S	24	1250	30	83	50	0.5	0.5	0.2	299.00

*Readings taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

SERIES 30AC DUAL OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE VDC	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
30AC5D	±5	2500	12.5	76	50	0.5	0.5	0.2	334.00
30AC12D	±12	1250	15	78	50	0.5	0.5	0.2	334.00
30AC15D	±15	1000	15	80	50	0.5	0.5	0.2	334.00

*Readings taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

SERIES 30AC TRIPLE OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

	MAIN OUTPUT VOLTAGE					AUXILIARY OUTPUT VOLTAGE						
PICO PART NUMBER	OUTPUT VOLTAGE DC VDC	MAX LOAD CURRENT mA OUTPUT	MAX OUTPUT POWER (watts) OUTPUT	V LD.REG. 25-100% LOAD (±%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p*	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	VOLT. LOAD REG. 25-100% LOAD (±%)*	OUTPUT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p*	EFF. @ FULL LOAD TYPICAL (%)	PRICE 1-24
30AC5T12	5	4000	20	0.5	50	±12	208	2.5	5	50	78	369.00
30AC5T15	5	4000	20	0.5	50	±15	166	2.5	5	50	78	369.00
30AC12T5	12	2080	25	0.5	50	±5	500	2.5	5	50	80	369.00
30AC15T5	15	1660	25	0.5	50	±5	500	2.5	5	50	80	369.00
	Common Characteristics Main Output Voltge Tolerance ±0.5%* Main Line Rgulation ±0.2%					Common Characteristics Auxiliary Output Voltge Tolerance ±0.5%* Auxiliary Line Rgulation ±0.2%						

*Measurements taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

Delivery— stock to one week

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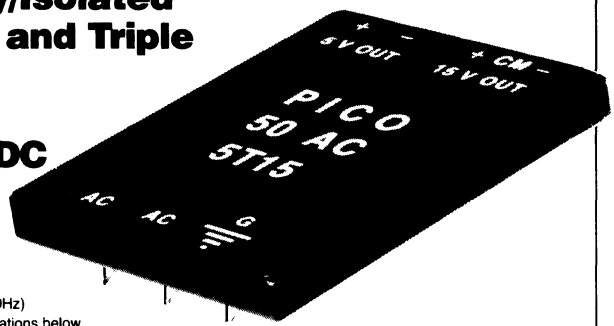
SERIES 50AC

Hi Reliability
Hi Efficiency/Isolated
Single, Dual and Triple Outputs
Regulated
55 Watt AC-DC Switchers

Lowest Profile!
0.5" ht. up to 55 Watts



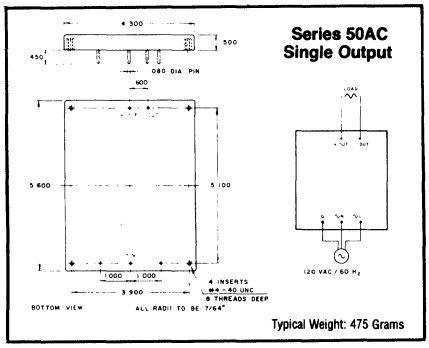
TYPICAL CHARACTERISTICS:
Test conditions: 25°C ambient
Input voltage: 90-130VAC (47-440Hz)
Line/load regulation: See specifications below
Converter frequency: 40-60 KHz typ.
Operating temperature: −25°C to +70°C
Output voltage temperature coefficient: 0.02%C
Storage temperature: −55°C to +125°C
Isolation: 1200V RMS
Short circuit protection: Continuous

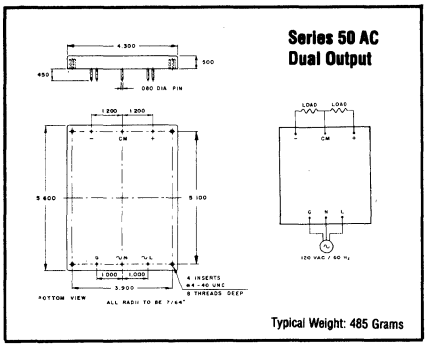
OPTIONS AVAILABLE PER MIL-STD-883
- *Expanded operating temp (−55°C to +85°C)*
- *Stabilization Bake (125°C ambient)*
- *Temperature Cycle (−55°C to +125°C)*
- *Hi Temp, burn in*

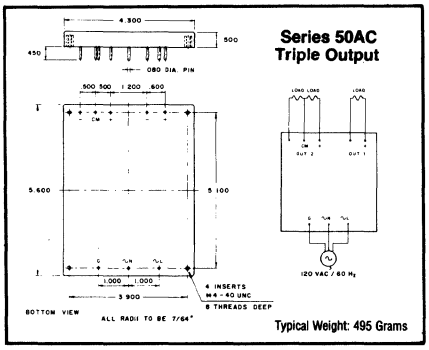
55 Watt AC-DC Switchers

FEATURES:
- Low Profile *0.500"*
- Low weight
- Encapsulated semiconductors, conservatively rated for maximum reliability.
- Excellent voltage regulation
- Excellent load regulation
- Up to 55 watts output power at 70°C ambient
- Low output ripple
- Isolation 1200V RMS
- Single, Dual and Triple Outputs
- No heat sink required
- Miniature size
- No output capacitor required
- Shielding

This series of low profile, 45-55 Watt AC to DC switchers come in 11 different models. These units offer high efficiency and precise regulation throughout the operating temperature range of -25°C to + 70°C ambient, with no heat sink or electrical derating required. The 50AC series keeps a maximum 0.500" height while still offering you 1200 volts RMS isolation in a rugged encapsulated case. The convenience of PC mounting and the availability of three outputs should aid your circuit design.







SERIES 50AC SINGLE OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE VDC	MAX. LOAD CURRENT mA	MAX. OUTPUT POWER (watts)	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
50AC5S	5	9000	45	75	50	1.0	0.75	0.2	359.00
50AC12S	12	4583	55	80	50	0.5	0.30	0.2	359.00
50AC15S	15	3667	55	83	50	0.5	0.30	0.2	359.00
50AC24S	24	2292	55	86	50	0.5	0.30	0.2	359.00

*Readings taken at 115VAC-60Hz **All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

SERIES 50AC DUAL OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

PICO PART NUMBER	OUTPUT VOLTAGE VDC	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	EFF. @ FULL LOAD TYPICAL (%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p	OUT VOLT TOLERANCE (±%)*	V LD. REG. 10%-100% LOAD (±%)*	LINE REGULATION (±%)*	PRICE 1-24
50AC5D	5	4500	22.5	75	50	1.0	0.75	0.2	377.00
50AC12D	12	2291	27.5	80	50	0.5	0.30	0.2	377.00
50AC15D	15	1833	27.5	83	50	0.5	0.30	0.2	377.00

*Readings taken at 115VAC-60Hz **All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

SERIES 50AC TRIPLE OUTPUT
INPUT VOLTAGE 90-130VAC (47-440Hz)
(OPTIONAL 170-240VAC, 47-400Hz**)

	MAIN OUTPUT VOLTAGE					AUXILIARY OUTPUT VOLTAGE						
PICO PART NUMBER	OUTPUT VOLTAGE DC VDC	MAX LOAD CURRENT mA OUTPUT	MAX OUTPUT POWER (watts) OUTPUT	V LD.REG. 25-100% LOAD (±%)*	OUT VOLT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p*	OUTPUT VOLTAGE DC PER OUTPUT	MAX. LOAD CURRENT mA PER OUTPUT	MAX. OUTPUT POWER (watts) PER OUTPUT	VOLT. LOAD REG.- 25-100% LOAD (±%)*	OUTPUT RIPPLE @ FULL LD. 1-1 MHz BW mv p-p*	EFF. @ FULL LOAD TYPICAL (%)	PRICE 1-24
50AC5T12	5	8000	40	0.75	50	±12	208	2.5	1.0	50	75	395.00
50AC5T15	5	8000	40	0.75	50	±15	167	2.5	1.0	50	75	395.00
50AC12T5	12	3750	45	0.25	50	±5	500	2.5	1.0	50	77	395.00
50AC15T5	15	3000	45	0.25	50	±5	500	2.5	1.0	50	79	395.00
	Common Characteristics Main Output Voltge Tolerance ±0.5%* Main Line Rgulation ±0.2%					Common Characteristics Auxiliary Output Voltge Tolerance ±0.5%* Auxiliary Line Rgulation ±0.2%						

*Measurements taken at 115VAC-60Hz

**All units available with 170-240VAC Input. Add H, prefix to part number-$40 per unit cost added.

Delivery— stock to one week

For immediate engineering assistance or to place an order— ***Call Toll Free 800-431-1064***

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PILLAR INDUSTRIES Manufacturer of AC ADAPTORS

- **UL, CSA Approved Power Supplies**
- **JIS Approved Japanese Power Supplies**
- **VDE Approved European Power Supplies**
- **British (U.K.) Style Power Supplies**

GENERAL SPECIFICATIONS

- Input:
  120VAC 60Hz UL/CSA North America
  220VAC 50Hz VDE/TÜV Europe
  100VAC 50Hz JIS Japan
  240VAC 50Hz BSI/SAA UK, Australia, S. Africa
- Output: ±0.5VCD rated load.
- Temperature: 0°C to +40°C full load condition
  −40°C to +70°C storage condition
- Humidity: 10% to 90% non-condensing
- Altitude: 0-10000 ft
- Vibration: Standard Export drop test
- Dielectric Withstand Voltage:
  UL CSA JIS 1500VAC 1 Minute
  VDE BSI TÜV SAA 4000VAC 1 Minute
- Enclosure: Noryl SE-100J, Cyclolac ABS or Equivalent.
- O/P Cord: 6 feet Awg 24 or heavier.
- Safety: UL, CSA, JIS, VDE, TÜV, BSI, SAA.
- MTBF: 30000 Hours at 25°C full load.
- QA: MIL-STD-105D

OPTIONS
Special enclosure colors, cord length and colors are available on request at higher price and longer delivery.

Customer brands are acceptable.

Special connectors are acceptable with cost separate tooling charge. (Approx. 4 weeks tooling leadtime).

CUSTOM DESIGN
Are available on request to meet exact specification.

PLUG IN BATTERY CHARGER

Model No.	Output Voltage (VDC)	Output Current (MA)	Charge Rate	Unit Size	Safety
AD-0610	6	100	1.2AHR/15HR	A	UL
AD-0630M	6	300	1.2AHR/6HR	A	UL
AD-0680	6	800	1.2AHR/2HR	B	UL
AD-061A	6	1000	1.2AHR/1.5HR	C	UL
AD-1215	12	150	1.2AHR/10HR	A	UL
AD-1250	12	500	1.2AHR/3HR	B	UL
AD-1280	12	800	1.2AHR/2HR	C	UL

AC/AC ADAPTORS

Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Unit Size	Safety
AA-042A	4.5	2000	9.00	B	UL/CSA
AA-061A5	6	1500	9.00	B	UL/CSA
AA-071A5	7.5	1500	11.25	B	UL/CSA
AA-091A	9	1000	9.00	B	UL/CSA
AA-1283	12	830	9.96	B	UL/CSA
AA-121A	12	1000	12.00	B	UL/CSA
AA-1370	13	700	9.10	B	UL/CSA
AA-1675	16	750	12.00	B	UL/CSA
AA-1860	18	600	10.80	B	UL/CSA
AA-2055	20	550	11.00	B	UL/CSA
AA-2445	24	450	10.80	B	UL/CSA

REGULATED AC ADAPTOR

Model No.	Output Voltage (VDC)	Output Current (MA)	Regulation	Unit Size	Safety
AD-0950RG	9	500	5%	B	CSA
AD-1240RG	12	400	5%	B	CSA
AD-0820RG	+8V	200	5%	81×45×48	CSA
	−8V	200	5%	LWN	
AD-0530R	+5.2	300	5%		
	+12	200	5%		
A-01	+5V	850	5%		
	+12V	125	5%		
	−12V	125	5%		

STANDARD AC/DC ADAPTORS JIS UL•CSA APPROVED

Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)
AD-0310	3.0	100	0.3
AD-0320	3.0	200	0.6
AD-0330	3.0	300	0.9
AD-0340	3.0	400	1.2
AD-0350	3.0	500	1.5
AD-0410	4.5	100	0.5
AD-0420	4.5	200	0.9
AD-0430	4.5	300	1.4
AD-0440	4.5	400	1.8
AD-0450	4.5	500	2.3
AD-0460	4.5	600	2.7
AD-052A	5	2000	10.0
AD-0603	6.0	30ma	0.2
AD-0610	6.0	100	0.6
AD-0620	6.0	200	1.2
AD-0630M	6.0	300	1.8
AD-0630	6.0	300	1.8
AD-0640	6.0	400	2.4
AD-0650	6.0	500	3.0
AD-0660	6.0	600	3.6
AD-0670	6.0	700	4.2
AD-0680	6.0	800	4.8
AD-0690	6.0	900	5.4
AD-061A	6.0	1A	6.0
AD-062A	6.0	2A	12.0
AD-0710	7.5	100ma	0.8
AD-0720	7.5	200	1.5
AD-0730M	7.5	300	2.3
AD-0740M	7.5	400	3.0
AD-0730	7.5	300	2.3
AD-0740	7.5	400	3.0
AD-0750	7.5	500	3.5
AD-0760	7.5	600	4.5
AD-0770	7.5	700	5.5
AD-0780	7.5	800	6.0
AD-0790	7.5	900	6.5
AD-071A	7.5	1A	7.5
AD-0903	9.0	30	0.3
AD-0905	9.0	50	0.5
AD-0910	9.0	100	0.9
AD-0920M	9.0	200	1.8
AD-0930M	9.0	300	2.7
AD-0920	9.0	200	1.8
AD-0930	9.0	300	2.7
AD-0940	9.0	400	3.6
AD-0950	9.0	500	4.5
AD-0960	9.0	600	5.4
AD-0960L	9.0	600	5.4
AD-0970	9.0	700	6.3
AD-0980	9.0	800	7.2
AD-0990	9.0	900	8.1
AD-091A	9.0	1000	9.0
AD-09A5	9.0	1500	13.5
AD-1205	12.0	50	0.6
AD-1210	12.0	100	1.2
AD-1215	12.0	150	1.8
AD-1220M	12.0	200	2.5
AD-1220	12.0	200	2.4
AD-1230	12.0	300	3.6
AD-1235	12.0	350	4.2
AD-1240	12.0	400	4.8
AD-1245	12.0	450	5.4
AD-1250	12.0	500	6.0
AD-1260	12.0	600	7.2
AD-1270	12.0	700	8.4
AD-1280	12.0	800	9.6
AD-1290	12.0	900	10.8
AD-121A	12.0	1A	12
AD-121A2	12.0	1.2A	14.4
AD-1515	15.0	150	2.3
AD-1520	15.0	200	3.0
AD-1525	15.0	250	3.8
AD-1530	15.0	300	4.5
AD-1535	15.0	350	5.3
AD-1540	15.0	400	6.0
AD-1540L	15.0	400	6.0
AD-1550	15.0	500	7.5
AD-1560	15.0	600	9.0
AD-1570	15.0	700	10.5
AD-1580	15.0	800	12
AD-1590	15.0	900	13.5
AD-151A	15.0	1A	15
AD-1605	16.0	50	0.8
AD-1610	16.0	100	1.6
AD-1615	16.0	150	2.4
AD-1620	16.0	200	3.2
AD-1625	16.0	250	4.0
AD-1630	16.0	300	4.8
AD-1635	16.0	350	5.6
AD-1645	16.0	450	7.2
AD-1650	16.0	500	8.0
AD-1655	16.0	550	8.8
AD-1660	16.0	600	9.6
AD-1670	16.0	700	11.2
AD-1680	16.0	800	12.8
AD-161A	16.0	1A	16
AD-1815	18.0	150	2.7
AD-1820	18.0	200	3.6
AD-1825	18.0	250	4.5
AD-1830	18.0	300	5.4
AD-1835	18.0	350	6.3
AD-1840	18.0	400	7.2
AD-1845	18.0	450	8.1
AD-1850	18.0	500	9.0
AD-1860	18.0	600	10.8
AD-1870	18.0	700	12.6
AD-1880	18.0	800	14.4
AD-1890	18.0	900	16.2
AD-2010	20.0	100	2.0
AD-2015	20.0	150	3.0
AD-2020	20.0	200	4.0
AD-2025	20.0	250	5.0
AD-2030	20.0	300	6.0
AD-2030L	20.0	300	6.0
AD-2035	20.0	350	7.0
AD-2040	20.0	400	8.0
AD-2045	20.0	450	9.0
AD-2050	20.0	500	10
AD-2060	20.0	600	12
AD-2070	20.0	700	16
AD-2230	22.0	300	6.6
AD-2235	22.0	350	7.7
AD-2240	22.0	400	8.8
AD-2250	22.0	500	11
AD-2260	22.0	600	13.2
AD-2410	24.0	100	2.4
AD-2415	24.0	150	3.6
AD-2420	24.0	200	4.8
AD-2425	24.0	250	6.0
AD-2425L	24.0	250	6.0
AD-2430	24.0	300	7.2
AD-2435	24.0	350	8.4
AD-2440	24.0	400	9.6
AD-2450	24.0	500	12
AD-2460	24.0	600	14.4

ALL ABOVE MODELS CAN BE CHANGED TO AC/AC OUTPUT

PILLAR INDUSTRIES, INC./1780 EVERGREEN STREET/DUARTE, CA 91010/TEL: 818-358-1337/FAX: 818-358-0398

PILLAR INDUSTRIES Manufacturer of AC ADAPTORS

220V AC 50Hz EUROPEAN CONTINENTAL TYPE AC ADAPTOR/TUV OR VDE APPROVED

Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)
AD-0330B	3	300	0.90	AD-0730B	7.5	300	2.25	AD-1250B	12	500	6	AD-2010B	20	100	2.00
AD-0350B	3	500	1.50	AD-0750B	7.5	500	3.75	AD-1280B	12	800	9.6	AD-2015B	20	150	3.00
AD-0360B	3	600	1.8	AD-0760B	7.5	600	4.5	AD-1515B	15	150	2.25	AD-2030B	20	300	6
AD-0430B	4.5	300	1.35	AD-071A2B	7.5	1.2A	7.5	AD-1525B	15	250	3.75	AD-2045B	20	450	9
AD-0450B	4.5	500	2.25	AD-0930B	9	300	2.70	AD-1540B	15	400	6	AD-2410B	24	100	2.40
AD-0460B	4.5	600	2.7	AD-0950B	9	500	4.50	AD-1560B	15	600	9	AD-2415B	24	150	3.60
AD-0630B	6	300	1.80	AD-0960B	9	600	5.4	AD-1815B	18	150	2.70	AD-2425B	24	250	6
AD-0650B	6	500	3.00	AD-091AB	9	1.0A	9	AD-1820B	18	200	3.60	AD-2440B	24	400	9.6
AD-0660B	6	600	3.6	AD-1220B	12	200	2.40	AD-1830B	18	300	5.4				
AD-061A2B	6	1.2A	7.2	AD-1230B	12	300	3.60	AD-1850B	18	500	9				

ALL ADOVE MODELS CAN BE CHANGED TO AC/AC OUTPUT

240V AC 50Hz S. AFRICA TYPE AC ADAPTOR

AC/DC TYPE

Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)
AD-0330C	3	300	0.90	AD-0730C	7.5	300	2.25	AD-1250C	12	500	6	AD-2010C	20	100	2.00
AD-0350C	3	500	1.50	AD-0750C	7.5	500	3.75	AD-1280C	12	800	9.6	AD-2015C	20	150	3.00
AD-0360C	3	600	1.8	AD-0760C	7.5	600	4.5	AD-1515C	15	150	2.25	AD-2030C	20	300	6
AD-0430C	4.5	300	1.35	AD-071A2C	7.5	1.2A	7.5	AD-1525C	15	250	3.75	AD-2045C	20	450	9
AD-0450C	4.5	500	2.25	AD-0930C	9	300	2.70	AD-1540C	15	400	6	AD-2410C	24	100	2.40
AD-0460C	4.5	600	2.7	AD-0950C	9	500	4.50	AD-1560C	15	600	9	AD-2415C	24	150	3.60
AD-0630C	6	300	1.80	AD-0960C	9	600	5.4	AD-1815C	18	150	2.70	AD-2425C	24	250	6
AD-0650C	6	500	3.00	AD-091AC	9	1.0A	9	AD-1820C	18	200	3.60	AD-2440C	24	400	9.6
AD-0660C	6	600	3.6	AD-1220C	12	200	2.40	AD-1830C	18	300	5.4				
AD-061A2C	6	1.2A	7.2	AD-1230C	12	300	3.60	AD-1850C	18	500	9				

ALL ADOVE MODELS CAN BE CHANGED TO AC/AC OUTPUT

240V AC 50Hz UK TYPE AC ADAPTOR/MEET BSI REGULATION

Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)
AD-0330D	3	300	0.90	AD-0730D	7.5	300	2.25	AD-1250D	12	500	6	AD-2010D	20	100	2.00
AD-0350D	3	500	1.50	AD-0750D	7.5	500	3.75	AD-1280D	12	800	9.6	AD-2015D	20	150	3.00
AD-0360D	3	600	1.8	AD-0760D	7.5	600	4.5	AD-1515D	15	150	2.25	AD-2030D	20	300	6
AD-0430D	4.5	300	1.35	AD-071A2D	7.5	1.2A	7.5	AD-1525D	15	250	3.75	AD-2045D	20	450	9
AD-0450D	4.5	500	2.25	AD-0930D	9	300	2.70	AD-1540D	15	400	6	AD-2410D	24	100	2.40
AD-0460D	4.5	600	2.7	AD-0950D	9	500	4.50	AD-1560D	15	600	9	AD-2415D	24	150	3.60
AD-0630D	6	300	1.80	AD-0960D	9	600	5.4	AD-1815D	18	150	2.70	AD-2425D	24	250	6
AD-0650D	6	500	3.00	AD-091AD	9	1.0A	9	AD-1820D	18	200	3.60	AD-2440D	24	400	9.6
AD-0660D	6	600	3.6	AD-1220D	12	200	2.40	AD-1830D	18	300	5.4				
AD-061A2D	6	1.2A	7.2	AD-1230D	12	300	3.60	AD-1850D	18	500	9				

ALL ADOVE MODELS CAN BE CHANGED TO AC/AC OUTPUT

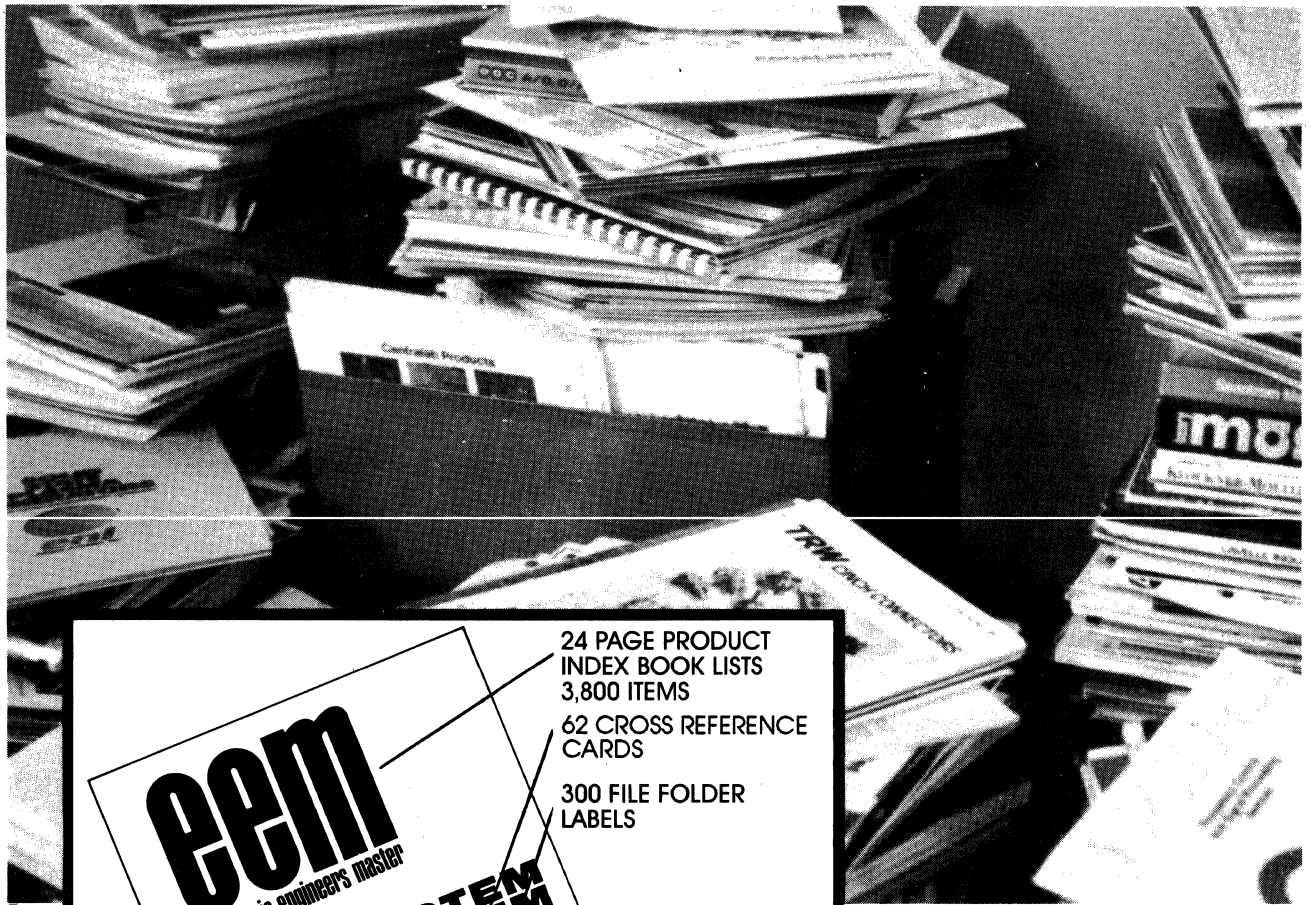
240V AC 50Hz AUSTRALIA TYPE AC ADAPTOR

AC/DC TYPE

Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)	Model No.	Output Voltage (VDC)	Output Current (MA)	Power (VA)
AD-0330E	3	300	0.90	AD-0730E	7.5	300	2.25	AD-1250E	12	500	6	AD-2010E	20	100	2.00
AD-0350E	3	500	1.50	AD-0750E	7.5	500	3.75	AD-1280E	12	800	9.6	AD-2015E	20	150	3.00
AD-0360E	3	600	1.8	AD-0760E	7.5	600	4.5	AD-1515E	15	150	2.25	AD-2030E	20	300	6
AD-0430E	4.5	300	1.35	AD-071A2E	7.5	1.2A	7.5	AD-1525E	15	250	3.75	AD-2045E	20	450	9
AD-0450E	4.5	500	2.25	AD-0930E	9	300	2.70	AD-1540E	15	400	6	AD-2410E	24	100	2.40
AD-0460E	4.5	600	2.7	AD-0950E	9	500	4.50	AD-1560E	15	600	9	AD-2415E	24	150	3.60
AD-0630E	6	300	1.80	AD-0960E	9	600	5.4	AD-1815E	18	150	2.70	AD-2425E	24	250	6
AD-0650E	6	500	3.00	AD-091AE	9	1.0A	9	AD-1820E	18	200	3.60	AD-2440E	24	400	9.6
AD-0660E	6	600	3.6	AD-1220E	12	200	2.40	AD-1830E	18	300	5.4				
AD-061A2E	6	1.2A	7.2	AD-1230E	12	300	3.60	AD-1850E	18	500	9				

ALL ADOVE MODELS CAN BE CHANGED TO AC/AC OUTPUT

PILLAR INDUSTRIES, INC./1780 EVERGREEN STREET/DUARTE, CA 91010/TEL: 818-358-1337/FAX: 818-358-0398



24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

62 CROSS REFERENCE CARDS

300 FILE FOLDER LABELS

ALL NEW with this edition of EEM

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Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

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EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

NEW! High-Power Switchers Provide >.99 Power Factor Correction.

MEETS PROPOSED IEC 555-2.

If you're seriously interested in Power Factor Correction, you owe it to yourself to investigate Pioneer's new high-power switchers that use a patented resistor emulation PFC technique. It has made available a full range of single and multiple output switchers able to provide up to 42% more output power — 1 kW from any standard 120 VAC, 15 A wall outlet and comply with UL's 12 A limitation.

Check these outstanding features:

- Meets UL1950, CSA 1402C and 220, IEC 380 and 435 and EN60950 safety standards.
- Meets VDE and FCC EMI specifications.
- Standard 5" x 8" package, 23 lbs. max.
- Insensitive to input voltage and frequency variations — 90-264 VAC, DC and 43-120 Hz.
- Eliminates input switching or strapping.
- Wide range of output power — 500 to 2500 W.
- No minimum load.
- 0 to 50°C operation at full load.
- AC input fuse.
- Overvoltage/overcurrent/overtemperature protection.
- Soft start.
- Remote sense.
- No turn-on or turn-off overshoot.
- Completely isolated outputs.
- Self-contained forced-air cooling.

SINGLE OUTPUT SUPPLIES WITH >.99 PF

	AC/DC			
Model	PM2943A	PM2945A	PM2946A	PM2541A
	—	PM3225A	—	—
Max. Total Output Pwr. (Watts)	625	850	1000	1500
Output Voltage (VDC)	Output Current (Amps)			
2	125	170	200	325
3	125	170	200	300
5	125	170	200	300
12	52	71	85	120
15	42	57	70	-
24	26	35	40	-
28	22	30	36	-
36	-	-	-	-
48	13	18	20	32
Chassis Size (A,B,C)	5x8x15 in.	5x8x15 in. / 5x8x11 in.	5 x 8 x 15 in.	
Maximum Weight	20 lbs.			25 lbs.

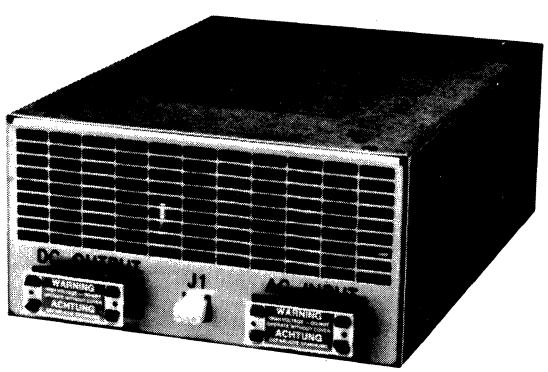
MULTI-OUTPUT SUPPLIES WITH >.99 PF

		AC/DC						
Model		—	PM2993A	—	PM2995A	PM2996A	PM2997A	—
		PM3272A	PM3273A	PM3274A	PM3275A	PM3186A	—	PM3187A
Max. Total Output Pwr. (Watts)		500	625	750	850	1000	1250	1344
Main Channel	DCV Avail.	5						
	Max.W @ 5A	400	500	600	750	750	900	1000
	Max.A @ 5A	80	100	120	150	150	180	200
Secondary Channels	DCV Avail.	2,3,5,12,15,24,28						Ch.2: 2-24V
	Max. A	15	15	15	15	15	15	40
	DCV Avail.	30,48						Ch3-5:2-24V
	Max. A	7.5	7.5	7.5	7.5	7.5	7.5	20
Chassis Size (A,B,C)		5 x 8 x 12.75 in. (PM2993A-97A series 5 x 8 x 15 in.)						5x8x12.75
Maximum Weight		20 lbs. (PM2993A-97A series 23 lbs.)						25 lbs.

NEW! PFC Bulk Power Converters.

PROVIDES 375-390 VDC TO CONVENTIONAL DC/DC CONVERTER OR DISTRIBUTED DC BUS NETWORKS. MEETS PROPOSED IEC 555-2.

- Meets UL, CSA and IEC safety standards.
- Meets VDE and FCC EMI specifications.
- >.99 active power factor correction.
- Eliminates input switches or jumpers.
- 90-264 VAC or DC and 43-120 Hz @ 20 A max.
- Single Output: 1680 W from 96 VAC to 150 VAC input. 2100 W available for 180-264 VAC input.
- 4" x 8" x 11" package, 10 lb. max.
- Overvoltage/overcurrent/overtemperature protection.
- 0 to 50°C operation at full load.
- Input and output fuses.
- Brownout to 75 VAC.
- Holdup performance improved up to 200%.
- Self-contained forced-air cooling.



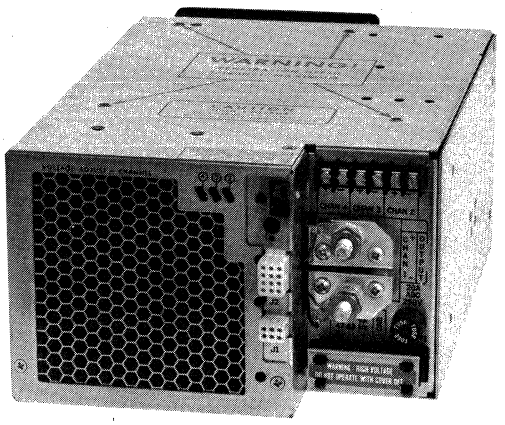
Pioneer Magnetics

800-233-1745

See our complete line of International Power Supplies on the following Page.

Pioneer Magnetics

Your best choice in high power switching supplies



It's the broadest line in the industry. From 500 to 2500 watts, single or multiple output, AC/DC or DC/DC. All the standard features and options you'll ever need or want. You can optimize your design with the International Line supplies, designed to meet tough noise and safety specs for worldwide applications. Pioneer power supplies are setting industry standards for reliability, performance and affordability.

- More than 350,000 units in the field.
- Over 250,000 hours MTBF.
- Conservatively rated for full performance at maximum output.
- Internal EMI filtering.

The International Line—

First choice for precise DC output power.

- >.99 active power factor correction.
- Meets FCC and VDE level A conducted noise (150 kHz to 30 MHz) and level B radiated noise specs.
- Meets SELV level of IEC/VDE, UL and CSA safety standards (standard models approved).
- Certifications provided upon request with volume orders.
- Full output rating at 50° C ambient.
- 85% efficiency.
- Completely isolated output.
- OV, overload and reverse voltage protection.
- Soft start; no turn-on or turn-off overshoot.
- Self-contained forced-air cooling.
- No minimum load required; each channel independently regulated.

Specifications

AC Input

Selected or Dedicated Input:
90-135 VRMS or 180-264 VRMS,
47-63 Hz, Single Phase. Line dips to 70-140 VRMS.

DC Input

38-63 V continuous (70 VDC short term).

Pioneer Magnetics

Number one in high power switching supplies.

800-233-1745
1745 Berkeley St., Santa Monica, CA 90404
(213) 829-6751
FAX (213) 453-3929

Dynamic Regulation:

International Line Units: Output Transient Response. 2% deviation (100 mV deviation for units under 5V) with recovery to ½% in less than 500 µsec for a 25% load step, 1A/µsec slew rate.

P-P Ripple and Noise: 1% of nominal output at full load current, 20 Hz to 20 MHz bandwidth for 5V to 48V outputs. 50 mV for outputs less than 5V.

Static Regulation:

- Line: ± 0.25% over full line range.
- Load: ± 0.25% over no load to full load.
- Voltage Stability: ± 0.1% after 30 min. warmup for a 24-hr. period.
- Temperature Coefficient: ± 0.02%/ °C from 0° C to 50° C.

Over-Temperature Protection:

Supply is automatically latched off in the event of an over-temperature condition.

Standard Options

- Switch-selectable input voltages.
- Power fail signal.
- Logic on/off.
- Crowbar.
- Remote programming/margining.
- Local margin check.
- Output tolerance status.
- Output power good signal.
- OV secondary channels.

Special Options

- Single channel battery backup.
- Single wire current sharing.
- Load sharing for power or redundancy.
- Tailored EMI filtering for system requirements.
- "Hot Pluggable" Power Shelf — 19" or 24" rack.

Custom options can be designed to your exact requirements.

Fast Delivery.

Most popular models available from immediate stock.
Consult factory.

Selection Guide –

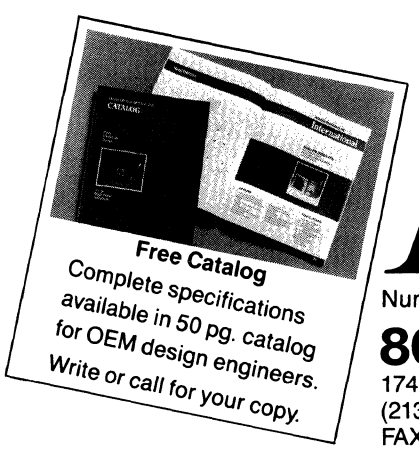
"World Class" Choices

Single Output Supplies

	AC/DC							DC/DC		
Model	PM2922A	PM2923A	PM2924A	PM2925A	PM2926A	PM2501B	PM2512A	PM3024	PM3025	PM3026
Max. Total Output Pwr (Watts)	500	625	750	850	1000	1500	2000	750	850	1000
Output Voltage (VDC)	Output Current (Amps)							Output Current (Amps)		
2	—	—	—	—	—	325	400	200	—	—
3	150	175	200	—	—	300	400	200	—	—
5	100	125	150	170	200	300	400	150	170	200
12	42	52	60	71	85	120	180	60	71	85
15	33	42	50	57	70	100	150	50	57	70
18	—	—	—	—	—	85	—	—	—	—
24	21	26	33	35	40	60	100	33	35	40
28	18	22	27	30	36	55	80	27	30	36
36	—	—	—	—	—	—	65	—	—	—
48	10	13	16	18	20	32	50	16	18	20
Chassis Size (A,B,C)	5 x 8 x 11 in.						5x8x15 in.	5 x 8 x 11 in.		
Maximum Weight	16 lbs.						25 lbs.	20 lbs.		

Multiple Output Supplies

		AC/DC							DC/DC		
Model		PM2972A	PM2973A	PM2974A	PM2975A	PM2976A	PM2977A	PM3178A	PM3074	PM3075	PM3036
Max. Total Output Pwr. (Watts)		500	625	750	850	1000	1250	1500	750	850	1000
Main Channel	DCV Avail.	2,3,5,12,15,24,28,48						5	2,3,5,12,15,24,28,48		
	Max.W @ 5V	400	500	600	750	750	900	1500	600	750	750
	Max.A @ 5V	80	100	120	150	150	180	300	120	150	150
Secondary Channels, Max. Output Current in Amperes	DCV Avail.	2,3,5,12,15,24,28,30						2-24	2,3,5,12,15,24,28,30		
	Low Curr.	6	6	6	6	6	6	—	6	6	6
	Std.	12	12	12	12	12	12	20	12	12	12
	High Curr.	15	15	15	15	15	15	—	15	15	15
	DCV Avail.	30,48						—	30,48		
	Low Curr.	3	3	3	3	3	3	—	3	3	3
	Std.	6	6	6	6	6	6	—	6	6	6
	High Curr.	7.5	7.5	7.5	7.5	7.5	7.5	—	7.5	7.5	7.5
Chassis Size (A,B,C)		5 x 8 x 11 in.		5 x 8 x 12.75 in.				5 x 8 x 11	5 x 8 x 12.75 in.		
Maximum Weight		16 lbs.		20 lbs.				22 lbs.	20 lbs.		



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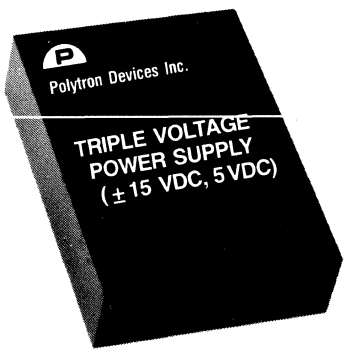
LINEAR ENCAPSULATED POWER MODULES

FEATURES:

- **REGULATION** LINE & LOAD 0.2% to 0.02%
- **P.C. CARD OR CHASSIS MOUNTING**
- **SHORT CIRCUIT PROTECTION**
- **SINGLE, DUAL, TRIPLE OUTPUTS**

FROM STOCK



SPECIFICATIONS: ①

■ **INPUT VOLTAGE AND FREQUENCY:**
105 to 125Vac-50 to 440Hz

■ **VOLTAGE OUTPUT TOLERANCE:**
Factory set at ±1% (fixed)

■ **TEMPERATURE COEFFICIENT:**
0.02% / °C typical

■ **INPUT ISOLATION:**
50 Mohms

■ **OPERATING TEMPERATURE:**
−25°C to +71°C

■ **STORAGE TEMPERATURE:**
−25°C to 85°C

SINGLE VOLTAGE UNITS

OUTPUT VOLT. (VDC)	OUTPUT CURRENT	REGULATION LINE	REGULATION LOAD	RIPPLE AND NOISE	CASE ② STYLE ③	MODEL NUMBER	PRICE 1-9 QTY.
5V	200mA	0.2%	.2%	1.0mV RMS	G	P34-5SM	36.00
	500mA	0.2%	.2%	0.5mV RMS	A, 1AT	P37	30.00
	500mA	0.02%	0.05%	0.5mV RMS	A, 1AT	P37-1	41.00
	1000mA	0.2%	0.2%	1.0mV RMS	B, 1BT	P38	50.00
	1000mA	0.02%	0.05%	1.0mV RMS	B, 1BT	P38-1	63.00
	1000mA	0.02%	0.05%	0.5mV RMS	C, 1CT	P38/1.56	66.00
	2000mA	0.02%	0.1%	1.0mV RMS	C, 1CT	P39	76.00
	3000mA	0.02%	0.15%	1.0mV RMS	D, 1DT	P39-3	95.00
10V	120mA	0.1%	0.1%	1.0mV RMS	E	P33-10SM	50.00
	150mA	0.1%	0.1%	1.0mV RMS	A, 1AT	P33-10S	28.00
	250mA	0.1%	0.1%	1.0mV RMS	B, 1BT	P34-10S	40.00
	500mA	0.02%	0.05%	0.5mV RMS	C, 1CT	P37-10S	54.00
12V	100mA	0.1%	0.1%	1.0mV RMS	E	P33-12SM	50.00
	120mA	0.02%	0.1%	1.0mV RMS	A, 1AT	P33-12S	28.00
	200mA	0.1%	0.1%	1.0mV RMS	B, 1BT	P34-12S	39.00
	500mA	0.02%	0.1%	0.5mV RMS	C, 1CT	P37-12S	54.00
	1000mA	0.1%	0.1%	1.0mV RMS	D, 1DT	P38-12S	69.00
15V	80mA	0.1%	0.1%	1.0mV RMS	E	P33-15SM	50.00
	120mA	0.02%	0.1%	1.0mV RMS	A, 1AT	P33-15S	26.00
	200mA	0.1%	0.1%	1.0mV RMS	B, 1BT	P34-15S	38.00
	300mA	0.1%	0.1%	1.0mV RMS	C, 1CT	P35-15S	55.00
	500mA	0.02%	0.1%	0.5mV RMS	C, 1CT	P37-15S	59.00
	800mA	0.02%	0.1%	1.0mV RMS	D, 1DT	P38-15S	69.00
18V	50mA	0.1%	0.1%	1.0mV RMS	E	P32-18SM	50.00
	50mA	0.02%	0.05%	1.0mV RMS	A, 1AT	P32-18S	31.00
	100mA	0.02%	0.05%	1.0mV RMS	A, 1AT	P33-18S	34.00
24V	50mA	0.1%	0.1%	1.0mV RMS	E	P32-24SM	50.00
	100mA	0.1%	0.1%	1.0mV RMS	A, 1AT	P33-24S	31.00
	300mA	0.1%	0.1%	1.0mV RMS	C, 1CT	P35-24S	57.00
48V	50mA	0.2%	0.2%	2.0mV RMS	B, 1BT	P32-48S	42.00
	100mA	0.2%	0.2%	2.0mV RMS	B, 1BT	P33-48S	54.00
	200mA	0.2%	0.2%	2.0mV RMS	C, 1CT	P34-48S	76.00

① 115 VAC, 50 to 400 Hz. @ 25°C ② CASE STYLES ENDING WITH THE LETTER "T" (CHASSIS MOUNTED UNITS WITH TERMINAL BARRIER STRIP) ARE DESIGNATED BY THE SUFFIX "T". CASE STYLES A,B,C,D,G AND E (PC CARD MOUNTING) DO NOT REQUIRE SUFFIXING.

③ **MOST COMPETITORS' PINOUTS AVAILABLE—CONTACT FACTORY**

POLYTRON DEVICES, INC.

P.O. BOX 398, PATERSON, N.J. 07544 (201) 345-5885 **FAX: (201) 345-1264**

LINEAR POWER MODULES (Continued)

	OUTPUT VOLT. (VDC)	OUTPUT CURRENT	REGULATION LINE	REGULATION LOAD	RIPPLE AND NOISE	CASE② STYLE	MODEL NUMBER	PRICE 1-9 QTY.
DUAL VOLTAGE	± 5V	± 50mA	0.02%	0.02%	1.0mV RMS	A, 2AT	P32-5	31.00
		± 100mA	0.1%	0.1%	1.0mV RMS	A, 2AT	P33-5	43.00
		± 200mA	0.1%	0.1%	1.0mV RMS	B, 2BT	P34-5	52.00
		± 300mA	0.02%	0.05%	0.5mV RMS	C, 2CT	P35-5	58.00
		± 500mA	0.02%	0.05%	0.5mV RMS	C, 2CT	P37-5	66.00
		± 1000mA	0.1%	0.1%	1.0mV RMS	D, 2DT	P38-5	86.00
	± 8V	± 500mA	0.1%	0.1%	1.0mV RMS	D, 2DT	P37-8	71.00
	± 10V	± 100mA	0.02%	.05%	0.5mV RMS	A, 2AT	P33-10	40.00
	± 12V	± 25mA	0.1%	0.1%	2mV RMS	G	P31-12M	36.00
		± 25mA	0.02%	0.05%	0.5mV RMS	A, 2AT	P31-12	23.00
		± 50mA	0.02%	0.05%	0.5mV RMS	A, 2AT	P32-12	29.50
		± 100mA	0.1%	0.1%	1.0mV RMS	A, 2AT	P33-12	40.00
		± 200mA	0.1%	0.1%	1.0mV RMS	B, 2BT	P34-12	59.00
		± 300mA	0.1%	0.1%	1.0mV RMS	C, 2CT	P35-12	69.00
		± 500mA	0.1%	0.1%	1.0mV RMS	D, 2DT	P37-12	85.00
	± 15V	± 25mA	0.1%	0.1%	2mV RMS	G	P31-M	36.00
		± 25mA	0.2%	0.2%	1.0mV RMS	A, 2AT	P31	23.00
		± 25mA	0.02%	0.02%	0.5mV RMS	A, 2AT	P31-1	26.00
		± 50mA	0.2%	0.2%	1.0mV RMS	A, 2AT	P32	28.00
		± 50mA	0.02%	0.02%	0.5mV RMS	A, 2AT	P32-1	37.00
		± 100mA	0.2%	0.2%	1.0mV RMS	A, 2AT	P33	38.00
		± 100mA	0.02%	0.02%	1.0mV RMS	A, 2AT	P33-1	42.00
		± 200mA	0.2%	0.2%	1.0mV RMS	B, 2BT	P34	57.00
		± 200mA	0.02%	0.05%	1.0mV RMS	B, 2BT	P34-1	68.00
		± 350mA	0.2%	0.2%	1.0mV RMS	C, 2CT	P35	68.00
		± 350mA	0.02%	0.05%	1.0mV RMS	C,2CT	P35-1	78.00
		± 500mA	0.1%	0.1%	1.0mV RMS	D,2DT	P37-15	86.00
	± 18V	± 50mA	0.1%	0.1%	1.0mV RMS	A, 2AT	P32-18	32.00
		± 100mA	0.1%	0.1%	1.0mV RMS	B, 2BT	P33-18	45.00
	± 24V	± 50mA	0.1%	0.1%	1.0mV RMS	B, 2BT	P32-24	46.00
		± 100mA	0.1%	0.2%	1.0mV RMS	B, 2BT	P33-24	69.00
		± 200mA	0.1%	0.2%	1.0mV RMS	C, 2CT	P34-24	92.00
TRIPLE VOLTAGE	5V/ ± 12V	250/ ± 60mA	.02%	0.1%	1.0mV RMS	C, 3CT	P51-12	52.00
		250/ ± 120mA	.02%	0.1%	1.0mV RMS	C, 3CT	P52-12	66.00
		500/ ± 120mA	.02%	0.1%	1.0mV RMS	C, 3CT	P53-12	72.00
		300/ ± 180 mA	.02%	0.1%	1.0mV RMS	C, 3CT	P53-12L	72.00
		1000/ ± 150mA	.02%	0.1%	1.0mV RMS	D, 3DT	P53-1280	94.00
	5V/ ± 15V	250/ ± 50mA	.02%	0.1%	1.0mV RMS	C, 3CT	P51-15	51.00
		250/ ± 100mA	.02%	0.1%	1.0mV RMS	C, 3CT	P52-15	61.00
		300/ ± 150mA	.02%	0.1%	1.0mV RMS	C, 3CT	P53-15L	71.00
		500/ ± 100mA	0.02%	0.1%	1.0mV RMS	C, 3CT	P53-15	69.00
		1000/ ± 150mA	0.02%	0.1%	1.0mV RMS	D, 3DT	P53-1580	99.00

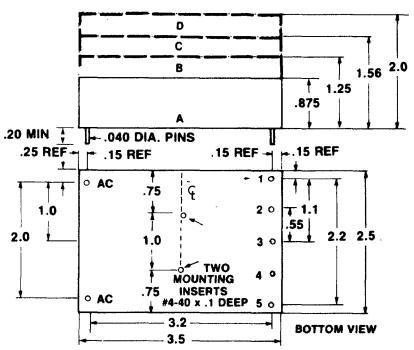
②CASE STYLES ENDING WITH THE LETTER "T" (CHASSIS MOUNTED UNITS WITH TERMINAL BARRIER STRIP) ARE DESIGNATED BY THE SUFFIX "T". CASE STYLES A,B,C,D,G AND E (P.C. CARD MOUNTING) DO NOT REQUIRE SUFFIXING

	SINGLE AND DUAL UNITS	TRIPLE OUTPUT UNITS
1	– VDC*	COM (5)
2	NO PIN	+ 5 Vdc
3	COM *	– 12/–15
4	NO PIN	COM (12/15)
5	+ VDC	+ 12/ + 15

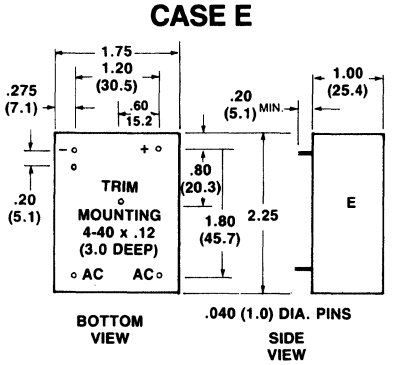
* – VDC Internally connected to COM for single output units. All dimensions are in inches.

OPTIONS AVAILABLE	SUFFIX	PRICE ADDER
220VAC	X	5.00
240VAC	XE	5.00
100VAC	Q	10.00
115/220	AX	15.00
Alternate Pin-Out	22	NONE
Chassis mounting with terminal barrier strip (case styles ending with letter ("T")	T	10.00

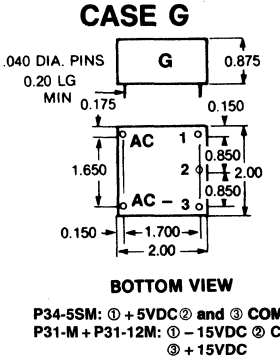
CASES A,B,C,D



CASE E



CASE G



P34-5SM: ① + 5VDC② and ③ COM
P31-M + P31-12M: ① – 15VDC ② COM ③ + 15VDC

LINEAR ENCAPSULATED POWER MODULES

50VDC TO 250VDC

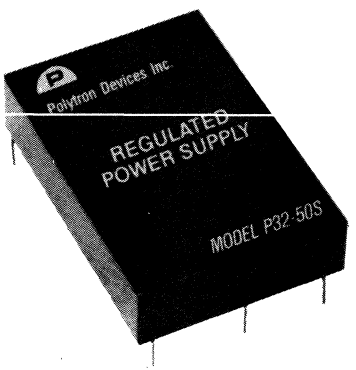
FEATURES:

- SHORT CIRCUIT PROTECTION
- HIGHLY REGULATED FLOATING OUTPUT
- P.C. CARD OR CHASSIS MOUNTING
- DOMESTIC AND/OR EUROPEAN LINE VOLTAGE

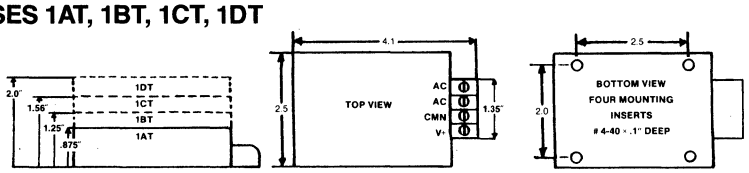
SPECIFICATIONS:

All electrical specifications are at 25°C and nominal input voltage unless otherwise noted.

- **INPUT VOLTAGE AND FREQUENCY**
  115VAC nominal (105 to 125VAC) 50 to 60Hz
  Other optional input voltages are available.
  Use designated suffix to order these units:
  220VAC nominal (200 to 240VAC) suffix X
  240VAC nominal (220 to 260VAC) suffix XE
  100VAC nominal (90 to 110VAC) suffix Q
  115/220VAC nominal (105 to 125VAC or 200 to 240VAC) suffix AX
- **VOLTAGE OUTPUT TOLERANCE**
  Factory set at ± 1% (fixed)
- **TEMPERATUE COEFFICIENT**
  0.02%/°C typical
- **INPUT ISOLATION RESISTANCE**
  100 Mohms
- **ISOLATION VOLTAGE**
  2500VDC
- **OPERATING TEMPERATURE**
  – 25°C to + 71°C
- **STORAGE TEMPERATURE**
  – 55°C to + 105°C



CHASSIS MOUNTED UNITS
CASES 1AT, 1BT, 1CT, 1DT

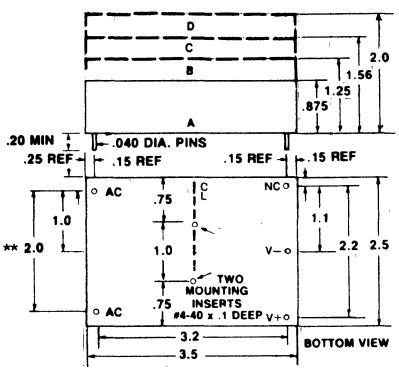


OUTPUT VOLTAGE VDC	OUTPUT CURRENT mA	REGULATION LINE %	REGULATION LOAD %	RIPPLE & NOISE mV (RMS)	CASE STYLE* P.C. Mount	CASE STYLE* Chassis Mount	MODEL #	PRICE 1-9
50	50	0.05	0.20	1.0	A	1AT	P32-50S	40.00
	100	0.05	0.20	2.0	B	1BT	P33-50S	52.00
	200	0.05	0.20	2.0	C	1CT	P34-50S	73.00
	300	0.20	0.20	3.0	D	1DT	P35-50S	79.00
75	35	0.05	0.20	2.0	A	1AT	P32-75S	43.00
	70	0.05	0.20	2.0	B	1BT	P33-75S	55.00
	150	0.05	0.20	2.0	C	1CT	P34-75S	76.00
	200	0.10	0.20	3.0	D	1DT	P35-75S	82.00
100	25	0.05	0.20	2.0	A	1AT	P32-100S	43.00
	50	0.05	0.20	2.0	B	1BT	P33-100S	55.00
	100	0.05	0.20	3.0	C	1CT	P34-100S	76.00
	150	0.10	0.20	3.0	D	1DT	P35-100S	82.00
150	17	0.05	0.20	2.0	A	1AT	P32-150S	43.00
	35	0.05	0.20	3.0	B	1BT	P33-150S	55.00
	70	0.05	0.20	3.0	C	1CT	P34-150S	76.00
	100	0.10	0.20	3.0	D	1DT	P35-150S	82.00
180	15	0.05	0.20	3.0	A	1AT	P32-180S	44.00
	30	0.05	0.20	3.0	B	1BT	P33-180S	56.00
	55	0.05	0.20	3.0	C	1CT	P34-180S	77.00
	80	0.10	0.20	3.0	D	1DT	P35-180S	83.00
200	12	0.05	0.20	3.0	A	1AT	P32-200S	44.00
	25	0.05	0.20	3.0	B	1BT	P33-200S	56.00
	50	0.05	0.20	3.0	C	1CT	P34-200S	77.00
	75	0.10	0.20	3.0	D	1DT	P35-200S	83.00
250	10	0.05	0.20	3.0	A	1AT	P32-250S	45.00
	20	0.05	0.20	3.0	B	1BT	P33-250S	57.00
	40	0.05	0.20	3.0	C	1CT	P34-250S	78.00
	60	0.10	0.20	3.0	D	1DT	P35-250S	85.00

*To order chassis mounted units use suffix "T" after model number (add $10 to price)
To order P.C. mounted units no suffix is required after model number.

P.C. MOUNTED UNITS
CASES A, B, C, D

**Available in 2.2" pin spacing
Use suffix 22 after Model #



POLYTRON DEVICES, INC.
P.O. BOX 398, PATERSON, N.J. 07544 (201) 345-5885 **FAX: (201) 345-1264**

REGULATED DC/DC CONVERTERS

WIDE INPUT VOLTAGE RANGE 15W

FEATURES:

- WIDE INPUT RANGE
- INPUT/OUTPUT – ISOLATION
- EFFICIENCY UP TO 87% @ FL
- OVER CURRENT PROTECTION • SIX SIDED SHIELDING
- SHORT CIRCUIT CURRENT LIMITING • COMPACT SIZE

APPLICATIONS:

- BATTERY OPERATED EQUIPMENT
- TELECOMMUNICATIONS
- PROCESS CONTROL
- INSTRUMENTATION
- ROBOTICS

SPECIFICATIONS:

Typical @ 25°C Under Full Load and Nominal Input Voltage Unless Otherwise Specified.

■ INPUT
INPUT VOLTAGE RANGE
12VDC Input Model. . . . . .10-18 VDC
24VDC Input Model. . . . . .18-36 VDC
48VDC Input Model. . . . . .36-62 VDC
INPUT FILTER . . . . . .LC Filter

■ OUTPUT
Voltage Accuracy . . . . . ±10%
Line Regulation . . . . . ±0.1%
Load Regulation. . . . . ±0.5%
Ripple and Noise (20 MHz BW) 50 mV P-P Max
Transient Response. . . . . .250 usec Max

■ GENERAL
Efficiency. . . . . .Up to 87%
Isolation Voltage . . . . . .500 VDC Min
Isolation Resistance . . . . . .100 Mohms
Switching Frequency . . . . . .From 100 KHz

■ ENVIRONMENTAL
Operating Temperature . . . . . –25°c to +70°c
Storage Temperature . . . . . –50°c to +105°c
Temperature Coefficient . . .Under 185 PPM/°c
Humidity . . . . . .20-95% RH
Cooling. . . . . .Free Air Convection
EMI/RFI/FCC . . .Five Sided Continuous Shield
Six Sided Continuous Shield (optional)

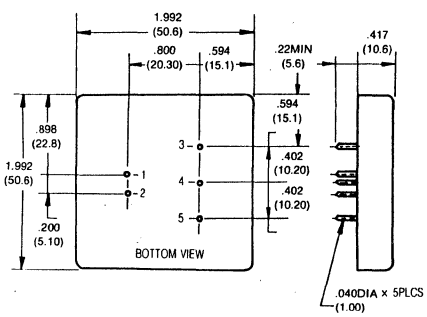
■ PHYSICAL
Case Material. . . . . .Metal Case
Dimensions . . . . . .1.992″ × 1.992″ × .417″
(50 × 50 × 10.6mm)
Weight. 100g

SINGLE VOLTAGE

INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	EFF %	MODEL NUMBER	PRICE 1-9 QTY
12 VDC (10-18)	5 VDC	3000 ma	80%	KW15-12S5	89.00
	12 VDC	1250 ma	81%	KW15-12S12	89.00
	15 VDC	1000 ma	84%	KW15-12S15	89.00
	24 VDC	625 ma	84%	KW15-12S24	89.00
24 VDC (18-36)	5 VDC	3000 ma	82%	KW15-24S5	89.00
	12 VDC	1250 ma	84%	KW15-24S12	89.00
	15 VDC	1000 ma	86%	KW15-24S15	89.00
	24 VDC	625 ma	87%	KW15-24S24	89.00
48 VDC (36-62)	5 VDC	3000 ma	81%	KW15-48S5	89.00
	12 VDC	1250 ma	82%	KW15-48S12	89.00
	15 VDC	1000 ma	83%	KW15-48S15	89.00
	24 VDC	625 ma	84%	KW15-48S24	89.00

DUAL VOLTAGE

INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	EFF %	MODEL NUMBER	PRICE 1-9 QTY
12 VDC (10-18)	±5 VDC	±1500 ma	78%	KW15-12-5	98.00
	±12 VDC	±625 ma	79%	KW15-12-12	98.00
	±15 VDC	±500 ma	81%	KW15-12-15	98.00
	±24 VDC	±313 ma	81%	KW15-12-24	98.00
24 VDC (18-36)	±5 VDC	±1500 ma	80%	KW15-24-5	98.00
	±12 VDC	±625 ma	82%	KW15-24-12	98.00
	±15 VDC	±500 ma	84%	KW15-24-15	98.00
	±24 VDC	±313 ma	85%	KW15-24-24	98.00
48 VDC (36-62)	±5 VDC	±1500 ma	80%	KW15-48-5	98.00
	±12 VDC	±625 ma	81%	KW15-48-12	98.00
	±15 VDC	±500 ma	81%	KW15-48-15	98.00
	±24 VDC	±313 ma	82%	KW15-48-24	98.00



ALL DIMENSIONS IN INCHES (M.M.)

Pin Connections		
Pin No.	Pin Function	
	Single Voltage	Dual Voltage
1	+ Input	+ Input
2	− Input	− Input
3	+ Output	+ Output
4	N.C.	Common
5	− Output	− Output

POLYTRON DEVICES, INC.
P.O. BOX 398, PATERSON, N.J. 07544 (201) 345-5885 **FAX: (201) 345-1264**

REGULATED DC/DC CONVERTERS

FEATURES:

- HIGH PERFORMANCE TT INPUT FILTER
- SHORT CIRCUIT PROTECTED
- EXTREMELY LOW OUTPUT NOISE
- HIGHLY REGULATED FLOATING OUTPUTS
- LOW INPUT REFLECTED RIPPLE
- P.C. CARD MOUNTING

SPECIFICATIONS:

- **INPUT REFLECTED RIPPLE** 1% of input voltage (max.)
- **OUTPUT VOLTAGE TOLERANCE** Factory set at ±1% (fixed)
- **REGULATION** Line-0.05% Load-0.05%; 0.1% for PR87S
- **RIPPLE AND NOISE** 1 MV RMS (max.)
- **INPUT—OUTPUT ISOLATION** 500 VDC (min.)
- **OPERATING TEMPERATURE** −25°C to +71°C
- **STORAGE TEMPERATURE** −55°C to +85°C
- **EFFICIENCY** Nominal line at full load 55-65%

SINGLE VOLTAGE UNITS

INPUT VOLT. (±10%)	OUTPUT VOLT. (VDC)	OUTPUT CURRENT (mA)	CASE STYLE	MODEL NUMBER	PRICE 1-9 QTY.
5VDC	5V	600	B1	PR87S	63.00
	5V	1000	C1	PR88S	69.00
	5V	2000	A1	PR89S	95.00
	12V	400	B1	PR12S	69.00
	15V	300	B1	PR15S	69.00
9VDC	5V	600	B1	PR87S-9	63.00
	5V	1000	C1	PR88S-9	69.00
	5V	2000	A1	PR89S-9	95.00
	12V	400	B1	PR12S-9	69.00
	15V	300	B1	PR15S-9	69.00
12VDC	5V	600	B1	PR87S-12	63.00
	5V	1000	C1	PR88S-12	69.00
	5V	2000	A1	PR89S-12	95.00
	12V	400	B1	PR12S-12	69.00
	15V	300	B1	PR15S-12	69.00
15VDC	5V	600	B1	PR87S-15	63.00
	5V	1000	C1	PR88S-15	69.00
	5V	2000	A1	PR89S-15	95.00
	12V	400	B1	PR12S-15	69.00
	15V	300	B1	PR15S-15	69.00
24VDC	5V	600	B1	PR87S-24	63.00
	5V	1000	C1	PR88S-24	69.00
	5V	2000	A1	PR89S-24	95.00
	12V	400	B1	PR12S-24	69.00
	15V	300	B1	PR15S-24	69.00
28VDC	5V	600	B1	PR87S-28	63.00
	5V	1000	C1	PR88S-28	69.00
	5V	2000	A1	PR89S-28	95.00
	12V	400	B1	PR12S-28	69.00
	15V	300	B1	PR15S-28	69.00
36VDC	5V	600	B1	PR87S-36	63.00
	5V	1000	C1	PR88S-36	69.00
	5V	2000	A1	PR89S-36	95.00
	12V	400	B1	PR12S-36	69.00
	15V	300	B1	PR15S-36	69.00
48VDC	5V	500	B1*	PR87S-48	63.00
	5V	1000	B1*	PR88S-48	69.00
	12V	450	B1*	PR12S-48	69.00
	15V	350	B1*	PR15S-48	69.00

POLYTRON DEVICES, INC.
P.O. BOX 398, PATERSON, N.J. 07544 (201) 345-5885 **FAX: (201) 345-1264**

REGULATED DC/DC CONVERTERS (continued)

	INPUT VOLT. (±10%)	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (mA)	CASE STYLE	MODEL NUMBER	PRICE 1-9 QTY.
DUAL VOLTAGE	5VDC	±12	± 150	B1*	PR81-12	63.00
		±12	± 250	B1*	PR82-12	69.00
		±12	± 350	A1	PR83-12	91.00
		±15	± 150	B1*	PR81-15	63.00
		±15	± 250	B1*	PR82-15	69.00
		±15	± 350	A1	PR83-15	92.00
	9VDC	±12	± 150	B1*	PR81-12-9	61.00
		±12	± 250	B1*	PR82-12-9	67.00
		±12	± 350	A1	PR83-12-9	88.00
		±15	± 150	B1*	PR81-15-9	61.00
		±15	± 250	B1*	PR82-15-9	67.00
		±15	± 350	A1	PR83-15-9	92.00
	12VDC	±12	± 150	B1*	PR81-12-12	61.00
		±12	± 250	B1*	PR82-12-12	67.00
		±12	± 350	A1	PR83-12-12	88.00
		±15	± 150	B1*	PR81-15-12	61.00
		±15	± 250	B1*	PR82-15-12	67.00
		±15	± 350	A1	PR83-15-12	92.00
	15VDC	±12	± 150	B1*	PR81-12-15	61.00
		±12	± 250	B1*	PR82-12-15	67.00
		±12	± 350	A1	PR83-12-15	88.00
		±15	± 150	B1*	PR81-15-15	61.00
		±15	± 250	B1*	PR82-15-15	67.00
		±15	± 350	A1	PR83-15-15	92.00
	24VDC	±12	± 150	B1*	PR81-12-24	61.00
		±12	± 250	B1*	PR82-12-24	67.00
		±12	± 350	A1	PR83-12-24	88.00
		±15	± 150	B1*	PR81-15-24	61.00
		±15	± 250	B1*	PR82-15-24	67.00
	36VDC	±12	± 150	B1*	PR81-12-36	61.00
		±12	± 250	B1*	PR82-12-36	67.00
		±12	± 350	A1	PR83-12-36	88.00
		±15	± 150	B1*	PR81-15-36	61.00
		±15	± 250	B1*	PR82-15-36	67.00
	48VDC	±12	±220	B1*	PR82-12-48	64.00
		±15	±170	B1*	PR82-15-48	64.00
TRIPLE VOLTAGE	5VDC	5/±12	600/±150	A1	PR97-12	98.00
		5/±15	600/±150	A1	PR97-15	98.00
	12VDC	5/±12	600/±150	A1	PR97-12-12	98.00
		5/±15	600/±150	A1	PR97-15-12	98.00
	24VDC	5/±12	600/±150	A1	PR97-12-24	98.00
		5/±15	600/±150	A1	PR97-15-24	98.00

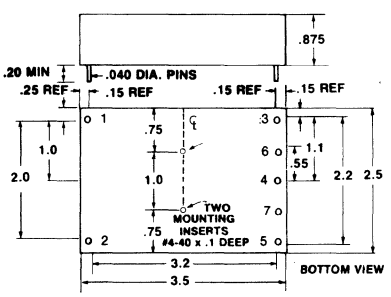
CONNECTIONS (A1, B1, B2)

PINS	SINGLE OUTPUT	DUAL OUTPUT	TRIPLE OUTPUT
1	+ VDC IN	+ VDC IN	+ VDC IN
2	- VDC IN	- VDC IN	- VDC IN
3	+ VDC OUT	+ VDC OUT	COM (5)
4	NO CONNECTION	COMMON OUT	-12/-15
5	- VDC OUT	- VDC OUT	+12/+15
6	NO PIN	NO PIN	+5 VDC
7	NO PIN	NO PIN	COM (12/15)

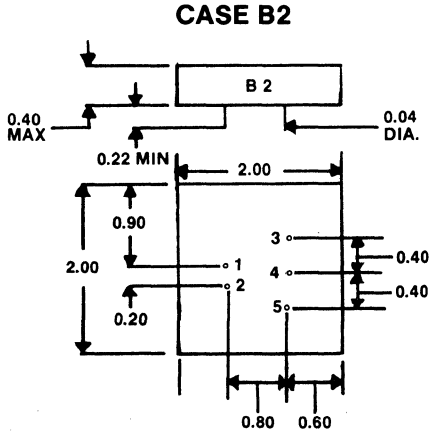
* Available in alternate pin configuration case B2 add suffix "C" after model number

Other voltages and currents available upon request

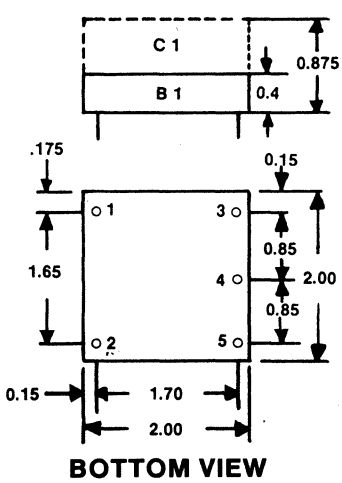
CASE A1



CASE B2



CASE B1, C1

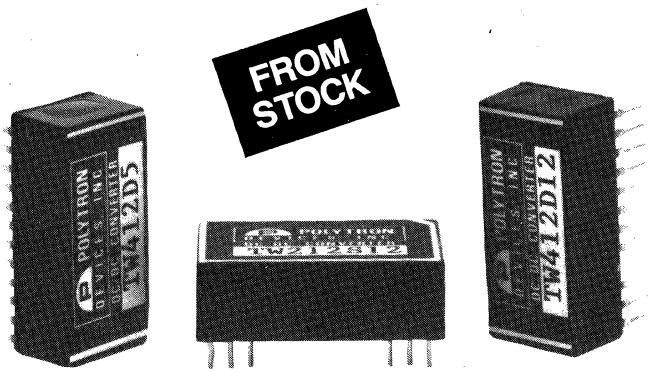


TW SERIES
1.8W-3W

REGULATED DC/DC CONVERTERS 24 PIN DIP

FEATURES:

- HIGH PERFORMANCE TT INPUT FILTER
- SINGLE AND DUAL OUTPUTS
- HIGHLY REGULATED ISOLATED OUTPUTS
- 100% BURN IN
- HIGH EFFICIENCY
- HIGH RELIABILITY
- NO EXTERNAL COMPONENTS



SPECIFICATIONS:

- **OUTPUT VOLTAGE STABILITY** 0.02%/°C Max.
- **OUTPUT VOLTAGE ACCURACY** ±5%
- **REGULATION** Line: ±0.5% Max. Load: ±1% Max.
- **RIPPLE AND NOISE** 50 mVP-P Max.
- **INPUT-OUTPUT ISOLATION** 500 VDC Min.
- **OPERATING TEMPERATURE** −25°C to + 71°C
- **STORAGE TEMPERATURE** −40°C to +100°C
- **EFFICIENCY** 55% Min.

SINGLE VOLTAGE UNITS

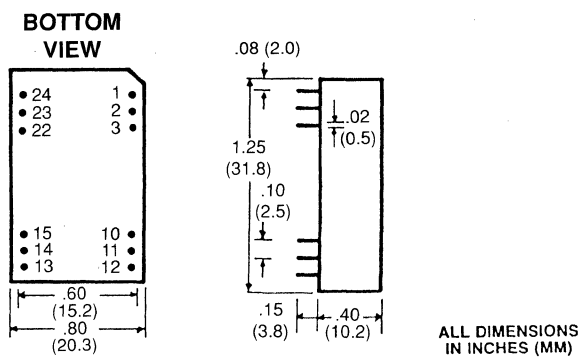
INPUT VOLTAGE (VDC)	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (mA)	MODEL NUMBER	PRICE 1-9 QTY
5 (4.75-5.25)	5	360	TW1.8-5S5	23.00
	5	600	TW3-5S5	29.00
	9	250	TW1.8-5S9	23.00
	9	334	TW3-5S9	29.00
	12	150	TW1.8-5S12	23.00
	12	250	TW3-5S12	29.00
	15	120	TW1.8-5S15	23.00
	15	200	TW3-5S15	29.00
12 (11.40-12.60)	5	360	TW1.8-12S5	23.00
	5	600	TW3-12S5	29.00
	9	250	TW1.8-12S9	23.00
	9	334	TW3-12S9	29.00
	12	150	TW1.8-12S12	23.00
	12	250	TW3-12S12	29.00
	15	120	TW1.8-12S15	23.00
	15	200	TW3-12S15	29.00
24 (22.80-25.20)	5	360	TW1.8-24S5	23.00
	5	600	TW3-24S5	29.00
	9	250	TW1.8-24S9	23.00
	9	334	TW3-24S9	29.00
	12	150	TW1.8-24S12	23.00
	12	250	TW3-24S12	29.00
	15	120	TW1.8-24S15	23.00
	15	200	TW3-24S15	29.00
28 (26.60-29.40)	5	360	TW1.8-28S5	23.00
	5	400	TW2-28S5	25.00
	5	600	TW3-28S5	29.00
	9	250	TW1.8-28S9	23.00
	9	334	TW3-28S9	29.00
	12	150	TW1.8-28S12	23.00
	12	250	TW3-28S12	29.00
	15	120	TW1.8-28S15	23.00
	15	200	TW3-28S15	29.00
48 (45.60-50.40)	5	360	TW1.8-48S5	23.00
	5	600	TW3-48S5	29.00
	9	250	TW1.8-48S9	23.00
	9	334	TW3-48S9	29.00
	12	150	TW1.8-48S12	23.00
	12	250	TW3-48S12	29.00
	15	120	TW1.8-48S15	23.00
	15	200	TW3-48S15	29.00

POLYTRON DEVICES, INC.

P.O. BOX 398, PATERSON, N.J. 07544 (201) 345-5885 **FAX: (201) 345-1264**

24-PIN DIP DC/DC CONVERTERS (continued)

	INPUT VOLTAGE (VDC)	OUTPUT VOLTAGE (VDC)	OUTPUT CURRENT (mA)	MODEL NUMBER	PRICE 1-9 QTY
DUAL VOLTAGE UNITS	5 (4.75-5.25)	±5	±180	TW1.8-5-5	29.00
		±5	±300	TW3-5-5	34.00
		±9	±100	TW1.8-5-9	29.00
		±9	±167	TW3-5-9	34.00
		±12	±75	TW1.8-5-12	29.00
		±12	±125	TW3-5-12	34.00
		±15	±60	TW1.8-5-15	29.00
		±15	±100	TW3-5-15	34.00
	12 (11.40-12.60)	±5	±180	TW1.8-12-5	29.00
		±5	±300	TW3-12-5	34.00
		±12	±75	TW1.8-12-12	29.00
		±12	±125	TW3-12-12	34.00
		±15	±60	TW1.8-12-15	29.00
		±15	±100	TW3-12-15	34.00
	24 (22.80-25.20)	±5	±180	TW1.8-24-5	29.00
		±5	±300	TW3-24-5	34.00
		±12	±75	TW1.8-24-12	29.00
		±12	±125	TW3-24-12	34.00
		±15	±60	TW1.8-24-15	29.00
		±15	±100	TW3-24-15	34.00
	28 (26.60-29.40)	±5	±180	TW1.8-28-5	29.00
		±5	±300	TW3-28-5	34.00
		±12	±75	TW1.8-28-12	29.00
		±12	±125	TW3-28-12	34.00
		±15	±60	TW1.8-28-15	29.00
		±15	±100	TW3-28-15	34.00
	48 (45.60-50.40)	±5	±180	TW1.8-48-5	29.00
		±5	±300	TW3-48-5	34.00
		±12	±75	TW1.8-48-12	29.00
		±12	±125	TW3-48-12	34.00
		±15	±60	TW1.8-48-15	29.00
		±15	±100	TW3-48-15	34.00

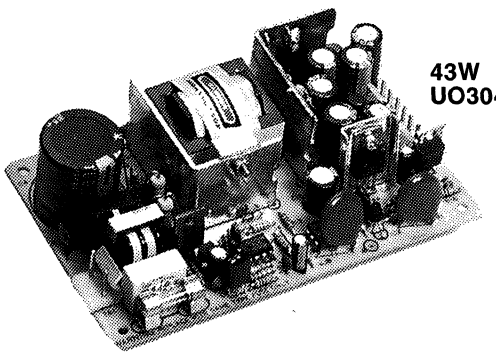


Pin Connections		
PIN	SINGLE OUTPUT	DUAL OUTPUT
1	+ V INPUT	+ V INPUT
2	N.C.	– V OUTPUT
3	N.C.	COMMON
10	– V OUTPUT	COMMON
11	+ V OUTPUT	+ V OUTPUT
12	– V INPUT	– V INPUT
13	– V INPUT	– V INPUT
14	+ V OUTPUT	+ V OUTPUT
15	– V OUTPUT	COMMON
22	N.C.	COMMON
23	N.C.	– V OUTPUT
24	+ V INPUT	+ V INPUT

POLYTRON DEVICES, INC.
P.O. BOX 398, PATERSON, N.J. 07544 (201) 345-5885 **FAX: (201) 345-1264**

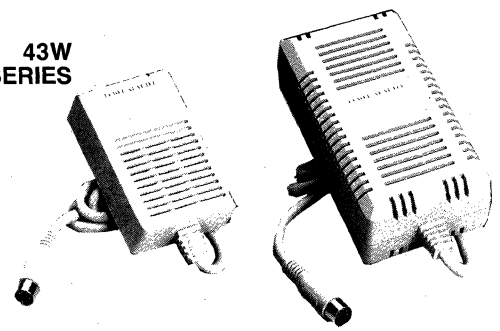
POTRANS

SWITCHING POWER SUPPLY SERIES



43W
UO3043x SERIES

43W
UP3043x SERIES



GENERAL SPECIFICATION:

Input voltage . . . . . 90VAC to 270VAC
Input frequency . . . . . 47Hz to 440Hz
Inrush current . . . . . 15A at 110VAC
30A at 230VAC
Operating temperature . . . . . 0°C to 50°C
Storage temperature . . . . . – 20°C to + 85°C
Temperature coefficient . . . . . ± 0.02°C
Efficiency . . . . . 73% Min
Cooling . . . . . Free air convection

Hold up time 20mS
Overvoltage protection rate . . . . . Crowbar
At main rated output + 15%
Overcurrent protection . . . . Hiccup at 150% load
Safety standard . . . . . UL 1950
CSA C22.2 NO 950
VDE EN60950
EMI . . . . . Meets FCC 15 class "B"
VDE 0871 class "B"

OUTPUT ELECTRICAL SPECIFICATION

MODEL	OUTPUT VOLTAGE	LOAD MIN.	LOAD RATED	LOAD MAX.	RIPPLE & NOISE	LOAD REGULATION
UO30430	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 12V	0.2A	2.0A	3.0A	120mV	± 5%
	– 12V	0.0A	0.3A	0.3A	120mV	± 1%
UO30431	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 15V	0.2A	1.6A	2.0A	150mV	± 5%
	– 15V	0.0A	0.3A	0.3A	150mV	± 1%
UO30432	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 12V	0.2A	2.0A	3.0A	120mV	± 5%
	– 5V	0.0A	0.3A	0.3A	50mV	± 1%
UO30433	+ 5V	0.6A	8.0A	8.0A	50mV	± 3%
UO30434	+ 12V	0.3A	3.6A	4.5A	120mV	± 3%
UO30435	+ 15V	0.3A	2.7A	3.5A	150mV	± 3%
UO30436	+ 24V	0.2A	1.8A	2.3A	240mV	± 3%
UO30437	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 12V	0.2A	2.0A	3.0A	120mV	± 5%
UO30438	+ 5V	0.6A	4.0A	6.0A	50mV	± 3%
	+ 15V	0.2A	1.0A	2.0A	150mV	± 5%
	– 5V	0.0A	0.3A	0.3A	50mV	± 1%
UO30439	+ 5V	0.6A	6.0A	8.0A	50mV	± 3%
	+ 24V	0.2A	0.5A	1.0A	240mV	± 3%
UO3043A	+ 15V	0.3A	1.3A	1.8A	150mV	± 3%
	– 15V	0.3A	1.3A	1.8A	150mV	± 5%
UO3043B	+ 5V	0.6A	4.0A	6.0A	50mV	± 3%
	+ 15V	0.2A	1.0A	2.0A	150mV	± 5%
	– 12V	0.0A	0.3A	0.3A	120mV	± 1%
UO3043C	+ 16.7V	0.2A	2.6A	3.4A	160mV	± 3%
UO3043D	+ 18V	0.2A	2.4A	3.0A	180mV	± 3%
UO3043E	+ 13.5V	0.3A	3.2A	4.2A	150mV	± 3%
UO3043F	+ 9V	0.3A	4.7A	6.0A	100mV	± 3%

OUTPUT ELECTRICAL SPECIFICATION:

MODEL	OUTPUT VOLTAGE	LOAD MIN.	LOAD RATED	LOAD MAX.	RIPPLE & NOISE	LOAD REGULATION
UP30430	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 12V	0.2A	2.0A	3.0A	120mV	± 5%
	– 12V	0.0A	0.3A	0.3A	120mV	± 1%
UP30431	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 15V	0.2A	1.6A	2.0A	150mV	± 5%
	– 15V	0.0A	0.3A	0.3A	150mV	± 1%
UP30432	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 12V	0.2A	2.0A	3.0A	120mV	± 5%
	– 5V	0.0A	0.3A	0.3A	50mV	± 1%
UP30433	+ 5V	0.6A	6.0A	8.0A	50mV	± 3%
UP30434	+ 12V	0.3A	3.6A	4.5A	120mV	± 3%
UP30435	+ 15V	0.3A	2.7A	3.5A	150mV	± 3%
UP30436	+ 24V	0.2A	1.8A	2.3A	240mV	± 3%
UP30437	+ 5V	0.6A	3.0A	5.0A	50mV	± 3%
	+ 12V	0.2A	2.0A	3.0A	120mV	± 5%
UP30438	+ 5V	0.6A	4.0A	6.0A	50mV	± 3%
	+ 15V	0.2A	1.0A	2.0A	150mV	± 5%
	– 5V	0.0A	0.3A	0.3A	50mV	± 1%
UP30439	+ 5V	0.6A	6.0A	8.0A	50mV	± 3%
	+ 24V	0.2A	0.5A	1.0A	240mV	± 3%
UP3043A	+ 15V	0.3A	1.3A	1.8A	150mV	± 3%
	– 15V	0.3A	1.3A	1.8A	150mV	± 5%
UP3043B	+ 5V	0.6A	4.0A	6.0A	50mV	± 3%
	+ 15V	0.2A	1.0A	2.0A	150mV	± 5%
	– 12V	0.0A	0.3A	0.3A	120mV	± 1%
UP3043C	+ 16.7V	0.2A	2.6A	3.4A	160mV	± 3%
UP3043D	+ 18V	0.2A	2.4A	3.0A	180mV	± 3%
UP3043E	+ 13.5V	0.3A	3.2A	4.2A	150mV	± 3%
UP3043F	+ 9V	0.3A	4.7A	6.0A	100mV	± 3%

ASK ABOUT OUR NEW 25W EXTERNAL POWER SUPPLY!

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TELEX: 244319 POTRANS USA

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WALL PLUG-IN ADAPTERS

CATALOG NO.	INPUT		OUTPUT		SAFETY	
	VAC	Hz	VAC	A	UL	CSA
WP350109	120	60	9	0.1	★	★
WP350206	120	60	6	0.3	★	
WP350218	120	60	18	0.1	★	
WP350312	120	60	12	0.25	★	
WP350316	120	60	16	0.19	★	★
WP350324	120	60	24	0.1	★	
WP350512	120	60	12	0.4	★	
WP350526	120	60	17	0.2	★	
			9	0.1		
WP410124	120	60	24	0.03	★	
WP410306	120	60	6	0.5	★	
WP410412	120	60	12.5	0.3	★	
WP410424	120	60	18.5	0.2	★	
WP410509	120	60	9	0.555	★	
WP410528	120	60	13×2	0.15	★	★
WP410606	120	60	6	1	★	
WP410606A	120	60	6.2	0.71	★	★
WP410608	120	60	8	0.75	★	
WP410608A	120	60	8.5	0.7	★	
WP410610	120	60	10	0.6	★	
WP410612	120	60	12	0.5	★	★
WP410613	120	60	13	0.46	★	
WP410614	120	60	14	0.4	★	
WP410616	120	60	16	0.375	★	★
WP410624	120	60	24	0.25	★	
WP410909	120	60	8.5	1	★	
WP411010G	120	60	10	1	★	★
WP411010	120	60	10	1	★	
WP411012	120	60	12	0.83	★	★
WP411014	120	60	13.5	0.52	★	★
WP411014A	120	60	13.5	0.7	★	★
WP411018	120	60	18	0.555		★
WP411024	120	60	24	0.42	★	★
WP410306D	120	60	5.6	330	★	★
WP410320D	120	60	20	150	★	
WP410506D	120	60	6.2	710	★	★
WP410518D	120	60	18	275	★	
CL-0650	120	60	6	500	★	
CL-0950	120	60	9	500	★	★
CL-1250	120	60	12	500	★	
DIA-4160	120	60	6	300	★	★
DIA-4190	120	60	9	300	★	★
DIA-4112	120	60	12	300	★	
CL-613	120	60	3/4.5/6	300	★	
			7.5/9/12			
CL-615	120	60	3/4.5/6	500	★	
			7.5/9/12			
CL-615A	120	60	3/4.5/6	500		
			7.5/9/12	300		
WP571420	120	60	20	0.7	★	
WP571616	120	60	16	1	★	★
WP571619	120	60	19	0.84	★	★
WP571724	120	60	24	0.7	★	
WP571916	120	60	16.5	1.1	★	★

CATALOG NO.	INPUT		OUTPUT		SAFETY	
	VAC	Hz	VAC	A	UL	CSA
WP572007	120	60	7	2.85	★	
WP572010	120	60	10	2	★	★
WP572012	120	60	12	1.67	★	★
WP572016	120	60	16	1.25	★	
WP572018	120	60	18	1.1	★	
WP572024	120	60	24	0.83	★	★
WP572408	120	60	8	3	★	
WP572410	120	60	10	2.4	★	
WP572412(C)	120	60	12	2	★	★
WP572416	120	60	16.5	1.45	★	★
WP572419	120	60	19	1.26	★	
WP572424	120	60	24	1	★	
WP572613	120	60	13	2	★	
WP572828	120	60	28	1	★	
WP573018	120	60	18	1.67	★	
WP573024	120	60	24	1.25	★	★
WP573512(CG)	120	60	12	2.9	★	★
WP573524	120	60	24	1.45	★	★
WP480816	120	60	16	0.5	★	
WP480816C	120	60	16	0.5	★	★
WP481004	120	60	3	3.6	★	★
WP481012	120	60	12	0.83	★	
WP481020	120	60	20	0.5	★	
WP481024	120	60	24	0.416	★	
WP481212	120	60	12	1	★	
WP481217(CG)	120	60	17	0.7	★	★
WP481220	120	60	19.3	0.6	★	
WP481220C	120	60	19.3	0.6	★	★
WP481224	120	60	24	0.5	★	
WP481309	120	60	9	1.4	★	
WP481514	120	60	13.5	1.11	★	
WP481714	120	60	13.5	1.25	★	
WP481812	120	60	12	1.5	★	
WP481812(CG)	120	60	12	1.5	★	★
P-970	220	50	24	0.75		
Q-026A	220	50	3.4	2.8A		
WP480515D	120	60	±7.5	350	★	
WP480709D	120	60	9	700	★	
WP480909D	120	60	9	1000	★	
WP481012D	120	60	12	800	★	
WP481218D(V)	120	60	+9	1000	★	★
			−9	300		
DIA-4860	120	60	6	1000		
DIA-4890	120	60	9	1000	★	
DIA-4812	120	60	12	1000		
WP280101D	120	60	1.5	75	★	
WP280102D	120	60	2.4	80	★	
WP280103D	120	60	2.9	100	★	
WP280103D-1	120	60	3.6	80	★	
WP280104D	120	60	3.6	50	★	
WP280118D	120	60	18	20	★	
DIA-2890	120	60	9	100		
CL-0910	120	60	7.5	100	★	
CL-0910A	120	60	9	75	★	

CATALOG NO.	INPUT		OUTPUT		SAFETY	
	VAC	Hz	VAC	A	UL	CSA
WP571245D	120	60	S1 23.4	200	★	
			S2 8.5	500		
WP571512D	120	60	12	1200	★	
WP571709D	120	60	8.5	2000	★	
WP571812D	120	60	12	1500	★	
DIA-5760	120	60	6	2000		
WP663021	120	60	21	1.4	★	
WP663322	120	60	22	1.5	★	
WP664012	120	60	12	3.3	★	
WP664018	120	60	18	2.2	★	
WP664024	120	60	24	1.67	★	
WP665026	120	60	26	1.92	★	
DIA-3512	120	60	12	200	★	
DIA-3560	120	60	6	200	★	★
DIA-3560B	120	60	6	300	★	
DIA-3590	120	60	9	200	★	★
DIA-3590A	120	60	9	300	★	★
WP350109D	120	60	9.5	100	★	★
WP350110D	120	60	10.1	88	★	★

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TABLE TOP POWER SUPPLIES

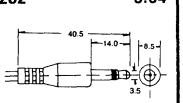
MODEL	OUTPUT		SAFETY UL	SAFETY CSA
PS571420	AC20V 0.7A ★		★	
PS571616	AC16V 1.0A		★	
PS571619	AC19V 0.84A		★	
PS571916	AC16.5V 1.1A		★	
PS572007	AC7.0V 2.85A		★	
PS572010	AC10V 2A		★	
PS572012	AC12V 1.67A		★	
PS572016	AC16V 1.25A		★	
PS572018	AC18V 1.1A		★	
PS572018G	AC18V 1.1A		★	★
PS572024	AC24V 0.83A		★	
PS572408	AC8V 3A		★	
PS572410	AC10V 2.4A		★	
PS572412	AC12V 2A		★	★
PS572416	AC16.5V 1.45A		★	
PS572416CG	AC16.5V 1.45A		★	★
PS572419	AC19V 1.26A		★	
PS572419CG	AC19V CT 1.26A		★	★
PS572613	AC13V 2A		★	
PS572828	AC28V 1A		★	
PS573018	AC18V 1.67A		★	
PS573024	AC24V 1.25A		★	
PS573512	AC12V 2.9A		★	
PS573524	AC24V 1.45A		★	
P-279	AC8V 1.5A AC28V CT 0.25A		★	
PS571012D	DC12V 0.83A	FILTERED	★	★
PS571245D	DC23.4V 0.2A DC85V 0.5A	UN-FILTERED	★	★
PS571325DU	DC26V 0.5A	FILTERED	★	★
PS571325DV	DC26V 0.5A	FILTERED	★	★
PS571799D	DC32.5V 0.2A DC11.9V 0.5A AC90V 45mA	FILTERED UN-FILTERED	★	
PS472434D	DC24V 0.6A DC10V 0.6A	FILTERED	★	★
PS572434DT	DC24V 0.6A DC12V 0.6A	FILTERED	★	★
PS663021	AC21V 1.4A		★	

MODEL	OUTPUT		SAFETY UL	SAFETY CSA	SAFETY TUV
PS663204CV	2X12V AC 2X 0.625A				★
PS663322	AC22V 1.5A		★		
PS663322V	AC22V 1.5A				★
PS664012	AC12V 3.3A		★		
PS664018	AC18V 2.2A		★		
PS664024	AC24V 1.67A		★		
PS662433	AC13.7V 1A AC19V 0.5A		★	★	
PS663304G	AC3.5V 4.7A AC3.5V 4.7A			★	
PS664004	AC3.5V 5.75A AC3.5V 5.75A		★		
PS664736	AC14.8V 1A AC21V 1.5A		★	★	
P-772-2	AC3.5V 5.7A AC3.5V 5.7A				★
RPS661206	DC + 6V 2A	REGULATED			
RPS661417	DC + 5V 1A DC + 12V 0.5A	REGULATED			
RSP661429	DC + 5V 1.2A DC ± 12V 0.3A	REGULATED			
RPS661429-1V	DC + 5V 2.5A DC – 24V 0.05A	REGULATED			★
RPS661429-1D	DC + 5V 2.5A DC – 24V 0.05A	REGULATED	★	★	
RPS661529	DC + 5V 0.6A DC ± 12V 0.5A	REGULATED			
RPS661629	DC + 5V 1.75A DC ± 12V 0.3A	REGULATED			
RPS661729	DC + 5V 1A DC ± 12V 0.5A	REGULATED			
RPS661824	DC ± 12V 0.75A	REGULATED			
RPS661929	DC + 5V 1.5A DC ± 12V 0.45A	REGULATED			
RPS662129	DC + 5V 1.8A DC ± 12V 0.5A	REGULATED			
PS764812D	DC + 12V 4A	UN-FILTERED			
RPS570729	DC6V 0.75A	REGULATED	★	★	

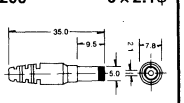
MODEL	OUTPUT	DC CONDITION	SAFETY UL	SAFETY CSA	
RPS570729	DC ± 12V 80mA				
RPS570805	DC5V 1.5A	REGULATED			
RPS570806	DC6V 1.25A	REGULATED			
RPS570912	DC12V 0.75A	REGULATED			
RPS570929	DC5V 1.2A DC ± 12V 0.1A	REGULATED			
RPS571005	DC5V 2A	REGULATED			
RSP571029	DC5V 1A DC ± 12V 0.2A				
RPS571129	DC5V 1A DC ± 12V 0.25A	REGULATED	★	★	
RPS571212	DC12V 1A	REGULATED			
RPS571229	DC5V 1.5A DC ± 12V 0.2A	REGULATED			
RPS571717	DC16.75V 1A	REGULATED	★	★	
RPS571812	DC12V 1.5A	REGULATED			
RPS571818	DC18V 1A	REGULATED	★	★	
PS480816	AC16V 0.5A				
PS481007D	DC7.1V 1.3A	UN-FILTERED			
PS481012D	DC12V 0.8A	FILTERED			
PS481024	AC24V 0.4A		★		
PS481204	AC3.5V 3.4A	UN-FILTERED	★	★	TUV
PS481217	AC17V 0.7A		★		
PS481217CV	AC17V CT 0.7A				VDE
PS481220	AC19.3V 0.6A		★	★	
PS481524CG12	AC24V CT 0.6A	UN-FILTERED	★	★	VDE
RPS480333	DC32V 0.065A	REGULATED	★	★	
RPS480405V	DC5V 0.6A	REGULATED	★		
RPS480548	DC48V 0.1A	REGULATED	★		
RPS480606	DC6V 1A	REGULATED			
RPS480612	DC12V 0.5A	REGULATED			
RPS480529	DC5V 0.5A DC ± 12V 0.1A	REGULATED			
PS766012	AC12V 5A				
PS766024	AC24V 2.5A				
PS766026CG	AC26V CT 2.25A		★		
PS601809D	DC9V2A	FILTERED			
PS603612	AC12V 3A				
PS603624	AC24V 1.5A				

OUTPUT PLUG

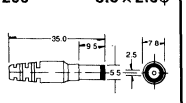
202 3.54



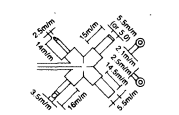
203 5 × 2.1φ



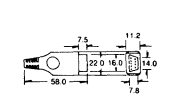
206 5.5 × 2.6φ



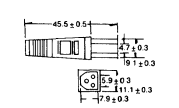
207 UNIVERSAL PLUG



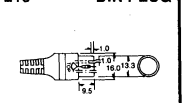
211 ATARI PLUG



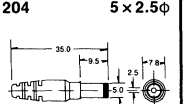
212 MINI DIN PLUG



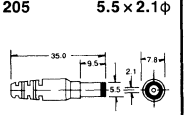
213 DIN PLUG



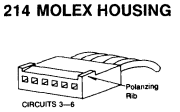
204 5 × 2.5φ



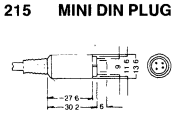
205 5.5 × 2.1φ



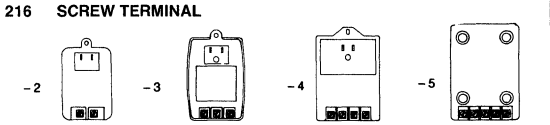
214 MOLEX HOUSING



215 MINI DIN PLUG



216 SCREW TERMINAL



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eem SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

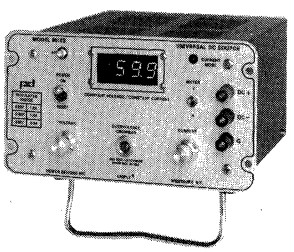
Yugoslavia Federal Institute of Standardization

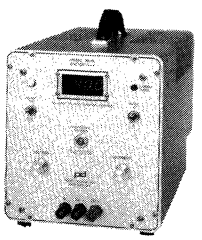
POWER DESIGNS

LABORATORY POWER SOURCES

SINGLE OUTPUT LABORATORY POWER SOURCES

- **Constant Voltage/Constant Current**
- **Digital Panel Meter Available**
- **Adjustable Overvoltage Crowbar**
- **1 Millivolt Peak To Peak Ripple**
- **5 Year Guarantee**
- **IEEE-488 Programmable***





These regulated DC power sources feature constant voltage/constant current operation with automatic crossover. A patented regulator technique trademarked "uniply" is utilized to provide operating features not obtainable with conventional dissapative regulator type circuits and constant output power characteristics not available in SCR or switching regulator systems. The regulator is RFI free and employs linear circuits only. No triacs, SCR's or switching circuits are used. Power output capability increases with increasing AC line voltage. Useful regulated output at reduced levels is available at line voltages as low as 85 volts.

Ten turn potentiometers for voltage and current controls are provided for high resolution. Metering is provided by means of an analog meter. An optional 3½ digit LED meter is available. The meter is switch selectable for either voltage or current monitoring. A front panel adjustable crowbar protects the load circuits against overvoltage conditions. An indicator lamp is activated when either the current mode function is in operation or the overvoltage crowbar fires.

Panel mounted binding posts are provided for ease of connection. The output terminals are floating with respect to the chassis permitting positive or negative output polarity. Rear terminals are provided for DC output, remote sensing and remote voltage and current programming by resistance. No derating of the output current is required when remote programming over the entire voltage range of the supply.

These power sources are housed in portable steel cabinets designed for bench use, stacking or rack mounting. Rack panel adaptors are available.

ELECTRICAL SPECIFICATIONS:
Input: 105-125 /210-250 VAC, 47-440 Hz

*With optional PD-488 controller.

MODEL	OUTPUT		REGULATION		RIPPLE & NOISE	
	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT
1513D	0-15V	0-13A	.005%	.02%	1 mv P-P	10ma P-P
2100D	0-20V	0-10A	.005%	.02%	1mv P-P	10ma P-P
4050D	0-40V	0-5A	.005%	.02%	1mv P-P	10ma P-P
5015D	0-50V	0-1.5A	.005%	.03%	1mv P-P	.5ma P-P
6010D	0-60V 0-50V 0-20V	0-.5A 0-1A 0-1.5A	.005%	.03%	1mv P-P	.5ma P-P
6050D	0-60V 0-30V 0-15V 0-6V	0-1A 0-2A 0-3A 0-5A	.005%	.02%	1mv P-P	5ma P-P

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POWER DESIGNS

LABORATORY POWER SOURCES

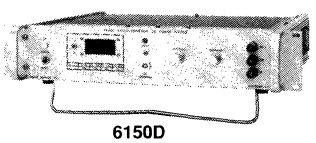
SINGLE OUTPUT LABORATORY POWER SOURCES

- **Voltage Regulated**
- **Adjustable Current Limiting**
- **Low Ripple & Noise**
- **Digital Panel Meter Available**

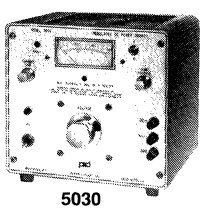
These regulated DC power sources feature constant voltage operation with continuously adjustable over current protection.

Stable, low noise DC power is provided through the use of linear regulator techniques. Continuously adjustable voltage controls provide better than 20 millivolt resolution. Adjustable current limiting is accomplished by means of a front panel mounted control. An overload lamp indicates when an overcurrent condition has occurred. Metering is accomplished by means of a dual scale analog meter. A 3½ digit LED meter is available as an option. The meter is switch selectable for either voltage or current monitoring.

The output terminals are floating with respect to the chassis permitting positive or negative output polarity. The output may be continuously shorted without damage to the power source. Panel mounted binding posts are provided for ease of connection.



6150D



5030

ELECTRICAL SPECIFICATIONS
Input: 105-125 VAC, 47-65 Hz

MODEL	OUTPUT		REGULATION	RIPPLE & NOISE
	VOLTAGE	CURRENT		
1120S	0-120v	0-1a	.01%	1mv P-P
2505	0-250v	0-0.5a	.01%	1mv P-P
5030	0-50v 0-33v	0-2a 0-3a	.01%	3mv P-P
6150D	0-60v 0-25v 0-15v 0-6v	0-2a 0-5a 0-7.5a 0-15a	.01%	1mv P-P

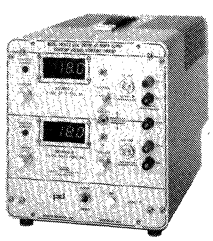
DUAL OUTPUT LABORATORY POWER SOURCES

- **Constant Voltage/Constant Current**
- **Digital Panel Meters Available**
- **Adjustable Overvoltage Crowbar**
- **Low Ripple & Noise**

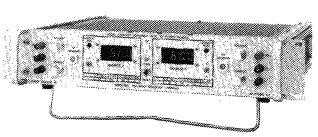
These regulated DC power sources feature constant voltage/constant current operation with automatic crossover. Independent voltage and current adjustment of each output is provided utilizing separate 10 turn potentiometers. Metering is provided by means of two separate meters. The meters are switch selectable for either voltage or current monitoring of each source. 3½ digit LED panel meters are available as an option.

Panel mounted binding posts are provided for ease of connection. The output terminals are floating with respect to each other and the chassis. This permits positive or negative output polarity and series operation. In addition the Model TW347D features a switch selectable tracking mode. When the switch is set for tracking, there is an internal connection between both outputs and source B tracks source A within 10 millivolts.

The Models TW347D and TW6050D include a front panel adjustable crowbar that protects load circuits against overvoltage conditions. An indicator lamp is activated when either the current mode function is in operation or the overvoltage crowbar fires.



TW347D



TW6050D

ELECTRICAL SPECIFICATIONS
Input: 105-125 VAC, 210-250 VAC, 47-440 Hz

MODEL	OUTPUT (each source)		REGULATION		RIPPLE & NOISE	
	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT
TW347D	0-18V 0-16V	0-3A 0-5A	.01%	.02%	2mv P-P	10ma P-P
TW5005D	0-50V	0-.5A	.005%	.06%	1mv P-P	.3ma P-P
TW6050D	0-60V 0-25V 0-15V 0-6V	0-1A 0-2A 0-3A 0-5A	.005%	.02%	1mv P-P	5ma P-P

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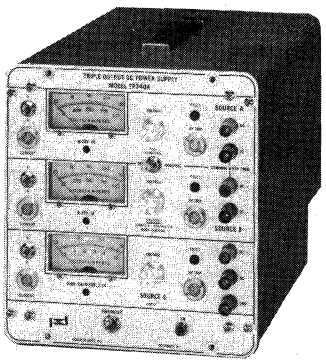
POWER DESIGNS

LABORATORY POWER SOURCES

TRIPLE OUTPUT LABORATORY POWER SOURCES

- **Voltage Regulated**
- **Adjustable Current Limiting**
- **Adjustable Overvoltage Crowbar**
- **1 MV Peak To Peak Ripple & Noise**
- **Automatic Voltage Tracking**



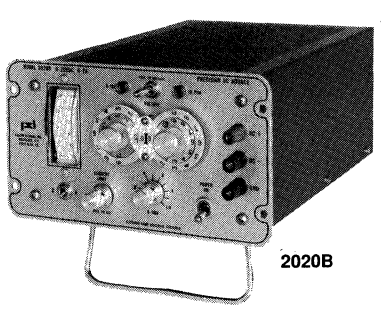
These triple output regulated DC power sources feature constant voltage operation with continuously adjustable over current protection. Stable, low noise, DC power is provided through the use of linear regulator techniques. Independent adjustment of each output is provided utilizing ten turn potentiometers for high resolution. Automatic voltage tracking of the A and B sources is accomplished by means of a panel mounted toggle switch. When the switch is set for tracking, source B tracks source A within 10 millivolts. This switch is equipped with a locking lever to prevent accidental actuation.

Individual current limit adjustments for each output and individually adjustable overvoltage crowbars are conveniently located on the front panel. Overvoltage protection for the A and B sources will trip simultaneously if either is triggered by an overvoltage condition. A fault indicator lamp on each output signals an overload, short circuit, or overvoltage condition.

Metering is provided by means of three separate dual range analog meters. The meters are switch selectable for voltage or current monitoring of each source.

MODEL	SOURCE	OUTPUT VOLTAGE	OUTPUT CURRENT	REGULATION	RIPPLE & NOISE
TP340A	A	0-32V	0-1A		
	B	0-32V	0-1A		
	C	0-15V 0-6V	0-2.5A 0-5A	.01%	1mv P-P
TP343B	A	0-25V 0-20V	0-1A 0-2.5A		
	B	0-25V 0-20V	0-1A 0-2.5A	.01%	1mv P-P
	C	0-15V 0-6V	0-2.5A 0-5A		

PRECISION CALIBRATED LOW VOLTAGE POWER SOURCES



2020B

• Two dual concentric switches (four decades) and a calibrated potentiometer provide digital readout to five significant figures • A toggle switch provides readout to six figures above 10 volts • Last-place potentiometer has 10 μV resolution • Source impedance is less than two milliohms at DC, less than 0.5 ohms at 1 MHz • Recovery times is less than 50 microseconds to return within a 20 millivolt band of the programmed voltage for an 80% load change • Front and rear access terminals.
• Better than 0.1% calibration accuracy • 10 PPM plus 100 μV stability for 8 hours • Temperature coefficient better than 10 PPM or 50 μV per °C • Self-restoring overload and short circuit protection with adjustable current limit control and flashing limit indicator • 100 μV maximum peak-to-peak ripple • Solid silver decade switch contacts • 100 hour minimum burn-in prior to calibration • Individual calibration data furnished with each unit • Provisions for remote sensing and remote resistance programming at 1000Ω/volt • Voltage or current metering.

Model	Range Volts	Current Amps	Regulation Line/Load	Max. Ripple Pk to Pk	Stability	TC Per °C	Size	Special Features
2020B	0-20	0-2	.0005% +100 μV	100 μV	.001% +100 μV/8 hrs.	.001% or 50 μV	8 3/8 x4 3/4 x 11 9/16	4 decade readout with .1% accuracy. Continuous current limiting with panel pushbutton setting. Remote programmable 1000Ω/V.
5020	0-20/50	0-2A/1A	.001% + 100 μV	100 μV	.001% +100 μV/8 hrs.	.001% or 50 μV	8 3/8 x 4 3/4 x 11 9/16	
C500	0-100	0-0.5	.001% +100 μV	250 μV	.001% +100 μV/8 hrs.	.001% or 50 μV	8 3/8 x 4 3/4 x 11 9/16	

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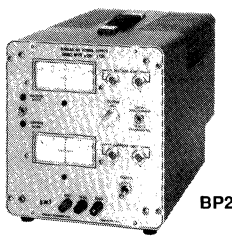
FOUR QUADRANT BI-POLAR PROGRAMMABLE POWER SOURCE

- **Constant Voltage**
- **Constant Current**
- **Adjustable Boundry Limits**
- **Low Ripple And Noise**
- **IEEE-488 Programmable**

These bi-polar power sources are regulated, four quadrant DC power supplies that can be adjusted or programmed from -100% to +100% of its range in both the voltage or current mode. The output passes smoothly and linearly through zero automatically without the need for polarity switching. The supply is either a source or sink for up to 100% of its current rating at any output voltage setting. Provisions are made for both local and remote programming of the output. In the local programming mode the output voltage and current are controlled by a front panel mounted 10 turn potentiometer. A remote programming feature allows the output to be controlled by either an external voltage or current source or by means of an external potentiometer. The power supply can also be programmed by an optional external IEEE-488 controller. Remote programming inputs are located on the rear of the unit. Linear regulator techniques are employed to ensure a low noise output free from RFI and switching spikes.

The power supply is bounded in all four quadrants by four individually adjustable limit controls located on the front panel.



BP20

This allows the voltage and current limits to be preset in both the positive and negative polarity. Two LED's are provided to indicate when the voltage limit or current limit set points have been reached.

Metering is provided by means of two separate zero center analog recessed panel meters. One indicates the output voltage and the other indicates output current. Meter accuracy is +/ - 2%.

Panel mounted binding posts are provided for DC output to allow for ease of connection. A rear terminal strip provides screw terminals for DC output, remote sensing and remote programming connections. The output terminals are floating with respect to the chassis to allow the output to be isolated from ground.

Input (All Models): 105- 125 / 210-250 VAC, 47-440 Hz

*With optional PD-488 controller.

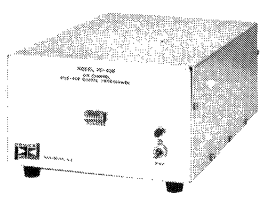
MODEL	OUTPUT		REGULATION		RIPPLE & NOISE	
	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT
BP-20	- 20V TO +20V	- 10A TO +10A	.01%	.01%	1MV RMS	.03% RMS
BP-50	- 50V TO +50V	- 4A TO +4A	.01%	.01%	1MV RMS	.03% RMS
BP-100	- 100V TO +100V	- 2A TO +2A	.01%	.01%	1MV RMS	.03% RMS

IEEE-488 INTERACTIVE DIGITAL PROGRAMMER

MODEL PD-488

- **Interfaces With GPIB Buss Per IEEE-488/1978 Standard**
- **Six channels Of Control**
- **Program By Voltage Or Resistance**
- **Logic Controllled Outputs Can Control Relays, Alarms, Etc.**
- **Can Report Instantaneous Operating Conditions Of Each Channel**
- **Use With Any Power Designs Supply**

The Power Designs Model PD-488 interactive interface gives the user flexible control of up to six Power Designs power supplies with remote voltage or resistance programming capability. It is a "talker/listener" system that can be used to control a single power supply or a multiple power supply system. Its six channels allow any computer with an IEEE-488 port to control up to six independent functions. It also enables the power supply to respond with its instantaneous operating conditions. An optional resistance programming pack is available to control the output of resistance programmed power supplies. This controller complies with the IEEE-488/1978 standard data bus (GPIB). Standard ASCII character strings are used to communicate with the controller.



PROGRAMMABLE FUNCTIONS (LISTENING)

Each of the six voltage control channels can be used to program one function of a supply such as the output voltage, the current limit, or the overvoltage trip point setting. Channels can be grouped to allow the control of multiple functions on several supplies. For example, if one channel per supply is used, one function on six supplies may be controlled. If two channels per supply are used, then two functions on three supplies may be controlled. If three channels per supply are used, then three functions on two supplies may be controlled. A digital interface port with eight logic controlled outputs is provided which can be used to actuate relays, alarms, or other functions.

TALKING FUNCTIONS

If requested, the controller can measure and report the instantaneous output voltage or current levels back to the host computer. The host computer may then reformat this data and send it to any other IEEE-488 peripheral such as a plotter or printer. Eight TTL compatible inputs allow the state of external flags to be reported.

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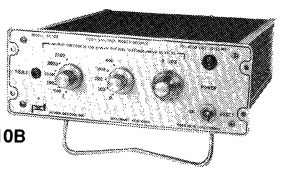
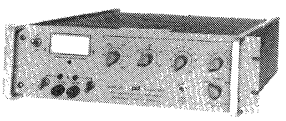
POWER DESIGNS

PRECISION CALIBRATED HIGH VOLTAGE POWER SOURCES

- **0.25% Calibration Accuracy**
- **Low Ripple & Noise**
- **High Stability/ Low TC**
- **Overlaod Protection**
- **1 Year Guarantee**



3K10B



1570

These calibrated laboratory high voltage DC power sources are ideally suited for applications requiring high stability, low noise and superior regulation. Output voltage control is achieved by means of a series of front panel mounted decade switches and a continuously adjustable calibrated vernier potentiometer control. Calibration accuracy is better than 0.25% of the dial settings above 250 volts and 1.0% below 250V.

Long term stability is better than .005% per hour; less than .02% per 24 hour period for all models except the 3K10B which is .01% per hour or .03% per 24 hour period.

Current limiting is provided which permits continuous operation into an overload or short circuit condition without damage to the power source. In addition the Models 3K10B, 2K100 and 3K75 feature overvoltage protection which acts to disable the high voltage output in the event of an internal or external malfunction.

Metering is provided by a dual scale analog meter which permits voltage or current monitoring on all models except the 3K10B.

Meter function is selected by a front panel mounted spring returned toggle switch. This switch is normally in the KV position to prevent damage to the meter in the event of an overcurrent or short circuit condition.

Two high voltage output connectors mounted on the rear of each unit are connected in parallel. A rear panel warning indicator lamp is illuminated when these connectors are energized with the exception of the Model 3K10B.

These power sources are designed for bench use, stacking or rack mounting. A tilting bail is provided on the Model 3K10B for ease of viewing when the unit is used on a bench. Rack panel adaptors are available for the 3K10B.

ELECTRICAL SPECIFICATIONS: Input (All Models): 105-125 VAC, 47-440 Hz
210-250 VAC, 47-440 Hz available on most models.

MODEL	OUTPUT		REGULATION	RIPPLE & NOISE	POLARITY
	VOLTAGE	CURRENT			
1K200P	250-1012V	0-200 MA	.001%	5mv P-P	Positive
1K200N	250-1012V	0-200 MA	.001%	5mv P-P	Negative
2K20A	1-2012V	0-2 MA	.001%	1mv P-P	Reversible
2K100P	500-2012V	0-100 MA	.001%	5mv P-P	Positive
2K100N	500-2012V	0-100 MA	.001%	5mv P-P	Negative
3K10B	10-3000V	0-10 MA	.001%	3mv P-P	Reversible
1570A	1-3012V	0-40 MA	.001%	1mv P-P	Reversible
3K75P	500-3012V	0-75 MA	.001%	5mv P-P	Positive
3K75N	500-3012V	0-75 MA	.001%	5mv P-P	Negative
1556B	10-6012V	0-20 MA	.001%	1mv P-P	Reversible
1543C	10-10, 012V	0-10 MA	.001%	1mv P-P	Reversible

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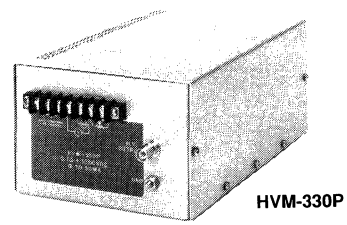
POWER DESIGNS

MODULAR HIGH VOLTAGE POWER SOURCES

- **IEEE-488 Programmable***
- **Low Ripple and Noise**
- **High Stability/Low TC**
- **Current Limiting**
- **Overvoltage Protection**
- **Positive or Negative Polarity Available on all Models**



HVM-330P

The UPMD series are modular high voltage power sources of high stability and low noise designed for critical applications where remote panel adjustment of the output is required. It is ideal for such typical applications as amplitude control of photomultiplier output, proportional detectors, focus control of cathode ray tubes, ion guns or electrostatic lenses.

The UPMD series achieves its compact size and light weight through the use of efficient high frequency inverter techniques.

Remote control of the output voltage is achieved by means of an external potentiometer operating at low potentials with respect to ground. Output voltage resolution is a function of this external control. An option is available for remote voltage control of the output at any desired input/output voltage ratio, making the UPMD series suitable for digital programming with an external digital/analog converter.

Propriety protection circuits, electronic current limiting and tracking overvoltage protection are incorporated to prevent damage to the supply or its load in the event of an overload, short circuit or overvoltage condition. The tracking overvoltage circuit operates to shut down the high voltage output electronically if a malfunction results in an output voltage or transient approximately 500 volts over the preset output level. An internal 1% multiplier permits connection of an external microammeter to monitor output voltage, if desired. The high voltage output is available at a "Safety High Voltage" BNC receptacle (SHV).

When ordering, add suffix "P" for positive output or suffix "N" for negative output polarity.

ELECTRICAL SPECIFICATIONS:
Input (All Models): 105-125 VAC, 47-440 Hz, 210-250 VAC, 47-440 Hz available

MODEL	OUTPUT		REGULATION	RIPPLE & NOISE	TC
	VOLTAGE	CURRENT			
HVM-150	10-1000V	0-50 MA	.001%	10mv P-P	<50 PPM/°C
HVM-1100	10-1000V	0-100 MA	.001%	10mv P-P	<50 PPM/°C
HVM-225	10-2000V	0-25 MA	.001%	10mv P-P	<50 PPM/°C
HVM-250	10-2000V	0-50 MA	.001%	10mv P-P	<50 PPM/°C
HVM-315	10-3000V	0-15 MA	.001%	10mv P-P	<50 PPM/°C
HVM-330	10-3000V	0-30 MA	.001%	10mv P-P	<50 PPM/°C
HVM-510	10-5000V	0-10 MA	.001%	10mv P-P	<50 PPM/°C
HVM-520	10-5000V	0-20 MA	.001%	10mv P-P	<50 PPM/°C
HVM-1010	10-10,000V	0-10 MA	.001%	10mv P-P	<50 PPM/°C

*With optional PD-488 programmer

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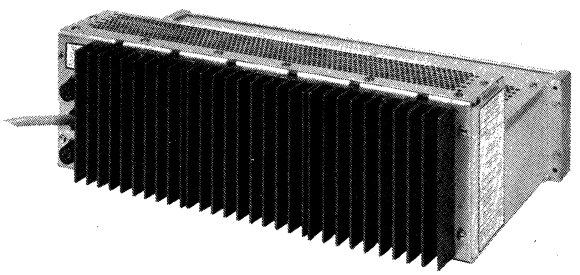
POWER DESIGNS

POWER SUPPLIES FOR NUCLEAR INSTRUMENTATION

AEC-320-9 ±6V/±12/±24V

The Power Designs Model AEC-320-9 conforms to or exceeds the requirements of a Type V-H Power Supply per TID-20893 (Rev. 4).

The equipment provides six regulated outputs: ±6 VDC at 10 amperes, current shared, ±12 VDC at 4 amperes, current shared (maximum 3 amperes from either source) and ±24 VDC at 2 amperes current shared (maximum 1.5 amperes from either source). 117 VAC at 0.5A is available when the supply is operated on 234 VAC, 50-65 Hz. The total power capacity is 150 VA with equally shared currents and 130 VA with unbalanced load currents.



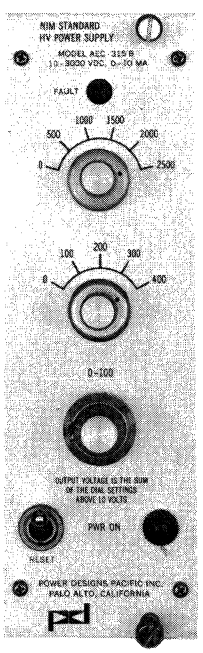
Built-in overvoltage crowbars are provided on the ±6 volt outputs.

Modifications of the output voltage and current levels of the Model AEC-320-9 are available on special order. Call the factory for details.

AEC-315B 10-3000V/10 mA

The Model AEC-315B is a calibrated DC source designed for use with photomultipliers or solid state detectors requiring high stability, low noise and food regulation. It mounts in a standard 8 3/4" NIM Bin and occupies two module widths. It is supplied with an integral NEMA 3-wire line cord and does not use the Bin Power Supply.

Input: 102-129 VAC, 47-440 Hz, 65 watts.
Calibration Accuracy: 0.25% of the dial settings from 500-3000 volts.
Resolution: 50 millivolts (10-turn vernier potentiometer with 100 volt range).
Noise and Ripple: 3 millivolts peak-to-peak to 15 MHz.
Regulation: .001 or 3 millivolts, whichever is greater, for line or load variations.



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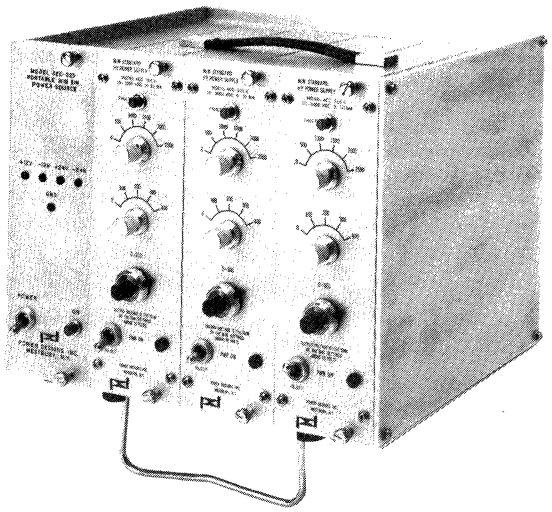
POWER DESIGNS

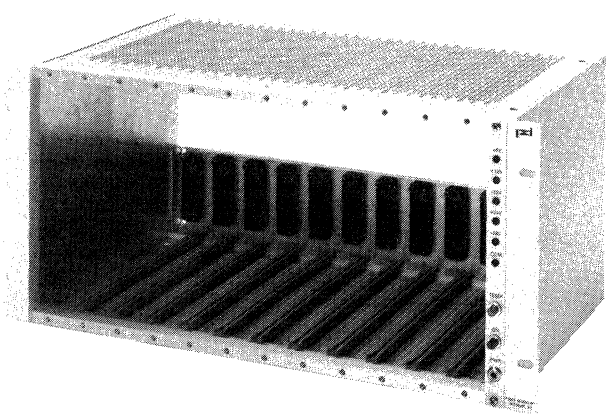
BINS FOR NUCLEAR INSTRUMENTATION

MODEL AEC-200 MINI-BIN



The Model AEC-200 is designed to accomodate up to 6 standard NIM modules in a convenient bench top configuration. It features a plug in power source that supplies ±12V @ 1A and ±24V @ 0.6A to the six rear mounted connectors wired in accordance with TID-20893. A top mounted handle is furnished for portability and a tilting bail is provided for ease of viewing when the unit is used on the bench.

MODEL AEC-100 NIM-BIN



The Model AEC-100 is a full sized Nuclear Instrumentation Bin in accordance with AEC TID-20893. It contains guide rails and connectors to accomodate up to 12 standard nuclear Instrument Modules. All of the rear connectors are wired in parallel for ±6V, ±12V, ±24V and 115VAC. A control panel with an on-off switch, power indicator lamp, temperature warning lamp and a voltage monitoring test point for each output is provided.

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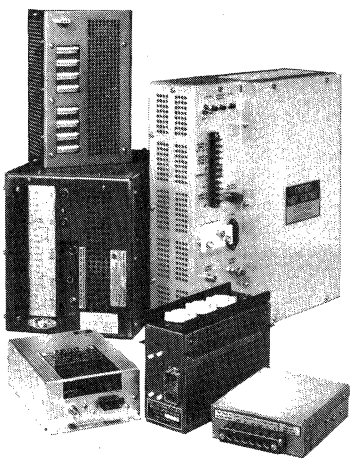
POWER DESIGNS

CUSTOM OEM PRODUCTS

CUSTOM DESIGNED POWER SOURCES FOR ANY APPLICATION

CAPABILITIES

- **AC to DC**
- **DC to DC**
- **Switchers**
- **Linears**
- **UL/CSA Approval**
- **Single Output**
- **Multiple Output**
- **High Voltage**
- **Low Voltage**
- **High Stability/LowNoise**



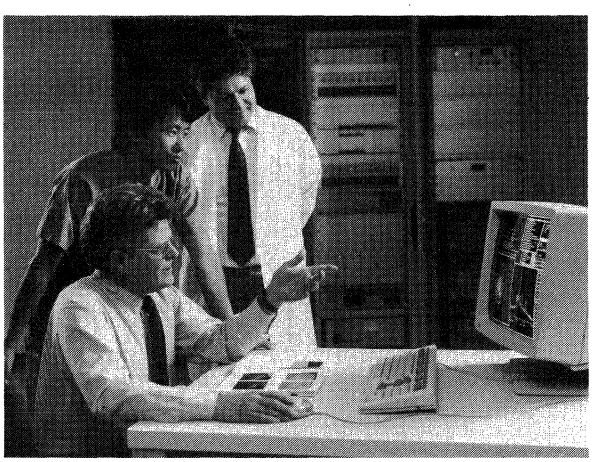
Don't be caught powerless! Power Designs specializes in the design and manufacture of power supplies custom made to your electrical and mechanical specifications. From single output linears to multiple output switchers, we can fulfill your particular needs.

An application engineer will review your requirements. We will work with you to determine your technical needs. A written proposal will be prepared to assure you that the power supply will conform to your specifications. Blanket orders with scheduled delivery releases can be arranged to suit your inventory and shipping requirements.

POWER SUPPLIES FOR MEDICAL INSTRUMENTATION AND IMAGING

POWER SUPPLIES FOR:

- **MRI Systems**
- **C-T Scanners**
- **Mobile X-Ray Systems**
- **Blood Analyzers**
- **Electrophoresis**
- **Life Support Systems**



A leader in power supply technology, Power Designs has been selected as a source of D.C. power supplies by major manufacturers of medical instrumentation. We provide custom designed and manufactured products to customer's exact electrical and mechanical specifications for diagnostic and patient connected applications. Conformance and listing to UL187 and UL544 can be obtained when required.

Some of the diverse applications for our products are power supplies for mobile X-Ray systems, C-T Scanners, Blood Analyzing Instruments and DNA Analyzers. We also manufacture programmable bi-polar power sources for MRI systems to drive both shim coils and gradient coils.

Call us about your power supply requirements. Our Engineering staff will work with you to develop a power source to fulfill your needs. You will find that our pricing is extremely competitive. Blanket orders with scheduled deliveries can be arranged.

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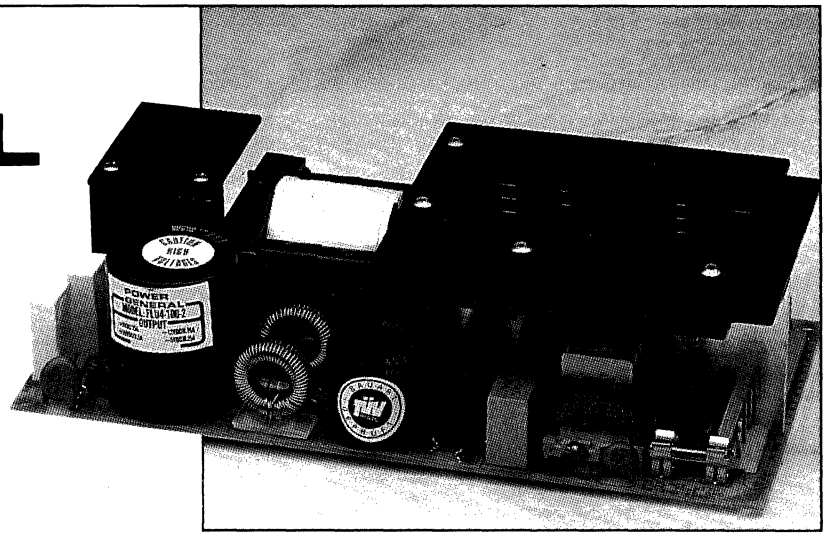
POWER GENERAL



Power General offers a full range of AC/DC switching power supplies and DC/DC converters. Our products provide the high performance, high quality and high reliability solution to your power supply needs. Our U.S. factory provides the high level of service you need today!

AC/DC SWITCHERS

- **25 to 150 Watts**
- **Universal Input Voltage Range**
- **VDE/FCC Class "B" Input Filter**
- **UL/CSA VDE Safety Approvals**
- **> 4 Million Hours Demonstrated MTBF**
- **Single & Multiple Outputs**
- **UL544 Approvals (Medical)**

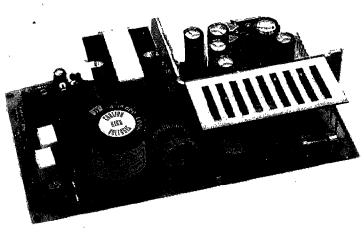
DC/DC CONVERTERS

- **1 to 100 Watts**
- **Wide Model Selection**
- **Industry Standard Footprints**
- **Ultra-Wide Input Range**
- **Single & Multiple Outputs**
- **Ultra-High MTBF**
- **5 Year Warranty**

Product Family	Input	Outputs					Package	Agency Approvals	MTBF
		Single	Dual	Triple	Quad	Power			
FLUx-Series	AC	•	•	•	•	40-150W	Open Frame	UL/CSA/UDE	>165,000
DCx-Series	DC	•	•	•		1-40W	Module		>1,000,000
SMx-Series	AC	•	•	•		25W	Module	UL/CSA/UDE	>165,000
MDUx-Series	AC	•	•	•		40W-100W	Open Frame	UL544	>175,000

FREE
Product Guide
& Literature

Power General manufactures these products in the USA (Canton, MA). The latest manufacturing technologies are used on our statistical process controlled, JIT production lines to insure repeatable quality and timely delivery.



POWER GENERAL

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Tel: 617-828-6216 Fax: 617-828-5060 Fax: 617-828-3215

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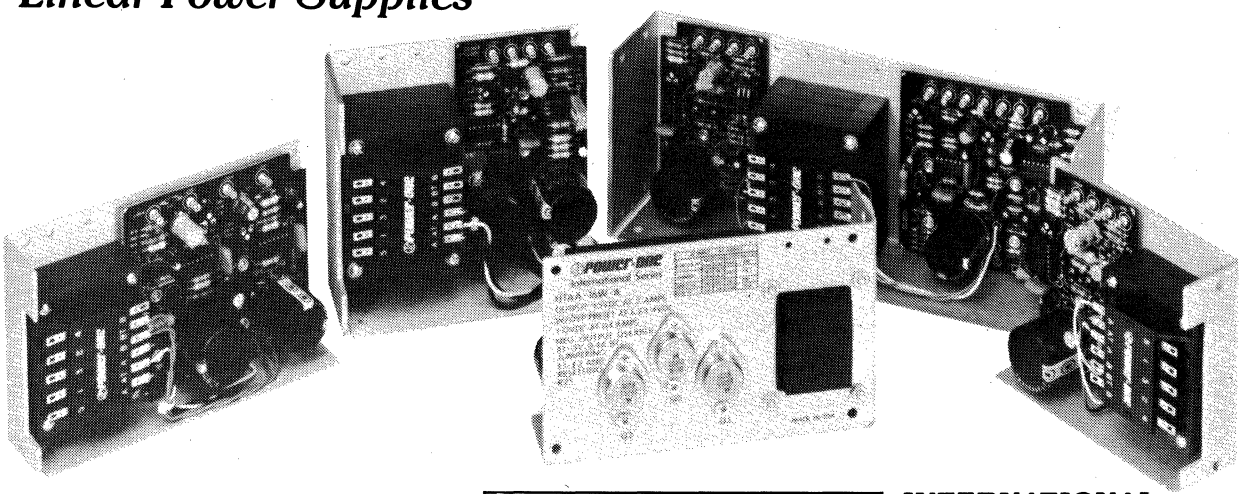
International Series

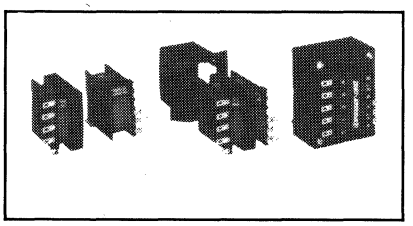
Linear Power Supplies

THE NEW WORLD STANDARD IN D.C. POWER SUPPLIES



FEATURES

- VDE TRANSFORMER CONSTRUCTION
- WORLDWIDE AC INPUT CAPABILITIES 100/120/220/230/240 VAC
- MEETS DOMESTIC AND FOREIGN SAFETY STANDARDS - UL, CSA, IEC, VDE, BPO, ECMA, CEE
- INDUSTRY STANDARD PACKAGES



INTERNATIONAL TRANSFORMER CONSTRUCTION

Power-One's patented International Series transformers feature separate, fully enclosed, primary and secondary coils. Meets safety requirements of VDE, UL, CSA, BPO, IEC, CEE, and ECMA.

DESCRIPTION

POWER-ONE's new International Series is the first and only high reliability D.C. power supply series designed for products sold throughout the world's major electronics markets.
The International Series can be used anywhere, for almost any application. It meets the most important safety requirements of UL, CSA, IEC, VDE, BPO, ECMA, and CEE. Also, each unit provides the AC input ranges needed for worldwide operation: 100, 120, 220, 230, and 240 volts, 47 to 63 Hz. This multi-range input capability reduces customer inventory and service requirements since only one standard off-the-shelf power supply is needed, regardless of the product's final destination. These are exclusive features of the International Series, and are not available on any competitive standard model.

In an effort to meet the world's toughest safety regulations, POWER-ONE achieved a technological breakthrough in power transformer design. Our new patented winding process features separate, fully enclosed primary and secondary windings. This unique construction complies with the most respected regulatory safety agency specifications, worldwide.
The end result is that product acceptance throughout the world is greatly simplified for domestic and foreign equipment manufacturers. The International Series power supplies comply with the major body of regulatory safety agencies responsible for product safety in virtually all of the major world markets. Its compatibility with world safety standards, combined with dramatically increased flexibility, results in far greater potential for international acceptance of your products.

MEETS SAFETY AGENCY REQUIREMENTS THROUGHOUT THE WORLD

Why compliance is so important!
For years electronic equipment manufacturers have found that safety requirements for most of the world's electronics markets are significantly different than those established in the USA by Underwriters Laboratories (UL). Also, there is little consistency in the requirements among the world's regulatory safety agencies. This has created almost impossible compliance problems for designers who are developing products for worldwide distribution.
Recognizing this dilemma, POWER-ONE initiated an extensive R&D program aimed at producing the first D.C. power supply line that truly meets the world's toughest safety requirements. The innovative new International Series – the solution to the difficult problem of gaining worldwide acceptance for your products.

SAFETY AGENCIES WORLDWIDE

The following regulatory agency specifications have gained industry-wide acceptance as the most important to comply with when designing products for the world's major electronics markets. The International Series meets or exceeds the leakage current, creepage distance, and dielectric withstand test requirements of these safety agency specifications:

UL 1012	CSA 22.2 No. 154	IEC 435 Class I	VDE 0730 Part 2P Class II	BPO Tech. Guide No. 26	CEE-10 Part 2P Class I
UL 478	IEC 380 Class I	IEC 435 Class II	VDE 0804 Class I	ECMA-57 Class I	CEE-10 Part 2P Class II
CSA 22.2 No. 143	IEC 380 Class II	VDE 0730 Part 2P Class I	VDE 0804 Class II	ECMA-57 Class II	

INTERNATIONAL SERIES DESIGN STANDARDS:

Leakage Current, Line to Ground: 0.05mA Max.

Safety Spacings, Live Parts to Dead Metal: 9.0 mm

Dielectric Withstand Voltage,
Input to Ground: 3750 VAC
Input to Outputs: 3750 VAC
Outputs to Ground: 300 VDC

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Phone or write for new brochure . . . see what it takes to set a new standard for the world!

International Series

Linear Power Supplies

MEETS INTERNATIONAL SAFETY REQUIREMENTS THROUGHOUT THE WORLD

SPECIFICATIONS

AC Input: 100/120/220/240 VAC +10% −13%. 47-63 Hz.Tolerance for 230 VAC operation is +15%, −10%. Derate output current 10% for 50 Hz operation.

DC Output: See Voltage/Current Rating Chart. Adjustment range ±5% minimum.

Line Regulation: ±.05% for a 10% line change.

Load Regulation: ±.05% for a 50% load change.

Output Ripple: 5V through 15V models: 5.0 mV PK-PK maximum; 24V and 28V models: 0.2% PK-PK maximum.

Transient Response: 50μ seconds for a 50% load change.

Short Circuit and Overload Protection: Automatic current limit/foldback.

Overvoltage Protection: Provided on 5V outputs where indicated. Set at 6.2V ±0.4V. Other outputs use optional overvoltage protectors OVP-12 and OVP-24.

Stability: ±0.3% for 24 hours after warm-up.

Temperature Rating: 0°C to 50°C full-rated, derated linearly to 40% at 70°C.

Temperature Coefficient: .01%/°C typical, .03%/°C maximum.

Efficiency: (typical)
5V outputs: 45%
12V and 15V outputs: 55%
24V and 28V outputs: 60%

Vibration: Per MIL-STD-810C, Method 514, Procedure X

Shock: Per MIL-STD-810C, Method 516, Procedure V

EMI/RFI: These linear power supplies have inherently low conducted and radiated noise levels. For most system applications they will meet the requirements of FCC Docket 20780 for Class A equipment and VDE 0871 for Class A equipment without additional noise filtering.

VOLTAGE/CURRENT RATING CHARTS

SINGLE OUTPUT MODELS

Model	Voltage/ Current	Case Size	Price (1-24)
2 VOLTS			
HB2-3-A	2V @ 3A	B	$ 37.95
HC2-6-A	2V @ 6A	C	59.95
HD2-12-A	2V @ 12A	D	92.95
HE2-18-A	2V @ 18A	E	124.95
5 VOLTS			
HA5-1.5/OVP-A*	5V @ 1.5A	B	$ 27.95
HB5-3/OVP-A*	5V @ 3A	B	32.95
HC5-6/OVP-A*	5V @ 6A	C	54.95
HN5-9/OVP-A*	5V @ 9A	N	74.95
HD5-12/OVP-A*	5V @ 12A	D	84.95
HE5-18/OVP-A*	5V @ 18A	E	119.95
F5-25/OVP-A*	5V @ 25A	F	154.95
G5-35/OVP-A*	5V @ 35A	F	194.95
CP197-A*	5V @ 50A	F	229.95
12 VOLTS			
HA15-0.9-A	12V @ 0.9A	B	$ 27.95
HB12-1.7-A	12V @ 1.7A	B	32.95
HC12-3.4-A	12V @ 3.4A	C	49.95
HN12-5.1-A	12V @ 5.1A	N	69.95
HD12-6.8-A	12V @ 6.8A	D	79.95
HE12-10.2-A	12V @ 10.2A	E	109.95
F15-15-A	12V @ 16A	F	154.95
15 VOLTS			
HA15-0.9-A	15V @ 0.9A	B	$ 27.95
HB15-1.5-A	15V @ 1.5A	B	32.95
HC15-3-A	15V @ 3A	C	49.95
HN15-4.5-A	15V @ 4.5A	N	69.95
HD15-6-A	15V @ 6A	D	79.95
HE15-9-A	15V @ 9A	E	109.95
F15-15-A	15V @ 15A	F	154.95
24 VOLTS			
HA24-0.5-A	24V @ 0.5A	B	$ 27.95
HB24-1.2-A	24V @ 1.2A	B	32.95
HC24-2.4-A	24V @ 2.4A	C	49.95
HN24-3.6-A	24V @ 3.6A	N	69.95
HD24-4.8-A	24V @ 4.8A	D	79.95
HE24-7.2-A	24V @ 7.2A	E	109.95
F24-12-A	24V @ 12.A	F	154.95
28 VOLTS			
HA24-0.5-A	28V @ 0.5A	B	$ 27.95
HB28-1-A	28V @ 1A	B	32.95
HC28-2-A	28V @ 2A	C	49.95
HN28-3-A	28V @ 3A	N	69.95
HD28-4-A	28V @ 4A	D	79.95
HE28-6-A	28V @ 6A	E	109.95
F24-12-A	28V @ 10A	F	154.95
48 VOLTS			
HB48-0.5-A	48V @ 0.5A	B	$ 34.95
HC48-1-A	48V @ 1A	C	54.95
HD48-3-A	48V @ 3A	D	84.95
HE48-4-A	48V @ 4A	E	119.95
180/200 VOLTS			
HB200-0.12-A	175-210V @ 0.12A	B	$ 44.95
250 VOLTS			
HB250-0.1-A	250V @ 0.1A	B	$ 44.95

*INCLUDES OVERVOLTAGE PROTECTION.

DUAL OUTPUT MODELS

Model	Output #1	Output #2	Case Size	Price (1-24)
±5 VOLTS				
HAA5-1.5/OVP-A	5V @ 1.5A*	−5V @1.5A*	AA	$ 49.95
HBB5-3/OVP-A	5V @ 3A*	−5V @3A*	BB	72.95
HCC5-6/OVP-A	5V @ 6A*	−5V @ 6A*	CC	96.95
±12 TO 15 VOLTS				
HAD12-0.4-A	12V @ 0.4A	−12V @ 0.4A	B	39.95
HAD15-0.4-A	15V @ 0.4A	−15V @ 0.4A	B	39.95
HAA15-0.8-A	12V @ 1A OR 15V @ 0.8A	−12V @ 1A OR −15V @ 0.8A OR −5V @ 0.4A	AA	42.95
HBB15-1.5-A	12V @ 1.7A OR 15V @ 1.5A	−12V @ 1.7A OR −15V @ 1.5A OR −5V @ 0.7A	BB	54.95
HCC15-3-A	12V @ 3.4A OR 15V @ 3A	−12V @ 3.4A OR −15V @ 3A	CC	87.95
HDD15-5-A	12V TO 15V@ 5A	(−) 12V TO 15V@5A	E	129.95
5 VOLTS AND 9 TO 15 VOLTS (Isolated Outputs)				
HAA512-A	5V @ 2A*	9 TO 15V @ 0.5A	AA	$ 49.95
HBB512-A	5V @ 3A*	9 TO 15V @ 1.25A	BB	59.95
HCC512-A	5V @ 6A*	9 TO 15V @ 2.5A	CC	94.95
±18 TO 24 VOLTS				
HAA24-0.6-A	18-20V @ 0.4A OR 24V @ 0.6A	(−)18-20V @ 0.4A OR −24V @ 0.6A	AA	42.95
HBB24-1.2-A	18-20V @ 0.9A OR 24V @ 1.2A	(−)18-20V @ 0.9A OR −24V @ 1.2A	BB	54.95
HCC24-2.4-A	18-20V @ 1.8A OR 24V @ 2.4A	(−)18-20V @ 1.8A OR −24V @ 2.4A	CC	87.95

TRIPLE OUTPUT MODELS

Model	Output #1	Output #2	Output #3	Case Size	Price (1-24)
HTAA-16W-A	5V @ 2A*	9 TO 15V @ 0.4A	(−)9 TO 15V @0.4A OR −5V @ 0.4A	AA	$ 57.95
HBAA-40W-A	5V @ 3A*	12V @ 1A OR 15V @ 0.8A	−12V @ 1A OR −15V @ 0.8A OR −5V @ 0.4A	BAA	89.95
HCAA-60W-A	5V @ 6A*	12 TO 15V @ 1A	(−)12 TO 15V @ 1A OR −5V @ 0.4A	D	89.95
HCBB-75W-A	5V @ 6A*	12V @ 1.7A OR 15V @ 1.5A	−12V @ 1.7A OR −15V @ 1.5A OR −5V @ 0.7A	CBB	99.95
CP131-A	5V @ 8A*	12V @ 1.7A OR 15V @ 1.5A	−12V @ 1.7A OR −15V @ 1.5A OR −5V @ 0.7A	131	119.95
HDBB-105W-A	5V @ 12A*	12V @ 1.7A OR 15V @ 1.5A	−12V @ 1.7A OR −15V @ 1.5A OR −5V @ 0.7A	DBB	134.95
HDCC-150W-A	5V @ 12A*	12V @ 3.4A OR 15V @ 3A	−12V @ 3.4A OR −15V @ 3A	DCC	154.95

DISK-DRIVE MODELS

Model	Output #1	Output #2	Output #3	Output #4	Output #5	Case Size	Price (1-24)
CP340-A	5V @ 0.5A/ 0.7A PK*	12V @ 0.9A/ 1.8A PK				CP340-A	$ 57.95
CP205-A	5V @ 1.A*	−5V @ 0.5A*	24V @ 1.5A/ 1.7A PK			BAA	89.95
CP510-A	5V @ 6A*	12V @ 2.5A/ 7.5A PK				CP510-A	79.95
CP323-A	5V @ 2A*					N	79.95
CP498-A	5V @ 6A*	12V @ 5A/ 10A PK	−12V @ 0.5A OR −5V @ 0.25A			131	129.95
CP379-A	5V @ 6A*	−5V @ 1.2A OR −12V @ 1.2A	24V @ 3.5A/ 8A PK			131	129.95
CP503-A	5V @ 6A*	12V @ 1.2A	−12V @ 0.8A	24V @ 2.5A/ 4APK		131	129.95
CP384-A	5V @ 9A*	−5V @ 1.2A OR −12V @ 1.2A	24V @ 2A/ 8A PK			131	129.95

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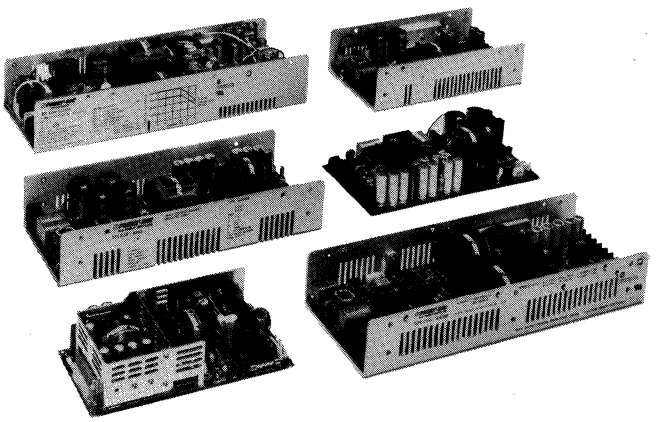
INTERNATIONAL SERIES SWITCHING POWER SUPPLIES

SINGLE AND MULTIPLE OUTPUT MODELS, WITH WORLDWIDE CAPABILITIES

FEATURES

- INDUSTRY'S BEST COST PER WATT RATIO
- HYBRID CONTROLLERS FOR INCREASED RELIABILITY
- 26 NEW MODELS . . . 125 TO 400 WATTS
- WORLDWIDE AC INPUT, 90-132/180-264 VAC, USER-SELECTABLE
- UP TO 75% EFFICIENCY
- HIGH POWER DENSITY
- MOV INPUT TRANSIENT PROTECTION
- UP TO 5 FULLY REGULATED OUTPUTS
- VDE CONSTRUCTION
- MEETS DOMESTIC AND INTERNATIONAL SAFETY:
  3750 VAC ISOLATION
  VDE SAFETY SPACINGS
- MEETS DOMESTIC AND INTERNATIONAL EMI:
  FCC DOCKET 20780 CLASS A
  VDE 0871/6.78 CLASS A
- FULL LOAD BURN-IN AND THERMAL CYCLING
- 2 YEAR WARRANTY
- MADE IN U.S.A.



DESCRIPTION

The International Series switch-mode power supplies incorporate the latest state-of-the-art switching technology while providing POWER-ONE's traditional high quality at low prices.

The International Series offers an initial selection of 26 new standard models, available in either fully regulated or quasi-regulated configurations. Also, any standard model can be modified to meet special electrical or mechanical requirements depending on the user's particular needs. These features allow optimization to the user's specific application, resulting in the most cost-effective approach possible.

These versatile new models offer the most popular voltage and current combinations required by today's applications. They are ideally suited for CAD/CAM and CAE systems, minicomputer workstations, computer peripherals, and general purpose use.

Plus, each offers the finest features of switching power supply technology including high efficiency, low heat dissipation, small size, and simple construction.

In addition, the International Series offers the benefit of being designed for products sold in the world's major electronics markets. They operate on virtually any mains voltage, from 90 to 264 VAC, 47 to 63 Hz. And, as with all POWER-ONE switchers, they meet the World's toughest safety agency requirements and represent POWER-ONE's true "World Market" design philosophy. This results in easier and faster acceptance for our customers' end products when marketed not only in the U.S., but internationally as well.

VOLTAGE/CURRENT RATING CHARTS

SINGLE OUTPUT

Model	Voltage	Current	Line Regulation	Load Regulation	Price (1-9)
5 Volts					
SPL40-1005	5V	8A	±0.2%	±1%	$ 95.00
SPL53-1005	5V	16A	±0.2%	±1%	$120.00
SPL130-1005	5V	26A	±0.1%	±1%	$170.00
SPL250-1005	5V	50A	±0.1%	±1%	$270.00
12-15 Volts					
SPL40-1012	12-15V	3.3A/2.7A	±0.2%	±1%	$ 95.00
SPL53-1012	12-15V	6.7A/5.3A	±0.2%	±1%	$120.00
SPL130-1012	12-15V	11A/9A	±0.1%	±1%	$170.00
SPL250-1012	12-15V	21A/17A	±0.1%	±1%	$270.00
24-28 Volts					
SPL40-1024	24-28V	1.6A/1.4A	±0.2%	±1%	$ 95.00
SPL53-1024	24-28V	3.3A/2.8A	±0.2%	±1%	$120.00
SPL130-1024	24-28V	5.5A/4.5A	±0.1%	±1%	$170.00
SPL250-1024	24-28V	10A/9A	±0.1%	±1%	$270.00

NOTES

A. Voltage level adjustable from 4.75V to OVP trip point.
B. Fully regulated output, voltage fixed (3 terminal regulator).
C. Quasi-regulated output.
D. Fully regulated output, voltage adjustable ±5% minimum.
E. The sum of the main +5V and AUX 1 load currents must not exceed 30A.
F. The sum of the main +5V and AUX 1 load currents must not exceed the main +5V current rating.
G. Maximum load is 10A or 120W.
H. The sum of the main +5V and AUX 1 load currents must not exceed 50A.

MULTIPLE OUTPUT

SPL40 SERIES — **PRICE: $105.00 (1-9)**
40 WATTS CONTINUOUS

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL40 -4000	+5V	5A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	0.5A	±4% Note B	±0.1%	±1%	N/A
	−12V	0.5A	±4% Note B	±0.1%	±1%	N/A
	−5V	0.5A	±4% Note B	±0.1%	±1%	N/A

SPL50 SERIES — **PRICE: $58.00 (1-9)**
50 WATTS CONTINUOUS, 60 WATTS PEAK

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL50 -3200	+5V	6A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	2A/ 4A PK	±5% Note C	±0.3%	±3%	±5%
	−12V	0.5A	±5% Note C	±0.3%	±5%	±10%

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INTERNATIONAL SERIES SWITCHING POWER SUPPLIES MULTIPLE OUTPUT (CONTINUED)

SPL53 SERIES — PRICE: $125.00 (1-9)
80 WATTS

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL53 -4000	+5V Note G	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V Note G	2.5A/ 5A PK	Adjustable Note D	±0.1%	±1%	N/A
	−12V	0.6A	±4% Note B	±0.1%	±1%	N/A
	−5V	0.6A	±4% Note B	±0.1%	±1%	N/A
SPL53 -4101	+5V	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	1.2A	±4% Note B	±0.1%	±1%	N/A
	−12V	0.6A	±4% Note B	±0.1%	±1%	N/A
	+24V	1.5A/ 3A PK	±5% Note C	±0.3%	±5%	±5%
SPL53 -4102	+5V	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	1.2A	±4% Note B	±0.1%	±1%	N/A
	+12V	2.5A/ 5A PK	±5% Note C	±0.3%	±5%	±5%
	−12V	0.6A	±4% Note B	±0.1%	±1%	N/A
SPL53 -3200	+5V	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	4A/ 6A PK	±5% Note C	±0.3%	±5%	±5%
	+24V	1.5A/ 2.5A PK	±5% Note C	±0.3%	±5%	±5%

SWA125 SERIES — PRICE: $156.00 (1-9)
125 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA125 -4000R	+5V	15A	4A	Adjustable Note A	±0.5%	±1%	N/A
	+12V	4A/ 8A PK	.005A	Adjustable Note D	±0.5%	±1%	N/A
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−5V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A

SWA175 SERIES — PRICE: $207.00 (1-9)
175 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA175 -4100	+5V	20A Note F	4A	Adjustable Note A	±0.5%	±1%	N/A
	+12V Aux 1	5A/ 8A PK	1A	±5% Note C	±0.5%	±5%	±5%
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−5V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
SWA175 -4200	+5V	20A Note F	4A	Adjustable Note A	±0.5%	±1%	N/A
	+15V Aux 1	5A/ 8A PK	1A	+15%, −0% Note C	±0.5%	±5%	±5%
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−5V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A

SWA175 SERIES (CONT.) — PRICE: $207.00 (1-9)
175 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA175 -4300	+5V	20A Note F	4A	Adjustable Note A	±0.5%	±1%	N/A
	+24V Aux 1	4A/ 6A PK	0.8A	±5% Note C	±0.5%	±5%	±5%
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−5V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
SWA175 -4400	+5V	20A Note F	4A	Adjustable Note A	±0.5%	±1%	N/A
	+12V Aux 1	5A/ 8A PK	1A	±5% Note C	±0.5%	±5%	±5%
	+12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
SWA175 -4500	+5V	20A Note F	4A	Adjustable Note A	±0.5%	±1%	N/A
	+15V Aux 1	5A/ 8A PK	1A	+15%, −0% Note C	±0.5%	±5%	±5%
	+12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
SWA175 -4600	+5V	20A Note F	4A	Adjustable Note A	±0.5%	±1%	N/A
	+24V Aux 1	4A/ 6A PK	0.8A	±5% Note C	±0.5%	±5%	±5%
	+12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A
	−12V	1.5A	.005A	±4% Note B	±0.1%	±1%	N/A

SWA200 SERIES — PRICE: $269.00 (1-9)
200 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA200 -4100	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+12V Aux 1	5A/ 8A PK	1A	±5% Note C	±0.5%	±5%	±5%
	+12V	3A	.005A	±5% Note D	±0.1%	±1%	N/A
	−12V	3A	.005A	±5% Note D	±0.1%	±1%	N/A
SWA200 -4200	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+15V Aux 1	5A/ 8A PK	1A	+15%, −0% Note C	±0.5%	±5%	±5%
	+12V	3A	.005A	±5% Note D	±0.1%	±1%	N/A
	−12V	3A	.005A	±5% Note D	±0.1%	±1%	N/A

NOTES

A. Voltage level adjustable from 4.75V to OVP trip point.
B. Fully regulated output, voltage fixed (3 terminal regulator).
C. Quasi-regulated output.
D. Fully regulated output, voltage adjustable ±5% minimum.
E. The sum of the main +5V and AUX 1 load currents must not exceed 30A.
F. The sum of the main +5V and AUX 1 load currents must not exceed the main +5V current rating.
G. Maximum load is 10A or 120W.
H. The sum of the main +5V and AUX 1 load currents must not exceed 50A.

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INTERNATIONAL SERIES SWITCHING POWER SUPPLIES MULTIPLE OUTPUT (CONTINUED)

SWA200 SERIES (CONT.) — PRICE: $269.00 (1-9)
200 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA200 -4300	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+24V Aux 1	2.5A/ 6A PK	0.5A	±5% Note C	±0.5%	±5%	±5%
	+12V	1.5A	.005A	±5% Note D	±0.1%	±1%	N/A
	−12V	1.5A	.005A	±5% Note D	±0.1%	±1%	N/A
SWA200 -4400R	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+12V Aux 1	6A	.005A	Adjustable Note D	±0.5%	±1%	N/A
	+12V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−12V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
SWA200 -4500	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+12V Aux 1	5A/ 8A PK	1A	±5% Note C	±0.5%	±5%	±5%
	−12V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
SWA200 -4600	+5V	25A NoteE	6A	Adjustable Note A	±0.5%	±1%	N/A
	+15V Aux 1	5A/ 8A PK	1A	+15%, −0% Note C	±0.5%	±5%	±5%
	−12V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
SWA200 -4700	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+24V Aux 1	2.5A/ 6A PK	0.5A	±5% Note C	±0.5%	±5%	±5%
	−12V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
SWA200 -4800R	+5V	25A Note E	6A	Adjustable Note A	±0.5%	±1%	N/A
	+12V Aux 1	6A	.005A	Adjustable Note D	±0.5%	±1%	N/A
	−12V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	1.5A	.005A	Adjustable Note D	±0.1%	±1%	N/A

SWA300 SERIES — PRICE: $355.00 (1-9)
300 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA300 -5100P	+5V	35A Note F	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	5A/ 8A PK	1A	Adjustable Note D	±0.1%	±1%	N/A
	−12V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	+12V Aux 1	6A/ 10A PK	1.2A	±5% Note C	±0.5%	±5%	±5%

SWA300 SERIES (CONT.) — PRICE: $355.00 (1-9)
300 WATTS

Model	Voltage	Current Max.	Current Min.	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SWA300 -5200P	+5V	35A Note F	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V Aux 1	6A/ 10A PK	1.2A	±5% Note C	±0.5%	±5%	±5%
	+12V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−12V	5A/ 8A PK	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
SWA300 -5300P	+5V	35A Note F	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−12V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	5A/ 8A PK	.005A	Adjustable Note D	±0.1%	±1%	N/A
	+24V Aux 1	6A/ 10A PK	1.2A	±5% Note C	±0.5%	±5%	±5%
SWA300 -5400P	+5V	35A Note F	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V	5A/ 8A PK	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−12V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	+24V Aux 1	6A/ 10A PK	1.2A	±5% Note C	±0.5%	±5%	±5%
SWA300 -5500P	+5V	35A Note F	8A	Adjustable Note A	±0.1%	±1%	N/A
	+12V Aux 1	6A/ 10A PK	1.2A	±5% Note C	±0.5%	±5%	±5%
	−12V	3A	.005A	Adjustable Note D	±0.1%	±1%	N/A
	−5V	5A/ 8A PK	.005A	Adjustable Note D	±0.1%	±1%	N/A
	+24V	6A/ 10A PK	1.2A	±5% Note C	±0.5%	±5%	±5%

SPL400 SERIES — PRICE: $493.00 (1-9)
400 WATTS

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL400 -5000P	+5V	50A Note H	Adjustable Note A	±0.1%	±1%	N/A
	+12V Aux 1	3A	Adjustable Note D	±0.1%	±1%	N/A
	+5V to 18V	10A Note G	Fully Adjustable	±0.1%	±1%	N/A
	−12V	3A	Adjustable Note D	±0.1%	±1%	N/A
	−5.2V	6A	Adjustable Note D	±0.1%	±1%	N/A

NOTES

A. Voltage level adjustable from 4.75V to OVP trip point.
B. Fully regulated output, voltage fixed (3 terminal regulator).
C. Quasi-regulated output.
D. Fully regulated output, voltage adjustable ±5% minimum.
E. The sum of the main +5V and AUX 1 load currents must not exceed 30A.
F. The sum of the main +5V and AUX 1 load currents must not exceed the main +5V current rating.
G. Maximum load is 10A or 120W.
H. The sum of the main +5V and AUX 1 load currents must not exceed 50A.

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INTERNATIONAL SERIES SWITCHING POWER SUPPLIES MULTIPLE OUTPUT (CONTINUED)

SPL400 SERIES — PRICE: $493.00 (1-9)
400 WATTS

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL400 -5001P	+5V	50A Note H	Adjustable Note A	±0.1%	±1%	N/A
	+15V Aux 1	3A	Adjustable Note D	±0.1%	±1%	N/A
	+5V to 24V	10A	Fully Adjustable	±0.1%	±1%	N/A
	−15V	3A	Adjustable Note D	±0.1%	±1%	N/A
	−5.2V	6A	Adjustable Note D	±0.1%	±1%	N/A

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL400 -5200P	+5V	50A Note H	Adjustable Note A	±0.1%	±1%	N/A
	+24V Aux 1	10A	±5% Note C	±0.3%	±3%	±3%
	+5V to 18V	10A Note G	Fully Adjustable	±0.1%	±1%	N/A

SPL400 SERIES (CONT.) — PRICE: $493.00 (1-9)
400 WATTS

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL400 -5200P (CONT.)	−12V	10A	±5% Note C	±0.3%	±3%	±3%
	−5.2V	6A	Adjustable Note D	±0.1%	±1%	N/A

Model	Voltage	Current	Initial Setting Tolerance	Line Regulation	Load Regulation	Cross Regulation
SPL400 -5201P	+5V	50A Note H	Adjustable Note A	±0.1%	±1%	N/A
	+12V Aux 1	10A	±5% Note C	±0.3%	±3%	±3%
	+5V to 18V	10A Note G	Fully Adjustable	±0.1%	±1%	N/A
	−12V	10A	±5% Note C	±0.3%	±3%	±3%
	−5.2V	6A	Adjustable Note D	±0.1%	±1%	N/A

GENERAL INFORMATION

HOW TO ORDER

Contact your local POWER-ONE Distributor or Representative for immediate order placement or price and delivery information. Please refer to POWER-ONE's Distributor and Representative listing for the office nearest you.

For Factory direct orders or assistance, please contact us direct:

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Camarillo, California 93012-8583
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FAX: (805) 388-0476
Call Toll Free: (800) 678-9445

DELIVERY

POWER-ONE and its Distributors maintain large inventories of standard power supplies for immediate shipment. Most orders are shipped from stock within 24 hours.

DISCOUNTS

POWER-ONE offers liberal discounts to quantity buyers, with OEM contracts available. Consult POWER-ONE or your local POWER-ONE Representative for a prompt quotation.

QUOTATIONS

Inquiries are welcome concerning custom power supplies or modifications to our standard models. Furnish POWER-ONE or your local POWER-ONE Representative with complete specifications including quantity and delivery information.

APPLICATION ENGINEERING ASSISTANCE

POWER-ONE's applications engineers are always available to assist you in selecting the best approach to your specific requirements. For technical information on Standard Catalog items or applications assistance on your special custom requirements, just contact POWER-ONE or your local factory Representative.

SPECIAL APPLICATIONS

CUSTOM DESIGNS

POWER-ONE is an experienced manufacturer of custom designed power supplies for high-quantity applications requiring special electrical and mechanical configurations.

For applications where POWER-ONE's standard models or FLEX-Series models are not suitable we will supply a custom designed product to your exact specifications.

POWER-ONE's Application Engineers are always available to assist you in selecting the most cost-effective approach to your custom power supply requirements.

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MODIFIED STANDARD PRODUCTS

Upon request, any of POWER-ONE's standard power supplies may be modified to meet special requirements. For example, these modifications may involve DC output voltages or current, AC input characteristics, chassis components, mounting facilities, markings, harnesses and connectors.

WARRANTY

POWER-ONE warrants each power supply of its manufacture that does not perform to published specifications, as a result of defective materials or workmanship, for a period of two (2) full years from the date of original shipment. This warranty is honored at our factory in Camarillo, California, provided the defective product is returned freight prepaid.

POWER-ONE assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations are expressed or implied.

FEDERAL MANUFACTURER'S IDENTIFICATION (FSCM): No. 54407

DIMENSION CHART

Case Size	Dimensions Inches	Case Size	Dimensions Inches	Case Size	Dimensions Inches	Case Size	Dimensions Inches
B	4.87 x 4.0 x 1.62	CBB	11.0 x 4.87 x 2.75	SWITCHERS, MULTIPLE OUTPUT		SWITCHERS, SINGLE OUTPUT	
C	5.62 x 4.87 x 2.5	DBB	14.25 x 4.87 x 2.75	SPL40	6.30 x 3.92 x 2.00	SPL40	5.75 x 3.92 x 2.20
N	7.0 x 4.87 x 2.75	DCC	15.0 x 4.88 x 3.75	SPL50	6.30 x 3.92 x 1.75	SPL53	8.25 x 4.25 x 2.20
D	9.0 x 4.87 x 2.75	131	11.0 x 4.87 x 2.75	SPL53	8.25 x 4.25 x 2.10	SPL130	8.90 x 5.00 x 2.45
E	14.0 x 4.87 x 2.75	CP340-A	5.5 x 4.0 x 1.62	SWA125, SWA175	9.00 x 4.75 x 2.35	SPL250	12.00 x 4.94 x 2.45
F	16.75 x 4.87 x 5.0	CP510-A	8.25 x 4.87 x 2.75	SWA200	10.50 x 5.00 x 2.75		
AA	6.5 x 4.0 x 1.62	OVP-12	1.6 x 1.6 x 0.7	SWA300	13.00 x 5.00 x 3.00		
BB	7.0 x 4.87 x 2.5	OVP-24	2.8 x 2.0 x 0.9	SPL400	14.50 x 5.00 x 3.00		
CC	9.38 x 4.87 x 2.75	AR5-0.6/OVP	1.5 x 1.55 x 0.8	MAP55	6.0 x 3.27 x 1.60		
BAA	10.25 x 4.0 x 2.5			MAP80	7.20 x 4.20 x 1.80		
				MAP130	8.50 x 4.50 x 2.00		

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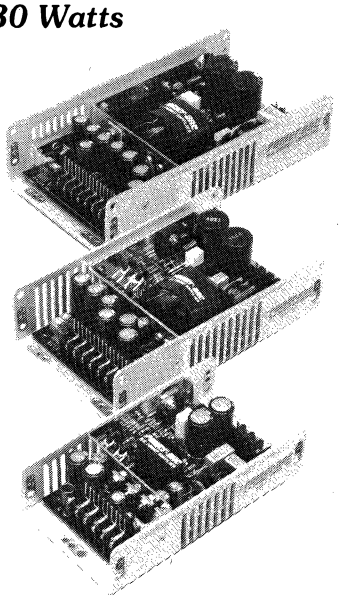
International Series - Map Series

Multiple Output Switch-Mode Models – 55 Watts to 130 Watts

FEATURES

- AUTOMATIC SELECTING AC INPUT: 90-132/175-264 VAC, 47-63 HZ
- ALL OUTPUTS FULLY REGULATED
- MEETS DOMESTIC AND INTERNATIONAL SAFETY: 3750 VAC ISOLATION • VDE SAFETY SPACINGS
- UNIVERSAL TERMINAL BLOCK CONNECTORS
- UNIVERSAL MOUNTING SYSTEM
- HIGH POWER DENSITY, UP TO 2.2 WATTS/CUBIC INCH
- MOSFET SWITCHING TECHNOLOGY
- RUGGED WRAP-AROUND CHASSIS
- 105°C RATED STORAGE CAPACITORS
- 75% TYPICAL EFFICIENCY
- PLATINUM BARRIER SCHOTTKY RECTIFIERS
- CONVECTION COOLED
- THERMAL SHUTDOWN WITH WARNING
- UL RECOGNIZED, CSA CERTIFIED
- MEETS DOMESTIC AND INTERNATIONAL EMI: FCC 47CFR, PART 15, LEVEL B • VDE 0871 LEVEL B
- INTERNAL INPUT LINE FILTER
- POWER-FAIL WARNING SIGNAL
- FULL LOAD BURN-IN AND THERMAL CYCLING
- 2 YEAR WARRANTY



DESCRIPTION

The versatile new MAP Series switch-mode DC power supplies represent the latest offering in POWER-ONE's industry-acclaimed International Series. A wide variety of exceptional performance features, including Automatic Selecting AC Input, Universal Terminal Block Connectors and Universal Mounting Facilities, provide outstanding application flexibility and make integration into the end product convenient and trouble-free. In addition, the advantages of convection cooling and 100% fully regulated DC outputs assure reliable, long-term performance in virtually any application.

Designed for a broad range of applications requiring precision regulated DC voltage sources, the MAP Series is ideally suited for computer peripherals, displays, telecommunication devices, as well as general purpose use. The industry's most popular voltage and current combinations are available in power levels from 55 watts to 130 watts. Each model includes a high-capacity main output to accommodate today's 5 volt logic, while fully regulated auxiliary outputs provide the high surge-current required by disk-drives and similar devices. Also, each model offers the finest features of switch-mode technology including high efficiency, low heat dissipation, small size, and simple construction.

Finally, each MAP Series model has received certification to the world's toughest safety agency requirements including VDE, IEC, UL and CSA. The conducted emissions limits of FCC 47CFR, Part 15, Level B; and VDE 0871 Level B are also met. The result is greater acceptance for products marketed not only domestically, but internationally as well.

VOLTAGE/CURRENT RATING CHARTS

MAP55 Series 55 Watts Continuous, 65 Watts Peak Price:$105.00 (1-9)

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP55 -4000	+5V	6A	ADJUSTABLE NOTE A	0.2%	2%
	+12V	3A/4A PK	±4% NOTE C	0.2%	2%
	-12V	0.5A	±4% NOTE C	0.5%	2%
	-5V	0.5A	±4% NOTE C	0.5%	2%
MAP55 -4001	+5V	6A	ADJUSTABLE NOTE A	0.2%	2%
	+24v	1.5A	±4% NOTE C	0.2%	2%
	+12V	0.5A	±4% NOTE C	0.5%	2%
	-12V	0.5A	±4% NOTE C	0.5%	2%
MAP55 -4002	+5V	6A	ADJUSTABLE NOTE A	0.2%	2%
	+12V	3A/4A PK	±4% NOTE C	0.2%	2%
	+12V	0.5A	±4% NOTE C	0.5%	2%
	-12V	0.5A	±4% NOTE C	0.5%	2%

MAP80 Series 80 Watts Continuous, 90 Watts Peak Price:$125.00 (1-9)

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP80 -4000	+5V	14A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	4A/7A PK	ADJUSTABLE NOTE B	0.2%	2%
	-12V	1A	±4% NOTE C	0.5%	2%
	-5V	1A	±4% NOTE C	0.5%	2%
MAP80 -4001	+5V	14A	ADJUSTABLE NOTE A	0.2%	1%
	+24v	2A	ADJUSTABLE NOTE B	0.2%	2%
	+12V	1A	±4% NOTE C	0.5%	2%
	-12V	1A	±4% NOTE C	0.5%	2%
MAP80 -4002	+5V	14A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	4A/7A PK	ADJUSTABLE NOTE B	0.2%	2%
	+12V	1A	±4% NOTE C	0.5%	2%
	-12V	1A	±4% NOTE C	0.5%	2%

NOTES: A. Voltage level adjustable from 4.75V to 5.50V. Factory set to at 5.0 to 5.2V.
B. Fully regulated output, voltage adjustable ±4% minimum. Factory set to ±1% of nominal.
C. Fully regulated output, voltage fixed.

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International Series - Map Series

Multiple Output Switch-Mode Models

VOLTAGE/CURRENT RATING CHARTS (cont.)

MAP130 Series 130 Watts Continuous, 165 W Peak Price: $198.00 (1-9)

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP130 -4000	+5V	20A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	5A/10A PK	ADJUSTABLE NOTE B	0.2%	2%
	-12V	1A	±4% NOTE C	0.5%	2%
	-5V	1A	±4% NOTE C	0.5%	2%
MAP130 -4001	+5V	20A	ADJUSTABLE NOTE A	0.2%	1%
	+24v	3.5A/5A PK	ADJUSTABLE NOTE B	0.2%	2%
	+12V	1A	±4% NOTE C	0.5%	2%
	-12V	1A	±4% NOTE C	0.5%	2%
MAP130 -4002	+5V	20A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	5A/10A PK	ADJUSTABLE NOTE B	0.2%	2%
	+12V	1A	±4% NOTE C	0.5%	2%
	-12V	1A	±4% NOTE C	0.5%	2%

NOTES: A. Voltage level adjustable from 4.75V to 5.50V. Factory set to at 5.0 to 5.2V.
B. Fully regulated output, voltage adjustable ±4% minimum. Factory set to ±1% of nominal.
C. Fully regulated output, voltage fixed.

ELECTRICAL SPECIFICATIONS

AC Input: Automatic selecting dual range: 90-132 VAC or 175-264 VAC. 47-63 HZ single phase. NOTE: AC input range selection is fully automatic. No manual switchover is required.

DC Outputs: See Voltage/Current Rating Charts.

Output Power: See Voltage/Current Rating Charts.

Peak Output Power: See Voltage/Current Rating Charts. Peak power capability is recommended for short term operation only. Contact POWER-ONE for technical assistance on specific applications.

Brown-Out Protection: Regulation is maintained down to 90/175 VAC, at full rated load, with no compromise in performance.

Hold-Up Time: 20 msec minimum at full rated load and nominal AC input voltage. Hold-up time increases to 40 msec at 50% load.

Power-Fail Warning Signal: TTL compatible signal goes low before the main +5V output drops 5%, at full rated load. Minimum warning time: MAP80: 5 msec MAP130: 2.5 msec Warning time increases at reduced load levels.

Efficiency: Measured at full rated load and nominal AC input voltage. 75% ±5% depending on how the load is distributed among the outputs.

Regulation Characteristics: See Voltage/Current Rating Charts for individual model ratings.

Measurement method: LINE: Measured over a 90-132 VAC or 175-264 VAC line change. LOAD: Measured over a 20% to 100% load change.

Initial Setting Tolerance: Measured at 50% of full rated load on all outputs.

Minimum Load: MAP130 series models only. A 3A minimum load is required on the main +5V output for full load capability on auxiliary outputs.

Remote Sensing: Provided on the main +5V output. MAP130 series models only.

Output Noise and Ripple: 0.3% RMS, 1% PK-PK maximum on main +5V output.

Transient Response: Main +5V output: 500 µsec typical for a 50-100% load change and recovery to within 1% of initial voltage set point. Maximum excursion: 4% from initial voltage set point.

Overload Protection: Fully protected against output overload and short circuit. Automatic recovery upon removal of overload condition. Delayed-foldback current limiting characteristics assure reliable turn-on into reactive and non-linear loads. Provided on MAP130 series models.

Overvoltage Protection: Provided on the main +5V output. Set at 6.2V ±0.6V.

Overtemperature Protection: Initiates shutdown in the event of an overtemperature condition. Automatic reset. Power-Fail Warning Signal is initiated prior to shutdown. Provided on MAP130 series models.

Power-Up Initialization Period: Typical 0.3 sec turn-on delay assures orderly ramp-up and stabilization of all output voltages during power-up.

Input Protection: AC input line fuse provided.

Internally located.

Inrush Current: Internally limited by thermistor.

Temperature Rating: OPERATING: 0°C to +50°C at full rated output power. Consult factory for operating information between +50°C to +70°C. STORAGE: -55°C to +85°C.

Temperature Coefficient: ±0.03%/°C typical, ±0.05%/°C maximum over entire operating temperature range of 0°C to +70°C.

Cooling: Convection cooling is adequate where non-restricted air flow is available. When operating in a confined area, forced air cooling is recommended.

Vibration: Per MIL-STD-810D, Method 514.3, Category 1, Procedure I.

Shock: Per MIL-STD-810D, Method 514.3, Procedure III.

SAFETY SPECIFICATIONS

The International Series meets the safety requirements of the world's most respected regulatory safety agencies. All models exceed the following safety standards:

Leakage Current: Line to Ground (max.): 500 µA

Safety Spacings: 8.0 mm minimum between primary and secondary circuitry. 4.0 mm minimum between primary and grounded circuitry.

Dielectric Withstand Voltage (min.): Input to Ground: 3750 VRMS; Input to Outputs: 3750 VRMS; Outputs to Ground: 700 VDC. Consult POWER-ONE for testing methods.

UL RECOGNIZED: UL File Number E55974

CSA CERTIFIED: CSA File Number LR38879

TUV Essen Certified: TUV certified to meet the requirements of VDE 0805, VDE 0806, IEC 380, IEC 950, and EN60950.

EMI SPECIFICATIONS

All International Series models are equipped with internal line filtering which allows compliance to the conducted emisson limits of FCC 47CFR, Part 15, Level B; and VDE 0871 Level B.

FREQUENCY RANGE	150KHZ-450KHZ	450KHZ-30MHZ
INTERNATIONAL SERIES DESIGN STANDARDS	<52dBµV	<46dBµV
AGENCY LIMITS—CLASS B		
VDE 0871 Level B	54dBµV	48dBµV
FCC 47CFR, Part 15 Level B	54dBµV	48dBµV

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International Series - Map Series

Single Output MAP Series Products

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION	Power	
						Continuous	Peak
MAP40 -1005	5V	8A/11Apk	ADJUSTABLE NOTE A	0.2%	2%	40	55
MAP55 -1012	12V 15V or	5A/5.8Apk 4A/4.7Apk	ADJUSTABLE NOTE B	0.2%	1%	60	70
MAP55 -1024	24V 28V or	2.5A/3Apk 2.2A/2.5Apk	ADJUSTABLE NOTE C	0.2%	1%	60	70

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION	Power	
						Continuous	Peak
MAP130 -1005	5V	26A/TBD pk	ADJUSTABLE NOTE A	0.2%	1%	130	TBD
MAP130 -1012	12V 15V or	12A/13.8Apk 10A/6.7Apk	ADJUSTABLE NOTE B	0.2%	1%	144	165
MAP130 -1024	24V 28V or	6.25A/6.8Apk 5.4A/5.9Apk	ADJUSTABLE NOTE C	0.2%	1%	150	165

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION	Power	
						Continuous	Peak
MAP80 -1005	5V	16A/20Apk	ADJUSTABLE NOTE A	0.2%	1%	80	100
MAP80 -1012	12V 15V or	7.5A/9.2Apk 6A/7.3Apk	ADJUSTABLE NOTE B	0.2%	1%	90	110
MAP80 -1024	24V 28V or	3.8A/4.6Apk 3.2A/3.9Apk	ADJUSTABLE NOTE C	0.2%	1%	91	110

NOTES
A. Voltage level adjustable from 4.75V to 5.50V. Factory set to ±1% of nominal.
B. Voltage level adjustable from 11V to 16V. Factory set to 12V ±0.2V.
C. Voltage level adjustable from 23V to 29V. Factory set to 24V ±0.2V.
D. Voltage level adjustable from 10V to 16V. Factory set to 12V ±0.2V.

Multiple Output MAP Series Products

55 WATTS CONTINUOUS, 65 WATTS PEAK

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP55 -4003	+5V	6A	ADJUSTABLE NOTE A	0.2%	2%
	+15V	2.5A/3.5Apk	±4% NOTE C	0.2%	2%
	−5V	0.5A	±4% NOTE C	0.5%	2%
	−15V	0.5A	±4% NOTE C	0.5%	2%

130 WATTS CONTINUOUS, 165 WATTS PEAK

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP130 -4003	+5V	20A	ADJUSTABLE NOTE A	0.2%	1%
	+15V	4A/8Apk	ADJUSTABLE NOTE B	0.2%	2%
	−5V	1A	±4% NOTE C	0.5%	2%
	−15V	1A	±4% NOTE C	0.5%	2%

80 WATTS CONTINUOUS, 90 WATTS PEAK

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP80 -4003	+5V	14A	ADJUSTABLE NOTE A	0.2%	1%
	+15V	3.5A/6Apk	ADJUSTABLE NOTE B	0.2%	1%
	−5V	1A	±4% NOTE C	0.5%	2%
	−15V	1A	±4% NOTE C	0.5%	2%

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP130 -4010	+5V	20A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	5A/10Apk	ADJUSTABLE NOTE B	0.2%	2%
	−5V	1A	±4% NOTE C	0.5%	2%
	−12V	3A	±4% NOTE C	0.5%	2%

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP80 -4010	+5V	14A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	4A/7Apk	ADJUSTABLE NOTE B	0.2%	1%
	−5V	1A	±4% NOTE C	0.5%	2%
	−12V	3A	±4% NOTE C	0.5%	2%

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP130 -4020	+5V	20A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	5A/10Apk	ADJUSTABLE NOTE B	0.2%	2%
	−12V	1A	±4% NOTE C	0.5%	2%
	−5V	3A	±4% NOTE C	0.5%	2%

MODEL	VOLTAGE	CURRENT	INITIAL SETTING TOLERANCE	LINE REGULATION	LOAD REGULATION
MAP80 -4020	+5V	14A	ADJUSTABLE NOTE A	0.2%	1%
	+12V	4A/7Apk	ADJUSTABLE NOTE B	0.2%	1%
	−12V	1A	±4% NOTE C	0.5%	2%
	−5V	3A	±4% NOTE C	0.5%	2%

NOTES
A. Voltage level adjustable from 4.75V to 5.50V. Factory set to 5.0 to 5.2V.
B. Fully regulated output, voltage adjustable ±4% minimum. Factory set to ±1% of nominal.
C. Fully regulated output, voltage fixed.

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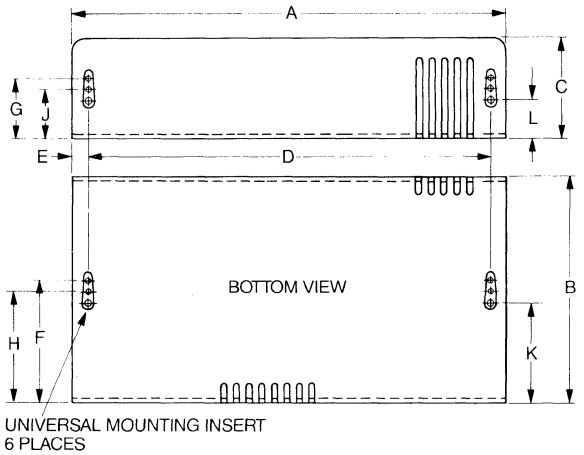
INTERNATIONAL SERIES D.C. POWER SUPPLIES—MAP SERIES

MAP55 SERIES

OVERALL SIZE: 6.00" x 3.27" x 1.60"
WEIGHT: 1.21 LB., 0.549 KG.

DIM	INCH	MM
A	6.000	152.400
B	3.270	83.058
C	1.600	40.640
D	5.500	139.700
E	0.250	6.350

MOUNTING HOLE DIMENSIONS								
6-32 THREAD HOLE 'A'			M4 THREAD HOLE 'B'			.170 DIA. THRU HOLE 'C'		
DIM.	INCH	MM	DIM.	INCH	MM	DIM.	INCH	MM
F	1.913	48.590	H	1.685	42.799	K	1.383	35.128
G	1.078	27.381	J	0.850	21.590	L	0.548	13.919



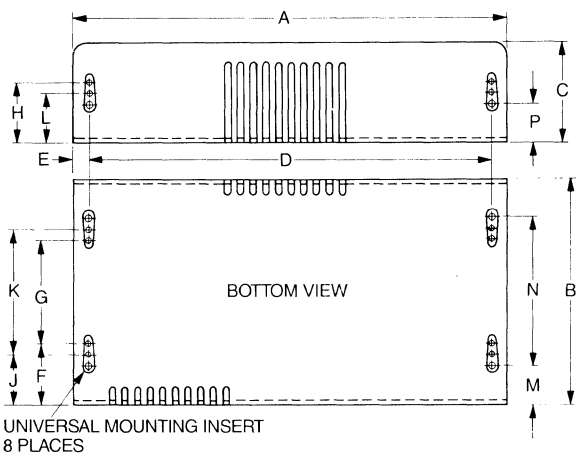
UNIVERSAL MOUNTING INSERT
6 PLACES

MAP80 SERIES

OVERALL SIZE: 7.20" x 4.20" x 1.80"
WEIGHT: 1.70 LB., 0.771 KG.

DIM	INCH	MM
A	7.200	182.880
B	4.200	106.680
C	1.800	45.720
D	6.700	170.180
E	0.250	6.350

MOUNTING HOLE DIMENSIONS								
6-32 THREAD HOLE 'A'			M4 THREAD HOLE 'B'			170 DIA. THRU HOLE 'C'		
DIM.	INCH	MM	DIM.	INCH	MM	DIM.	INCH	MM
F	1.028	26.112	J	0.800	20.320	M	0.498	12.649
G	2.144	54.458	K	2.600	66.040	N	3.204	81.382
H	1.053	26.746	L	0.825	20.955	P	0.523	13.284



UNIVERSAL MOUNTING INSERT
8 PLACES

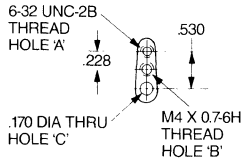
MAP130 SERIES

OVERALL SIZE: 8.50" x 4.50" x 2.00"
WEIGHT: 2.54 LB., 1.134 KG.

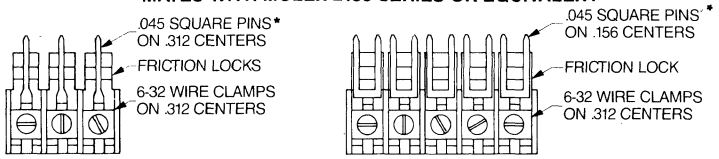
DIM	INCH	MM
A	8.500	215.900
B	4.500	114.300
C	2.000	50.800
D	8.000	203.200
E	0.250	6.350

MOUNTING HOLE DIMENSIONS								
6-32 THREAD HOLE 'A'			M4 THREAD HOLE 'B'			170 DIA. THRU HOLE 'C'		
DIM.	INCH	MM	DIM.	INCH	MM	DIM.	INCH	MM
F	1.278	32.461	J	1.050	26.670	M	0.748	18.999
G	1.944	49.377	K	2.400	60.960	N	3.004	76.302
H	1.278	32.461	L	1.050	26.670	P	0.748	18.999

UNIVERSAL MOUNTING INSERT
TYPICAL ALL MODELS



UNIVERSAL TERMINAL BLOCK CONNECTORS
AC INPUT (TYPICAL ALL MODELS) **DC OUTPUT (MAP55 SHOWN FOR REFERENCE)**
***MATES WITH MOLEX 2139 SERIES OR EQUIVALENT**



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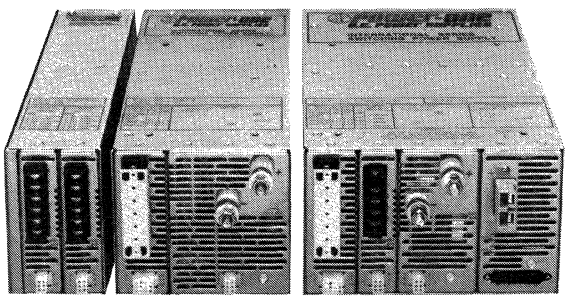
International High Power Series

500 to 1500 Watt Multiple Output Modular Power Systems

FEATURES

- FULLY MODULAR CONSTRUCTION
- UP TO 15 FULLY REGULATED OUTPUTS...2V THRU 48V
- WORLDWIDE AC INPUT: 90-132/180-264 VAC, 47-440 HZ, FIELD SELECTABLE
- 100% SWITCH-MODE OUTPUTS
- MOSFET SWITCHING TECHNOLOGY
- CURRENT-MODE CONTROL
- PARALLELABLE OUTPUTS WITH CURRENT SHARING
- UPS BATTERY BACKUP OPTION
- 48 VDC INPUT OPTION
- 300 VDC INPUT OPTION
- HIGH RELIABILITY HYBRID CONTROLLERS
- BALL BEARING DC FAN
- EXTENSIVE SYSTEM INTERFACE FEATURES
- TUV CERTIFIED TO: VDE 0806, IEC 435, IEC 380, IEC 950, EN60 950
- MEETS FCC AND VDE EMI LIMITS
- UL RECOGNIZED, CSA CERTIFIED
- 24 HOUR FULL LOAD BURN-IN AND THERMAL CYCLING
- 2 YEAR WARRANTY
- MADE IN U.S.A.



500 WATTS SPM2 **1000 WATTS SPM3** **1500 WATTS SPM5**

DESCRIPTION

POWER-ONE'S International High Power Series is a unique concept in system-oriented power supply technology using fully modular construction to achieve the highest degree of application flexibility available today. The series offers an extraordinary variety of standard performance features and options in a true off-the-shelf standard product line.

A NEW INDUSTRY STANDARD. Using the very latest MOSFET switching technology along with thick-film hybrid circuitry and a power density of up to 3.4 watts per cubic inch, the International High Power Series has clearly defined the standard for high power modular power systems. Offered by the industry leader in value and performance, the Series provides a cost-effective solution to today's as well as future power requirements.

SPECIFY UP TO 15 OUTPUTS...FROM STOCK. Fully modular design allows user to specify a proven multiple output power system from a wide selection of single, dual and triple output plug-in power modules. Virtually any combination of output voltage and current ratings, including UPS and DC input capabilities, can be delivered from stock, thereby avoiding the traditional time consuming and costly custom design process.

APPLICATION FLEXIBILITY. All outputs are completely independent and floating, and can be configured for either output polarity. The outputs use fully isolated MOSFET switching regulators to achieve high conversion efficiency with minimal size and weight. In addition, the design incorporates the latest current-mode control techniques to achieve precise current sharing when operating outputs in parallel for increased output current capability or redundancy.

ON-BOARD UPS CAPABILITY. Only POWER-ONE offers a completely self-contained on-board UPS module providing unlimited battery backup of up to 1000 watts of DC output power. Available off-the-shelf, these standard UPS modules mount entirely within the main power system enclosure. Also, a 48V DC input option is available for true high power DC-DC converter operation. Available for models SPM2 and SPM3.

TRUE FAULT-TOLERANT SYSTEM OPERATION. This important feature can easily be achieved by using POWER-ONE's standard on-board UPS module (G5) in conjunction with parallel connected output modules. This provides full battery backup/redundant-mode capabilities using standard off-the-shelf system modules.

STANDARD CONTROL FEATURES AND OPTIONS. A broad range of system interface features provide the capability to control and monitor the operation of the power supply by its host system. Standard features include output inhibit/enable, overtemperature warning, output good signal, input power fail warning, and output margining/remote voltage adjust. Upon request, an optional Logic Option Board can be configured to provide custom user specified control functions. For example, logic controlled margining, optically isolated control signals, selective output inhibit/enable, inverted logic signals and up/down output sequencing.

A TRUE WORLD MARKET POWER SYSTEM. The International High Power Series offers the benefit of being designed for products sold in the world's major electronics markets. The models operate on virtually any mains voltage from 90 to 264 VAC, 47 to 440 HZ. And, as with all POWER-ONE switchers, they meet the world's toughest safety agency and EMI requirements, and represent POWER-ONE's true "World Market" design philosophy. This results in easier and faster acceptance for the users' end products when marketed not only in the U.S., but internationally as well.

HOW TO ORDER

The International High Power Series is a unique concept in system-oriented power supply technology utilizing fully modular construction. This feature allows the user to easily specify a proven single or multiple output power system from a wide selection of standard plug-in output modules. Choose from the module listings below. The power system is delivered completely assembled, tested and burned-in, incorporating the users' specified output modules and options. Call POWER-ONE toll-free for complete ordering information.

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International High Power Series

SPECIFICATIONS

POWER SYSTEMS

SYSTEM MODEL NUMBER	TOTAL OUTPUT POWER (WATTS)	NUMBER OF DC OUTPUTS AVAILABLE	SYSTEM SLOTS AVAILABLE	OVERALL SIZE (INCHES)
SPM2	500	1 TO 6	2	5 × 3 × 11
SPM3	1000	1 TO 9	3	5 × 5.5 × 11
SPM5	1500	1 TO 15	5	5 × 8 × 11

DC OUTPUT MODULE RATINGS (CONTINUED)

SINGLE OUTPUT MODULES

VOLTAGE, NOMINAL (VOLTS)	CURRENT @ 50°C (AMPS)	OUTPUT POWER (WATTS)	SYSTEM SLOTS OCCUPIED	MODULE DESIGNATION
2	35	70	1	F1
5	35	175	1	A1
5	60	300	1	A6
12	20	240	1	B1
15	16	240	1	C1
20	12	240	1	T1
24	10	240	1	D1
28	8.6	240	1	E1
48	5	240	1	G1
2	150	300	2	F2
3.3	150	495	2	H2
5	150	750	2	A2
12	65	780	2	B2
15	52	780	2	C2
20	38	760	2	T2
24	32	768	2	D2
28	27	756	2	E2
36	21	756	2	J2
48	16	768	2	G2
5	200	1000	3	A3

DC OUTPUT MODULE RATINGS (CONTINUED)

DUAL OUTPUT MODULES

VOLTAGE, NOMINAL (VOLTS)	CURRENT @ 50°C (AMPS)	OUTPUT POWER (WATTS)	SYSTEM SLOTS OCCUPIED	MODULE DESIGNATION
+12/−12	10/10	240	1	B4
+15/−15	8/8	240	1	C4
+24/−24	5/5	240	1	D4

TRIPLE OUTPUT MODULES

VOLTAGE, NOMINAL (VOLTS)	CURRENT @ 50°C (AMPS)	OUTPUT POWER (WATTS)	SYSTEM SLOTS OCCUPIED	MODULE DESIGNATION
5/12/12	10/10/10	290	1	M6
12/12/12	10/10/10	360	1	N6
24/12/12	5/10/10	360	1	P6
5/24/24	10/5/5	290	1	R6
5/12/24	10/10/5	290	1	U6
5/15/15	10/8/8	290	1	V6

48V D.C. INPUT/UPS BATTERY BACKUP MODULES

MODULE DESIGNATION	INPUT, NOMINAL (VOLTS)	DC OUTPUT/ BACKUP CAPABILITY (WATTS)	BATTERY CHARGER, BUILT-IN	BATTERY CHARGE CURRENT (AMPS)
G5	48	1000	YES	4
M5	48	1000	N/A	N/A

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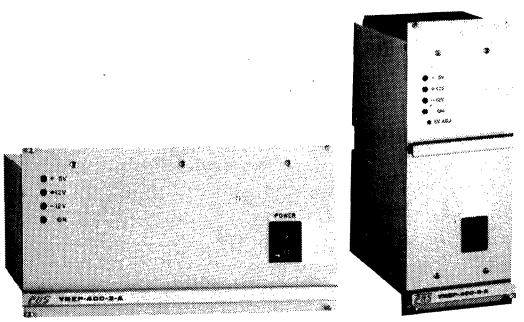
POWER PAC™ Power Supplies

VMEP SERIES VMEbus/Eurocard Modular AC-DC Switching Power Supplies

The Power Pac™ VMEP Series is a group of high-efficiency switching power supplies in 130 models, with capacities ranging from 120 to 800 watts, and a large selection of outputs. The supplies are designed specifically for VMEbus and incorporate VMEbus-compatible signals ACFAIL and SYSRESET.

Power switch and indicator light, and LED indicators for the three outputs are located on the front panel. Input, output, system logic, and sensing connections are made on the back through connectors, or studs for high-current connections.

The units are designed for total environmental compatibility—physical and electrical—with VMEbus systems.



FEATURES

- Dual input 115/230 VAC @ 47-63 Hz
- Wide choice of outputs
- ±0.2% or 10mV max line/load regulation
- EMI filtering
- System logic interface
- Parallel operation/power sharing optional
- SMT construction
- Modular configuration
- Fully isolated outputs
- 50KHz switching frequency
- Floating grounds for choice of output polarity

Notes on Sizes:
Single height (3U)—5.06″ (128.5mm)
Double height (6U)—10.3″ (261.8mm)
Depth of all units—6.73″ (171mm)
Single-height units are about twice the width of double-height units of similar capacity. Widths are given in the tables that follow, at the head of each group.

NOTES ON RATINGS

The output current ratings in the charts indicate the maximum steady-state current that can be drawn from the appropriate output at 50°C. The total wattage drawn from all outputs shall not exceed the unit output wattage rating.

The 120- and 200-Watt unit ratings are for convection cooling. With forced air cooling of 40cfm the total output power rating of these units can be increased by 30%.

Auxiliary outputs have a peak current rating of 115% of ratings shown (20 sec. duration).

***NOTE:** The VMEP200-6 Series is also available with 48VDC input. Please order DC-input series as VMEC200-6-X, where X designates the desired outputs, as in the table above.

VMEP SERIES—Models, Ranges, Outputs, Sizes

OUTPUT VOLTAGE→	5	12	15	24	**
Part No.	Current in Amps DC				Case Size
VMEP120-X-A	22.0	4.0/2.0			
VMEP120-X-B	22.0		3.0/1.5		
VMEP120-X-C	22.0/4.0	4.0			
VMEP120-X-D	22.0/2.0			2.0	6U x 8HP
VMEP120-X-E	22.0/4.0	2.0			
VMEP120-X-F	22.0	4.0		1.0	
VMEP200-X-A*	34.0	4.0/3.6			
VMEP200-X-B	34.0		3.0/2.9		
VMEP200-X-C	34.0/8.7	4.0			
VMEP200-X-D	34.0	3.6		2.0	
VMEP200-X-E	34.0/10.0			1.8	
VMEP200-X-F	34.0	4.0		1.8	6U x 16HP
VMEP200-X-G	10.0/8.7	14.0			or
VMEP200-X-H	10.0	14.0/3.6			3U x 36HP
VMEP200-X-J	10.0	14.0		1.8	
VMEP200-X-K	10.0/8.7			7.0	
VMEP200-X-L	10.0	3.6		7.0	
VMEP200-X-M		4.0/3.6		7.0	
VMEP300-X-A	50.0	6.0/5.0			
VMEP300-X-B	50.0		4.5/4.0		
VMEP300-X-C	50.0/13.0	6.0			6U x 16HP
VMEP300-X-D	50.0	5.0		3.0	
VMEP300-X-E	50.0/15.0			3.0	
VMEP300-X-F	50.0	6.0		3.0	
VMEP400-X-A	68.0	8.0/7.2			
VMEP400-X-B	68.0		6.0/5.8		
VMEP400-X-C	68.0/12.0	8.0			
VMEP400-X-D	68.0	7.2		4.0	
VMEP400-X-E	68.0/12.0			3.6	
VMEP400-X-F	68.0	8.0		3.6	6U x 20HP
VMEP400-X-G	12.0/12.0	28.0			or
VMEP400-X-H	12.0	28.0/7.2			3U x 48HP
VMEP400-X-J	12.0	28.0		3.6	
VMEP400-X-K	12.0/12.0			14.0	
VMEP400-X-L	12.0	7.2		14.0	
VMEP400-X-M		8.0/7.2		14.0	
VMEP600-X-A	102.0	12.0/10.8			
VMEP600-X-B	102.0		10.0/8.7		
VMEP600-X-C	102.0/26.0	12.0			
VMEP600-X-D	102.0	10.8		6.0	
VMEP600-X-E	102.0/29.0			5.5	
VMEP600-X-F	102.0	12.0		5.4	6U x 28HP
VMEP600-X-G	29.0/12.0	42.0			
VMEP600-X-H	29.0	42.0/10.8			
VMEP600-X-J	29.0	42.0		5.4	
VMEP600-X-K	29.0/12.0			21.0	
VMEP600-X-L	29.0	10.8		21.0	
VMEP600-X-M		12.0/10.8		21.0	
VMEP800-X-A	134.0	16.0/12.0			
VMEP800-X-B	134.0		13.0/11.5		
VMEP800-X-C	134.0/36.0	12.0			
VMEP800-X-D	134.0	12.0		8.0	
VMEP800-X-E	134.0/36.0			7.2	
VMEP800-X-F	134.0	16.0		7.2	6U x 42HP
VMEP800-X-G	36.0/12.0	56.0			or
VMEP800-X-H	36.0	56.0/12.0			3U x 84HP
VMEP800-X-J	36.0	56.0		7.2	
VMEP800-X-K	36.0/12.0			28.0	
VMEP800-X-L	36.0	12.0		28.0	
VMEP800-X-M	36.0	16.0/12.0		28.0	

SIGNIFICANCE OF MODEL NUMBERS

For convenience in using this brochure, we have devised a system of model numbers as follows:

VMEC	XXX	-	X	-	X
Designates type	Designates total power		Designates height in VMEBus height units (1u=1.75″[44.45mm])		(Suffix) designates outputs as given in table

** **NOTE:** 48 VDC output available on special order.

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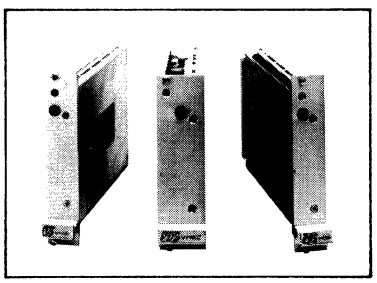
POWER PAC™ Power Supplies

VMEC SERIES Modular DC-DC Converters

Designed specifically for VMEbus applications, these switchmode converters draw their DC input from the main supply or other external source, providing additional regulated DC outputs.
DC Input: 10-18VDC or 20-36VDC
Regulation: ±0.2% line/load.



VMEC SERIES—Models, Ranges, Outputs, Sizes

OUTPUT VOLTAGE→	02	05	12	15	24	36	48	
Part No.	Current in Amps DC							Case Size
40 WATT UNITS								
VMEC40-3-A-XX*	8.0							
VMEC40-3-B-XX		8.0						
VMEC40-3-C-XX			3.3					
VMEC40-3-D-XX				2.6				
VMEC40-3-E-XX					1.7			
VMEC40-3-F-XX						1.1		3U x 5HP
VMEC40-3-G-XX							0.8	
VMEC40-3-H-XX	4.0		1.7					
VMEC40-3-J-XX			1.7/1.7					
VMEC40-3-K-XX				1.3/1.3				
VMEC40-3-L-XX		4.0	1.7					
VMEC40-3-M-XX		4.0			0.9			
80 WATT UNITS								
VMEC80-3-A-XX	16.0							
VMEC80-3-B-XX		16.0						
VMEC80-3-C-XX			6.6					
VMEC80-3-D-XX				5.2				
VMEC80-3-E-XX					3.4			
VMEC80-3-F-XX						2.2		3U x 7HP
VMEC80-3-G-XX							1.6	
VMEC80-3-H-XX	8.0		3.4					
VMEC80-3-J-XX			3.4/3.4					
VMEC80-3-K-XX				2.6/2.6				
VMEC80-3-L-XX		8.0	3.4					
VMEC80-3-M-XX		8.0			1.8			

*Specify nominal input voltage: – 12 for 12VDC, – 24 for 24VDC, (48VDC opt.)

FEATURES
- 3U Eurocard format
- Wide choice of outputs
- EMI filtering
- Isolated outputs
- Floating grounds
- Remote sense
- Remote on/off
- Overvoltage protection
- Overload protection
- Line/load regulation < ±0.2%

KS SERIES Telecommunications AC-DC Power Sources
Regulated/unregulated, optional battery back-up

Power Pac™ KS Series power sources are designed for the key/PBX telephone system OEM and similar applications. Models have single outputs of either 24VDC or 48VDC. Input is 117VAC ±10%, 60 Hz, fuse protected. 230VAC ±10%, 50 Hz, is optional.

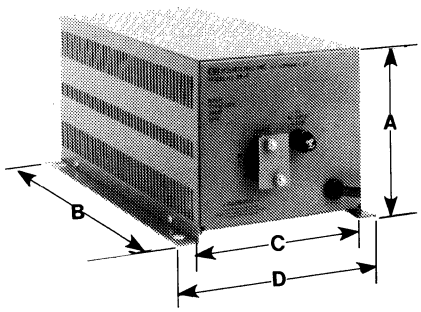
The units with the battery back-up circuitry ("B" and "D" models) charge stand-by batteries, not included, monitor line and output voltage, and automatically switch to batteries when needed. Normal operation is resumed when line voltage is restored.

FEATURES
- Reliable, conservative design
- Convection cooled
- 6-foot, 3-wire line cord
- Short circuit/overload protected
- 80–90% efficiency
- Low cost UPS protection

Models, ratings and sizes

OUTPUT VOLTAGE→ 24	48	
Part No.	Current in Amps DC	Case
BASIC (UNREGULATED) UNITS		
KSA100-XX	4.0	2.0	KS3
KSA200-XX	7.0	4.0	KS5
KSA400-XX	15.0	8.0	KS7
UNREGULATED, W/ BATTERY BACK-UP CIRCUIT		
KSB100-XX	4.0	2.0	KS5
KSB200-XX	7.0	4.0	KS5
KSB400-XX	15.0	8.0	KS7
CONSTANT VOLTAGE (FERRORESONANT) UNITS		
KSC100-XX	4.0	2.0	KS5
KSC200-XX	7.0	4.0	KS5
KSC400-XX	15.0	8.0	KS7
FERRORESONANT W/ BATTERY BACK-UP CIRCUIT		
KSD100-XX	4.0	2.0	KS5
KSD200-XX	7.0	4.0	KS5
KSD400-XX	15.0	8.0	KS7

*Specify output voltage req'd - 24 or 48VDC



DIMENSIONS
(refer to models listing for case designation)

CASE	A	B	C	D
KS3	4.75" (120mm)	9" (229mm)	6" (152mm)	7.5" (190mm)
KS5	5.75" (146mm)	12" (305mm)	6" (152mm)	7.5" (190mm)
KS7	5.25" (133mm)	12" (305mm)	9" (229mm)	10.5" (267mm)

REGULATION:

	A, B Models	C, D Models
Line	DC output proportional to input	±1%
Load	10% (50-100% change)	7% (25-100% change)
Ripple	5.0% RMS	0.5% RMS

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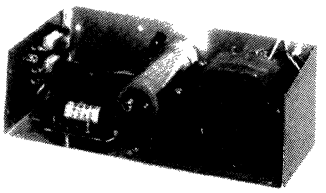
POWER PAC™ Power Supplies

EP SERIES Linear Open Frame Power Supplies



The EP Series of open-frame linear power supplies are conservatively-rated, convection-cooled units that provide low-noise, highly-regulated DC power required by test equipment, machine controls, and other sesitive applications. Available in single (EP), dual (EPD) and triple (EPT) output configurations, many of these models can be shipped from stock in small quantity.

FEATURES

- Rugged, conservative design
- High quality, high reliability
- Custom outputs/configurations welcomed
- Low noise, high regulation
- Overload protection: foldback current limiting on all outputs
- Overvoltage protection: standard on all outputs (can be deleted by request)
- Floating grounds for choice of output polarity
- Safety covers optional
- Five-year warranty
- UL recognized

SPECIFICATIONS

Input voltage: 105/152 or 210/250 VAC, 47/440 Hz.

Output voltage/current: See rating in table. Current ratings are for 57/440 Hz. Derate 10% at 50 Hz.

Output adj. range: ±5% or .5 VDC minimum.

Regulation: ±0.15% Line & Load combined.

Ripple: 1.5 mV RMS, 5 mV pk-pk max.

Stability: ±0.1% for 8 hours after warm-up.

Temperature operating: 0°C to 71°C continuous.

Temperature derating: Derate 2%/°C above 40°C.

Temperature coefficient: Better than 0.03%/°C.

Cooling: Convection cooled.

Overload protection: Built-in foldback type current limit circuit to protect against overload and short circuit condition, with automatic recovery. Set to operate at 120 to 135% of full load current at 40°C.

Overvoltage protection: Built-in SCR crowbar set at 120-130% of nominal output.

Remote sense: Standard on size 2C and larger.

Output polarity: Floating, either side may be grounded.

Shielding: Electrostatic shield between primary and secondary of transformer.

Transient response: 50µsec for a 50% load change to recover within ±10 mV band.

EP, EPD, EPT Models, ratings and sizes

OUTPUT VOLTAGE→			+05	−05	+06	−06	+12	−12	+12/+15	−12/−15	+15	−15	+24	−24	+28	−28	+36	−36	+48	−48	CALL
		Part No.	Current in Amps DC																		Case Size: Inches/Millimeters
	S	EP6A-XX-0V	1.2		1.0		0.5				0.5		0.4		0.35		3.750 × 3.000 × 0.375"/ 95 × 76 × 35mm				
	I	EP1B-XX-0V	3.0		3.0		1.7				1.5		1.2		1.0		4.875 × 4.000 × 1.625"/124 × 102 × 165mm				
	N	EP2C-XX-0V	6.0		6.0		3.4				3.0		2.4		2.0		5.625 × 4.875 × 2.500"/143 × 124/ 64mm				
	G	EP8C-XX-0V	9.0		8.5		5.1				4.5		3.3		3.0		7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
	L	EP3D-XX-0V	12.0		12.0		6.8				6.0		5.0		4.4		9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
	E	EP9D-XX-0V	18.0		18.0		10.8				9.5		7.2		6.0		14.000 × 4.875 × 2.750"/366 × 124 × 70mm				
		EP4E-XX-0V	25.0		23.0		15.0				14.0		11.0		10.0		16.750 × 4.875 × 4.875"/425 × 124 × 124mm				
		EP5F-XX-0V	50.0		46.0		30.0				28.0		22.0		20.0		16.750 × 4.875 × 4.875"/425 × 124 × 124mm				
		EPD1B-12-0V							0.7	0.7							4.750 × 4.000 × 2.250"/121 × 102 × 57mm				
		EPD7H-05-0V	3.0	3.0													7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
L		EPD7H-06-0V			2.5	2.5											7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
I		EPD7H-12-0V					1.7	1.7									7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
N	D	EPD7H-15-0V									1.5	1.5					7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
E	U	EPD3D-05-0V	6.0	6.0													9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
A	A	EPD3D-06-0V			5.0	5.0											9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
R	L	EPD3D-12-0V					3.4	3.4									9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
S		EPD3D-15-0V									3.0	3.0					9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
		EPD9D-12-0V					5.0	5.0									14.000 × 4.875 × 2.750"/356 × 124 × 70mm				
		EPD9D-15-0V									5.0	5.0					14.000 × 4.875 × 2.750"/356 × 124 × 70mm				
		EPD4D-36-0V															15.000 × 6.125 × 5.000"/381 × 156 × 127mm				
		EPT0-05-0V	1.0	0.25			0.25										4.750 × 3.375 × 3.375"/121 × 86 × 86mm				
		EPT0-12-0V	1.0				0.25	0.25									4.750 × 3.375 × 3.375"/121 × 86 × 86mm				
		EPT5-12-0V	2.0				0.4	0.4									6.500 × 4.000 × 1.625"/165 × 102 × 41mm				
		EPT1-24-0V	2.0										1.5	1.5			12.000 × 5.875 × 5.500"/305 × 149 × 140mm				
		EPT1-05-0V	3.0	0.4													7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
		EPT7-12-0V	3.0				0.6	0.6									7.000 × 4.875 × 2.750"/178 × 124 × 70mm				
	T	EPT8-12-0V	3.0				1.0	1.0									10.250 × 4.000 × 2.500"/260 × 102 × 64mm				
	R	EPT5-15-0V	3.0								0.8	0.8					10.250 × 4.000 × 2.500"/260 × 102 × 64mm				
	I	EPT1-12-0V	3.0				1.5	1.5									9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
	P	EPT1-15-0V	3.0								1.3	1.3					9.000 × 4.875 × 2.750"/229 × 124 × 70mm				
	L	EPT2-12-0V	6.0				1.7	1.7									12.000 × 6.000 × 6.000"/305 × 152 × 152mm				
	E	EPT2-15-0V	6.0								1.3	1.3					11.000 × 4.875 × 2.750"/279 × 124 × 70mm				
		EPT2-24-0V	3.0										3.0	3.0			11.000 × 4.875 × 2.750"/279 × 124 × 70mm				
		EPT3-12-0V	6.0				3.0	3.0									16.750 × 4.875 × 4.875"/425 × 124 × 124mm				
		EPT3-15-0V	6.0								2.8	2.8					16.750 × 4.875 × 4.875"/425 × 124 × 124mm				
		EPT9-12-0V	12.0				1.7	1.7									14.00 × 4.875 × 2.750"/356 × 124 × 70mm				
		EPT9-15-0V	12.0								1.5	1.5					14.000 × 4.875 × 2.750"/356 × 124 × 70mm				
		EPT4-12-0V	12.0				3.4	3.4									16.750 × 4.875 × 4.875"/425 × 124 × 124mm				
		EPT4-15-0V	12.0								3.0	3.0					16.750 × 4.875 × 4.875"/425 × 124 × 124mm				

[1]Specify desired output voltage in place of "XX"

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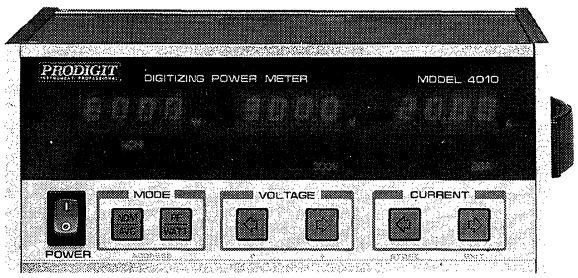
SPECIALIZING IN POWER ELECTRONICS TEST & MEASUREMENT

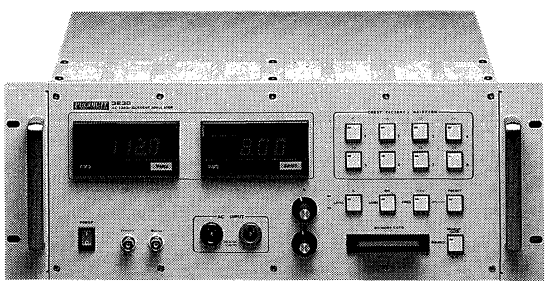


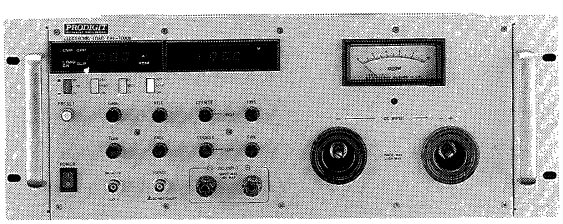
MODEL-4010
DIGITIZING POWER METER

- Digital RMS & Digital Integration Technique
- 0.1% High Accuracy
- Watt / Power Factor, V rms & A rms Display
- IEEE 488 Interface
- Front Panel Electronic Calibration

MODEL-3230
AC LOAD / CURRENT SIMULATOR

- Up to 1.5KW
- 280 V rms / 15 A rms (52.5 Apeak)
- Generate Crest Factor from $\sqrt{2}$ to 3.5 (8 steps)
- CC Mode & CR Mode
- IEEE 488 Interface
- 8 Arbitrary Current Waveforms



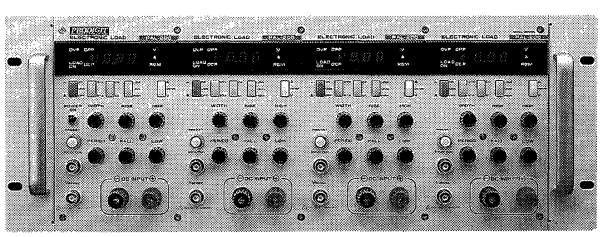


PAL-500B / 1000B
500W / 1000W DC ELECTRONIC LOAD

- Up to 200A, Up to 50V
- CC Mode & CR Mode
- Imonitor, Vsense
- 5 Protections (OVP, OCP, OPP, OTP, Reverse Polarity)
- Dynamic Load (Built in Pulse Generator)
- Optional IEEE 488 Interface

PAL-3322
250W / 250W / 200W / 200W
DC ELECTRONIC LOAD

- Up to 4 Independent Load Units Per Set
- Dynamic Load (Built in Pulse Generator)
- CC Mode (Constant Current)
  CR Mode (Constant Resistance)
- Preset Load Current (HIGH/LOW),
  Dynamic Load (Scope)
- Ext. Waveform Input (Slew Rate: 2A/us)
  (Arbitrary Waveform 0-20KHz)
- Option: GPIB for System Integration



PRIMARY APPLICATIONS:

- UPS, AVR, AC Source Test
- Power Supply Test
- Arbitrary AC Load Current Simulation

PRODIGIT
INSTRUMENT PROFESSIONAL
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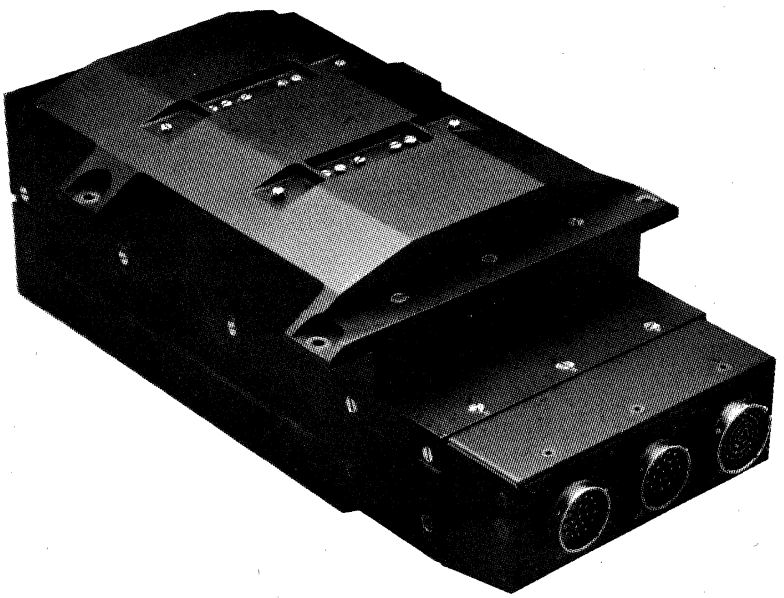
Switchmode / Linear Supplies

Single and Multiple Outputs

Complete Power Supply Systems



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2 YEAR WARRANTY

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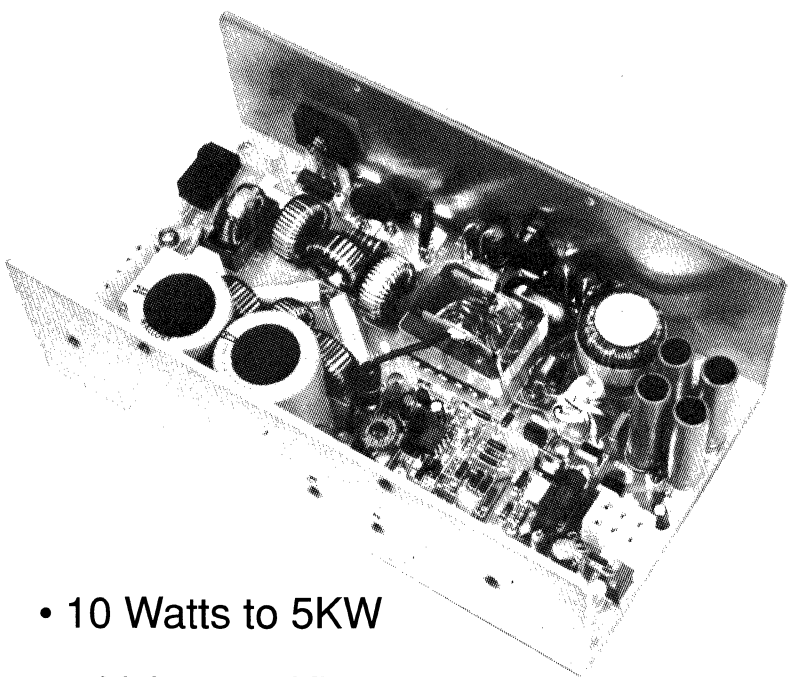

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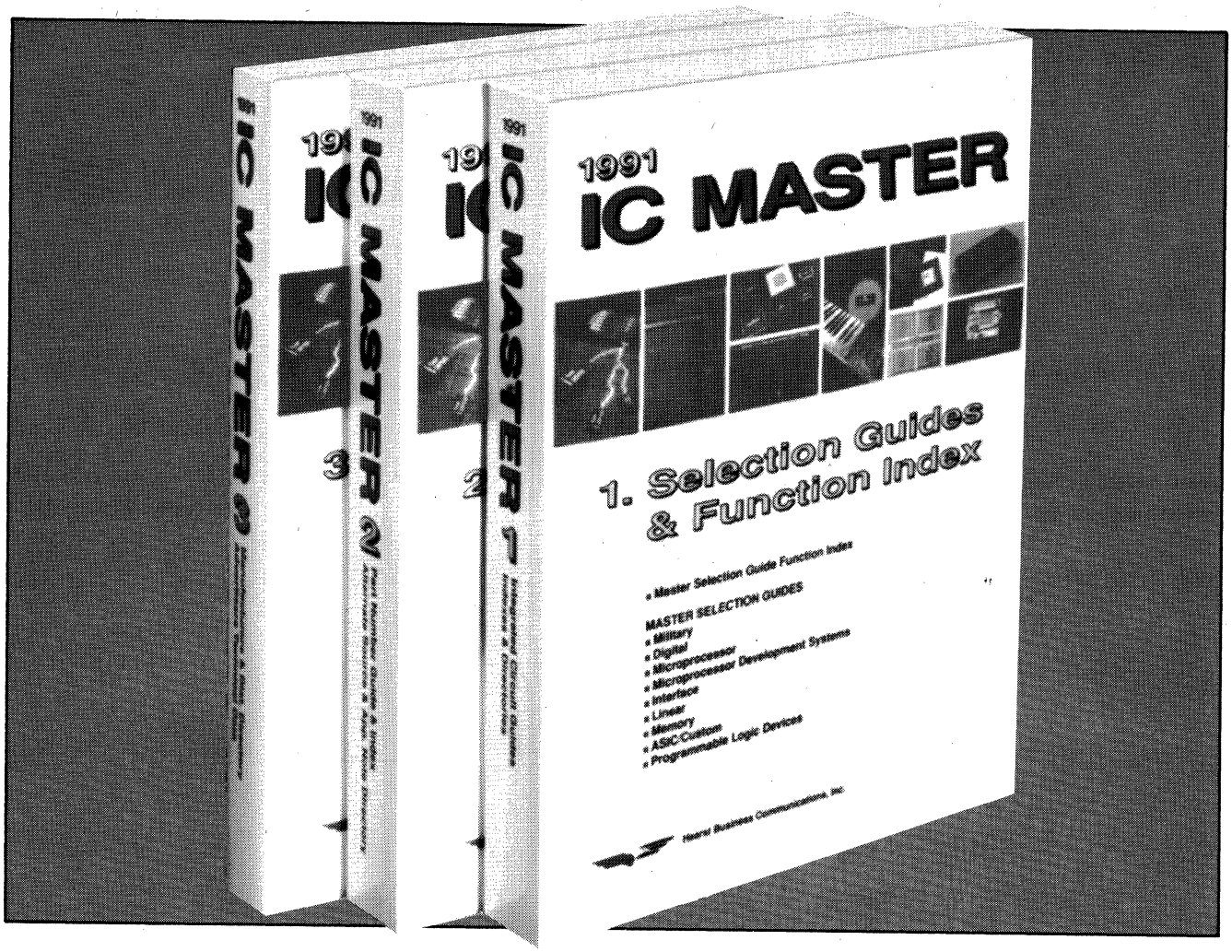

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IC MASTER

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PS-STANDARD/"BABY" AT SERIES

FEATURES

- High quality, designed for use by OEMs, not hobbyists unconcerned with agency approvals
- UL recognized, CSA certified, and TUV approved
- EMI/RFI within limits of VDE 0871/6.78 and FCC Part 15, subpart J
- Operates on 115 or 230 VAC
- OVP on +5 VDC output
- Full ONE YEAR WARRANTY
- 150-325 Watts
- Custom options available
- Tight regulation on all outputs available
- Automatic current limit
- Short circuit protection
- MTBF greater than 50,000 hours

SPECIFICATIONS

PS-AT-150 (BABY AT)			
DC OUTPUT VOLTAGE	MIN.	RATED LOADS TYP.	MAX.
+5V	10A	15.0A	18.0A
+12V	1A	5.0A	6.5A (10 sec.)
−12V	0A	0.5A	1.0A
−5V	0A	0.5A	1.0A

PS-AT-200 (BABY AT)			
DC OUTPUT VOLTAGE	MIN.	RATED LOADS TYP.	MAX.
+5V	10A	20.0A	25A
+12V	1A	6.0A	8.0A
−12V	0A	0.5A	1.0A
−5V	0A	0.5A	1.0A

PS-AT-190			
DC OUTPUT VOLTAGE	MIN.	RATED LOADS TYP.	MAX.
+5 VDC	2.0A	19A	20A
+12 VDC	1.5A	7.0A	8.0A
−12 VDC	0	0.5A	1.0A
−5 VDC	0	0.5A	1.0A

PS-AT-230			
DC OUTPUT VOLTAGE	MIN.	RATED LOADS TYP.	MAX.
+5 VDC	3.0A	25A	26A
+12 VDC	1.5A	8.0A	9.0A
−12 VDC	0	0.5A	1.0A
−5 VDC	0	0.5A	1.0A

PS-AT-270			
DC OUTPUT VOLTAGE	MIN.	RATED LOADS TYP.	MAX.
+5 VDC	3.0A	30A	33A
+12 VDC	2.0A	8.0A	10A
−12 VDC	0	0.5A	1.0A
−5 VDC	0	0.5A	1.0A

PS-AT-325			
DC OUTPUT VOLTAGE	MIN.	RATED LOADS TYP.	MAX.
+5 VDC	3.0A	40A	42A
+12 VDC	2A	10A	11A
−12 VDC	0	0.5A	1.0A
−5 VDC	0	0.5A	1.0A

BATTERY BACK-UP OPTION

The "Standard" PS-AT Series is now available with a battery back-up module to give you uninterruptible power source capabilities. Operation in the back-up mode is a function of the ampere hours rating of the external (customer supplied) batteries. Add suffix BU to model number.

FEATURES

- No outage at switch over
- 85% efficiency
- Battery charging circuit available
- Low battery voltage signal
- Automatic switch-off for low batteries
- Automatic switch-over from batteries when AC returns

MODIFIED STANDARDS, AND CUSTOM DESIGNS AVAILABLE

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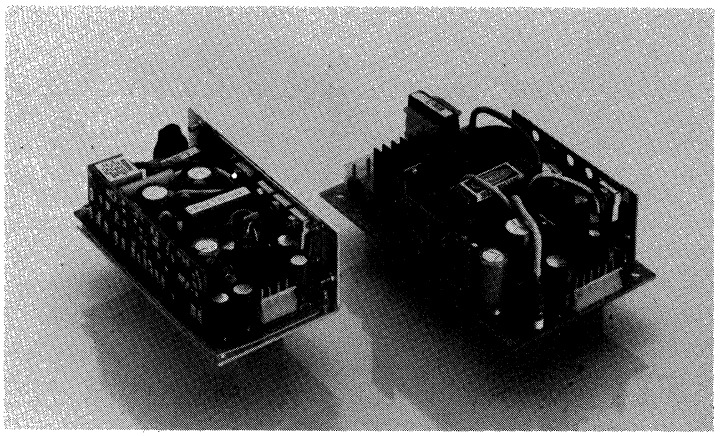
PVI UNIVERSAL AUTOMATIC AC INPUT SERIES

SINGLE AND MULTIPLE OUTPUTS



FEATURES

- Automatically Accommodates Universal AC Sources
- Designed and Tested to Worldwide EMI/RFI Regulations. Meets VDE and FCC Level "B" Emissions
- Compact Size
- Overload Protection
- Overvoltage Protection
- Many Options Available
- MTBF Greater than 100K Hours
- UL Recognized, CSA Certified, TUV Licensed
- High Peak Currents for Starting Loads

SPECIFICATIONS

PARAMETER	CONDITIONS	LIMITS
AC INPUT	No load to full load	90-260 VAC (115 or 230 VAC nominal) Auto input range without any external changes
AC INPUT FREQUENCY	No load to full load	47-63 Hz (consult factory for 440 Hz operation)
INPUT SURGE CURRENT	Peak (cold start)	15A (115 VAC) 30A (230 VAC)
DC OUTPUT		See Model Selection Chart
DC OUTPUT ADJUSTMENT	+5VDC output	+4.5V to OVP trip point
HOLD-UP TIME	Nominal input voltage and max output power	20 ms
LINE REGULATION	Within specified AC limits	±0.5% typical
LOAD REGULATION	20% to 100% load change	±1.0% main output ±3.0% for auxiliary output without post regulator ±1.0% for auxiliary output with post regulator

PARAMETER	CONDITIONS	LIMITS
RIPPLE AND NOISE	Max load	50mV Pk-Pk max 5V output 1% max any other output
TRANSIENT RESPONSE	50% load change	2% max deviation, returns to initial condition in 1 ms max
AMBIENT OPERATING TEMPERATURE	Continuous duty, full rating Derate linearly to 50% of full rating at +71°C	0° to 50°C 0% to 70% (fan cooled) 50° to 71°C
STORAGE TEMPERATURE	Non operating	−20°C to +80°C
OVERVOLTAGE PROTECTION	+5V output only	+6.2V ± 0.4V
SHORT CIRCUIT PROTECTION	Will withstand a continuous short without damage; will automatically return to regulation upon removal of short.	
OVERLOAD PROTECTION	Maximum rated current cannot be drawn from all outputs at the same time. The overload protection feature will reduce all output voltages to a safe dissipation level when the total output power exceeds 125% of maximum rated power.	
NO LOAD OPERATION	No damage to power supply will occur when operating at no load.	

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PVI UNIVERSAL AUTOMATIC AC INPUT SERIES

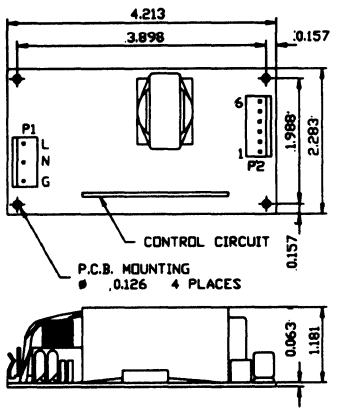
SINGLE AND MULTIPLE OUTPUTS

VOLTAGE/CURRENT RATING CHART

PVI-10 SERIES

10 Watt maximum output power convection cooled.

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK		AUX 2	AUX 3
PVI-10-10	+5 @ 2.0	—	—	—	
PVI-10-11	+12 @ 1.0	—	—	—	
PVI-10-12	+15 @ 0.7	—	—	—	
PVI-10-13	+24 @ 0.5	—	—	—	
PVI-10-20	+5 @ 1.7	5 @ 0.3	1.0	—	—
PVI-10-21	+5 @ 1.0	12 @ 0.5	1.0	—	—
PVI-10-22	+5 @ 1.0	15 @ 0.4	1.0	—	—
PVI-10-23	+5 @ 1.0	24 @ 0.2	1.0	—	—

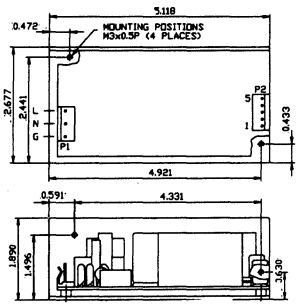


PVI-10 SERIES

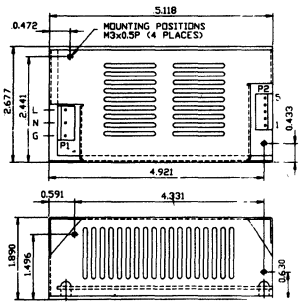
PVI-21 SERIES

20 Watt maximum output power convection cooled.

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK		AUX 2	AUX 3
PVI-21-20	+5 @ 3.0	5 @ 1.0	1.0	—	—
PVI-21-21	+5 @ 3.0	12 @ 0.5	1.0	—	—
PVI-21-22	+5 @ 3.0	15 @ 0.5	1.0	—	—
PVI-21-23	+5 @ 2.0	24 @ 0.5	1.0	—	—
PVI-21-30	+5 @ 2.0	+12 @ 0.5	1.0	12 @ 0.5	—
PVI-21-31	+5 @ 2.0	+12 @ 0.5	1.0	5 @ 1.0	—
PVI-21-32	+5 @ 2.0	+24 @ 0.2	1.0	12 @ 0.5	—
PVI-21-33	+5 @ 2.0	+15 @ 0.5	1.0	15 @ 0.5	—
PVI-21-34	+5 @ 2.0	+24 @ 0.2	1.0	5 @ 1.0	—



PVI-21 SERIES

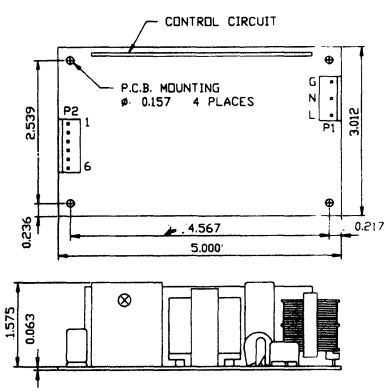


PVI-21 SERIES (BOX)

PVI-30 SERIES

40 Watts maximum output power convection cooled.

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK		AUX 2	AUX 3
PVI-30-10	+5 @ 8.0	—		—	—
PVI-30-11	+12 @ 3.3	—		—	—
PVI-30-12	+15 @ 2.6	—		—	—
PVI-30-13	+24 @ 1.6	—		—	—
PVI-30-20	+5 @ 3.0	−5 @ 2.5	4.0	—	—
PVI-30-21	+5 @ 3.0	+12 @ 2.5	4.0	—	—
PVI-30-23	+5 @ 3.0	+24 @ 1.5	2.0	—	—
PVI-30-30	+5 @ 3.0	+12 @ 2.5	4.0	12 @ 1.0	—
PVI-30-33	+5 @ 3.0	+24 @ 1.5	2.0	12 @ 1.0	—
PVI-30-34	+5 @ 3.0	+15 @ 2.0	3.0	15 @ 1.0	—
PVI-30-21TA	+5 @ 3.0	+12 @ 3.0	5.5	—	



PVI-30 SERIES

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PVI UNIVERSAL AUTOMATIC AC INPUT SERIES

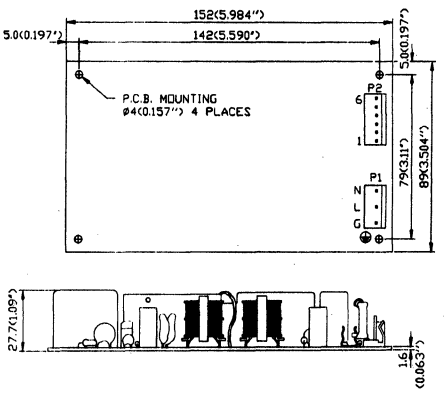
SINGLE AND MULTIPLE OUTPUTS

VOLTAGE/CURRENT RATING CHART

PVI-33 SERIES

Low Profile 30 Watt

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK	AUXILIARY 2
PVI-33-10	+5 @ 6.5	—	—
PVI-33-11	+12 @ 2.7	—	—
PVI-33-12	+15 @ 2.0	—	—
PVI-33-13	+24 @ 1.5	—	—
PVI-33-20	+5 @ 5.5	5 @ 1.0 1.0	—
PVI-33-21	+5 @ 4.0	12 @ 1.0 1.0	—
PVI-33-23	+5 @ 4.0	24 @ 0.5 1.0	—
PVI-33-30	+5 @ 3.0	+12 @ 1.0 1.5	12 @ 0.5
PVI-33-31	+5 @ 3.0	+12 @ 1.2 1.5	5 @ 0.5
PVI-33-32	+5 @ 3.0	+24 @ 1.5 2.0	12 @ 1.0
PVI-33-33	+5 @ 3.0	+15 @ 2.0 3.0	15 @ 1.0

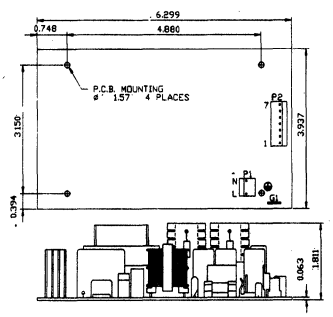


PVI-33 SERIES

PVI-40 SERIES

40 Watt maximum output power convection cooled.

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK	AUX 2	AUX 3
PVI-40-30	+5 @ 3.0	+12 @ 1.5 2.0	12 @ 0.5	—
PVI-40-31	+5 @ 3.0	+12 @ 1.5 2.0	5 @ 1.0	—
PVI-40-32	+5 @ 3.0	+24 @ 0.8 1.5	12 @ 0.5	—
PVI-40-33	+5 @ 3.0	+15 @ 1.4 2.0	15 @ 0.4	—
PVI-40-40	+5 @ 3.0	+12 @ 1.2 2.0	12 @ 0.5	−12 @ 0.5
PVI-40-41	+5 @ 3.0	+12 @ 1.2 2.0	12 @ 0.5	−5 @ 1.0
PVI-40-42	+5 @ 3.0	+24 @ 0.5 1.5	12 @ 0.5	−12 @ 0.5
PVI-40-43	+5 @ 3.0	+15 @ 1.0 2.0	15 @ 0.5	−12 @ 0.5

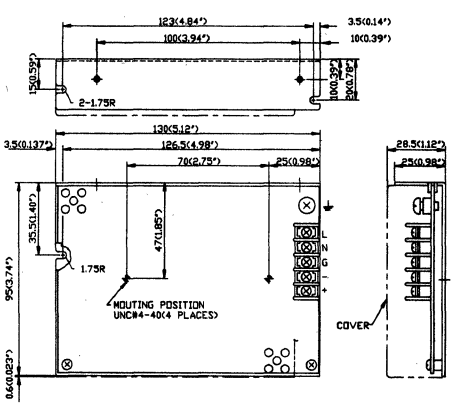


PVI-40 SERIES

PVI-50 SERIES

Low Profile 50 Watt

MODEL NUMBER	MAIN OUTPUT AVE, PEAK
PVI-50-10	+5 @ 10.0 10.0
PVI-50-11	+12 @ 4.0 4.5
PVI-50-12	+15 @ 3.0 3.5
PVI-50-13	+24 @ 2.0 2.2



PVI-50 SERIES (BOX)

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PVI UNIVERSAL AUTOMATIC AC INPUT SERIES

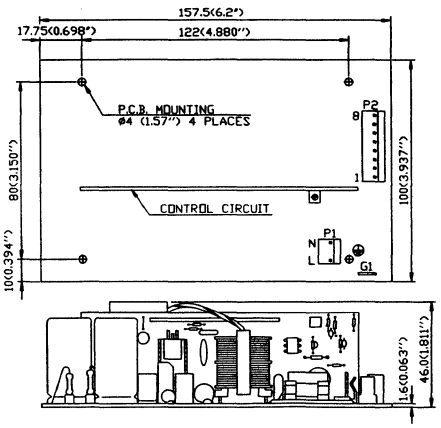
SINGLE AND MULTIPLE OUTPUTS

VOLTAGE/CURRENT RATING CHART

PVI-80 SERIES

80 watts max output power with 12 cfm forced air cooling

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK		AUXILIARY 2
PVI-80-21	+5 @ 6.0	+12 @ 6.0	13.0	
PVI-80-30	+5 @ 8.0	+12 @ 2.0	4.0	−12 @ 2.0
PVI-80-32	+5 @ 8.0	+24 @ 1.5	3.0	−12 @ 1.0
PVI-80-33	+5 @ 8.0	+12 @ 2.0	4.0	+24 @ 1.5
PVI-80-34	+5 @ 8.0	+15 @ 1.5	3.0	−15 @ 1.5

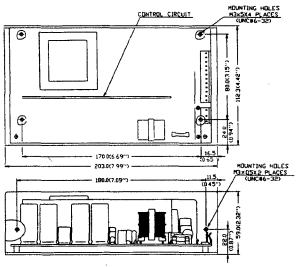


PVI-80 SERIES

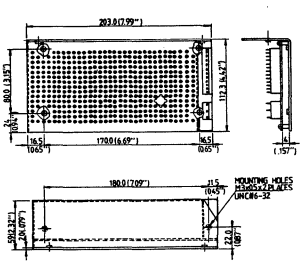
PVI-90 SERIES

90 Watt max convection cooled 110 watts with 12 cfm forced air cooling

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK		AUX 2	AUX 3
PVI-90-30	+5 @ 10.0	+12 @ 3.0	4.0	−12 @ 1.5	—
PVI-90-32	+5 @ 10.0	+24 @ 1.5	3.0	−12 @ 1.5	—
PVI-90-33	+5 @ 10.0	+24 @ 1.5	3.0	+12 @ 1.5	—
PVI-90-34	+5 @ 10.0	+15 @ 2.0	4.0	−15 @ 1.6	—
PVI-90-40	+5 @ 10.0	+12 @ 2.0	3.0	−12 @ 1.5	−5 @ 1.5
PVI-90-42	+5 @ 10.0	+24 @ -1.5	3.0	+12 @ 1.5	−12 @ 1.0
PVI-90-43	+5 @ 10.0	+15 @ 2.5	4.0	−15 @ -1.5	−5 @ 1.5
PVI-90-44	+5 @ 10.0	+12 @ 3.0	4.0	+12 @ 1.5	−12 @ 1.0



PVI-90 SERIES

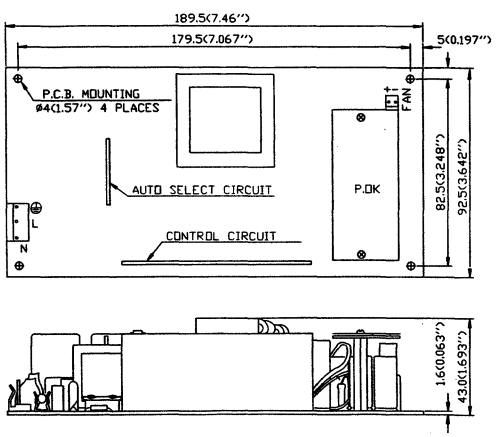


PVI-90 SERIES (BOX)

PVI-110 SERIES

110 watts max output power with 12 cfm forced air cooling

MODEL NUMBER	MAIN OUTPUT	AUXILIARY 1 AVE, PEAK		AUXILIARY 2
PVI-110-31T	+5 @ 14.0	+12 @ 3.0	3.0	−12 @ 0.5
PVI-110-30	+5 @ 10.0	+12 @ 3.0	4.0	−12 @ 1.5
PVI-110-32	+5 @ 10.0	+24 @ 1.5	3.0	−12 @ 1.5
PVI-110-33	+5 @ 10.0	+24 @ 1.5	3.0	+12 @ 1.5
PVI-110-34	+5 @ 10.0	+15 @ 2.0	4.0	−15 @ 1.5



PVI-110 SERIES

Power Systems, Inc.

A MINEBEA Group Company
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(203) 726-1300
Fax: (203) 726-1495

Standard or Custom Power Supplies: NOW THE CHOICE IS REALLY YOURS!

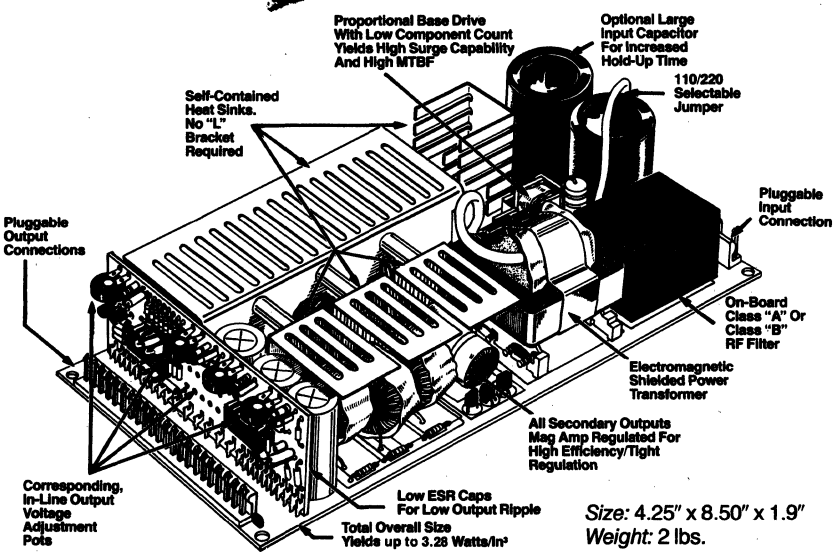
Power Systems Inc. now offers you a choice between completely custom-designed power supplies or our new, fully configured, multiple-output standard switching power supplies.

PSI/STD

PSI/STD is a line of standard power supplies that offers a broad range of choices for many OEM applications that previously required a custom-designed power supply.

The versatility of the PSI/STD module with its available options enables you to obtain a "custom" power supply without the lead time or development costs associated with custom products.

PSI 175 is a 175-watt, convection-cooled, quad output power supply. Standard features include 110/220 VAC, 47-440 Hz, full power rating at 50°C, fully regulated outputs . . . all in the smallest package available. L-brackets for special mounting, and input autoranging are available, plus many other options. Also available are 135-watt and 225-watt modules with the same package size, features and options as the 175-watt. Call for quotation.



Size: 4.25″ x 8.50″ x 1.9″
Weight: 2 lbs.

PSI 135, 175, 225 STANDARD FEATURES

- Outputs: 4 Max.
- Input: 110/220 VAC
- Frequency: 47-440 Hz
- Brownout Protection
- Inrush Current: 40A @ 220V Max.
- Leakage Current: .50MA Max.
- Efficiency: 75% Min.
- Internal Fuse
- Regulation: ±1%
- Ripple (VI): 50mV PK-PK
- Power Fail Signal
- Shortcircuit & Overload Protection
- Adjustable Outputs: ±5%
- Operating Temperature: 0-50°C
- MTBF: 50K Hours Min.
- FCC/VDE Class A EMI Filter
- UL, CSA, TUV Safety
- Hold-Up Time: 16mS
- Warranty: 2 Years
- Overvoltage Protection On All Outputs

OPTIONS

- Thermal Protection
- Hold-Up Time: 24mS/36mS
- Remote Sense
- L-Bracket: 8.5″ x 4.5″ x 2.25″
- L-Bracket: 10″ x 5″ x 2.25″
- Cover & L-Bracket: 8.5″ x 4.5″ x 2.5″
- FCC/VDE Class B EMI Filter
- Line Filter Deletion
- Lower Ripple Outputs
- Delete Outputs Up To 3
- Quasi-Regulation
- Output Terminal Block
- Input Terminal Block
- Input Voltage Autoranging
- Latch Off Fault Circuit
- Output Current Surge Capibility
- Remote Shutdown
- Fan Output
- Add On OR-ing Board For Redundant Operation

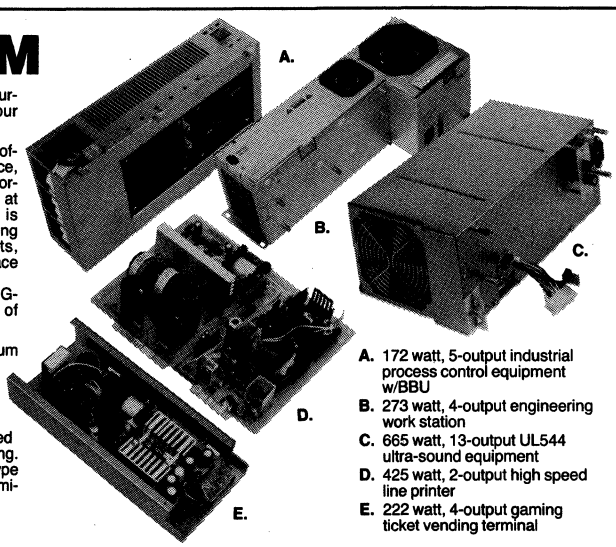
PSI/CUSTOM

PSI is still deeply committed to manufacturing custom power supplies that meet your specifications—and expectations.

CUSTOM DESIGNED POWER SUPPLIES offer optimum performance, systems interface, and cost-effectiveness. They provide the correct current ratings for each output voltage at proper temperatures. The final design is checked out under actual system operating conditions. You specify adjustment pots, desired locations for outputs, and interface features.
Form and fit are tailored for exacting CONFIGURATION CONTROL and efficient use of available space.

THERMAL DESIGN OPTIONS take maximum advantage of cooling methods in your cabinet or housing design including heat sinking in optimum convection areas, or utilizing forced air cooling to minimize cost.

INPUT/OUTPUT CONNECTIONS are placed for ease of assembly and minimum cabling. Choices include plated-edge PCB or pin-type connectors, flying-lead cables, solder terminals, or barrier-terminal blocks.



A. 172 watt, 5-output industrial process control equipment w/BBU
B. 273 watt, 4-output engineering work station
C. 665 watt, 13-output UL544 ultra-sound equipment
D. 425 watt, 2-output high speed line printer
E. 222 watt, 4-output gaming ticket vending terminal

SYSTEM-RELATED FEATURES include interface logic, Standard TTL logic signals, AC power failure, DC power failure, DC power good (one or all outputs), remote inhibit one or all outputs, and remote turn-on or off. Choice of digital or analog signals remotely program an output voltage.

PSI DESIGNS meet applicable UL, CSA and VDE safety standards as well as FCC and VDE EMI/RFI standards. Many supplies have been approved by TUV as being compliant with VDE and IEC safety standards.

MAXIMUM COST-EFFECTIVENESS is achieved by a custom designed power supply with a form, fit, and function that exactly matches the needs of the system. Power application engineers will be happy to assist in writing specifications, advising on configuration design, and reviewing cost trade-offs.

Now You Really Have A Choice. Whether you choose PSI/CUSTOM or PSI/STD, you know you will receive a consistently superior power supply from Power Systems, Inc.

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POWER SUPPLIES

High Power • 600W to 10KW

Lowest Prices in Industry • 5 Year Warranty • OVP Included in Prices

Single Phase

3300 SERIES
600W & 1000W
1¾" H • < 15#

3400 SERIES
1800W & 2000W
3½" H • < 30#

4500 SERIES
2500W
5¼" H • < 45#

Three Phase

Single Output

4600 SERIES
2500W & 5000W
5¼" H • < 55#

4700 SERIES
7500 & 10000W
10½" H • < 110#

Dual Output

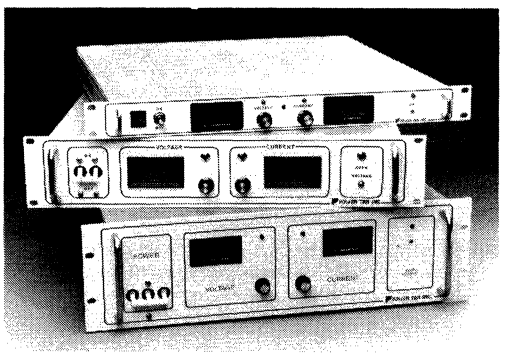
5600 SERIES*
5000W TOTAL
5¼" H • < 55#

5700 SERIES*
7500W TOTAL
10½" H • < 110#

5800 SERIES*
1000W TOTAL
10½" H • < 110#

Plus other V-A Combinations

* Mix or Match



Single Phase Prime Power

MODEL	Output DC		Output Ripple RMS
	Volts	Amps	
3300-7.575	0 - 7.5	75	30 mV
3300-7.5125	0 - 7.5	125	30 mV
3400-7.5250	0 - 7.5	250	30 mV
4500-7.5300	0 - 7.5	300	10 mV
3300-1060	0 - 10	60	30 mV
3300-10100	0 - 10	100	30 mV
3400-10200	0 - 10	200	30 mV
4500-10250	0 - 10	250	10 mV
3300-2030	0 - 20	30	30 mV
3300-2050	0 - 20	50	30 mV
3400-20100	0 - 20	100	30 mV
4500-20125	0 - 20	125	10 mV
4500-3080	0 - 30	80	30 mV
3300-4015	0 - 40	15	30 mV
3300-4025	0 - 40	25	30 mV
3400-4050	0 - 40	50	30 mV
4500-4060	0 - 40	60	10 mV
3300-6010	0 - 60	10	30 mV
3300-6016	0 - 60	16	30 mV
3400-6030	0 - 60	30	30 mV
4500-6040	0 - 60	40	20 mV
3300-8006	0 - 80	6	50 mV
3300-8012	0 - 80	12	50 mV
4500-8030	0 - 80	30	20 mV
3300-10010	0 - 100	10	50 mV
4500-10025	0 - 100	25	50 mV
4500-15016	0 - 150	16	75 mV
4500-25010	0 - 250	10	100 mV
3400-3006	0 - 300	6	100 mV
4500-3008	0 - 300	8	100 mV
4500-4505	0 - 450	5	150 mV
3400-6003	0 - 600	3	200 mV
4500-6004	0 - 600	4	200 mV

Three Phase Prime Power

MODEL	Output DC		Output Ripple RMS
	Volts	Amps	
4600-7.5300	0 - 7.5	300	10 mV
4600-10250	0 - 10	250	10 mV
4600-10375	0 - 10	375	10 mV
4600-10500	0 - 10	500	10 mV
4700-10750	0 - 10	750	30 mV
4700-101000	0 - 10	1000	30 mV
4600-20125	0 - 20	125	10 mV
4600-20185	0 - 20	185	10 mV
4600-20250	0 - 20	250	10 mV
4700-20375	0 - 20	375	30 mV
4700-20500	0 - 20	500	30 mV
4600-3080	0 - 30	80	10 mV
4600-30120	0 - 30	120	10 mV
4600-30160	0 - 30	160	10 mV
4700-30240	0 - 30	240	10 mV
4700-30320	0 - 30	320	10 mV
4600-4060	0 - 40	60	10 mV
4600-4090	0 - 40	90	10 mV
4600-40125	0 - 40	125	10 mV
4700-40185	0 - 40	185	30 mV
4700-40250	0 - 40	250	30 mV
4600-6040	0 - 60	40	20 mV
4600-6060	0 - 60	60	20 mV

Three Phase Prime Power (Continued)

MODEL	Output DC		Output Ripple RMS
	Volts	Amps	
4600-6080	0 - 60	80	20 mV
4700-60125	0 - 60	125	30 mV
4700-60160	0 - 60	160	30 mV
4600-8030	0 - 80	30	20 mV
4600-8045	0 - 80	45	20 mV
4600-8060	0 - 80	60	20 mV
4600-10025	0 - 100	25	50 mV
4600-10037	0 - 100	37	50 mV
4600-10050	0 - 100	50	50 mV
4600-15016	0 - 150	16	75 mV
4600-15024	0 - 150	24	75 mV
4600-15033	0 - 150	33	75 mV
4600-25010	0 - 250	10	100 mV
4600-25015	0 - 250	15	100 mV
4600-25020	0 - 250	20	100 mV
4700-25030	0 - 250	30	100 mV
4700-25040	0 - 250	40	100 mV
4600-3008	0 - 300	8	100 mV
4600-30012	0 - 300	12	100 mV
4600-30016	0 - 300	16	100 mV
4700-30024	0 - 300	24	100 mV
4700-30032	0 - 300	32	100 mV
4600-4505	0 - 450	5	150 mV
4600-4507	0 - 450	7	150 mV
4600-45010	0 - 450	10	150 mV
4700-45016	0 - 450	16	150 mV
4700-45022	0 - 450	22	150 mV
4600-6004	0 - 600	4	200 mV
4600-6006	0 - 600	6	200 mV
4600-6008	0 - 600	8	200 mV
4700-60012	0 - 600	12	200 mV
4700-60016	0 - 600	16	200 mV

Dual Output (Mix or Match)

	PS1			PS2		
Series	DC Output		Output Ripple RMS	DC Output		Output Ripple RMS
	Volts (0 to)	Amps (0 to)		Volts (0 to)	Amps (0 to)	
5600 Height=5 1/4" Weight= < 55 lbs. 5,000W Total	10	250	10mV	10	250	10mV
	15	160	10mV	15	160	10mV
	20	125	10mV	20	125	10mV
	30	80	10mV	30	80	10mV
	40	60	10mV	40	60	10mV
	60	40	10mV	60	40	10mV
	80	30	10mV	80	30	10mV
5700 Height= 10 1/2" Weight= < 110 lbs. 7,500W Total	10	375	10mV	10	375	10mV
	15	240	10mV	15	240	10mV
	20	185	10mV	20	185	10mV
	30	120	10mV	30	120	10mV
	40	90	10mV	40	90	10mV
	60	60	10mv	60	60	10mv
5800 Height= 10 1/2" Weight= < 110 lbs. 10,000W Total	10	500	10mV	10	500	10mV
	15	320	10mV	15	320	10mV
	20	250	10mV	20	250	10mV
	30	160	10mV	30	160	10mV
	40	125	10mV	40	125	10mV
	60	80	10mv	60	80	10mv

Excellent Reliability
High Efficiency, typically 80 - 85%
High Power Density to
10 W/cubic inch

POWER TEN INC.

Also MIL-Spec & Custom Designs
Qualified to MIL-I-45208
Single & Multiple Outputs
Conduction or Convection Cooled

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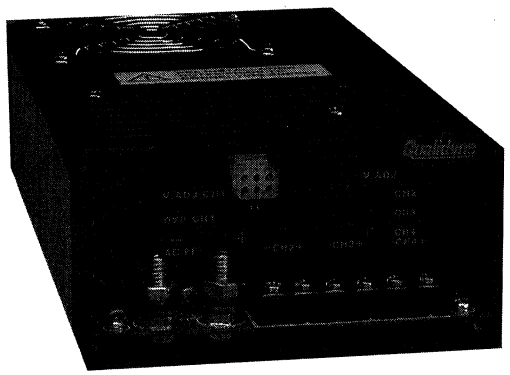
250 TO 600W SINGLE & MULTI-OUTPUT, LOW COST SWITCHMODE POWER SUPPLIES



SERIES 2
250 WATTS, 2″ × 4.5″ × 9″
400 WATTS, 2.5″ × 5″ × 10″
500 WATTS, 2.5″ × 5″ × 11.5″
600 WATTS, 2.5″ × 5″ × 14″

FEATURES

- 1 to 4 Outputs
- Isolated & Floating Outputs
- EMI Filter (FCC/VDE)
- DC Ball-Bearing Fan Cooled
- OVP on All Outputs
- Approved to UL, CSA, VDE, EN Specs
- Input Power Fail Signal
- Field-Selectable 115/230VAC
- Three-Year Warranty

AVAILABLE OPTIONS

- Auto AC Line Select
- Universal AC Input
- 0.99 Power Factor Correction
- Inhibit, Logic Low
- Margining (Main)
- Wide Range Adjustable Outputs

250 TO 600W STANDARD MODELS (Partial Listing)

Output #1 (Main)*	Output #2	Output #3	Output #4
5V/30A	12-15V/10A	12-15V/3A	5V/3A
5V/30A	12-15V/10A	12-15V/3A	12-24V/3A
5V/50A	12-15V/15A	12-24V/3.5A	5-15V/6A
5V/50A	12V/15A	12V/6A	5V/6A
5V/70A	12-15V/15A	12-24V/3.5A	5-15V/6A
5V/70A	12V/15A	12V/6A	5V/6A
5V/70A	12-15V/15A	12-24V/3.5A	2-6V/6A
5V/70A	12-15V/20A	12-24V/5A	2-6V/10A
5V/70A	12-15V/20A	12-24V/5A	5-15V/10A
5V/70A	12-15V/20A	12V/10A	12-24V/5A

*Available as Single Output Supply

BABT

INPUT SPECIFICATIONS

AC Input Voltage Ranges	90-132/180-264VAC, strappable; automatic line select (option); 90-264VAC, universal input (option)
Input Frequency (AC Units)	47-63 Hz
In-Rush Current, Peak	30A
Hold-Up Time	20 msec, typical

OUTPUT SPECIFICATIONS

Output Polarity	All units are floating
Line Regulation	0.2%, max.
Load Regulation	0.8% for 0 to 100% load change with remote sense
Transient Response	3% for 25% load change; recovery to <1% in 300 μsec
Overshoot, Turn-On	1%, max.
PARD, All Channels	1% measured over 30 MHz bandwidth
Temperature Coefficient	0.02%/°C max.
Current Limit	120% of rated current
Overvoltage Protection	125% of nominal output voltage; latching
Reverse Voltage Protection	To 100% rated current, main; 50% rated current, auxiliaries
Remote Sense	Remote sense will compensate for up to 0.5V of total load cable drop

GENERAL SPECIFICATIONS

Efficiency, Typical	75%
Turn-On Delay (Soft Start)	1 sec after input voltage applied
Dielectric Withstand	2200VDC, input-to-output
Leakage Current, Line-to-Chassis	3.5 mA max. @ 264VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature Range	0-70°C
Derating, 50-70°C	Linearly to 50% at 70°C
Storage Temperature Range	-40 to +85°C
Cooling	Internal fan
Humidity	5-95% non-condensing
EMI/RFI, Conducted	VDE 0871 Level A, FCC 20780, Part 15-J Level A
Vibration & Shock, Operating	5-500 Hz; 0.03″ to 0.25G, 5G, half sine 15 msec, bottom
Vibration & Shock, Non-Operating	5-500 Hz; 0.15″ to 1.0G, 10G, half sine 15 msec, 3-axis

PHYSICAL SPECIFICATIONS

AC Input Connections	Terminal strip with (5 ea.) 6-32 screw terminals
DC Output Connections	¼×20 studs on main channel; barrier strip with (6 ea.) 6-32 screw terminals for auxiliary outputs

SAFETY

Safety Specifications	UL478 or 1950, CSA22.2 No. 220 or No. 950, EN60950

IMPORTANT NOTES

Please consult factory if requirements are not met by models listed here. Specifications are subject to change without notice.

Approvals may be pending on some models; check with factory for status.

CALL OR WRITE FOR NEW CATALOG/BINDER

Qualidyne
Lambda Group of Unitech plc

QUALIDYNE SYSTEMS, INC. 3055 Del Sol Blvd. San Diego, CA 92154
(619) 575-1100 Telex: 709 029 FAX: (619) 429-1011

300 TO 400W SINGLE & MULTI-OUTPUT, USER CONFIGURABLE SWITCHMODE POWER SUPPLIES

SERIES 4/OMEGA
2.5" × 5" × 8"-11"

FEATURES

- Up to 7 Outputs
- Isolated & Floating Outputs
- EMI Filter Meets VDE/FCC, Class B
- Meets UL, CSA, BS, IEC & EN Specs
- Wide Range User-Adjustable Outputs
- No Pre-Loading
- Low Leakage Current
- Field-Selectable 115/230VAC

AVAILABLE OPTIONS

- Input Power Fail Signal
- Global & Individual Inhibits
- Auto Current Sharing on All Outputs
- Output Good Signals
- 300VDC Back-up Input
- Side Mount I/O Connections
- In-Line I/O Connections

300 TO 400W STANDARD MODELS (Partial Listing)

Volt/Amps (Adjustment Range)

Output #1	Output #2	Output #3	Output #4
5V/60A (2-6V)			
5V/80A (2-6V)			
24V/14A (12-28V)			
5V/60A (2-6V)	**12V/12A** (5-15V)	**12V/12A** (5-15V)	
5V/60A (2-6V)	**12V/12A** (5-15V)	**12V/12A** (5-15V)	**24V/7A** (12-28V)
5V/60A (2-6V)	**12V/12A** (5-15V)	**12V/12A** (5-15V)	**12V/12A** (5-15V)
12V/24A (5-15V)	**12V/12A** (5-15V)	**5V/12A** (2-6V)	**5V/12A** (2-6V)
24V/15A (12-28V)	**12V/12A** (5-15V)	**12V/12A** (5-15V)	**5V/12A** (2-6V)

Note: Tailored Volt/Amp combinations are available due to modular construction.

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INPUT SPECIFICATIONS

AC Input Voltage Ranges	90-132/180-264VAC, externally selectable
Input Frequency (AC Units)	47-63 Hz
In-Rush Current	13A
Hold-Up Time	20 msec, min.

OUTPUT SPECIFICATIONS

Output Polarity	All units are floating
Line Regulation	0.1%, max.
Load Regulation	0.1% for 0 to 100% load change with remote sense
Transient Response	10% max. for 50% load change; recovery to <1% in 300 μsec
Minimum Load	No minimum load required
PARD, All Channels	1% measured over 50 MHz bandwidth
Temperature Coefficient	0.02%/°C max.
Current Limit	120% of rated current
Overvoltage Protection	125% of nominal output voltage; latching, individual adjustments
Reverse Voltage Protection	To 100% rated current, when fan is operating
Remote Sense	Remote sense will compensate for up to 0.5V of total load cable drop

GENERAL SPECIFICATIONS

Efficiency, Typical	75%
Turn-On Delay (Soft Start)	1 sec after input voltage applied
Dielectric Withstand	2200VDC, input-to-output
Leakage Current, Line-to-Chassis	.56 mA max. @ 264VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature Range	0-70°C
Derating, 50-70°C	Linearly to 50% at 70°C
Storage Temperature Range	-40 to +85°C
Cooling	Internal fan
Humidity	5-95% non-condensing
EMI/RFI, Conducted	VDE 0871 Level B, FCC 20780, Part 15-J Level B
Vibration & Shock, Operating	5-500 Hz; 0.03" to 0.25G, 5G half sine 15 msec, bottom
Vibration & Shock, Non-Operating	5-500 Hz; 0.15" to 1.0G, 10G half sine 15 msec, 3-axis

PHYSICAL SPECIFICATIONS

AC Input Connections	Terminal strip with (7 ea.) 6-32 screw terminals
DC Output Connections	M6 screw terminals on main channel; M4 screw terminals for auxiliary outputs; M3 screw terminals for sense connections

SAFETY

Safety Specifications	When correctly installed in a system the Series 4 will meet the requirements of UL478 or 1950, CSA22.2 No. 220 or No. 950, BS7002, BS6301, IEC950, EN60950

IMPORTANT NOTES

Please consult factory if requirements are not met by models listed here. Specifications are subject to change without notice.

Approvals may be pending on some models; check with factory for status.

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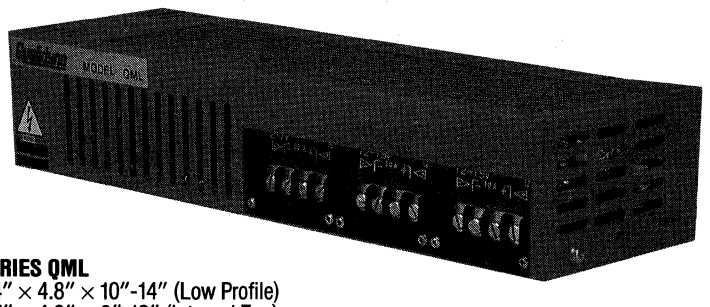
100 TO 300W MODULAR POWER SUPPLIES & DC-DC CONVERTERS



SERIES QML
2.4″ × 4.8″ × 10″-14″ (Low Profile)
6.7″ × 4.8″ × 9″-12″ (Integral Fan)

FEATURES

- AC & DC Inputs
- Up to 9 Outputs
- User Configurable
- Quickly Customized
- Low Profile Cases
- Isolated/Floating Outputs
- 2V to 100VDC Outputs
- No Preloading
- Tailored Module Combinations

AVAILABLE OPTIONS

- Power Good Signal
- Power Fail Signal
- Extended Hold-Up
- Class B RFI Filter
- Short Case with Integral Fan
- Overvoltage Protection
- Parallel Operation
- In-Rush Control
- Inhibit Control

INPUT SPECIFICATIONS

110/220VAC Input Units

Input Voltage	90-132VAC/187-264VAC
Input Frequency	47-63 Hz
Output Power	100 to 300 Watts*
In-Rush Current	18A, Peak
EMI/RFI	VDE 0871 Class A (Class B with NF option)
Efficiency	70-85% depending on configuration
Thermal Protection	Standard

48VDC Input Units

Input Voltage	38-64VDC, 48VDC nominal
Output Power	100 to 300 Watts*
In-Rush Current	20A with In-Rush Control Module
Efficiency	60-65%
Psophometric Noise Filter	Standard on 150 Watt units

General Specifications

Operating Temperature	0-70°C in free air (derating above 50°C, 2.5%/°C)
Storage Temperature	-30 to +85°C
Safety**	UL478, CSA22.2
Input Fuse	Standard
Operating Frequency	75 KHz
Start-Up Time	<0.5 sec

*Indicated power levels can be exceeded subject to ambient temperatures and forced air cooling; contact factory.
**Contact factory for other safety requirements and specifics regarding approvals.

CONTACT FACTORY FOR INFORMATION ON STANDARD MODELS CONSISTING OF THE MODULES LISTED BELOW, OR CONFIGURE YOUR OWN SUPPLY

Output Module Description

Module	Voltage	Current	Topology	Module Width (In.)
B	5-30V (30-100V)	1A (0.1A)	Linear	1.18
C	2-30V	3A	Linear	1.18
F	5-36V	4A	Switchmode	1.18
G	5-36V	4A (10A Surge for 10 sec)	Switchmode	1.18
L	2-7V	10A	Switchmode	2.36
M	2-7V	20A	Switchmode	2.36
N	10-28V	4A	Switchmode	2.36
Q	8-19V	10A	Switchmode	2.36
R	5-24V	8A	Switchmode	2.36
S	5-24V	8A (16A Surge for 10 sec)	Switchmode	2.36
X	2-7V	40A	Switchmode	2.36
Y	19-28V	10A	Switchmode	3.54
BT	Dual 12V	1.5A/0.5A	Dual Linear	1.18
CT	12V/5V	1.5A/0.5A	Dual Linear	1.18
DT	Dual 12/15V	1.0A (Each)	Dual Linear	1.18

Output Module Specifications

Module Type	L M N Q X Y	F G R S	B C	BT CT DT
Output Voltage	2-28V	5-36V	5-30V	5-15V
Adjustment	Potentiometer*	Fixed: Preset	Fixed: Preset	Fixed: Preset
Output Setting	±1%	±3%	±1%	±1%
Temperature Coefficient	0.02%/°C	0.1%/°C	0.03%/°C	0.03%/°C
Line Regulation, -15% to +10% of Nominal AC Input	.05%	1%	0.2%	0.2%
Load Regulation (0-100%, Unless Otherwise Stated)	0.1%	0.5% 10-100%; 1.5% 0-100%	B 2% C 0.1%	2%
Ripple/Noise, Pk-Pk	50 mV or 1%	1%	0.5%	0.5%
Transient Response, 50-100% Load Change	3 msec	3 msec	B 25 μsec C 50 μsec	25 μsec
Overcurrent Protection	Current Limit 110-115%	Current Limit F & R Only	Foldback** Current Limit	Thermal Foldback Current Limit
Overvoltage Protection	Option (Std. on 5V)	Option	N/A	N/A
Non-Dissipative Crowbar	Std. on 5V, Optional on Others	Option	N/A	N/A
Remote Sense (¼V Per Line)	Standard	N/A	Standard (C Only)	N/A

*Adjustment range dependent on module type.
**C module has thermal foldback current limit.

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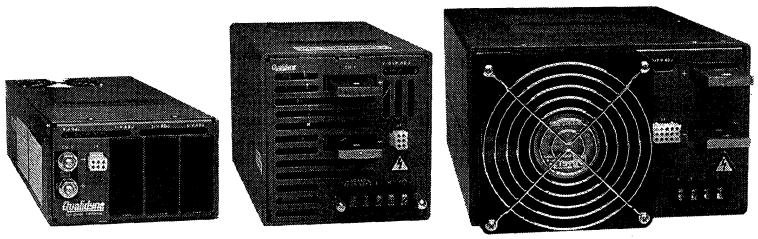
Lambda Group of Unitech plc

QUALIDYNE SYSTEMS, INC. 3055 Del Sol Blvd. San Diego, CA 92154
(619) 575-1100 Telex: 709 029 FAX: (619) 429-1011

300 TO 3000W SINGLE OUTPUT SWITCHMODE POWER SUPPLIES & DC-DC CONVERTERS



SERIES 21, 23, 28, 31 & 36
(SEE FRONT PAGES OF THIS VOLUME FOR PRODUCT LINE PHOTOS)

FEATURES

- 2V to 56VDC Outputs
- International Safety Specs
- Wide Adjustment Ranges
- Inhibit
- Input Power Fail Signal
- Three-Year Warranty
- AC (1φ or 3φ) & DC Inputs
- EMI Filter (FCC/VDE)
- DC Ball-Bearing Fan Cooled
- Margining
- Compact Cases

AVAILABLE OPTIONS

- 0.99 Power Factor Correction
- Auto Current Sharing w/Supply Fail Signal (Ideal for N+1 Redundancy)
- Output Power Good Signal
- Output Current Monitor
- Universal Input: 90-264VAC

300-3000W SINGLE OUTPUT MODELS (Partial Listing)

Series 23 3×5×14.25" **600W** (max.)	Series 21 6.5×5×10" **750W** (max.)	Series 28 5×5×11/11.5" **1000W** (max.)	Series 31 5×8×11/11.5" **1KW-2KW** (max.)	Series 36 5×8×15.5" **3000W** (max.)
2V/150A	2V/200A	2V/250A	2-4V/375A	2V/700A
5V/100A	5V/100A	5V/200A	4-6V/300A	5V/600A
12V/50A	12V/50A	12V/84A	7-12V/125A	12V/250A
24V/25A	24V/25A	24V/36A	12-28V/54A	15V/200A
48V/13A	48V/13A	48V/18A	28-56V/17A	24V/125A
2-4V/150A	2-4V/187A	2-4V/250A	2-4V/400A	28V/110A
4-6V/120A	4-6V/150A	4-6V/200A	2-6V/400A	48V/65A
7-12V/50A	7-12V/63A	7-12V/84A	7-12V/167A	–
12-28V/22A	12-28V/27A	12-28V/36A	12-28V/72A	–
28-56V/11A	28-56V/14A	28-56V/18A	28-56V/36A	–

INPUT SPECIFICATIONS

AC Input Voltage Ranges	90-132/180-264VAC, externally selectable; 180-264VAC 1φ or 3φ; universal input 90-264VAC (option)
Input Frequency (AC Units)	47-63 Hz
DC Input Voltage Range	42-56VDC
In-Rush Current, Peak	80A (max.)
Hold-Up Time	20 msec, typical

OUTPUT SPECIFICATIONS

Output Polarity	Floating
Line Regulation	0.2%, max.
Load Regulation	0.8% for 0 to 100% load change with remote sense
Transient Response	3% for 25% load change; recovery to <1% in 300 μsec
Overshoot, Turn-On	1.0%, max.
Minimum Load	No minimum load required
PARD, All Channels	1% measured over 50 MHz bandwidth
Temperature Coefficient	0.02%/°C max.
Current Limit	120% of rated current
Overvoltage Protection	125% of nominal output voltage; latching
Reverse Voltage Protection	To 100% rated current
Remote Sense	Remote sense will compensate for up to 0.5V of total load cable drop

GENERAL SPECIFICATIONS

Efficiency, Typical	75%
Turn-On Delay (Soft Start)	1 sec after input voltage applied
Dielectric Withstand	2200VDC, input-to-output
Leakage Current, Line-to-Chassis	3.5 mA max. @ 264VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature Range	0-70°C
Derating, 50-70°C	Linearly to 50% at 70°C
Storage Temperature Range	-40 to +85°C
Cooling	Internal fan
Humidity	5-95% non-condensing
EMI/RFI, Conducted	VDE 0871 Level A, FCC 20780, Part 15-J Level A
Vibration & Shock, Operating	5-500 Hz; 0.03" to 0.25G, 5G half sine 15 msec, bottom
Vibration & Shock, Non-Operating	5-500 Hz; 0.15" to 1.0G, 10G half sine 15 msec, 3-axis

PHYSICAL SPECIFICATIONS

AC Input Connections	Terminal strip with 6-32 screw terminals
DC Output Connections	¼×20 studs; 5/16×18 studs, or bus bars

SAFETY

Safety Specifications	UL478 or 1950, CSA22.2 No. 220 or No. 950, EN60950

IMPORTANT NOTES

Please consult factory if requirements are not met by models listed here. Specifications are subject to change without notice.

Approvals may be pending on some models; check with factory for status.

BABT

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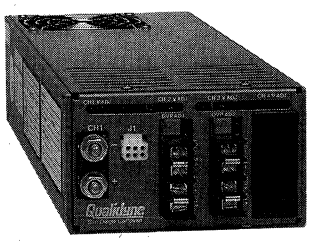
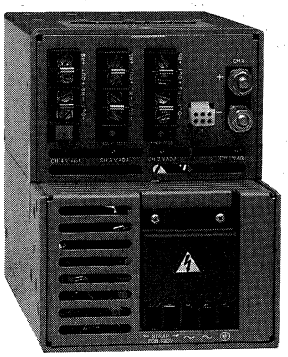
CALL OR WRITE FOR NEW CATALOG/BINDER

QUALIDYNE SYSTEMS, INC. 3055 Del Sol Blvd. San Diego, CA 92154
(619) 575-1100 Telex: 709 029 FAX: (619) 429-1011

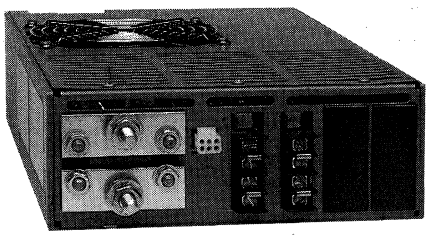
600 TO 2500W MULTIPLE OUTPUT, MODULAR SWITCHMODE POWER SUPPLIES & DC-DC CONVERTERS



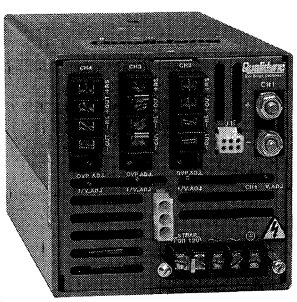
SERIES 23/33
600 WATTS
3″ × 5″ × 14.25″
750 WATTS
4″ × 5″ × 14.25″



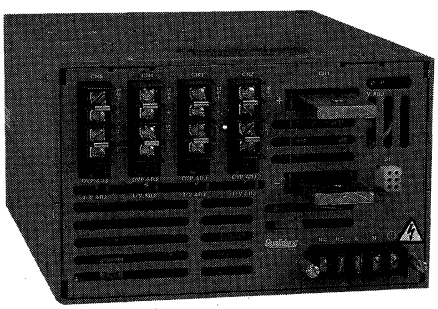
SERIES 21
TO 750 WATTS
6.5″ × 5″ × 10″



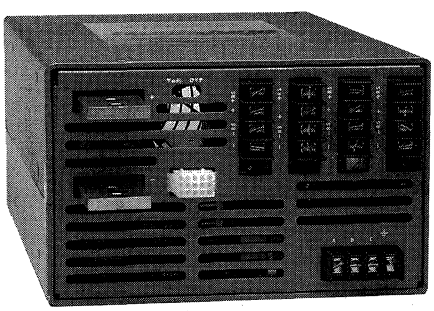
SERIES 34
1000 WATTS
3″ × 8″ × 14.25″



SERIES 28
TO 1000 WATTS
5″ × 5″ × 11″/11.5″



SERIES 31
1000-2000 WATTS
5″ × 8″ × 11″/11.5″
5″ × 8″ × 12.5″ w/PFC



SERIES 36
2500-3000 WATTS
5″ × 8″ × 13.75″/15.5″

FEATURES

- 2V to 56VDC Outputs
- Up to 9 Outputs
- International Safety Specs
- Wide Adjustment Ranges
- Inhibit
- Input Power Fail Signal
- Three-Year Warranty
- AC (1φ or 3φ) & DC Inputs
- EMI Filter (FCC/VDE)
- DC Ball-Bearing Fan Cooled
- Margining (Main)
- Compact Cases

AVAILABLE OPTIONS

- 0.99 Power Factor Correction
- Auto Current Sharing w/Supply Fail Signal (Ideal for N+1 Redundancy)
- Output Power Good Signal
- Output Current Monitor (Main)
- Universal Input: 90-264VAC

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600 TO 2500W MULTIPLE OUTPUT, MODULAR SWITCHMODE POWER SUPPLIES & DC-DC CONVERTERS

STANDARD MODELS (Select Any 3, 4, or 5 Outputs)

Total Power (max.) (Series)	Output #1 (Main)	Output #2	Output #3	Output #4	Output #5
650W (21, 23, 28)	5V/80A	12-15V/10A	12-15V/5A	5V/5A	24V/5A
	5V/80A	12-15V/10A	12-15V/10A	5V/5A	24V/5A
	5V/80A	12-15V/20A	12-15V/10A	5V/5A	24V/5A
750W (21, 28, 33)	5V/100A	12-15V/10A	12-15V/10A	5V/5A	24V/5A
1000W (28)	5V/120A	12-15V/20A	12-15V/10A	5V/5A	24V/5A
1000W (31, 34)	5V/150A	12-15V/20A	12-15V/10A	5V/10A	24V/5A
	5V/150A	12-15V/20A	12-15V/20A	5V/10A	24V/10A
	5V/150A	12-15V/20A	12-15V/10A	5V/20A	24V/10A
1500W (31)	5V/200A	12-15V/20A	12-15V/10A	5V/10A	24V/5A
	5V/200A	12-15V/20A	12-15V/20A	5V/10A	24V/10A
	5V/200A	12-15V/30A	12-15V/10A	5V/20A	–
2500W (36)	5V/400A	12-15V/20A	12-15V/10A	5V/10A	24V/5A
	5V/400A	12-15V/20A	12-15V/20A	5V/10A	24V/10A
	5V/400A	12-15V/30A	12-15V/10A	5V/20A	–
Partial Listings, Consult Factory for Other Volt/Amp Combinations					

WIDE ADJUSTMENT RANGE MODELS (Select Any 3, 4, or 5 Outputs)

Total Power (max.) (Series)	Output #1 (Main)	Output #2	Output #3	Output #4	Output #5
750W (21, 23, 33)	5V/80A	5-15V/15A	5-24V/10A	5-24V/10A	–
	5V/80A	5-24V/10A	5-24V/10A	5-24V/10A	–
	5V/100A	5-24V/10A	5-24V/5A	5-24V/5A	–
	5V/100A	5-15V/20A	5-15V/20A	5-24V/10A	–
1000W (28)	5V/120A	5-15V/20A	5-15V/20A	5-24V/10A	–
1000W (31, 34)	5V/150A	5-15V/20A	5-15V/20A	5-24V/10A	5-24V/10A
1500W (31)	5V/200A	5-15V/20A	5-15V/20A	5-24V/10A	5-24V/10A
2500W (36)	5V/400A	5-15V/20A	5-15V/20A	5-24V/10A	5-24V/10A
	5V/400A	5-15V/20A	5-24V/10A	5-24V/10A	5-24V/10A
Partial Listings, Contact Factory for Other Volt/Amp Combinations					

INPUT SPECIFICATIONS

AC Input Voltage Ranges	90-132/180-264VAC, externally selectable; 180-264VAC 1φ or 3φ; universal input 90-264VAC (option)
Input Frequency (AC Units)	47-63 Hz
DC Input Voltage Range	42-56VDC
In-Rush Current, Peak	80A (max.)
Hold-Up Time	20 msec, typical

OUTPUT SPECIFICATIONS

Output Polarity	All outputs are floating
Line Regulation	0.2%, max.
Load Regulation	0.8% for 0 to 100% load change with remote sense
Transient Response	3% for 25% load change; recovery to <1% in 300 μsec
Overshoot, Turn-On	1.0%, max.
PARD, All Channels	1% measured over 50 MHz bandwidth
Temperature Coefficient	0.02%/°C max.
Current Limit	120% of rated current
Overvoltage Protection	125% of nominal output voltage; latching
Reverse Voltage Protection	To 100% rated current
Remote Sense	Remote sense will compensate for up to 0.5V of total load cable drop

GENERAL SPECIFICATIONS

Efficiency, Typical	75%
Turn-On Delay (Soft Start)	1 sec after input voltage applied
Dielectric Withstand	2200VDC, input-to-output
Leakage Current, Line-to-Chassis	3.5 mA max. @ 264VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature Range	0-70°C
Derating, 50-70°C	Linearly to 50% at 70°C
Storage Temperature Range	-40 to +85°C
Cooling	Internal fan
Humidity	5-95% non-condensing
EMI/RFI, Conducted	VDE 0871 Level A, FCC 20780, Part 15-J Level A
Vibration & Shock, Operating	5-500 Hz; 0.03" to 0.25G, 5G half sine 15 msec, bottom
Vibration & Shock, Non-Operating	5-500 Hz; 0.15" to 1.0G, 10G half sine 15 msec, 3-axis

PHYSICAL SPECIFICATIONS

AC Input Connections	Terminal strip with 6-32 screw terminals
DC Output Connections	¼×20 studs; 5/16×18 studs, or bus bars on main outputs; terminal strip with 6-32 screw terminals on each auxiliary module

SAFETY

Safety Specifications	UL478 or 1950, CSA22.2 No. 220 or No. 950, EN60950

IMPORTANT NOTES

Please consult factory if requirements are not met by models listed here. Specifications are subject to change without notice.

Approvals may be pending on some models; check with factory for status.

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MICROWAVE & ELECTRONICS INC.
Subsidiary of Esco Electronics Corp.

1173 LOS OLIVOS AVE.
LOS OSOS, CA. 93402

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HIGH VOLTAGE POWER SUPPLIES FOR ALL CRT APPLICATIONS

◆◆◆WHEN IMAGE COUNTS◆◆◆

STANDARD AND CUSTOM DESIGNS

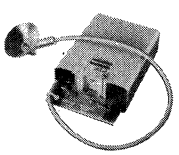
COMMERCIAL
For monochrome and color CRT computer displays, as well as graphics workstations, CAD/CAE systems, medical equipment, phototypesetting, film recorders and projection equipment, or other applications.

MILITARY
For applications ranging from submarine to space shuttle. Whether shipboard, battlefield or avionics, our technology has been tested and qualified to the extremities of military ranges.

RUGGEDIZED
For higher tech yet low cost applications, requiring semi-stringent environments. Especially suitable for commercial avionics, industrial programs, or foreign military not bound by full mil-spec requirements.

Founded in 1971, Rantec Division (formerly PTK) has the experience and technology, as well as the support of our parent company, Esco Electronics Corp., to provide the most sophisticated, highest quality high voltage power supplies in the industry. Our dedicated business team is committed to that extra effort to "make things happen" in support of your program needs. There is no better choice for standard or custom high voltage power supplies than Rantec. For further technical information, please contact us.

LCC Series Low Cost Commercial HVPS



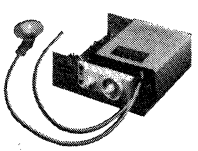
FEATURES:
- Extremely low cost
- Designed for high volume production
- UL recognized, CSA, TUV certifiable
- Overvoltage safety circuit (DHHS compliant)
- High quality, MTBF >100,000 hrs.
- 2kV to 20kV at up to 10 watts, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: Fixed output specified from 2kV to 20kV ±3% @ up to 10 watts maximum all outputs
- **Aux #1**: Specified −1kV to +1kV ±10% @ up to 1mA
- **Aux #2**: Specified −1kV to +1kV ±10% @ up to 1mA
- Input: +24V ±1.2Vdc (options available)
- Low ripple <5V p-p (C_L = 1500pf), Low RFI
- Tightly regulated .3% line, .1% load

MECHANICAL SPECS:
Size: 5.10" x 3.12" x 1.4" Weight: <.9 lbs.
Material: Aluminum Finish: None or Clear Irridite

ENVIRONMENTAL SPECS:
Operating Temp: 0 to +60°C case Storage Temp: −35°C to +85°C
Operating Altitude: 0 to 10,000 ft. Humidity: 0 to 95% non-condensing

CDC Series Color Display Commercial HVPS



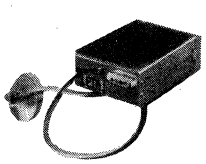
FEATURES:
- Extremely low cost
- UL & CSA recognized, TUV Certifiable
- Overvoltage safety circuit (DHHS compliant)
- High quality, MTBF >68,000 hrs.
- Low ripple, tightly regualted
- 18kV to 30kV @ 1.2mA, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: 25kV adjustable ±1kV @ 0-1.2mA
- **Focus**: 19-29% or 22-34% of anode @ ±15µA
- **G2**: 0-825V or 200-1kV @ ±5µA • **G1**: −200V ±10% @ 1mA
- **Amp B+ output**: +400V ±10% @ 3mA • **DF Input**: 500V max/40Hz to 250kHz
- Input: +26V ±3Vdc (options available)
- Remote On/Off—TTL compatible
- Optional Anode Monitor or Beam Current Sense

MECHANICAL SPECS:
Size: 6.0" x 5.0" x 1.75" Weight: <1.8 lbs.
Material: Aluminum Finish: Line Grain

ENVIRONMENTAL SPECS:
Operating Temp: 0 to +65°C case Storage Temp: −35°C to +90°C
Operating Altitude: 0 to 10,000 ft. Humidity: 0 to 95% non-condensing

ULC Series Commercial HVPS



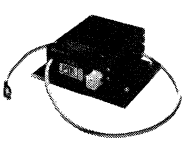
FEATURES:
- Low cost
- UL recognized, CSA, TUV Certifiable
- High quality, MTBF >100,000 hrs.
- Low ripple, tightly regualted
- Optional overvoltage protection and remote on/off
- 2kV to 20kV at up to 10 watts, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: Specified from 2kV to 20kV adjustable ±5% @ up to 10 watts maximum total all outputs
- **Aux #1**: Specified −1kV to +1kV ±10% @ up to 1mA
- **Aux #2**: Specified −1kV to +1kV ±10% @ up to 1mA
- Input: +26Vdc ±10% (options available)
- Low ripple • Tightly regulated • Low RFI

MECHANICAL SPECS:
Size: 4.13" x 3.16" x 1.37" Weight: <.9 lbs.
Material: Aluminum Finish: None or Black Anodized

ENVIRONMENTAL SPECS:
Operating Temp: 0 to +65°C case Storage Temp: −35°C to +85°C
Operating Altitude: 0 to 10,000 ft. Humidity: 0 to 95% non-condensing

DFC Series Dynamic Focus Commercial HVPS



FEATURES:
- Internal Dynamic Focus Amplifier
- 300V p-p modulation
- DC to 200kHz bandwidth
- Local and remote trim, or fully remote
- Remote on/off
- 2kV to 5.2kV @ up to 600µA
- Other options available

ELECTRICAL SPECS:
- **Focus Voltage**: Specified 2kV to 5.2kV @ up to 600µA
- Local Adjustment: ±15%
- Remote Adjustment: ±3% or ±18% (no local)
- Input: +24Vdc ±10% (options available)
- **Dynamic Focus Amplifier:** Input 0-10V, Output 10-300V
- Low ripple • Tightly regulated
- UL recognized

MECHANICAL SPECS:
Size: Power Supply 4.13" x 3.16" x 1.37" Weight: Approx. 1.2 lbs.
Base Plate 4.13" x 5.00" x 0.34"
Material: Aluminum Finish: Black Anodized

ENVIRONMENTAL SPECS:
Operating Temp: 0 to +65°C case Storage Temp: −35°C to +85°C
Operating Altitude: 0 to 10,000 ft. Humidity: 0 to 95% non-condensing

Rantec reserves the right to change specifications at any time without prior notice. It is Rantec's policy to improve products as new techniques and components become available.

rantec®
MICROWAVE & ELECTRONICS INC.
Subsidiary of Esco Electronics Corp.

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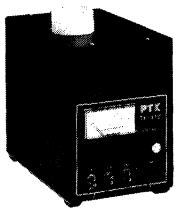
TF Series Testers for HVPS



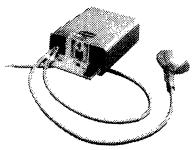
FEATURES:
- HVPS testers suitable for incoming inspection testing
- Continuously adjustable loads with pulse load capability
- 4½ or 5½ digit DVM readout
- Calibrated with NBS traceability, .5% accuracy
- Output for ripple and transient measurements
- 500V to 27.5kV at up to 3mA, option to 30kV
- Other options available

ELECTRICAL SPECS:

Model	Voltage Range	Load Current
TF-112	+5kV to +27.5kV	1.5mA
TF-113	+5kV to +27.5kV	3.0mA
TF-114	+500V to 7.5kV	3.0mA

MECHANICAL SPECS:
Size: 10" x 6" x 8" Weight: Approx. 7 lbs.
Material: Aluminum Finish: Black anodized

LFC Series Low Cost Commercial HVPS



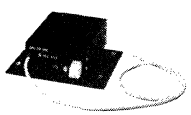
FEATURES:
- Extremely low cost
- Designed for high volume production
- UL recognized, CSA, TUV certifiable
- Overvoltage safety circuit (DHHS compliant)
- High quality, MTBF >100,000 hrs.
- 2kV to 20kV at up to 10 watts, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: Fixed output specified from 2kV to 20kV ±3% at up to 10 watts maximum total all outputs
- **Focus**: Specified up to 50% of anode ±10% at up to 50μA
- **Aux #1**: Specified −1kV to +1kV ±10% @ up to 1mA
- **Aux #2**: Specified −1kV to +1kV ±10% @ up to 1mA
- Input: +24V ±1.2Vdc • Low ripple • Tightly regulated • Low RFI

MECHANICAL SPECS:
Size: 5.10" x 3.12" x 1.4" Weight: < 1 lb.
Material: Aluminum Finish: None or Clear Irridite

ENVIRONMENTAL SPECS:
Operating Temp: 0 to +60°C case Storage Temp: −35°C to +85°C
Operating Altitude: 0 to 10,000 ft. Humidity: 0 to 95% non-condensing

DFI Series Dynamic Focus Ruggedized HVPS



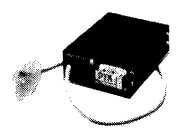
FEATURES:
- "Ruggedized" for avionics or industrial applications
- Internal dynamic focus amplifier
- 300V p-p modulation
- DC to 200kHz
- Local and remote trim, or fully remote; and on/off
- 2kV to 5.2kV at up to 600μA
- Other options available

ELECTRICAL SPECS:
- **Focus Voltage:** Specified 2kV to 5.2kV @ up to 600μA
- Local Adjustment: ±15% • Remote Adjustment: ±3% or ±18% (no local)
- Input: +24Vdc ±10% (options available)
- **Dynamic Focus Amplifier:** Input 0-10V, Output 10-300V
- Low ripple • Tightly regulated
- UL recognized

MECHANICAL SPECS:
Size: Power Supply 4.13" x 3.16" x 1.37" Weight: Approx. 1.2 lbs.
Baseplate 4.13" x 5.00" x 0.34"
Material: Aluminum Finish: Black anodized

ENVIRONMENTAL SPECS:
Operating Temp: −40°C to +85°C case Storage Temp: −40°C to +95°C
Operating Altitude: 0 to 30,000 ft. Humidity: 0 to 95% non-condensing

ULI Series Ruggedized HVPS



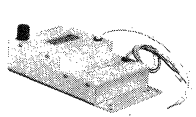
FEATURES:
- Low cost
- "Ruggedized" for avionics or industrial applications
- Light weight, only 1 lb.
- Low ripple, tightly regulated
- Optional overvoltage protection and remote on/off
- 2kV to 20kV at up to 10 watts, multiple outputs
- Other applications available

ELECTRICAL SPECS:
- **Anode**: Specified from 2kV to 20kV adjustable ±5% @ 10 watts maximum total all outputs
- **Aux #1**: Specified −1kV to +1kV ±10% @ up to 1mA
- **Aux #2**: Specified −1kV to +1kV ±10% @ up to 1mA
- Input: +26Vdc ±10% (options available)
- Low ripple • Tightly regulated • Low RFI

MECHANICAL SPECS:
Size: 4.13" x 3.16" x 1.37" Weight: < .9 lbs.
Material: Aluminum Finish: Black anodized

ENVIRONMENTAL SPECS:
Operating Temp: −40°C to +85°C case Storage Temp: −40°C to +95°C
Operating Altitude: 0 to 30,000 ft. Humidity: 0 to 95% non-condensing

SMI-18-01 Shadow Mask Ruggedized HVPS



FEATURES:
- Compact size, lightweight
- Sophisticated performance to power hi-res color displays
- "Ruggedized" for use in general aviation pilot displays
- Internal dynamic focus
- Low ripple, tightly regulated
- 18kV @ 600μA, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: 18kV adjustable ±500V @ 600μA
- **Focus**: Adjustable 25% to 31% of anode @ ±15μA
- **G2**: +400V ±10% @ up to 1mA • **G1**: −100V ±10% @ up to 1mA
- **Dynamic Focus:** −600V @ 5V input (TTL) • Input: +28.5V ±4.5V
- Low ripple • Tightly regulated
- Reverse voltage protection

MECHANICAL SPECS:
Size: Approx. 4.96" x3.15" x 1.23" Weight: Approx. 1 lb.
Material: Aluminum Finish: None

ENVIRONMENTAL SPECS:
Operating Temp: −25°C to +70°C case Storage Temp: −40°C to +90°C
Operating Altitude: 0 to 55,000 ft. Humidity: 0 to 95% non-condensing

SMI-14-01 Shadow Mask Ruggedized HVPS

FEATURES:
- Extremely compact size, lightweight
- Sophisticated performance to power hi-res color displays
- "Ruggedized" for use in general aviation pilot displays
- Four outputs, including adjustable anode, focus & G2
- Remote on/off
- 14kV @ 1.2mA, multiple outputs

ELECTRICAL SPECS:
- **Anode**: +14.0kV adjustable @ .45mA average, 1.2mA peak
- **Focus**: Adjustable +3.0kV to +4.2kV @ ±15μA
- **G2**: Adjustable +180V to +510V @ ±5μA
- **G1**: Adjustable −130V @ 0-800μA
- Input +15V ±1V @ 2A • Tightly regulated • Low ripple
- Remote on/off — TTL Compatible

MECHANICAL SPECS:
Size: Approx. 3.62" x 4.83" x 1.26" Weight: Approx. .75 lb.
Material: Aluminum Finish: Line Grain

ENVIRONMENTAL SPECS:
Operating Temp: −20°C to +75°C case Storage Temp: −55°C to +85°C
Operating Altitude: 0 to 55,000 ft. Humidity: 0 to 95% non-condensing

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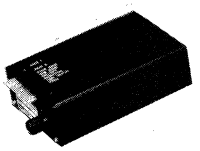
GPM Series General Purpose Military HVPS



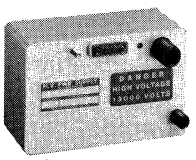
FEATURES:
- Full military qualified, JANTX components
- Compact size and lightweight
- Low ripple, tightly regulated
- MTBF 35,000 hours
- Remote on/off, HV Monitor
- 2kV to 18kV at up to 20 watts, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: Specified 2kV to 18kV ±5% @ up to 1mA
- **Aux #1**: Specified −1kV to +1kV ±10% @ up to 1mA
- **Aux #2**: Specified −1kV to +1kV ±10% @ up to 1mA
- HV monitor: .1% of output, ±3% accuracy
- Input: +28V ±2Vdc @ up to 1.4A
- Low ripple <15V p-p (C_L = ϕ)
- Tightly regulated, .03% line, .01% load
- Excellent transient response, low tempco

MECHANICAL SPECS:
Size: 4.88" x 3.13" x 1.50" — Weight: Approx. 1.5 lbs.
Material: Aluminum — Finish: Black Anodized

ENVIRONMENTAL SPECS:
Operating Temp: −55 to + 85°C case — Storage Temp: −65 to +100°C
Operating Altitude: 0 to 50,000 ft. — Humidity: 0 to 95% non-condensing

M213-10 Military HVPS



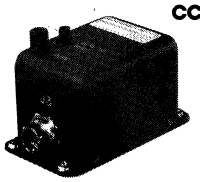
FEATURES:
- Full military qualified for avionics HUD
- Mature product, manufactured for over 10 years
- Compact size, lightweight
- Short circuit, overvoltage, overtemperature protection
- BIT indicator, Remote on/off
- 12.5kV @ 625µA, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: 12.5kV adjustable ±500V @ 625µA
- **Focus**: +500V ±30V @ 50µA • Input: +26.5V ±10% @ 500mA
- Tightly regulated • Low ripple • Remote on/off (TTL)
- Built-in-test (BIT) indicator
- Short circuit, overvoltage and overtemperature protection
- Optional reverse voltage protection (Model M213-11)

MECHANICAL SPECS:
Size: 3.81" x 2.44" x 1.73" — Weight: <1 lb.
Material: Aluminum — Finish: Clear Anodized

ENVIRONMENTAL SPECS:
Operating Temp: −54°C to +85°C case — Storage Temp: −65°C to +125°C
Operating Altitude: 0 to 70,000 ft. — Humidity: 0 to 95% non-condensing

CCM-07-01 Military HVPS



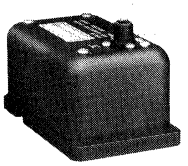
FEATURES:
- Full military qualified for Hi-res CRT displays
- Mature product, over 5,000 manufactured
- Compact size, lightweight
- Internal dynamic focus amplifier
- Tightly regulated, low ripple
- 7kV @ 50µA, multiple outputs

ELECTRICAL SPECS:
- **Anode**: 7kV ±1% @ 0 to 50µA
- **Focus**: Adjustable +1175V to +1450V @ 0-500µA
- **G2**: +300V ±3% @ 0-20µA • **G1**: −125V @ 0-5mA
- Input: ±15V ±2% @ .26A • **DF amplifier**: 0-46V p-p
- Tightly regulated • Low ripple
- Short circuit and arc protection

MECHANICAL SPECS:
Size: 4.38" x 3.81" x 2.68" — Weight: <1.5 lbs.
Material: Aluminum — Finish: Black Anodized

ENVIRONMENTAL SPECS:
Operating Temp: −32°C to +60°C — Storage Temp: −51°C to +71°C
Operating Altitude: 0 to 10,000 ft. — Humidity: 0 to 95% non-condensing

CCM-11-02 Military HVPS



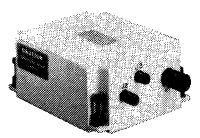
FEATURES:
- Full military qualified, JANTX components
- Humidity sealed for stand-alone testing
- Compact size, lightweight
- Remote on/off, short circuit, arc and reverse voltage protection
- Anode and Focus voltage monitors
- 11kV @ 110µA, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: 11kV ±5% @ 110µA • Anode Monitor: 1000:1
- **Focus**: +300V ±10% @ 50µA • Focus Monitor: 100:1
- Input: +28Vdc ±10% @ 375mA • Remote On/Off: 5.2Vdc = on
- Grid Sense: −40V to −50V = on • Full protection circuitry

MECHANICAL SPECS:
Size: 4.9" x 2.9" x 2.5" — Weight: <1.5 lbs.
Material: Aluminum — Finish: Black Anodized

ENVIRONMENTAL SPECS:
Operating Temp: −30°C to +75°C ambient — Storage Temp: −55°C to +100°C
Operating Altitude: 0 to 70,000 ft. — Humidity: 240 hours @ up to 100% condensing

CCM-20-17B/1 Military HVPS



FEATURES:
- Full military qualified for avionics displays
- Compact size, lightweight
- Adjustable anode, focus and G2
- Internal dynamic focus amplifier
- Output monitors, remote on/off, overheat indicator
- 20kV @ 1.5mA, multiple outputs

ELECTRICAL SPECS:
- **Anode**: 20kV adjustable ±2% @ 1.5mA
- **Focus**: 5kV adjustable ±1kV @ 750µA
- **G2**: +500V adjustable ±100V @ 50µA • **G1**: −100V @ 2 to 25mA
- **DF Amplifier**: 0 to 300V p-p
- Input: +30V ±5% @ 2.7A
- Tightly regulated • Low ripple
- TTL remote on/off • Overheat indicator

MECHANICAL SPECS:
Size: Approx. 4.32" x 3.49" x 1.81" — Weight: Approx. 1.25 lbs.
Material: Aluminum — Finish: Clear Anodize

ENVIRONMENTAL SPECS:
Operating Temp: −55°C to +71°C case — Storage Temp: −55°C to +71°C
Operating Altitude: 0 to 35,000 ft. — Humidity: 0 to 95% non-condensing

CMM-27-01 Military HVPS

FEATURES:
- Full military qualified for avionics color CRT displays
- Independently adjustable dual focus outputs
- Internal dynamic focus amplifier, 530V p-p
- Remote on/off, remote focus controls, BIT circuit (all outputs)
- Short circuit and overvoltage protection
- 27kV @ 700µA, multiple outputs
- Other options available

ELECTRICAL SPECS:
- **Anode**: 27kV ±1% @ 700µA
- **Focus #1**: Adjustable 4.5kV to 7kV @ ±15µA
- **Focus #2**: Adjustable 4.5kV to 7kV @ ±15µA
- **G2**: Adjustable +350V to +750V @ ±15µA • **G1**: −200V ±5% @ 1mA
- **DF Amplifier**: 530V p-p modulated upon Focus #2
- Input: +24V ±2.4V @ 3A • Remote Focus: ±500V

MECHANICAL SPECS:
Size: 9.1" x 7.9" x 1.5" — Weight: <5.5 lbs.
Material: Aluminum — Finish: Gold Chemical Conversion Coating

ENVIRONMENTAL SPECS:
Operating Temp: −54°C to +71°C case — Storage Temp: −57°C to +85°C
Operating Altitude: 0 to 50,000 ft. — Humidity: 240 hours up to 100% condensing

Rantec reserves the right to change specifications at any time without prior notice. It is Rantec's policy to improve products as new techniques and components become available.

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
Encapsulation, Miniglossary **C**•1126
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **C**•1601
Fiber Optics, Miniglossary **B**•1224
Fiber Optics, Product Selection Guide **B**•1214
Filters, Power, Product Selection Guide **A**•1609
Filters, Signal, Product Selection Guide **A**•1651
Instruments, Test & Measuring, Product Selection Guide **D**•1207
Interconnection Systems, Product Selection Guide **C**•1678
Keyboards & Keypads, Product Selection Guide **B**•1794
Lamps, Lights, & Indicators, Product Selection Guide **B**•1135
Logofinder & Trademark Directories **C**•901
Microwave Components, Product Selection Guide **A**•1746
Military Qualified Products List **B**•1002
Motors, Drives, & Rotating Components, Product Selection Guide **B**•1233
Opto Semiconductors, Miniglossary **B**•1334
Oscilloscopes, Product Selection Guide **D**•1406
Panel Hardware, Product Selection Guide **C**•1582
Panel Meters, Analog & Digital, Product Selection Guide **D**•1340
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **A**•2013
Power Supplies, Miniglossary **D**•1522, **D**•2184
Power Supplies, AC, Product Selection Guide **D**•2146
Power Supplies, DC, Product Selection Guide **D**•1501
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **B**•1347
Relay Contact Forms **B**•1550
Relays, Electromechanical, Miniglossary **B**•1449
Relays, Product Selection Guide **B**•1397
Resistor Color Codes **A**•1924
Resistors, Product Selection Guide **A**•1835
Servo Components, Miniglossary **B**•1270, **D**•2244
SI Units, Basic Guide To, **A**•2080, **B**•1666, **C**•1362, **D**•2246
Solenoids, Product Selection Guide **B**•1614
Switches, Product Selection Guide **B**•1639
Symbols—International Authorities **A**•1139, **B**•1024, **C**•1156, **D**•1090
Thermal Components, Product Selection Guide **B**•1831
Thermal Conductivity of Dielectrics at Room Temperature **C**•1709
Thyristors/High Power Diodes, Miniglossary **A**•1728, **A**•2084
Timers, Miniglossary **B**•1409, **D**•1149
Trademark & Logofinder Directories **C**•901
Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

Resonant Power Technology, Inc.

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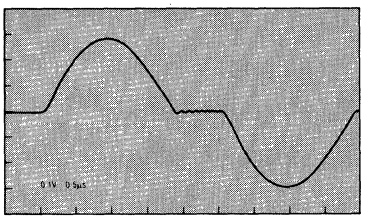
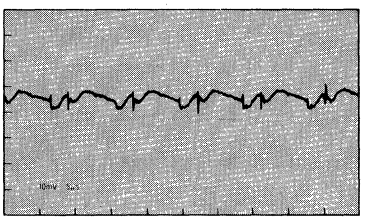
800-767-6715 • FAX (408) 982-0210

The Future is Now... True Series Resonant Technology Today

Technology and Determination: Resonant Power Technology is an industry leader in the design and manufacture of high technology switching power supplies. In 1985, the founders of RPT began their work towards developing the first commercially available, off-line, series resonant switching power supply. Series resonance provided a smaller, lighter, highly reliable and quieter (both in EMI and output noise & ripple) product that also was able to produce significant surge currents.

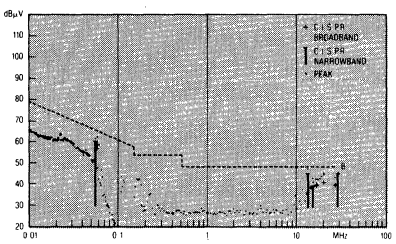


Resonant Circuit Sinusoidal Current Waveform



12 Volt Output Noise Waveform

Radio-Interference Voltages
frequency range: 0.01–30 MHz



RP-130
Series Performance Against
VDE Class B Limits

■ Series resonance offers a number of performance advantages. Switching sinusoidal currents at the zero cross-over point elminates the peak switching stress, typically in the multiple kilowatt region, experienced by pulse width modulated products. Very low switching stress combined with inherent peak current limiting and thermal limiting circuitry results in a power converter whose durability exceeds that indicated by calculated MTBF's in excess of 80,000 hours. RPT's products have been designed using premium quality components derated conservatively thereby enhancing the reliability of its series resonant topology.

■ The sinusoidal current waveform generated by the resonant circuit produces lower RFI/EMI and output noise than conventional square wave converters, due to the substantial reduction in the rate of current change i.e. di/dt. FCC and VDE Class B levels are achieved without use of external filtering on all RPT power supplies. Output ripple levels typcially achieved only by linear power supplies (20 mVolts peak to peak on all outputs) are also a by-product of the series resonant technology.

■ Higher switching frequencies allow the use of smaller passive components resulting in overall size reductions of 2 or 3:1 as compared with conventional switching power supplies. RPT's products typically offer power densities greater than 3.5 Watts/cubic inch.

■ Resonant Power's product line is based upon resonant modules of 130 and 230 Watts offered in single or multiple output versions. A unique characteristic of the resonant converter is its ability to share power equally when placed in a master/slave relationship. RPT has designed and manufactured custom power supplies offering in excess of 600 Watts and 7 outputs utilizing parallel converters. RPT encourages custom designs and offers a broad range of options including power fail detect, power good signal, remote shut down and individual output voltage margining circuits in order to satisfy its customers' individual requirements.

Resonant Power Technology, Inc.

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SPECIFICATION TABLE

RPT MODEL NUMBER	OUTPUT 1 VOLTS dc @ AMPERES	OUTPUT 2 VOLTS dc @ AMPERES	OUTPUT 3 VOLTS dc @ AMPERES	OUTPUT 4 VOLTS dc @ AMPERES	OPERATING FREE AIR @ 40 C	TEMPERATURE FORCED AIR @ 40 C w/200 LFM	OUTPUT POWER 190/85 VAC	VS. 200/100 VAC	LINE VOLTAGE 220/110 VAC	AC POWER FAIL DETECT OPTIONAL	DC POWER GOOD DETECT OPTIONAL	FORM FACTOR
RP-120	12@0-10A				80 W	120 W	100 W	110 W	135 W			5.8″×3.1″×1.5″
	13@0-9.2A				80 W	120 W	100 W	110 W	135 W			
	14@0-8.5A				80 W	120 W	100 W	110 W	135 W			
	15@0-8A				80 W	120 W	100 W	110 W	135 W			
	16@0-7.5A				80 W	120 W	100 W	110 W	135 W			
	17@0-7A				80 W	120 W	100 W	110 W	135 W			
RP-120/2	+12@0-8A	+5@0.4A			80 W	120 W	100 W	110 W	120 W	OUTPUT VOLTAGE MARGINING OPTIONAL		7.4″×3.6″×1.6″
RP-130/3	+12@0-8A	+5@0-12A	−12@0-1A		80 W	130 W	100 W	110 W	135 W			7.4″×3.1″×1.6″
RP-130/4	+12@0-8A	+5@0-12A	−12@0-1A	−5@0-1A	80W	130 W	100 W	110 W	135 W		■	6.1″×4.9″×2.1″
RP-230	12@0-20A				120 W	230 W	200 W	220 W	300 W			6.3″×4.9″×2.1″
	13@0-17.5A				120 W	230 W	200 W	220 W	300 W			
	14@0-16.5A				120 W	230 W	200 W	220 W	300 W			
	15@0-15.2A				120 W	230 W	200 W	220 W	300 W			
	16@0-14.2A				120 W	230 W	200 W	220 W	300 W			
	17@0-13.5A				120 W	230 W	200 W	220 W	300 W			
RP-230/2	+12@0-9A	+5@0-20A			120 W	230 W	200 W	220 W	300 W			6.3″×4.9″×2.1″
RP-230/3	+12@0-9A	+5@0-20A	−12@0-1A		120 W	230 W	200 W	220 W	300 W			6.3″×4.9″×2.1″
RP-230/4	+12@0-9A	+5@0-20A	−12@0-1A	−5@0-1A	120 W	230 W	200 W	220 W	300 W	■	■	6.3″×4.9″×2.1″
RP-440/4	+12@0-10A	+5@0-20A	−12@0-10A	−5@0-20A	280 W	440 W	400 W	440 W	600 W			11.5″×5.0″×2.1″

INPUT

Input Specifications

Input Voltage Range (Internally Selectable) . . . . . 95–132 VAC or 190–264 VAC
Input Frequency . . . . . 47–440 Hz
Input Protection . . . . . Internal Fuse
Inrush Current Limit: 80–130 watts (117 VAC/230 VAC) . . . . . 20A max/40A max
140–230 (117 VAC/230 VAC) . . . . . 20A max/40A max
Input EMI Filter: . . . . . FCC Class B std
VDE Class B opt
Universal Input . . . . . Optional
Power Factor Correction . . . . . Optional

OUTPUT

Output Specifications

Line/Load Regulation (Outputs 1&2) . . . . . 1% nominal
(Outputs 3&4) . . . . . 3% nominal
Ripple all outputs . . . . . 20mV peak-to-peak
Hold-Up Time . . . . . 30 mSec
Temperature Coefficient . . . . . 0.05%/degree C
Overload Protection . . . . . Fold back with automatic recovery
Thermal Protection . . . . . Fold back with automatic recovery
Overvoltage Protection . . . . . 6.2±0.6 Volts crowbar on the +5 Vdc Output
14.0±1.0 Volts crowbar on the +12 Vdc Output*
Power Good Signal . . . . . Signal given when: +5 Vdc 4.6–4.9 Vdc
−5 Vdc −4.3–4.7 Vdc
+12 Vdc 10.8–11.8 Vdc
−12 Vdc −10.4–11.2 Vdc
AC Power Fail Detect . . . . . To customer specification

Environmental Specifications

Operating Temperature Range: . . . . . 0°C to 70°C
Storage Temperature . . . . . −25°C to 75°C

General Specifications

Transient Response . . . . . 500 µsec to settle to within 1% of the final value after a 25% load step
Frequency . . . . . 250 kHz Resonant Frequency
Conversion Method . . . . Series Resonant circuit switching sinusoidal currents in zero current mode

Specifications subject to change without notice. **RP-230 Series only*

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

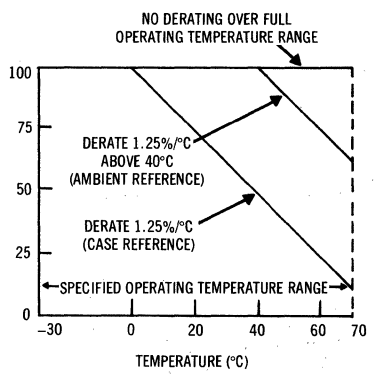

Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

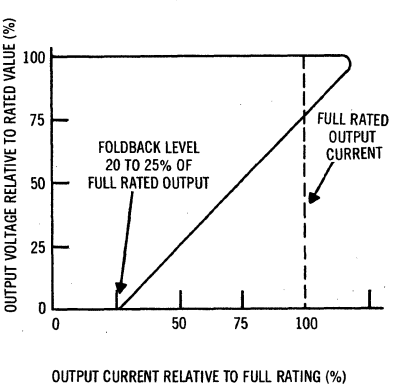

Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

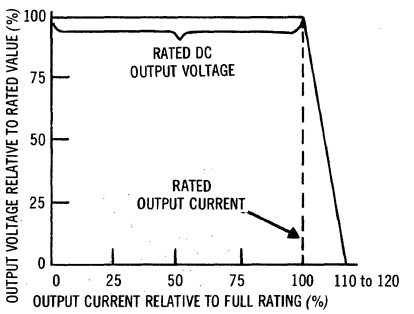

Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

Relco CONTINUOUS DC POWER SUPPLIES

MAGNETICALLY REGULATED—GUARANTEED 10 YEARS

- Withstand 220% surges
- Inherently failsafe
- Immune to EMI/RFI
- CSA and UL approved
- Continuous use under full load
- Any failure mode drops output
- 13.8 VDC at up to 70°C ambient
- Impervious to sustained short circuits
- No derating between – 30°C and 70°C

MODEL	AMPS	REG. VS. LOAD @ LINE OF 117V	REG. VS. LINE @ 105V TO 130V LINE	RIPPLE & NOISE (MAX)
PS601MR	6A	15% for 0-6 Amp	2% @ 6 Amp Output	230 MV RMS
PS1001MR	10A	15% for 0-10 Amp	2% @ 10 Amp Output	230 MV RMS
PS1001MRXF	10A	15% for 0-10 Amp	2% @ 10 Amp Output	30 MV RMS
PS2513MR	25A	10% for 0-25 Amp	2% @ 25 Amp Output	26 MV RMS
PS5013MR	50A	10% for 0-50 Amp	2% @ 50 Amp Output	26 MV RMS

IDEAL FOR FIELD AND ROUGH USE, COMMUNICATIONS, AUDIO DISPLAYS, ETC.

ELECTRONICALLY REGULATED—GUARANTEED 5 YEARS

- Foldback current limiting automatic reset
- Crowbar circuit
- No turn on or turn off transients
- Continuous use under full load

MODEL	AMPS[1]	OUTPUT VOLTAGE	REG. VS. LOAD @ LINE OF 117V	REG. VS. LINE @ 105V TO 130V LINE	RIPPLE & NOISE (MAX)
PS400R	4A	13.8 VDC[2]	.2% for 0-4 Amp	.1% @ 4 Amp Output	2 MV RMS
PS600R	6A	13.8 VDC[2]	.2% for 0-6 Amp	.1% @ 6 Amp Output	2 MV RMS
PS1000R	10A	13.8 VDC[2]	.2% for 0-10 Amp	.1% @ 20 Amp Output	2 MV RMS
PS2000R	20A	13.8 VDC[2]	.2% for 0-20 Amp	.1% @ 10 Amp Output	2 MV RMS
* PS600RMV	6A	10-15 VDC	.2% for 0-6 Amp	.1% @ 6 Amp Output	2 MV RMS
* PS2000RMV	20A	10-15 VDC	.2% for 0-20 Amp	.1% @ 20 Amp Output	2 MV RMS

1 = Output Current at up to 50°C Ambient * = Metered
2 = Output Voltage Internally Adjustable ± 5%

- Unique RELCO design
- Foldback current limiting automatic reset
- Crowbar circuit
- Continuous use under full load

OPEN FRAME ELECTRONIC REGULATED POWER SUPPLIES

MODEL	AMPS[1]	OUTPUT VOLTAGE	REG. VS. LOAD @ LINE OF 117V	REG. VS. LINE @ 105V TO 130V LINE	RIPPLE & NOISE (MAX)
PS4120F	4A	12 VDC	.2% for 0-4 Amp	.5% @ 4 Amp Output	2.5 MV RMS
PS4130F	4A	13.8 VDC	.2% for 0-4 Amp	.5% @ 4 Amp Output	2.5 MV RMS
PS5240F	5A	24 VDC	.4% for 0-5 Amp	.5% @ 5 Amp Output	2.5 MV RMS

1 = Output Current at up to 50°C Ambient

LABORATORY AND EDUCATIONAL POWER SUPPLIES

Relco offers a variety of general purpose laboratory and educational power supplies with both fixed and variable voltages to assist the student or lab technician in his experiments. The high and low voltages use unique RELCO overload protection features.

UNREGULATED—GUARANTEED 5 YEARS

- Continuous use
- No turn or turn off transients

MODEL	AMPS[1]	OUTPUT VOLTAGE
PS200	2A	12 VDC
PS300	3A	12 VDC

1 = Output Current at up to 50°C Ambient

OFF-SHELF—O.E.M.—CUSTOM—PROTOTYPE

Relco

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Ontario, Canada NOB 2EO
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FAX (519) 696-2670

US POWER/RELCO MIDWEST
Wichita KS
(316) 722-6440

U.S. POWER CONVERTING CO.
Torrance, CA
Phone (213) 316-9984
FAX (213) 316-9050

RO ASSOCIATES

MILITARY/MIL-STD-810

INFORMATION HOTLINE
(408) 744-1450 (800) 443-1450

25 years experience ■
Low profile ■

MIL-STD-810C QUALIFIED

75-150
WATTS

FEATURES

- Meets MIL-STD's
- Low profile 1.7"
- Ruggedized design
- 115/230 VAC input without any strapping
- Fully protected
- Full power out at 80°C case temperature
- Brownout protection to below 95 or 190 VAC
- Parallelable (consult factory for procedure)
- Up to 1.6 W per cubic inch
- Soft start limits inrush to 13 amps max.

COMMON SPECIFICATIONS

Input
105 to 130/198 to 265 VAC (selectable on barrier block) 47-1000 Hz also 300 VDC ±10%. Brownout protection to 90/180 VAC.

Protection
All outputs are current limited, continuous overload and short circuit proof. Single outputs have self-recovering overvoltage protection. Thermal protection is provided by a thermal relay which opens the power input if the case temperature goes above 80°C. Multiple outputs have self-recovering OVP on the 5V output only.

Operating temperature
−40°C to +80°C case (no derating).

EMI filter
Will meet VDE 0871(A) and FCC spec for conducted emissions using an external filter. Corcom filter 3 SPIA is recommended. For MIL 461A, Captor A4581 is recommended.

Mounting
Mounting on bottom by means of 6, 10-32 tapped inserts.

Storage temperature
−55°C to +85°C

Cooling
Maximum mounting base temperature for full output is 80°C. For no (air or conductive cooling), maximum ambient temperature of 30°C for full power output.

Temperature stability
Better than .02%/°C.

Size
11.12" × 5.29" × 1.75". Single outputs. (28.3 cm × 13.5 cm × 4.3 cm).
10.55" x 5.29" × 1.75". Multiples.

Weight
5.5 lbs.

MTBF
115,000 hours as calculated by MIL-HDBK-217C. (Model 325).

Remote sensing
All models have remote sensing.

SINGLE OUTPUTS

Model	Volts	Amps	Regulation		Ripple & Noise
			Load	Line ±10%	DC-10MHz
325ST	5VDC	25	5mV	3mV	60mV p-p
325STC	6VDC	20	5mV	3mV	60mV p-p
350ST	12-15VDC	10	10mV	5mV	50mV p-p
351ST	24-28VDC	5	20mV	10mV	100mV p-p

DUAL OUTPUTS

302ST	±15VDC	±3A	10mV	5mV	50mV p-p 10mV rms
303ST	±12VDC	±3A	10mV	5mV	50mV p-p 10mV rms

MULTIPLE OUTPUTS

312ST	(A) 5VDC (B) ±12VDC	10A ±1A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
313ST	(A) 5VDC (B) ±15VDC	10A ±1A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
314ST	(A) 5VDC (B) 12VDC	10A 2A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
315ST	(A) 5VDC (B) 12VDC	8A 3A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
316ST	(A) 5VDC (B) 12VDC	12A 1A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p

MILITARY SPECIFICATIONS

Mil Spec		Method/Procedure	
MIL-STD-810C	Low Pressure	Method 500.1	Proc. I
MIL-STD-810C	High Temp.	Method 501.1	Proc. I, II
MIL-STD-810C	Low Temp.	Method 502.1	Proc. I
MIL-STD-810C	Temp. Shock	Method 503.1	Proc. I
MIL-STD-810C	Temp. Alt.	Method 504.1	Proc. I Class 2 (−20°C operating)
MIL-STD-810C	Humidity	Method 507.1	Proc. I, II
MIL-STD-810C	Fungus	Method 508.1	Proc. I
MIL-STD-810C	Salt Fog		
MIL-STD-810C	Sand & Dust	Method 510.1	Proc. I
MIL-STD-810C	Explosive Atmosphere	Method 511.1	Proc. I
MIL-STD-810C	Vibration	Method 514.2	Proc. VIII Curve W, XI
MIL-STD-810C	Shock	Method 516.2	Proc. I, IV Ground Equip. Fig. 516.2-2
MIL-STD-810C	Temp.-Humidity-Alt.	Method 518.1	Proc. I
MIL-STD-901C	High Shock	Grade A, Class 1	Type A
MIL-STD-461	RFI Conducted		With external filter
MIL-STD-1399	Voltage Transient	Type I	Single Phase
MIL-T-288CC	Random Vibration	Nav. Mat. Pub. P-9492 May, 1979 4.5.3.1.C	

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- Ultra High Density

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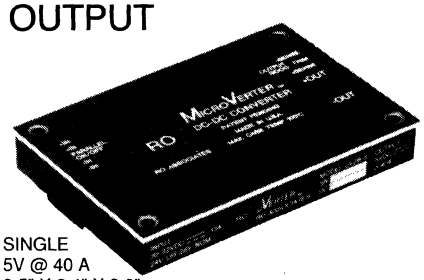
185-250 WATT HIGH DENSITY 28VDC INPUT PER MIL 704D

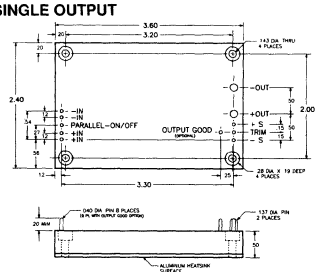
SINGLE AND TRIPLE OUTPUT



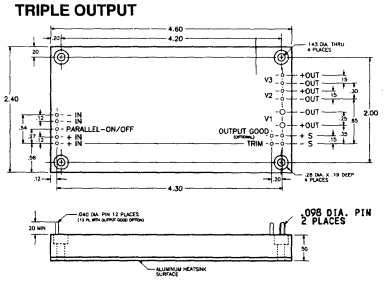
SINGLE
5V @ 40 A
0.5" X 2.4" X 3.6"

- Miniature Size
- High Density–up to 58 watts/in.^{3}
- Constant Frequency Operation
- Parallelable with Current Sharing
- Fault Tolerant–True n + 1 Redundancy
- Extremely Low Thermal Resistance
- Optional Output Good Signal
- Optional Sync Pin
- Hot Plug-in Capability
- 28VDC Input per Mil STD 704D
- Ruggedized–Meets MIL-STD 810D
- Non-shutdown OVP
- Logic On/Off
- Suitable for PC or Chassis Mounting
- Thermal/Input OVP Protection
- Fully automated Manufacturing

SINGLE OUTPUT



TRIPLE OUTPUT



SPECIFICATIONS

INPUT:	MIN	TYPICAL	MAX	UNITS
Input voltage	20	24-28	32	VDC
Brownout (75% full output power)	18			VDC
In rush charge		2.6×10^{-4}		Coulombs
Input reflected ripple (f. l. nom line)		20		%
No load power dissipation		1.5		watts
Logic disabled current (sink)		1		ma
Logic disabled power in		0.35		watts
Input ripple rejection (120 Hz)		60		dB
Input overvoltage (no damage to unit)	32		60	VDC
OUTPUT: (Singles and Main Output of Triple)				
Set point accuracy		± 1	± 1	%
Load regulation (0-100%)		.02	.2	%
Line regulation (over range)		.02	.2	%
Ripple (0-10 MHz)		1	3	% p-p
Trim range	± 10			%
Remote Sense compensation	0.5			V total
OVP (non shutdown aut rec.)		120		%
Current Limit (aut rec.)		110-120		% f. l.
Current sharing (automatic)		± 10		%
Transient response (20-80% load) Vout 1%		200		µs
Transient response (LL to HL) Vout 1%		200		µs
Transient response (50-100% load) Vout 1%		200		µs
Temp drift			.02	%/°C
OUTPUT: (Auxiliary Outputs of Triples)				
Set point accuracy		± 0.5	± 1	%
Load regulation (0-100%)		.2	.5	%
Line regulation (over range)		.01	.1	%
Ripple (0-10 MHz)		.25	.5	% p-p
Current Limit (aut rec.)		110-120		% f. l.
Transient response (20-80% load) Vout 1%		200		µs
Transient response (LL to HL) Vout 1%		200		µs
Transient response (50-100% load) Vout 1%		200		µs
Temp drift		.06		%/°C
CONTROL:				
Turn on time (power applied) Vout 1% (½ load)		50		ms
Logic turn on time (Vout 1%)		1		ms
ISOLATION:				
Input to output	1000			VDC
Input to case	1000			VDC
Output to case	200			VDC
Input to output capacity	2200			pF
THERMAL:				
Operating temperature	− 40		+ 100	°C case
Automatic shut down temperature	+ 100	+ 105	+ 110	°C case
Thermal resistance case to ambient		4.2 (singles)		°C/w
		3.3 (triples)		°C/w
WEIGHT:		7 (singles)		oz.
		9 (triples)		oz.

MODEL	OUTPUT VOLTAGE	OUTPUT CURRENT
µV28-5	5V	40A
µV28-12	12V	20A
µV28-15	15V	16A
µV28-24	24V	10A
µV28-28	28V	9A
µV28-T512	* 5V	35A
	12V	3A
	− 12V	3A
µV28-T515	* 5V	35A
	15V	3A
	− 15V	3A

*Maximum total output power 185W

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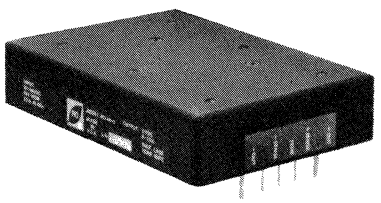
25 years experience ■
Low profile ■

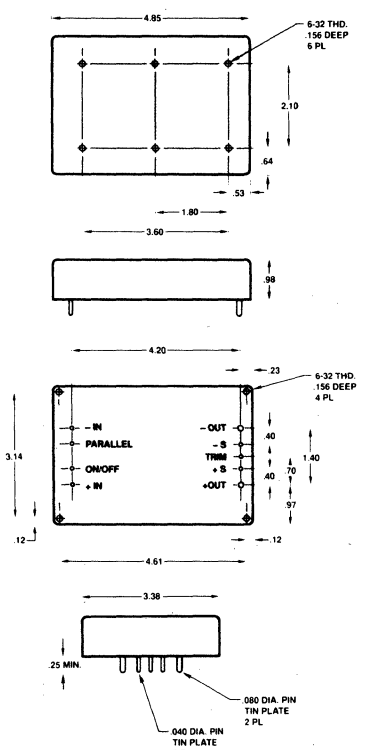
125-150 WATT HIGH DENSITY/ 48 α 300 VDC INPUT

New -
Dual Output Available



FEATURES

- Lowest Thermal Resistance – *2.5°C/Watt*
- Parallelable – Current Mode Control
- Fault Tolerant – True N + 1 Redundancy
- Hot Plug in Capability
- Current Sharing – No Master/Slave
- Compatible – Industry Standard Pin-Out
- Non-Shutdown OVP
- Logic ON/OFF
- 5 Sided Shielding
- Ruggedized Design – Meets MIL-810D
- UL/CSA/VDE Compliance
- Thermal Protection – Auto Reset
- Input Overvoltage Protection
- Optional Output Good Signal, ± 10%
- .98 height - 4.85 length - 3.38 width



SPECIFICATIONS

	RO 48 SERIES	RO300 SERIES	UNITS
INPUT:			
Input voltage	36-66	200-400	VDC
In rush charge	2.1×10^{-4}	3×10^{-6}	Coulombs
Input reflected ripple (f.l. nom line)	20	10	% P-P
No load power dissipation	3.1	6.2	watts
Logic disabled current (sink)	1	1	ma
Logic disabled power in	0.35	1.2	watts
Input ripple rejection (120Hz)	55	55	dB
Input Overvoltage (No damage to unit)	66-100	400-450	VDC
OUTPUT:			
Set point accuracy	±1	±1	%
Load regulation (0-100%)	10	10	mv
Line regulation (over range)	10	10	mv
Ripple (0-10MHz)	1	1	% p-p
Trim Range	±10	±10	%
Remote Sense compensation	0.5	0.5	V total
OVP (non shutdown auto rec.)	120	120	%
Current Limit (auto rec.)	110-120	110-120	% f.l.
Current sharing (automatic)	±10	±10	%
Transient response (20-80% load) Vout 1%	200	200	µs
Transient response (LL to HL) Vout 1%	200	200	µs
Transient response (50-100% load) Vout 1%	200	200	µs
Temperature drift	.02	.02	%/°C
CONTROL:			
Turn on time (power applied) Vout 1%	60	60	ms
Logic turn on time Vout 1%	6	6	ms
ISOLATION:			
Input to output	5500	5500	VDC
Input to case	2500	2500	VDC
Output to case	500	500	VDC
Input to output capacity	2200	2200	pF
THERMAL:			
Operating temperature	−55 to 100	−55 to 100	°C case
Automatic shut down temperature	105-110	105-110	°C case
Thermal resistance case to ambient (f.l.)	2.5	2.5	°C/watt
WEIGHT:	24	24	oz.

MODEL SELECTION

INPUT VOLTAGE	OUTPUT VOLTAGE/CURRENT		MODEL
48VDC	5V	25A	RO48-5
48VDC	12V	12A	RO48-12
48VDC	15V	10A	RO48-15
48VDC	24V	6A	RO48-24
48VDC	28V	5A	RO48-28
300VDC	5V	25A	RO300-5
300VDC	12V	12A	RO300-12
300VDC	15V	10A	RO300-15
300VDC	24V	6A	RO300-24
300VDC	28V	5A	RO300-28
48VDC	±12V	8A	RO48-D12
48VDC	±15V	6A	RO48-D15
48VDC	±5V	10A	RO48-D5
48VDC	5V/12V	10A/8A	RO48-D512
300VDC	5V/12V	8A	RO300-D12
300VDC	±15V	6A	RO300-D15
300VDC	±5V	10A	RO300-D5
300VDC	5V/12V	10A/8A	RO300-D512

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- 25 years experience
- High efficiency

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200 WATTS 24VDC/48VDC INPUT

FEATURES

- High efficiency secondaries
- Low profile (2.7" high)
- Up to 5 outputs in one package
- Output surge capability for disk drives
- Wide input range
- 4 outputs in one package
- No minimum load

SINGLE OUTPUT – 24VDC INPUT

Model	Volts	Amps	Regulation		Ripple & Noise
			O-FL	Line ±10%	DC-10MHz
2440	5VDC	40A	10mV	±10mV	60mV p-p

MULTIPLE OUTPUT

2410	5VDC	20A	10mV	±10mV	60mV p-p
	+12VDC	4A	0.5%	±10mV	60mV p-p
	−12VDC	4A*	0.5%	±10mV	60mV p-p
	−5VDC	0.5A*	400mV	±25mV	60mV p-p
2413	5VDC	20A	10mV	±10mV	60mV p-p
	+15VDC	3A	0.5%	±10mV	60mV p-p
	−15VDC	3A*	0.5%	±10mV	60mV p-p
	−5VDC	0.5A*	400mV	±25mV	60mV p-p
2424	5VDC	20A	10mV	±10mV	60mV p-p
	+12VDC	3A	0.5%	±10mV	60mV p-p
	−12VDC	2A	0.5%	±10mV	60mV p-p
	24VDC	2A, 3A surge	0.5%	±20mV	100mV p-p
2430	5VDC	28A	10mV	±10mV	60mV p-p
	+12VDC	3A	0.5%	±10mV	60mV p-p
	−12VDC	2A	0.5%	±10mV	60mV p-p

*Note: Total current of negative outputs cannot exceed 4 amps for −12V operation (3 amps for −15V)

SINGLE OUTPUT – 48VDC INPUT

Model	Volts	Amps	Regulation		Ripple & Noise
			O-FL	Line ±10%	DC-10MHz
1140	5V	40A	10mV	±10mV	60mV p-p

MULTIPLE OUTPUT

1110	5V	20A	10mV	±10mV	60mV p-p
	+(12-15)VDC	4A @ 12V-3A @ 15V	0.5%	±10mV	60mV p-p
	−(12-15)VDC	4A* @ −12V-3A @ −15V	0.5%	±10mV	60mV p-p
	−5VDC	0.5A*	400mV	±25mV	60mV p-p
1112	5V	20A	10mV	±10mV	60mV p-p
	+12V	4A (6A surge)	10%	±1%	1% p-p
	+(12-15)VDC	3A @ 12V-2.5A @ 15V	0.5%	±10mV	60mV p-p
	−(12-15)5VDC	2A** @ −12V-1.5A @ −15V	0.5%	±10mV	60mV p-p
	−5VDC	0.5**	400mV	±25mV	60mV p-p
1124	5V	20A	10mV	±10mV	60mV p-p
	+24V	2A (3A surge)	5%	±1%	1% p-p
	+(12-15)VDC	3A @ 12V-2.5A @ 15V	0.5%	±10mV	60mV p-p
	−(12-15)5VDC	2A** @ −12V-1.5A @ −15V	0.5%	±10mV	60mV p-p
	−5VDC	0.5**	400mV	±25mV	60mV p-p
1124S	5V	15A	10mV	±10mV	60mV p-p
	+24V	3A	0.5%	±10mV	60mV p-p
	+(12-15)VDC	2A	0.5%	±10mV	60mV p-p
	−(12-15)5VDC	2A	0.5%	±10mV	60mV p-p
1130	5VDC	30A	10mV	±10mV	60mV p-p
	+12VDC	3A (6A surge)	0.5%	±10mV	60mV p-p
	−12VDC	2A	0.5%	±10mV	60mV p-p

*Note: Total current of negative outputs cannot exceed 4 amps for −12V operation (3 amps for −15V)

**Note: Total current for negative outputs cannot exceed 2 amps for −12V operation (1.5 amps for −15V)

***MINIMUM 4A load on +5V is required for auxiliary outputs to regulate

SPECIFICATIONS

Input
24 VDC nominal (19-32 VDC)
48 VDC nominal (40-70 VDC)

Operating temperature
0°C to 50°C

Protection
All outputs current limited, continuous overload and short circuit proof. 5V, 12V, 15V, 5V and ±12/15V outputs have self-recovering overvoltage protection. Thermal protection is provided.

Remote sensing
Remote sensing only on +5V

Operating temperature
0°C to 50°C

Storage temperature
−55°C to +85°C

Isolation
1000 VDC input to case
1000 VDC input to output

Efficiency
72% typical at full load

Weight
5.5 lbs. (2.5 kilograms)

Size
2.7" × 5.25" × 11" max
(6.9 cm × 13.4 cm × 28 cm max)

Safety
Designed to meet UL 478 and UL 1012 and CSA 22.2. Model 1110 UL certification pending.

Temperature stability
Better than .02%/C°

RO ASSOCIATES, INCORPORATED 246 CASPIAN DRIVE, SUNNYVALE, CA 94086 / (408) 744-1450 FAX (408) 744-1521

RO ASSOCIATES

AC-DC HIGH REL

INFORMATION HOTLINE
(408) 744-1450 (800) 443-1450

25 years experience ■
Low profile ■

20-40 WATTS LOW NOISE – PURE DC

Input
105 to 125 VAC, 50 to 70 Hz except Model 115 which is 50 to 400Hz.*

SINGLE OUTPUTS

Model	Volts	Amps	P-P Ripple	Regulation Line ±10%	O-FL
105	1.5-6VDC adj.	5A	2mV	±1mV	3mV
106	6-28VDC adj.	1.5A	2mV	±1mV	3mV
107	12-15VDC adj.	2.5A	2mV	±1mV	3mV
108	6-12VDC adj.	3A	2mV	±1mV	3mV

DUAL OUTPUTS

115	±(12-15) adj.	0.75A	2mV	±3mV	3mV

*220 VAC input is available on special order ($10.00 additional).

FEATURES

- Low noise
- Up to 5 amps out
- 1¾" panel mount
- Crowbar included
- Low cost
- Short and overload proof

75-150 WATTS LOW PROFILE 1.68" HIGH

Input
105 to 130/198 to 265 VAC (selectable on barrier block) 47-1000Hz also 300 VDC ±10%.
Brownout protection to 90/180 VAC.

SINGLE OUTPUTS

Model	Volts	Amps	Regulation		Ripple & Noise DC-10MHz
			Load	Line ±10%	
325	5VDC	25	5mV	3mV	60mV p-p
325C	6VDC	20	5mV	3mV	60mV p-p
350	12-15VDC	10	10mV	5mV	50mV p-p
351	24-28VDC	5	20mV	10mV	100mV p-p

DUAL OUTPUTS

302	±15VDC	±3A	10mV	5mV	50mV p-p 10mV rms
303	±12VDC	±3A	10mV	5mV	50mV p-p 10mV rms

MULTIPLE OUTPUTS

312	(A) 5VDC (B) ±12VDC	10A ±1A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
313	(A) 5VDC (B) ±15VDC	10A ±1A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
314	(A) 5VDC (B) 12VDC	10A 2A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
315	(A) 5VDC (B) 12VDC	8A 3A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p
316	(A) 5VDC (B) 12VDC	12A 1A	5mV 10mV	5mV 5mV	60mV p-p 60mV p-p

FEATURES

- Low profile 1.7"
- Casting heat sink
- 115/230 VAC input without any strapping
- Fully protected
- Full power out at 80°C case temperature
- Brownout protection to below 95 or 190 VAC
- Parallelable (consult factory for procedure)
- Soft start

RO ASSOCIATES, INCORPORATED 246 CASPIAN DRIVE, SUNNYVALE, CA 94086 / (408) 744-1450 FAX (408) 744-1521

AC-DC HIGH REL

- 25 years experience
- High efficiency

INFORMATION HOTLINE
(800) 443-1450 **(408) 744-1450**

RO ASSOCIATES

200 WATT HIGH EFFICIENCY

SINGLE OUTPUTS

Model	Volts	Amps	Regulation		Ripple & Noise DC-10MHz
			O-FL	Line ±10%	
540EU	5V	40A	10mV	±10mV	60mV p-p
550 EU	12V	17A	10mV	±10mV	60mV p-p
555EU	15V	14A	10mV	±10mV	60mV p-p
551EU	24-28V	8A	20mV	±20mV	100mV p-p

MULTIPLE OUTPUTS

Model	Volts	Amps	Regulation		Ripple & Noise DC-10MHz
			O-FL	Line ±10%	
510EU**	5V	20A	10mV	±10mV	60mV p-p
	+(12-15)VDC	4A@12V-3A@15V	0.5%	±10mV	60mV p-p
	−(12-15)VDC	4A@*12V-3A@15V	0.5%	±10mV	60mV p-p
	−5VDC	0.5A*	400mV	±25mV	60mV p-p
524EU	5V	20A	10mV	+10mV	60mV p-p
	+(12-15)VDC	3A@12V-2.5A@15V	0.5%	±10mV	60mV p-p
	−(12-15)VDC	2A@12V-1.5A@15V	0.5%	±10mV	60mV p-p
	24V	2A3A surge	0.5%	±20mV	100mV p-p
525EU	5V	25A	10mV	±10mV	60mV p-p
	+(12-15)VDC	3A@12V-2.5A@15V	0.5%	±10mV	60mV p-p
	−(12-15)VDC	2A@12V-1.5A@15V	0.5%	±10mV	60mV p-p

*Note: Total current of negative outputs cannot exceed 4 amps for −12V operation (3 amps for −15v)
**Note: The Model 510EU can be ordered with 125VDC input (Model 5510) or with 150VDC input (Model 510).

Input
105 to 130/198 to 265 VAC (selectable on barrier strip) 47 to 1000Hz or 290 to 350VDC input.

FEATURES

- 4 outputs in one package
- Optional power fail signal/logic inhibit available
- AC input transient protection
- High efficiency independently regulated outputs
- Mag amp control for reliability
- No minimum load required

500-840 WATTS LOW PROFILE 3.34" HIGH

SINGLE OUTPUTS

Model	Volts	Amps	Regulation		Ripple & Noise DC-10MHz
			O-FL	Line ±10%	
710	5V	100A	10mV	5mV	100mV p-p
712	5V	120A	10mV	5mV	100mV p-p
715	5V	150A	10mV	5mV	100mV p-p
750	12-15V	40A	15mV	10mV	100mV p-p
751	24-28V	20A	20mV	10mV	150mV p-p
754	24-28V	30A	30mV	10mV	150mV p-p
748	48V	16A	200mV	±50mV	240mV p-p

MULTIPLE OUTPUTS*

Model	Volts	Amps	Regulation***		Ripple & Noise DC-10MHz
			O-FL	Line ±10%	
713	5V	50A	10mV	±5mV	100mV p-p
	+(12-15)VDC	10A	0.5%	±0.2%	2%
	−(12-15)VDC	10A	0.5%	±0.2%	2%
722	5V	50A	10mV	±0.2%	100mV p-p
	+(12-15)VDC	12A(14A surge)	0.5%	±0.2%	2%
	−(12-15)VDC	8A	0.5%	±0.2%	2%
724	5V	50A	10mV	±5mV	100mV p-p
	+24	4A	10%	±2%	2%
	+(12-15)VDC	6A	0.5%	±0.2%	2%
	−(12-15)VDC	6A	0.5%	±0.2%	2%
725	5V	50A	10mV	±5mV	100mV p-p
	+(12-15)VDC	6A	0.5%	±0.2%	2%
	−(12-15)VDC	6A	0.5%	±0.2%	2%
	−(2-5)VDC	10A	50mV	±10mV	100mV p-p

***MINIMUM 5A load on +5V is required for auxiliary outputs to regulate.

Input
105 to 130/198 to 265 VAC (selectable on barrier block) 47-63Hz also 300 VDC ±10%. Brownout protection to 90/180 VAC. 400Hz option.

FEATURES

- High efficiency secondaries
- Low profile (3.34" high)
- No parallel transistors
- Soft start
- 1.6 watts per cubic inch
- Brownout protection to below 95 or 190 VAC
- Parallelable (consult factory for procedure)

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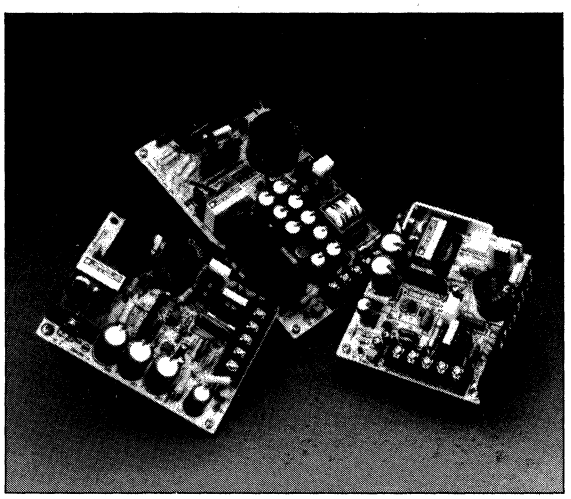
Shindengen America, Inc.

PERFORMANCE, RELIABILITY AND VALUE FOR YOUR POWER SUPPLY NEEDS

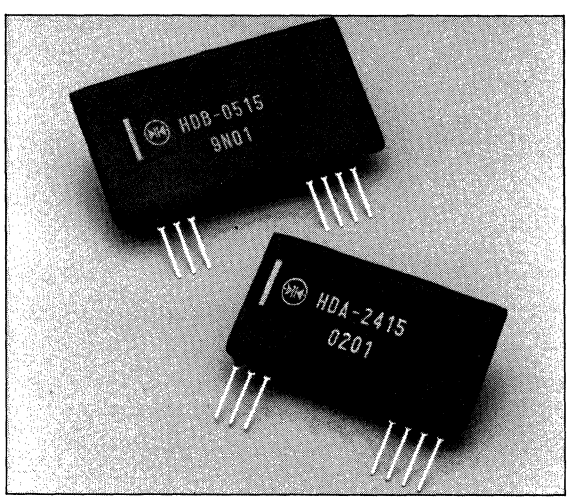
MULTIPLE OUTPUT
Switching Power Supplies



FEATURES
- MTBF up to 300,000+ hours
- UL, CSA, IEC Safety Approvals
- Over Voltage/Overload Protection
- On-Board EMI Filters Meet FCC and VDE Level B

DESCRIPTION
- Convection Cooled, Open Frame
- 2, 3, 4 or 5 Outputs
- Dual Input Voltage
- 19 Models, 15 to 160 Watts
- Full International Specs
- Popular Package Sizes

DC-DC CONVERTERS
Power Supplies



FEATURES
- High Reliability
- Compact, Light Weight
- Low Cost

DESCRIPTION
- 1 Watt thru 150 Watt Ratings
- 5, 12, 24 and 48 VDC Inputs
- SIP and Standard Board-Mounted Packaging
- Single, Dual and Triple Outputs
- Input/Output Isolation
- Input/Output Filters

Shindengen America, Inc. 2649 Townsgate Road, Suite 200, Westlake Village, CA 91361
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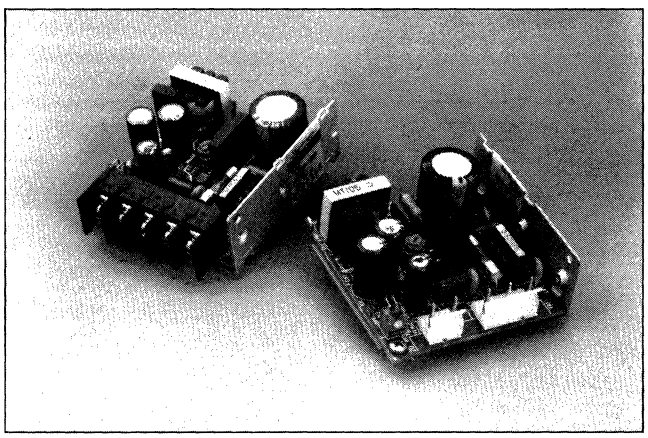
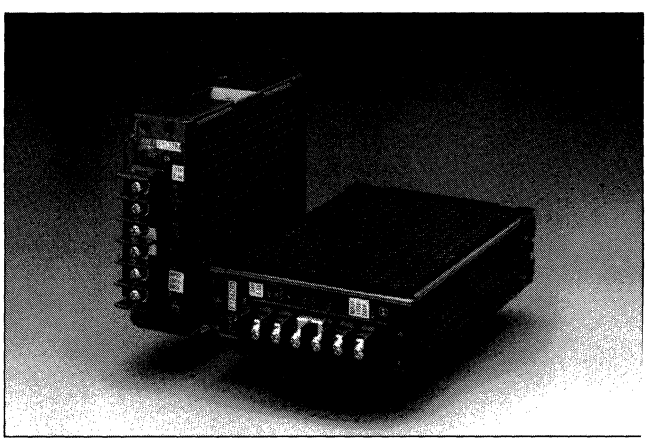
PERFORMANCE, RELIABILITY AND VALUE FOR YOUR POWER SUPPLY NEEDS

SINGLE OUTPUT
Switching Power Supplies

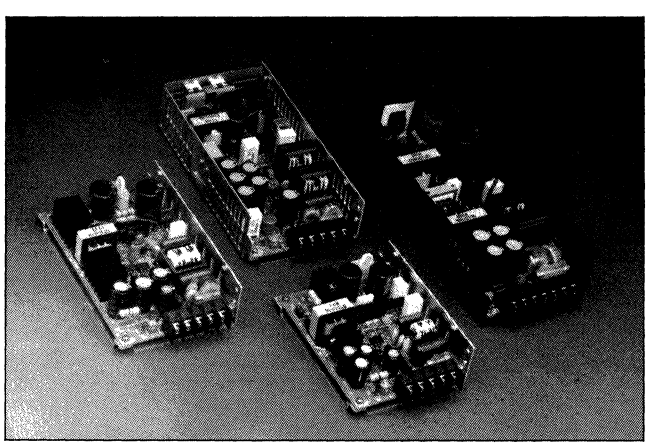


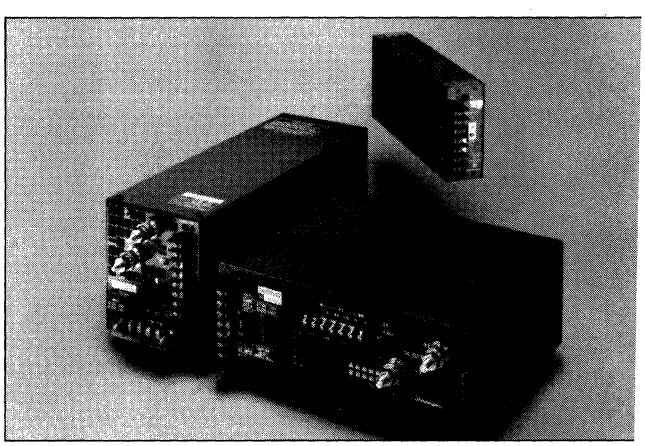
FEATURES
- MTBF from 85,000 hours to as high as 457,000 hours
- Conservative Thermal Design
- Low Component Count
- UL, CSA, IEC Safety Approvals
- Convection or Fan Cooled
- Dual or Wide Range VAC Input
- On-Board EMI Filters



DESCRIPTION
- Fully Enclosed and Open Frame
- Over 100 Models
- From 10 to 2,250 Watts Output
- Full International Specs
- Low Cost Design

Send for Free 1991 Power Supply Catalog





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SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

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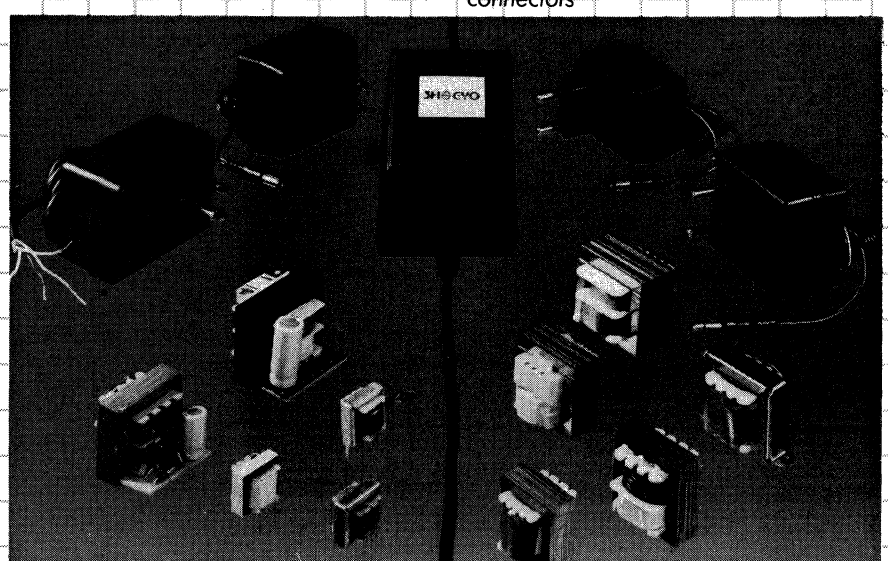
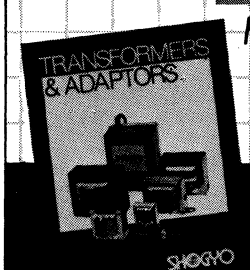
Including a diverse offering of UL/CSA approved:

- *Power transformers:*
  standard core sizes from EI-28 to EI-86, Nylon 66, PBT or Phinolic bobbin materials, channel frame or PCB mounting, enclosures with or without endbells, and UL recognized AWM, terminal, or pin connections
- *Double protection power transformers:*
  conform with UL 1411 seven hours construction and abnormal test requirements, 3500V dielectric test voltage
- *Line matching transformers:*
  70.7 and 25 volt, maximum power levels from 2 to 16 watts, standard core sizes from EI-41 to EI-66, and a secondary impedance of 8 ohms
- *Telephone coupling transformers:*
  high quality low insertion loss, core sizes from EI-19 to EI-35, frequency response of 300–3500Hz ± 3dBa, and a secondary impedance of 500, 600, or 900 ohms
- *Lamp ballast transformers:*
  UL 935 listed simple reactance coil type
- *Wall-mount, plug-in adapters:*
  European or American, 120V, 50/60Hz inputs, outputs from 3VDC to 24VDC, 100mA to 1.7Amp, and 0.3 to 14.4 watts

And featuring:

- *PC pin, solder leg mount or lead wire connections*
- *A complete line of mating cords and terminating plug connectors*





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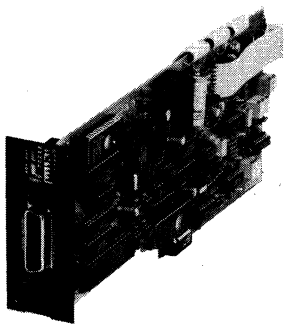
IEEE 488 INTERFACE CARD—OPTION M9A



NEW!
AVAILABLE FOR XT, HPD or DCS SERIES

- **Querying of setting, faults, errors**
- **Extensive request capability w/delay**
- **Programmable OVP & OVP reset**
- **Rear-panel accessible polarity, isolation, fault signals & external shutdown inputs.**

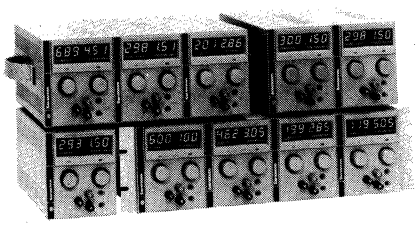
Option M9A allows any Sorensen XT, HPD or DCS Series power supply to operate with IEEE 488 GPIB (General Purpose Interface Bus) networks. Output voltage and current are controlled within 12-bit resolution. Front panel adjustable OVP is standard. Also, digital readback (actual) (12-bit resolution) of V&I is standard. Available customer or factory installed; see chart.

Specifying Note for XT and HPD Series. Where 8-bit resolution is acceptable for digital readback of Volts & Amps, contact Sorensen for Option M9.

LABORATORY/INDUSTRIAL POWER INSTRUMENTS

XT SERIES—Bench, Lab, Test and System 60-Watt Programmable Power Supplies

INTERNAL IEEE 488 INTERFACE AVAILABLE



XT Series 60 W programmable power supplies are designed for benchtop and portable applications requiring affordable, low noise and low ripple performance. Single output models may be configured into a standard package providing dual, triple, or quad outputs of the same voltage or a "custom configuration". Options include remote programming, OVP, remote ON/OFF, and isolated tracking. Customer-installed rack adapters are available for all packaging sizes. Output voltages are adjustable from 0-7 to 0-120 Vdc; current levels are from 0.5 to 6A. 0.01% line & load +2mV regulation; 1.0 mV rms ripple, 100 μs transient response ±50% change (typical), 10-turn pots, remote sensing. Options: M11 (10-turn current control pot). M5 (remote programming, remote On/Off, OVP, rear panel connectors, output/sense lines & remote control). M7 (incl. M5 + isolated tracking, audible mode). M9A IEEE 488 Interface Card). Input Voltage: 115 VAC ±10%, 10, 57-63 Hz. 3 year warranty.

Model	Voltage (Vdc)	Current (Adc @ 30°C)	Unit Price
XTS 7-6	0-7	6	$ 665.00
XTS15-4	0-15	4	665.00
XTS 20-3	0-20	3	665.00
XTS 30-2	0-30	2	665.00
XTS 60-1	0-60	1	665.00
XTS120-.5	0-120	0.5	665.00

XT Multiple Output Units
(Available with above mixed voltage and current outputs)

Model	Outputs	Case Size	Unit Price
XTD	Dual	See	$1,200.00
XTT	Triple	Table	1,770.00
XTQ	Quad	Below	2,220.00

NOTE: To order, use model number prefix (for number of outputs desired) followed by voltage-current outputs. For example: Four model XTS 20-3 in one package; order part number XTQ 20-3. Input power for each unit is 105/129 Vac - 1.2A. Multiple units are available with mixed voltage/current outputs (consult factory).

XT Options

Model	Description		Unit Price
M5	• Remote Programming • Remote On/Off • OVP • Rear Panel Connector		$190.00 per output
M7	• Includes M5 Options Plus: • Isolated Tracking • Audible Mode Indicator		$265.00 per output
M9A	IEEE 488 Interface Card Factory Installed—Specify M9A Customer Installed—Specify 1064062-1		$650.00 per output
M11	10-Turn Current Control Pot		70.00 per output
XTRA-1	1 unit	Rack Adapter Kit (contact factory)	$190.00
XTRA-2	2 units		
XTRA-3	3 units		
XTRA-4	4 units		
Special Orders	• Multiple Output Units with Mixed Voltage or Current Ranges are Available.		Details on Request

NOTE: To order, add option suffix to model number. Example: Order XTS 7-6 M7 for model XTS 7-6 with option M7.

Case Sizes—In. (mm)

Case	Height	Width	Length
Single	5.4 (137)	4.25 (107.9)	11.5 (292.1)
Dual		8.5 (215.9)	
Triple		12.75 (323.8)	
Quad		17 (431.8)	

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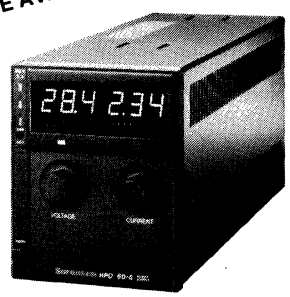
HPD Series—Bench, ATE & System 300-Watt Programmable Power Supplies

INTERNAL IEEE 488 INTERFACE AVAILABLE

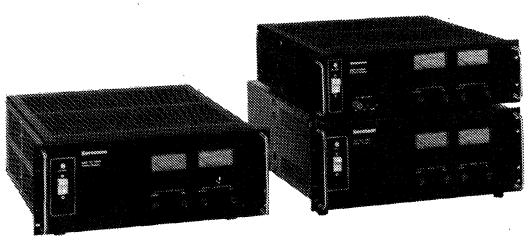


HPD Series (High Power Density) 300 W programmable power supplies are designed for system, benchtop, ATE and other instrument controlled applications. HPD Series offers 300 watts in a 1/4" rack package, zero-up output voltage & current, linear post regulator which achieves low output ripple and noise, and meets FCC class A requirements for reduced EMI. Single output models may be configured into a standard package providing dual, triple or quad outputs of the same voltage or a custom configuration. Options include IEEE 488 interface, OVP, remote programming, remote On/Off, rear panel terminals, isolated tracking, audible mode indication (consult factory) and 12-bit digital readback of Volts and Amps.

Output voltages are adjustable from 0-15 to 0-60 Vdc; current levels are from 5 to 20A. Ambient operating temperature is from 0-30°C. 0.01% + 2mV line & load regulation; 0.01% + 1mA line & load current regulation. Constant voltage ripple (PARD) is 5 mV rms/50 mV p-p; constant current ripple (PARD) is 5 mA rms/20 mA p-p. Transient response is < 500 μs. 10-turn voltage control pot, remote sensing. Input voltage: 115 Vac ±10%, 1 Ø, 57-63 Hz (47-400 Hz with 20% output current derating). 5 year warranty.

Model	Voltage (Vdc)	Current (Adc @ 30°C)	Unit Price
HPD 15-20	0-15	20	$1,350.00
HPD 30-10	0-30	10	1,350.00
HPD 60-5	0-60	5	1,350.00

DCR-B SERIES –High Power Single Phase Input Laboratory and Industrial Power Supplies (with built-in overvoltage protection on all models)



DCR-B Series high power laboratory and industrial power supplies have input SCR controlled regulator which provides unparalleled reliability along with regulation and transient response performance suitable for nearly all burn-in and test applications. 31 models in 9 voltage ranges offer from 0-7 to 0-600 Vdc with power levels from 400 to 2700W. OVP standard; LCD digital meters available. 0.05% line & load regulation (typical), 65-1200 mV rms ripple (model dependent), 50 ms transient response—50% change (typical). Sorensen has over 20 years of industry experience in designing this type of product. 5 year warranty.

DCR-B Accessories

Description	Unit Price
Chassis slide kits are available for all DCR-B models; contact factory for specifying assistance.	$125.00

NOTE: Unit may be controlled by IEEE-488 GPIB Bus via Sorensen's 488-DAP products.

DCR-B Input Voltage Modifications

Description	Model	Unit Price
115 (105-125) Vac Standard on All Models Except	Standard	N/C
• Case Sizes IV and V	Not Available	
208 (190-230) Vac Available for All Models	M1	$125.00
• Case Sizes IV and V	Standard	N/C
220 (200-240) Vac Available for All Models	M2	125.00
230 (210-250) Vac Available for All Models	M3	125.00

NOTE: To order, add option, modification suffix to model number. Example: Order DCR 10-40B M2 M50 to get this model with factory installed Digital Panel Meters and 220 volt input.

Model[1]	Voltage (Vdc)	Current (Adc @ 40°C)	Case Size[2]	Unit Price
DCR 7-300B	0-7	300	V	$2,300.00
DCR 10-40B	0-10	40	VI	1,325.00
DCR 10-80B	0-10	80	II or VI	1,645.00
DCR 10-120B	0-10	120	III	1,990.00
DCR 20-25B	0-20	25	VI	1,325.00
DCR 20-50B	0-20	50	II or VI	1,645.00
DCR 20-80B	0-20	80	III	1,990.00
DCR 20-115B	0-20	115	IV	2,300.00
DCR 40-13B	0-40	13	VI	1,325.00
DCR 40-25B	0-40	25	II or VI	1,645.00
DCR 40-40B	0-40	40	III	1,990.00
DCR 40-70B	0-40	70	IV	2,300.00
DCR 60-9B	0-60	9	VI	1,325.00
DCR 60-18B	0-60	18	II or VI	1,645.00
DCR 60-30B	0-60	30	III	1,990.00
DCR 60-45B	0-60	45	IV	2,300.00
DCR 80-6B	0-80	6	VI	1,325.00
DCR 80-12B	0-80	12	II or VI	1,645.00
DCR 80-33B	0-80	33	IV	2,300.00
DCR 150-2B	0-150	3	VI	1,325.00
DCR 150-6B	0-150	6	II or VI	1,645.00
DCR 150-12B	0-150	12	III	1,990.00
DCR 150-18B	0-150	18	IV	2,300.00
DCR 300-1.5B	0-300	1.5	VI	1,325.00
DCR 300-3B	0-300	3	II or VI	1,645.00
DCR 300-6B	0-300	6	III	1,990.00
DCR 300-9B	0-300	9	IV	2,300.00
DCR 600-.75B	0-600	0.75	VI	1,325.00
DCR 600-1.5B	0-600	1.5	II or VI	1,645.00
DCR 600-3B	0-600	3	III	1,990.00
DCR 600-4.5B	0-600	4.5	IV	2,300.00

[1]For case VI, add "2" suffix to part no. to specify. Example: A DCR 10-80B supplied in case VI—part no. would be DCR 10-80B2.
[2]Where case "II or VI" is listed, case II will be available until 3rd qtr., 1990, and case VI will be available starting 3rd qtr., 1990.

DCR-B Options

Description	Model	Unit Price
Digital Panel Meters (V and I Meters) • Factory Installation	M50	$100.00
• Field Installation	Consult Factory	
Overvoltage Protection	Standard on All Models	N/C

Case Sizes—In. (mm)

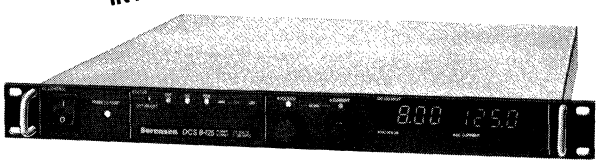
Case[1]	Height	Width	Length
I	3.5 (89)	19 (483)	16.125 (410)
II	5.25 (133)	19 (483)	16.4 (419)
III	7 (178)	19 (483)	19 (483)
IV	7 (178)	19 (483)	20 (508)
V	6.97 (177)	19 (483)	19 (483)
VI	3.5 (89)	19 (483)	19 (483)

[1]Case I no longer available; dimensions are for reference only.

Sorensen
A Raytheon Company
Toll Free: 1-800-525-2024/FAX: 312-775-7432

DCS Series—1 kW Programmable Switchmode Power Supplies

INTERNAL IEEE 488 INTERFACE AVAILABLE



The DCS Series represents the latest advancement of switchmode technology in programmable DC sources . . . a light weight, low cost, compact solution to many DC requirements. This new design provides excellent performance for a wide variety of applications and complies with FCC Part 15, subpart J, Class A, which clearly defines the limitations of conducted and radiated noise. Choose from 9 models: 0-8 to 0-600 Vdc. Standard features include remote programming, 10-turn V&I pots, indicator lamps (V, I, OVP, remote shutdown & remote/local), On/Off switch (with resettable circuit breaker), 3.5 digit voltmeter on sense line, and 3.5 digit ammeter (green LED type). Option: IEEE 488 plug-in programming PC card. Line & load regulation: 0.1%; Ripple: 10-100 mV rms. Dual selectable input: 100-132/200-264 Vac, 47-63 Hz, 1 phase. 5 year warranty.

Model	Voltage (Vdc)	Current (Adc @ 40°C)	Case Size	Unit Price
DCS 8-125	0-8	125	I	$1,150.00
DCS 20-50	0-20	50	I	1,150.00
DCS 33-33	0-33	33	I	1,150.00
DCS 40-25	0-40	25	I	1,150.00
DCS 60-18	0-60	18	I	1,150.00
DCS 80-13	0-80	13	I	1,150.00
DCS 150-7	0-150	7	I	1,150.00
DCS 300-3.5	0-300	3.5	I	1,150.00
DCS 600-1.7	0-600	1.7	I	1,150.00

Options

Model	Description	Unit Price
M9A	Internal IEEE 488 Programming Card	$800.00

Case Sizes—In. (mm)

Case	Height	Width	Length
I	1.75 (44.45)	19 (482.6)	20 (508)

DCR-T SERIES—High Power Three Phase Input Laboratory and Industrial Power Supplies

New DCR-T Series high power lab/industrial power supplies are specifically designed to meet today's requirement for sophisticated control and product styling of the high power burn-in market. 5 kW & 10 kW DCR-T Series represent state-of-the-art SCR controlled regulation as well as state-of-the-art features and packaging. 18 models: 0-4 Vdc to 0-600 Vdc and 4 to 800 Adc. Unique DCR-T includes full remote control, full remote monitoring, along with front panel adjustable or remote OVP programming. Features include: OVP shutdown, phase loss and thermal shutdown standard. All features available under remote On/Off or remote read back.

Features available on rear panel connectors: ac control, shutdown, voltage set, current set, OVP set, local/remote, remote V & I meter drive, OVP indication, thermal/phase indication, and remote sense. 0.1% line & load regulation (typical), 30-150 mV rms ripple (model dependent), 40 ms transient response - 50% change (typical), EMI protection on ac line. 5 year warranty.

Model	Voltage (Vdc)	Current (Adc @ 50°C)	Case Size	Unit Price
DCR 4-800	0-4	800	II	$3,800.00
DCR 8-400	0-8	400	II	3,195.00
DCR 16-310	0-16	310	II	3,195.00
DCR 16-625	0-16	625	III	4,295.00
DCR 32-155	0-32	155	II	3,195.00
DCR 32-310	0-32	310	III	4,295.00
DCR 55-90	0-55	90	II	3,195.00
DCR 55-180	0-55	180	III	4,295.00
DCR 80-62	0-80	62	II	3,195.00
DCR 80-125	0-80	125	III	4,295.00
DCR 110-45	0-110	45	III	3,195.00
DCR 110-90	0-110	90	III	$4,295.00
DCR 160-30	0-160	30	II	3,195.00
DCR 160-62	0-160	62	III	4,295.00
DCR 300-16	0-300	16	II	3,195.00
DCR 300-33	0-300	33	III	4,295.00
DCR 600-8	0-600	8	II	3,195.00
DCR 600-16	0-600	16	III	4,295.00

DCR-T Accessories

Description[1]	Model (specify)	Unit Price
Chassis Slide Kit Available for 10KW models	1060247-1	$300.00

[1]Does not include front or rear mounting brackets.

DCR-T Options

Description	Model	Unit Price
Overvoltage Protection:		
• Overvoltage Protection Shutdown	Std.	N/C
• Overvoltage Protection Crowbar		
5 kW Output	M5	$150.00
10 kW Output	M5	$200.00
Meter Controls:		
• Analog Meters	Std.	N/C
• Digital Meters	M50	N/C
• Without Meters and V & I Controls	M51	(deduct $100)

DCR-T Input Voltages

Suffix Designator	Description	Unit Price
	Input voltage Modifications	
T1	*208 (190-230) Vac, 57-63 Hz, 30	N/C
T2	380 (342-418) Vac, 50 Hz, 30	add $200.00
T3	415 (374-557) Vac, 50 Hz, 30	add 200.00
T4	440 (400-480) Vac, 60 Hz, 30	add 200.00
T5	**480 (432-528) Vac, 60 Hz, 30	N/C
T6	575 (518-633) Vac, 60 Hz, 30	add 200.00

*Standard on 5 kW units.
**Standard on 10 kW units.

Case Sizes—In. (mm)

Case	Height	Width	Length
II	8.75 (222.3)	19 (482.6)	24 (609.6)
III	12.22 (310.4)	19 (482.6)	24 (609.6)

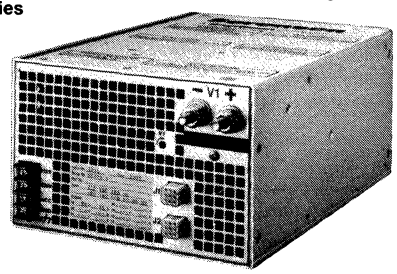
Toll Free: 1-800-525-2024/FAX: 312-775-7432

Sorensen
A Raytheon Company

S SERIES—500W to 2kW, 1 to 5 Outputs Switching Power Supplies

File E85422

NEW



High power and reliability with high packaging density are achieved through power MOSFET design. Additional advantages are high switching speeds, lower noise, ease of filtering, fast load response (even at low input voltages), absolute current sharing and 2-stage current limiting. Thousands of models are available with 500W, 750W, 1000W, 1250W, 1500W and 2000W power levels . . . and choice of 1 to 5 outputs (2V, 5V, 12V, 15V, 18V, 24V, 28V, 36V & 48V). Remote sensing can be specified and OVP is standard on outputs V1, V2, V3 & V4. Current sharing, reverse polarity protection, power fail warning & thermal shutdown are also standard features. UL, CSA & VDE recognized.

Dual (90-130/180-260 Vac) power inputs. Options include: dc power input (selected models), 3 phase (208/230 Vac input—1500W models), reverse air flow, DC OK, FCC Class A air filter, transzorb, and current sharing on V1 and V2 outputs. Regulation: Line—0.2%, Load—0.4%. Ripple & Noise (PARD): differential mode, 1% max. or 50 mV, whichever is greater. 5 year warranty.

S Series Options

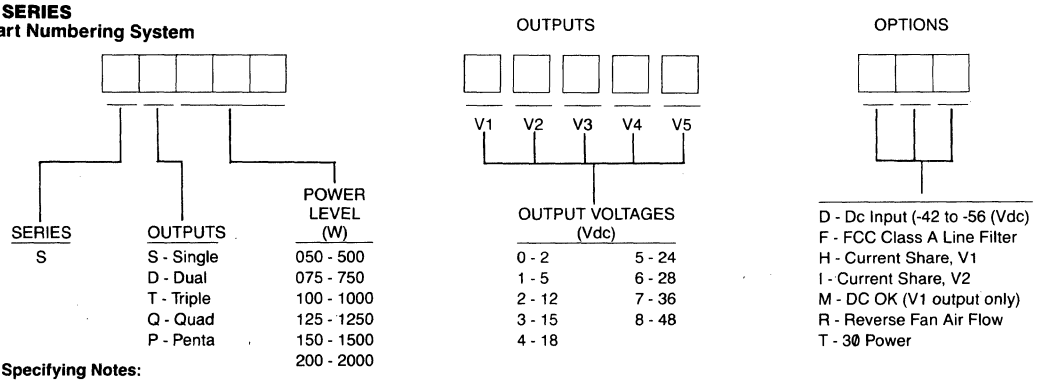
Description	Option Code
–42 to –56 Vdc input (500W, 750W, 1000W)	D
FCC Class A Line Filter	F
Current Share, V1 output	H
Current Share, V2 output	I
DC OK	M
Reverse Air Flow	R
3 phase ac input	T

Case Sizes—In. (mm)

Case	Width	Height	Length
I	8 (203.2)	5 (127)	12 (304.8)
II*	8 (203.2)	5 (127)	12 (304.8)
III	8 (203.2)	5 (127)	14 (355.6)

*Case II has dimensional variables inside overall envelope as compared to case I.

S SERIES Part Numbering System



Specifying Notes:

1. Current sharing standard on single output model.
2. Line filter (FCC 20780, Level A and VDE 0871, Level A) not available with 30 input (Option T). V5 output not available if line filter is specified.
3. DC-OK; optional form "C" relay is activated when output drops 5% below nominal.
4. DC input (Option D) available on 500W, 750W & 1000W models only.

ORDERING SINGLE & DUAL OUTPUT POWER SUPPLIES

EXAMPLES

1. Required: 750W single output supply, 36V @ 21A rating, with forward air flow & overvoltage protection.

Part No.

S	S	0	7	5	7

OVP is standard on output V1.

2. Required: Single output 1500W, 2V @ 340A, reverse air flow & overvoltage protection.

Part No.

S	S	1	5	0	0	R

OVP is standard on output V1.

SINGLE OUTPUT					
	500W	750W	1000W	1500W	2000W
V1	2V, 120A 5V, 100A 12V, 42A 15V, 34A 18V, 28A 24V, 21A 28V, 18A 36V, 14A 48V, 11A	2V, 175A 5V, 150A 12V, 63A 15V, 50A 18V, 42A 24V, 31A 28V, 27A 36V, 21A 48V, 16A	2V, 230A 5V, 200A 12V, 83A 15V, 67A 18V, 56A 24V, 42A 28V, 36A 36V, 28A 48V, 21A	2V, 340A 5V, 300A 12V, 125A 15V, 100A 18V, 83A 24V, 63A 28V, 54A 36V, 42A 48V, 31A	2V, 400A 5V, 400A 12V, 167A 15V, 134A 18V, 111A 24V, 84A 28V, 72A 36V, 56A 48V, 42A
Unit Price		CALL FOR QUOTE			

1. Required: Dual output supply with forward air flow and OVP on both outputs.
Output V1: 400W, 5V, 80A max.
Output V2: 500W, 24V, 21A max.

Part No.

S	D	1	0	0	1	5

Specifying Note: 1000W model must be ordered to accommodate total power requirements. OVP is standard on outputs V1 and V2.

2. Required: Dual output power supply with reverse air flow and OVP on output V2.
Output V1: 500W, 5V, 90A
Output V2: 120W, 15V, 8A

Part No.

S	D	0	7	5	1	3	R

Specifying Note: To assure total wattage rating is not exceeded, a 750W supply must be specified with output V1 (5V, 110A max.) and V2 (15V, 8A max.). OVP is standard on outputs V1 and V2.

DUAL OUTPUTS*					
	500W	750W	1000W	1250W	1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 15A 5V, 15A 12V, 15A 15V, 10A 24V, 10A	2V, 50A 5V, 50A 12V, 33A 15V, 27A 24V, 17A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A
Unit Price		CALL FOR QUOTE			

*Total output power is limited to power rating shown.

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MODULAR POWER SUPPLIES (continued)

S SERIES (cont.)

ORDERING TRIPLE & QUAD OUTPUT POWER SUPPLIES

EXAMPLES

1. Required: Three outputs with forward air flow, OVP on all outputs, and current share on V1 output.
   Output V1: 5V, 200A, 1000W
   Output V2: 12V, 10A, 120W
   Output V3: 24V, 3A, 72W
   } Combined output power must not exceed 1250W.

Part No.

S	T	1	2	5	1	2	5	H

OVP is standard on outputs V1, V2 & V3.

TRIPLE OUTPUTS*					
	500W	750W	1000W	1250W	1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 15A 5V, 15A 12V, 15A 15V, 10A 24V, 10A	2V, 20A 5V, 20A 12V, 15A 15V, 15A 24V, 10A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A
V3	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A
Unit Price		CALL FOR QUOTE			

*Total output power is limited to power rating shown.

1. Required: 4-output power supply, DC OK capability and reverse air flow cooling. OVP not required.
   Output V1: 5V, 150A, 750W
   Output V2: 2V, 10A, 20W
   Output V3: 12V, 8A, 100W
   Output V4: 24V, 2A, 50W
   } Specify a 1000W supply; total output power must not exceed 1000W

Part No.

S	Q	1	0	0	1	0	3	5	M

OVP is standard on outputs V1 thru V4.

QUAD OUTPUTS*					
	500W	750W	1000W	1250W	1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 15A 5V, 15A 12V, 15A 15V, 10A 24V, 10A	2V, 20A 5V, 20A 12V, 15A 15V, 15A 24V, 12A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A
V3	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A
V4	2V, 3A 5V, 3A 12V, 3A 15V, 2A 24V, 2A	2V, 3A 5V, 3A 12V, 3A 15V, 2A 24V, 2A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A
Unit Price		CALL FOR QUOTE			

*Total output power is limited to power rating shown.

ORDERING PENTA OUTPUT POWER SUPPLIES

1. Required: 5-output power supply, OVP on outputs V1 through V4, reverse air cooling and transzorb feature.
   Output V1: 5V, 60A, 300W
   Output V2: 5V, 10A, 50W
   Output V3: 5V, 5A, 25W
   Output V4: 12V, 3A, 36W
   Output V5: 12V, 5A, 60W
   } Order 500W supply; total power must not exceed rating of supply.

Part No.

S	P	0	5	0	1	1	1	2	2	R	Z

OVP is standard on outputs V1, V2, V3 & V4; output V5 is quasi-regulated.

PENTA OUTPUTS*					
	500W	750W	1000W	1250W	1500W
V1	5V, 80A	5V, 110A	5V, 150A	5V, 200A	5V, 230A
V2	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 6A	2V, 20A 5V, 20A 12V, 15A 15V, 15A 24V, 12A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A	2V, 100A 5V, 100A 12V, 42A 15V, 34A 24V, 21A
V3	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 5A 24V, 3A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A	2V, 10A 5V, 10A 12V, 10A 15V, 8A 24V, 5A
V4	2V, 3A 5V, 3A 12V, 3A 15V, 2A 24V, 2A	2V, 3A 5V, 3A 12V, 3A 15V, 2A 24V, 2A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A	2V, 5A 5V, 5A 12V, 5A 15V, 3A 24V, 3A
V5	†PK 12V, 5A/8A 24V, 5A/8A	†PK 12V, 7A/10A 24V, 7A/10A	†PK 12V, 8A/12A 24V, 8A/12A	**	**
Unit Price		CALL FOR QUOTE			

*Total output power is limited to power rating shown.
† Peak output for 30 seconds.
**Contact Sorensen

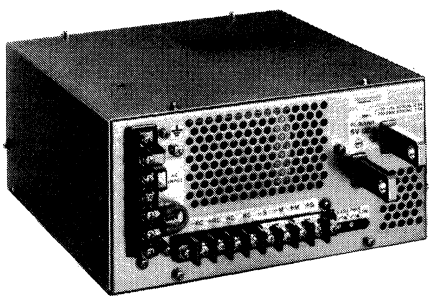
NOTE: V5 output not available if line filter is specified.

Toll Free: 1-800-525-2024/FAX: 312-775-7432 Sorensen A Raytheon Company

KE600 SERIES—600W Switching Power Supplies.

Previously SNG Series

File E85422



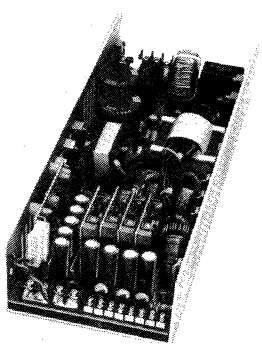
The advanced packaging of the KE600 Series 600W power supply is due to the state of the art 150 kHz switching technology, which allows high component density and light weight. This unit is designed with the end user in mind, providing maximum flexibility in the areas of remote On/Off, N+1 redundancy, selectable ac input, remote output monitoring, selectable remote sensing or PALS (Programmable Automatic Load Sensing) for fixed local line applications. PALS eliminates the need for external sense lines. Covers are supplied standard. Dual selectable ac inputs are: 85-132 Vac or 170-264 Vac, 1 phase, 47-440 Hz. Ripple/Noise: 0.1/0.008% max (model dependent). Line & Load Regulation: ±0.01% max. Meets UL, CSA, VDE (TUV) safety standards and conforms to FCC Class A on EMI. 2 year warranty.

Model	Voltage (Vdc) Adjustment Range		Current (Adc @50°C)	Unit Price
	Min.	Max.		
KE600-2	1.6	2.2	120	$650.00
KE600-5	4.5	5.5	120	650.00
KE600-12	10.8	13.2	50	650.00
KE600-15	13.5	15.5	40	650.00
KE600-24	21.6	26.4	25	650.00
KE600-28	25.2	30.8	22	650.00
KE600-48	43.2	52.8	13	650.00

Case Size—In. (mm)

3.78 (96) W x 7.87 (200) H x 7.87 (200) L

KSA400 SERIES—5 Output Switching Power Supply



Parallel-MOSFET forward converter technology gives a heavy duty, adjustable 5-output supply. KSA400 is built for up to 400W output and meets UL, CSA and TUV requirements, as well as EMI protection to FCC and VDE 0871, level 1. Outputs are: V1—5V+5%, 40 Adc (convection) or 50 A (forced air); V2, V3 & V4—5-15V, 0-6 Adc; V5—12-24V, 0-6 Adc. Overvoltage and remote sense are standard on V1; overcurrent protection is standard on all outputs. Power fail and remote inhibit are also standard. Dual selectable (95-132/190-264) power inputs (47-63 Hz, 1 phase). Optional cover with fan is available. Ripple & noise is greater of 1% or 100 mV pk-pk (V1 output—50 mV pk-pk). 2 year warranty.

Model	Unit Price
KSA400	$465.00

Option

Cover with fan . . . . . .Contact Sorensen for price

Case Size—In. (mm)

2.5 (63.5) H x 5 (127) W x 13 (330.2) L

MODULAR POWER SUPPLIES (continued)

KRE SERIES—Adjustable, Single-Output Switching Power Supplies

File E85422

150 kHz switching speed permits low cost supplies with small, compact packaging and high wattage/in.³. Output voltages are: 5V, 12V, 15V, 24V (±10%) at 50W, 100W and 150W power levels. Standard features include: OVP and overcurrent protection, inrush current limiting, remote sensing, covers, and dual input power (85-132 Vac or 110-176 Vdc). Series KRE meets UL (file E85422) and CSA safety standards and conforms to FCC Class B and VCCI-2 for EMI protection. Line regulation: ±0.5%; load regulation: ±1% max. Ripple/Ripple & Noise (p-p max.): 5V—60 mV/100 mV, 12V—120 mV/150 mV, 15V—180 mV/180 mV, 24V—240 mV/240 mV. 2 year warranty.

Model	Voltage Vdc, ±10%	Current Adc	Output Power W	Case Size	Unit Price
KRE50-05	5	10	50	I	$ 69.00
KRE50-12	12	4.2	50.4	I	69.00
KRE50-15	15	3.4	51	I	69.00
KRE50-24	24	2.2	52.8	I	69.00
KRE100-05	5	20	100	II	102.00
KRE100-12	12	8.5	102	II	102.00
KRE100-15	15	7	105	II	102.00
KRE100-24	24	4.5	108	II	102.00
KRE150-05	5	30	150	III	146.00
KRE150-12	12	13	156	III	146.00
KRE150-15	15	10	150	III	146.00
KRE150-24	24	6.5	156	III	146.00

Case Sizes—In. (mm)

Case	Height	Width	Length
I	1.42 (36.1)	3.82 (97)	5.62 (142.75)
II	1.97 (50)	3.82 (97)	7.52 (191)
III	2.56 (65)	3.82 (97)	7.92 (201.2)

Sorensen
A Raytheon Company
Toll Free: 1-800-525-2024/FAX: 312-775-7432

KVL SERIES—Compact, 3 Output Switching Power Supplies

NEW

KVL Series offers both low cost and small package size. Three outputs (+5V, ±12V & ±15V) are available in combinations at 15W, 25W, or 40W (nom.) power levels. Standard features are: overload and overvoltage protection, inrush current protection, cover mounting bracket, and ac (120V) or dc (110-170V) input. Cover is optional. Conforms to safety requirements of UL478 (UL file E85422); CSA C22.2, No. 1402; and noise standards of FCC-B. Output Effect (source, load & time): 5% max. Ripple: +5V (100 mV max.), ±12V & ±15V (150 mV max.). Noise: +5V (100 mV max.), ±12V & ±15V (150 mV max.). 2 year warranty

Model	Output 1 V (nom.)/ I (max.)	Output 2 V (nom.)/ I (max.)	Output 3 V (nom.)/ I (max.)	Output W	Case Size	Unit Price
KVL15-01T	+5/2	+12/0.3	−12/0.3	15	I	$37.00
KVL15-02T	+5/2	+15/0.3	−15/0.3	15	I	37.00
KVL25-01	+5/2.5	+12/1	−12/0.3	25	II	50.00
KVL25-01T	+5/2.5	+12/0.5	−12/0.3	22.1	II	56.00
KVL25-02	+5/2.5	+15/1	−15/1	25	II	50.00
KVL25-02T	+5/2.5	+15/0.5	−15/0.3	23.6	II	56.00
KVL40-01	+5/3	+12/2	−12/0.3	40	III	62.00
KVL40-01T	+5/3	+12/1	−12/0.3	30.6	III	68.00
KVL40-02	+5/3	+15/2	−15/0.3	40	III	62.00
KVL40-02T	+5/3	+15/1	−15/0.3	33.6	III	68.00

T = Post regulators on 2nd & 3rd outputs.

KVL Option

Description	Model[1]	Unit Price
Cover	C	$7.50

[1]Add option letter as suffix to part no. when ordering. Installation is $4.00 extra.

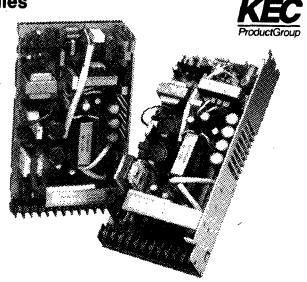
Case Sizes—In. (mm)

Case	Height	Width	Length
I	1.38 (35)	3.35 (85)	4.53 (115)
II	1.58 (40)	3.35 (85)	5.12 (130)
III	1.77 (45)	3.35 (85)	5.7 (145)

KG SERIES—130W & 170W, 4 Outputs Switching Power Supplies

File E85422

NEW



KG Series features MOSFET converter circuitry for minimum ripple and noise output. Four outputs can be specified with +5V, ±12V, ±15V, +24V in combinations at 130W or 170W output levels. Standard features are: overvoltage and overcurrent protection, selectable dual ac (90-132/180-264 Vac) input, EMI protection per FCC Class B, UL (file E85422) & CSA recognized. Output effect (line, load, cross, centering): 5±3% max. Ripple/Ripple & Noise (mV, typ.): +5V—15/45, +12V & +15V—35/60, −12V & −15V—5/60, +24V—70/85. 2 year warranty.

Case Sizes—In. (mm)

Case	Height	Width	Length
I	2.44 (62)	4.94 (125.5)	9 (230)
II	2.44 (62)	4.94 (125.5)	10 (254)

Model	RTN1 Output 1 V (nom.)/ I (max.)	RTN1 Output 2 V (nom.)/ I (max.)	RTN1 Output 3 V (nom.)/ I (max.)	RTN1 Output 4 V (nom.)/ I (max.)	RTN2 Output 4 V (nom.)/ I (max.)	Output W	Case Size	Unit Price
KG130-03	+5/13	+12/4	−12/1	—	+24/1.5	130	I	$172.00
KG130-04	+5/13	+15/4	−15/1	—	+24/1.5	130	I	172.00
KG130-06	+5/13	+12/4	−12/1	−12/1.2	—	130	I	172.00
KG170-03	+5/17	+12/5	−12/1	—	+24/1.5	170	II	184.00
KG170-04	+5/17	+15/5	−15/1	—	+24/1.5	170	II	184.00
KG170-06	+5/17	+12/5	−12/1	+12/1.5	—	170	II	184.00

Toll Free: 1-800-525-2024/FAX: 312-775-7432 Sorensen A Raytheon Company

MODULAR POWER SUPPLIES (continued)

KVB SERIES—Compact, Single-Output Switching Power Supplies

File E85422

NEW

Compact, lightweight, low cost KVB Series has single 5V, 12V, 15V or 24V output at 10W, 15W or 25W output power level. Standard features are: overvoltage and overcurrent protection, inrush current limiting, and ac (120V) or dc (110-170V) input. Cover is option "C". Conforms to FCC Class B for EMI protection and meets UL and CSA safety requirements. UL recognized (file E85422). Output effect: 5V—20 mV (source) & 40 mV (load). 12V-48 mV (source) & 100 mV (load). 15V—60 mV (source) & 120 mV (load). 24V—96 mV (source) & 150 mV (load). Ripple/Ripple & Noise (p-p max.): 80 mV/120 mV (5V). 120 mV/150 mV (12V, 15V, 24V). 2 year warranty.

Option

Description	Model[1]	Unit Price
Cover	C	$7.50

[1]Add option letter as suffix to part no. when ordering (cover not installed). For installed cover add $4.00. To order separate cover, suffix part no. with "COVER".

Model	Output V (nom.)/ I (max.)	Output W	Case Size	Unit Price
KVB010-05	5/2	10	I	$34.00
KVB010-12	12/0.8	10	I	34.00
KVB010-15	15/0.7	10	I	34.00
KVB010-24	24/0.4	10	I	34.00
KVB015-05	5/3	15	II	35.00
KVB015-12	12/1.3	15	II	35.00
KVB015-15	15/1	15	II	35.00
KVB015-24	24/0.6	15	II	35.00
KVB025-05	5/5	25	III	40.00
KVB025-12	12/2.1	25	III	40.00
KVB025-15	15/1.7	25	III	40.00
KVB025-24	24/1	25	III	40.00

Case Sizes—In. (mm)

Case	Height	Width	Length
I	1.06 (27)	2.91 (74)	3.82 (97)
II	1.38 (35)	3.57 (91)	4.63 (11.75)
III	1.38 (35)	3.58 (91)	5.43 (138)

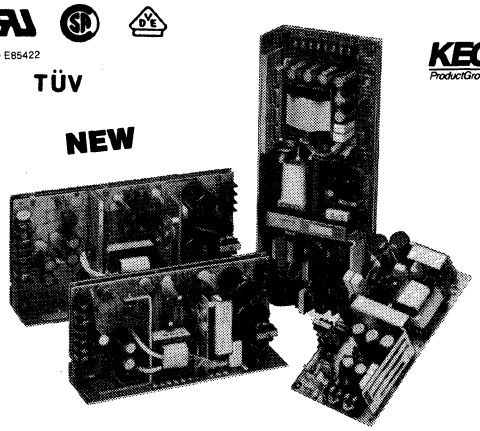
KFE SERIES—Adjustable, Single-Output Switching Power Supplies

File E85422

TÜV

NEW

KEC ProductGroup



Economical KFE Series open frame switchers offer unparalleled reliability in 50W, 100W, 130W & 200W types. Output voltages are 5V, 12V, 15V & 24V. Standard features are: dual ac input (90-132/180-264 Vac), OVP & overcurrent protection, LED "On" indicator, reverse voltage protection, remote sensing, high efficiency (up to 78%), input transient protection and logic inhibit (100, 130 & 200W). UL & TUV recognized, (UL file E85422; TUV file, KFE 050-R85709, KFE100-R85710, KFE130-R85711, KFE200-R85712). Options include covers and power fail detector. Line regulations: ±0.5% max.; load regulation: ±1% max. Ripple & Noise: 0.3% rms, 1% pk-pk max. 2 year warranty.

KFE Options

Description	Model	Unit Price
Cover, EMI/RFI	C	$12.00*
Power fail detector**	P	22.50
Remote On/Off**	R	7.50

*$7.50 for 50W model. Add option letter to part no. when ordering (cover not installed). For installed cover add $4.00. To order separate cover, suffix part no. with "COVER."
**Not available on 50W model.

Model	Voltage (Vdc) Adjustment Range		Current (Adc @50°C)	Output Power W	Case Size	Unit Price
	Min.	Max.				
KFE50-05	4.5	5.5	10	50	I	$102.00
KFE50-12	10.8	13.2	4.1	50	I	102.00
KFE50-15	13.5	16.5	3.3	50	I	102.00
KFE50-24	21.6	26.4	2.1	50	I	102.00
KFE100-05	4.5	5.5	20	100	II	139.00
KFE100-12	10.8	13.2	8.3	100	II	139.00
KFE100-15	13.5	16.5	6.7	100	II	139.00
KFE100-24	21.6	26.4	4.1	100	II	139.00
KFE130-05	4.5	5.5	26	130	III	170.00
KFE130-12	10.8	13.2	10.8	130	III	170.00
KFE130-15	13.5	16.5	8.7	130	III	170.00
KFE130-24	21.6	26.4	5.4	130	III	170.00
KFE200-05	4.5	5.5	40	200	IV	240.00
KFE200-12	10.8	13.2	16.6	200	IV	240.00
KFE200-15	13.5	16.5	13.3	200	IV	240.00
KFE200-24	21.6	26.4	8.3	200	IV	240.00

Case Sizes—In. (mm)

Case	Height	Width	Length
I	2 (51)	4.25 (108)	7.76 (197)
II	2.44 (62)	4.21 (107)	9.06 (230)
III	2.44 (62)	4.94 (125.5)	10.5 (266)
IV	2.44 (62)	4.94 (125.5)	13 (330)

Sorensen
A Raytheon Company
Toll Free: 1-800-525-2024/FAX: 312-775-7432

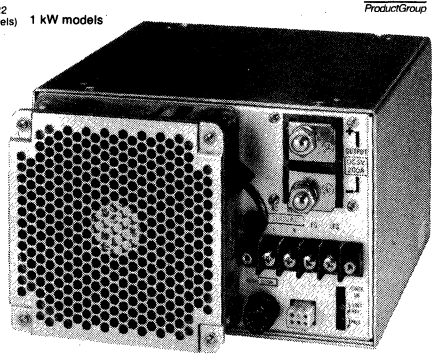
MODULAR POWER SUPPLIES (continued)

KE SERIES—750W & 1000W, 50 Hz Switching Power Supplies

Previously SCG Series

File E85422 (most models) 1 kW models

KEC ProductGroup



KE Series satisfies a broad range of high power applications. Each supply has single 750W or 1kW output which can be specified at 5, 12, 15, 24, 28 or 48 Vdc. Features include built-in overload and overvoltage protection, PALS (Programmed Automatic Load Sensing) for superior load/line drop compensation, remote On/Off, AC power failure, covers, and remote programming. 110-120 Vac, 48-62 Hz, 1 phase is standard. Option H (200-240 Vac, 48-62 Hz, 1 phase) can also be specified. Ripple/Ripple & Noise: 1%/1% + 50 mV typ. Load Regulation (no load/full load): 1% max. UL & CSA recognized (UL file E85422, CSA file LR60122-16). 2 year warranty.

Model[1]	Voltage (Vdc) Adjustment Range		Current (Adc @50°C)	Power (W)	Unit Price
	Min.	Max.			
KE750-02	1.8	2.2	150	300	$735.00
KE750-05	4.5	5.5	150	750	735.00
KE750-12	10.8	13.2	63	750	735.00
KE750-15	13.5	16.5	50	750	735.00
KE750-24	21.6	26.4	32	750	735.00
KE750-28	25.2	30.8	27	750	735.00
KE750-48	43.2	52.8	16	750	735.00
KE1000-02	1.8	2.2	200	400	795.00
KE1000-05	4.5	5.5	200	1,000	795.00
KE1000-12	10.8	13.2	84	1,000	795.00
KE1000-15	13.5	16.5	67	1,000	795.00
KE1000-24	21.6	26.4	42	1,000	795.00
KE1000-28	25.2	30.8	36	1,000	795.00
KE1000-48	43.2	52.8	21	1,000	795.00

1. All models UL & CSA recognized, except UL applied for on KE750-02, -12, -24, -48 and KE1000-15, -28.

Case Size—In. (mm)
4.98 (126.5) H x 7.7 (195.5) W x 10.08 (256) L

KE Option

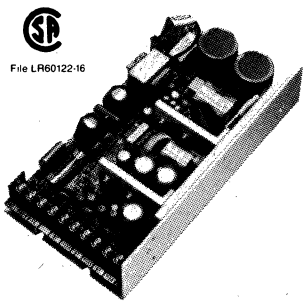
Description	Model	Unit Price
200-240 Vac, 48-62 Hz, 1 phase ac input	H	N/C

KT SERIES—Compact, 2 or 3 Output Switching Power Supplies

Previously SMT Series

File E85422 File LR60122-16

KEC ProductGroup



100 kHz switching speed permits light weight & space-saving construction. Two or 3 outputs (75 W max.) can be specified with ±5, ±12, ±15, and +24 Vdc in combinations. Standard features include: post regulation on −5 & ±15 V lines remote On/Off, FCC Class B line filter, and remote start-up & shut-down. Options include: covers and ac power fail. Line regulation—0.5% max. Load regulation: ±5 V, ±15 V, 1% max.; ±12 V, +24 V, 5% max. Ripple/Ripple & Noise: 1% +25 mV/2% +50 mV (max.). UL & CSA recognized (UL file E85422, CSA file LR60122). 2 year warranty.

Model	Output 1 (Master) V (nom.)/ I (max.)	Output 2 (Slave) V (nom.)/ I (max.)	Output 3 (Slave) V (nom.)/ I (max.)	Unit Price
KT075-01	+5/8	+12/2	−12/0.5	$115.00
KT075-02	+5/8	+15/1	−15/0.5	115.00
KT075-03	+5/8	+12/2	−5/0.5	115.00
KT075-04	+5/8	+12/2	+12/2	115.00
KT075-05	+5/8	+24/2	—	115.00

Case Size—In. (mm)
1.81 (46) H x 4.25 (108) W x 7.87 (200) L

KT Options Catalog Page 80

Description	Model[1]	Unit Price
Cover	C	$ 7.50
AC Power Fail	P	22.50

[1]Add option letter as suffix to part no. when ordering (cover not installed). For installed cover, add $4.00. To order separate cover, suffix part no. with "COVER".

Spellman
High Voltage Electronics Corp
7 Fairchild Avenue Plainview, NY 11803 * (516) 349-8686 * FAX (516) 349-8699 * TWX 510-221-2155

SR6 SERIES

SR6 Series 6kW HV Power Supplies

Features:

- Compact design and light weight
- Low cost per watt
- Low stored energy
- Low EMI and RFI
- Overvoltage, Overcurrent, Arc, and Short Circuit Protection
- Constant Voltage/Constant Current Operation with Automatic Crossover
- Arc Detect, Arc Quench and Arc Count
- Extensive Local and Remote Operation
- 85% efficiency
- System Status Indicators

The SR6 series incorporates series resonant converter technology with a unique patented control circuit to provide unmatched performance. Special circuitry enables this supply to operate without damage or interruption in rugged environments that frequently pose threats to conventional high voltage power supplies. In addition, the SR6 series protects your load from excessive peak currents by instantaneously limiting the output current when an arcover condition is sensed.

Remote Interface:

- Remote Voltage Control (0 to 10V)
- Remote Current Control (0 to 10V)
- Voltage Test Point (0 to 10V)
- Current Test Point (0 to 10V)
- Remote Power On/Off
- External Interlock
- Inhibit Control of High Voltage Output
- External HV On/Off Control and Indicators

The SR6 series provides extensive remote control capabilities with many standard features not usually found in other supplies. This combination provides the SR6 with flexibility for integration into your applications. Optional circuitry is available to meet your requirements. See Options section.

Specifications:

- Input: 208VAC ±10%, 50 or 60Hz, Three phase
- Output controls: Voltage and current are continuously adjustable over entire range via 10-turn potentiometers with a lockable counting dials.
- Voltage regulation:
  Load: 0.005% of full voltage for full load change.
  Line: ±0.005% of full voltage over specified input range.
- Current Regulation:
  Load: 0.05% of full current ±100uA for any voltage change.
  Line: ±0.05% of full current over specified input range.
- Ripple: 0.1% P-P.
- Temperature Coefficient: 100ppm/°C. Higher Stability (50ppm/°C) available on special order.
- Stability: 0.01%/hr. after ½ hour warm up, 0.02% per 8 hrs. (typical).
- Metering: Digital voltage and current meters, 1% accuracy.
- Output cable: 10 ft. shielded high voltage cable, removable at rear panel.
- Physical: 10 ½" H x 19" W x 19" D rack mount for units 1 to 70kV. 10 ½" H x 19" W x 24" D for units 80 to 120kV.

Options:

- AOL Adjustable Overload Trip
- FG Floating Ground
- LR Low Ripple (0.05% P-P)
- CPC Constant Power Control
- APT Adjustable Power Trip
- 220 220V AC Single Phase Input
- RMI Remote Mode Indicators
- ROA Remote Overvoltage Adjust
- SL Mounting Slides
- Filament Power Supply
- 12kW & 18 kW Parallel Operation

If you don't see the features or options that your application requires, please contact us with your needs so we may discuss customizing one of our products to match your application.

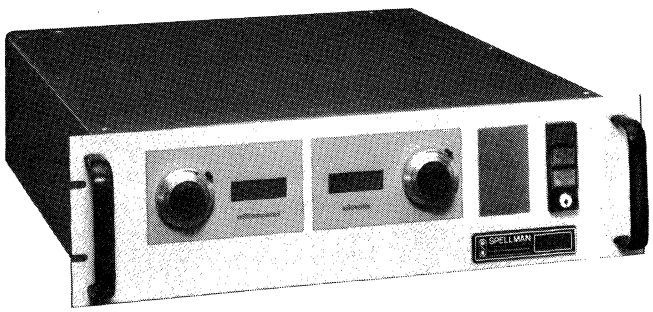
Maximum Rating		Model Number
kV	mA	
1	6000	SR1*6
2	3000	SR2*6
3	2000	SR3*6
6	1000	SR6*6
10	600	SR10*6
15	400	SR15*6
20	300	SR20*6
30	200	SR30*6
40	150	SR40*6
50	120	SR50*6
60	100	SR60*6
70	86	SR70*6
80	75	SR80*6
100	60	SR100*6
120	50	SR120*6

* Specify "P" for positive, "N" for negative, or "PN" for reversible polarity.
Higher voltage models available on special order.

Spellman
High Voltage Electronics Corporation
7 Fairchild Avenue Plainview, NY 11803 * (516) 349-8686 * FAX (516) 349-8699 * TWX 510-221-2155

SA4 SERIES

SA4 Series 4kW HV Power Supplies



Features:

- **Compact design and light weight**
- Low cost per watt
- Low stored energy
- Low EMI and RFI
- Overvoltage, Overcurrent, Arc, and Short Circuit Protection
- Constant Voltage/Constant Current Operation with Automatic Crossover
- Arc Detect, Arc Quench and Arc Count
- Extensive Local and Remote Operation
- 85% efficiency
- System Status Indicators

The SA4 series incorporates series resonant converter technology with a unique patented control circuit to provide unmatched performance. Special circuitry enables this supply to operate without damage or interruption in rugged environments that frequently pose threats to conventional high voltage power supplies. In addition, the SA4 series protects your load from excessive peak currents by instantaneously limiting the output current when an arcover condition is sensed.

Remote Interface:

- Remote Voltage Control (0 to 10V)
- Remote Current Control (0 to 10V)
- Voltage Test Point (0 to 10V), 0.5% accuracy
- Current Test Point (0 to 10V), 0.5% accuracy
- Remote Power On/Off
- External Interlock
- Inhibit Control of High Voltage Output
- External HV On/Off Control and Indicators

The SA4 series provides extensive remote control capabilities with many standard features not usually found in other supplies. This combination provides the SA4 with flexibility for integration into your applications. Optional circuitry is available to meet your requirements. See Options section.

Specifications:

- Input: 208VAC ±10%, 50 or 60Hz, three phase
- Output controls: Voltage and current are continuously adjustable over entire range via 10-turn potentiometers with lockable counting dials.
- Voltage regulation:
  Load: 0.005% of full voltage for full load change.
  Line: ±0.005% of full voltage over specified input range.
- Current Regulation:
  Load: 0.05% of full current ±100uA for any voltage change.
  Line: ±0.05% of full current over specified input range.
- Ripple: 0.1% rms. Lower ripple available.
- Temperature Coefficient: 100ppm/°C. Higher Stability (50ppm/°C) available on special order.
- Stability: 0.01%/hr. after ½ hour warm up, 0.02% per 8 hrs. (typical).
- Metering: Digital voltage and current meters, 1% accuracy.
- Output cable: 10 ft. shielded high voltage cable, removable at rear panel.
- Physical: 5¼" H x 19" W x 22" D rack mount.

Options:

- AOL Adjustable Overload Trip
- FG Floating Ground
- LR Low Ripple (0.05% rms)
- CPC Constant Power Control
- APT Adjustable Power Trip
- 220 220V AC Single Phase Input
- RMI Remote Mode Indicators
- ROA Remote Overvoltage Adjust
- SL Mounting Slides
- Filament Power Supply
- Parallel Operation
- Arc Status, Arc Quench, Arc Count

If you don't see the features or options that your application requires, please contact us with your needs so we may discuss customizing one of our products to match your application.

Maximum Rating		Model Number
kV	mA	
1	4000	SA1*4
2	2000	SA2*4
3	1330	SA3*4
6	667	SA6*4
10	400	SA10*4
15	267	SA15*4
20	200	SA20*4
30	133	SA30*4
40	100	SA40*4
50	80	SA50*4
60	67	SA60*4

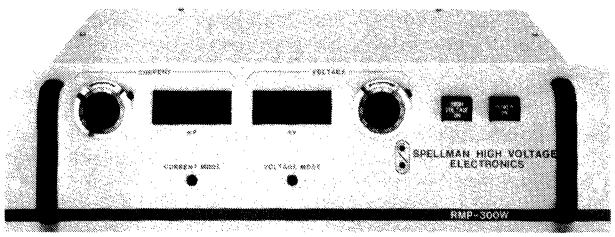
* Specify "P" for positive, "N" for negative, or "PN" for reversible polarity.
Higher voltage models available on special order.

Available First Quarter 1992

Spellman
High Voltage Electronics Corp
7 Fairchild Avenue Plainview, NY 11803 * (516) 349-8686 * FAX (516) 349-8699 * TWX 510-221-2155

RMP SERIES

RMP Series 300W-1kW HV Power Supplies



* Picture might not depict some models

Features:

- Low cost per watt
- Low stored energy
- Low EMI and RFI
- Overvoltage, Overcurrent, Arc, and Short Circuit Protection
- Constant Voltage/Constant Current Operation with Automatic Crossover
- Remote Operation
- Efficiency greater than 90%
- Slow Start
- Modular Design

The "Bullet Proof" design of the RMP series allow outstanding operation under arcing and extreme transient conditions without interruption or damage. In addition to providing protection, the patented control circuitry enables the supply to have a dynamic response time of less than 5 milliseconds, extremely low ripple and excellent regulation. The same series resonant topology and patented control circuitry that is found in our higher power models is utilized to give you superior performance and reliability in this series.

Options:

- OL Overload Trip
- CE CMOS Enable
- APM Analog Panel Meters
- 220 220V AC Single Phase Input
- 100 100V AC Single Phase Input
- NSS No Slow Start
- SL Mounting Slides
- SS(x) Non-standard Slow Start (x = time in seconds)
- FPR Front Panel Reversibility (1-30kV only) *
- LL Extra Length Output Cable *
- F(x) Focus Output (x = voltage in kV) *
- High Peak Power
- Bi-polar Operation
- Custom Designs

If you don't see the features or options that your application requires, please contact us with your needs so we may discuss customizing one of our products to match your application.

* Certain options will increase the length of the chassis.

Specifications:

- Input: 115VAC ±10%, 50 or 60Hz, Single phase
- Output controls: Voltage and current are continuously adjustable over entire range via 10-turn potentiometers with lockable counting dials.
- Load regulation: 0.005% of full voltage for NL to FL change.
- Line regulation: ±0.005% of full voltage over specified input range.
- Ripple: 0.05% Peak to Peak for 300 watt units. 0.1% Peak to Peak for 500 & 1000 watt units.
- Temperature Coefficient: 100ppm/°C Higher Stability (50ppm/°C) available on special order.
- Stability: 0.02%/hr. after ½ hour warm up, 0.05% per 8 hrs. (typical).
- Metering: Digital voltage and current meters, 1% accuracy.
- Output cable: 10 ft. shielded high voltage cable, removable at rear panel.

Dimensions	300 & 500 Watts		1000 Watts	
	1-60kV	80-125kV	1-60kV	80-125kV
Height	5¼"	5¼"	10½"	10½"
Width	19"	19"	19"	19"
Length	17"	24"	17"	24"

Remote Interface:

- Remote Voltage Control (0 to 10V)
- Remote Current Control (0 to 10V)
- Voltage Test Point (0 to 10V)
- Current Test Point (0 to 10V)
- TTL Enable (0V = HV OFF, > 4.5 V = HV ON)
- Floating Ground (50v Max.)
- External Interlock
- Reference Voltage (10.24V DC)

	RMP1000		RMP500		RMP300	
kV	mA	Model	mA	Model	mA	Model
1	1000	RMP1*1000	500	RMP1*500	300	RMP1*300
3	333	RMP3*1000	167	RMP3*500	100	RMP3*300
5	200	RMP5*1000	100	RMP5*500	60	RMP5*300
10	100	RMP10*1000	50	RMP10*500	30	RMP10*300
15	66.7	RMP15*1000	33	RMP15*500	20	RMP15*300
20	50	RMP20*1000	25	RMP20*500	15	RMP20*300
30	33	RMP30*1000	16.7	RMP30*500	10	RMP30*300
40	25	RMP40*1000	12.5	RMP40*500	7.5	RMP40*300
50	20	RMP50*1000	10	RMP50*500	6	RMP50*300
60	16.7	RMP60*1000	8.3	RMP60*500	5	RMP60*300
80	12.5	RMP80*1000	6.25	RMP80*500	3.75	RMP80*300
100	10	RMP100*1000	5	RMP100*500	3	RMP100*300
125	8	RMP125*1000	4	RMP125*500	2.4	RMP125*300

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Higher voltage models available on special order.

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RHP & DXR SERIES

RHP Series 3kW HV Power Supplies

Features:

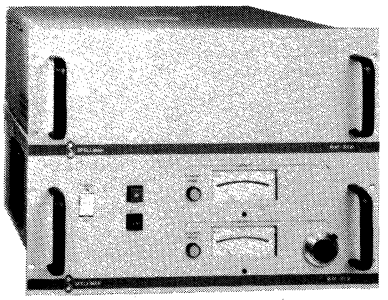
- Low Stored Energy
- Low EMI and RFI
- Overvoltage, Overcurrent, Arc and Short Circuit Protected
- Over 85% efficiency
- Remote Test Points and Remote Programming
- Inhibit Control of HV Output Via TTL Signal
- External Interlock Safety Circuitry

Options:

- DPM Digital Panel Meters
- CR Current Regulation
- CFC Coarse/Fine Controls
- FG Floating Ground
- 220 220V AC Single-phase Input
- RHVE Remote High Voltage Enable
- EAR External Alarm Relay

Specifications:

- Input: 208V AC ±10% Three phase, 50-60 Hz



- Line Regulation: ±0.01% for ±10% input change
- Load Regulation: 0.02% for a NL to FL change
- Ripple: 0.02% RMS
- Stability: 0.02%/hr. after ½ hr warm-up, 0.05%/8hrs
- Metering: Analog voltage and current meters, 2% accuracy
- Physical : 14" H x 19" W x 19" D rack mount for units 1-80kV. 15 ¾" H x 19" W x 19" D for 100 & 120 kV units.

Maximum Rating kV	mA	Model Number
1	3000	RHP1*3
3	1000	RHP3*3
6	500	RHP6*3
10	300	RHP10*3
15	200	RHP15*3
20	150	RHP20*3
30	100	RHP30*3
40	75	RHP40*3
50	60	RHP50*3
60	50	RHP60*3
80	40	RHP80*3
100	30	RHP100*3
120	25	RHP120*3
150	20	RHP150*3
180	16	RHP180*3

* Specify "P" for positive, "N" for negative or "PN" for reversible polarity.

The unique high frequency resonant inverter circuitry of the RHP series provides these supplies with outstanding performance. This technology improves output control and eliminates switching losses and undesirable electromagnetic radiation normally associated with switching and phase control regulators. Combining this performance with quality design and workmanship make the RHP series HV power supplies the best choice for your high voltage application.

DXR3000 Series 3kW X-Ray Generators

Features

- Greater than 85% efficiency
- High Stability
- Automatic Slew of High Voltage & Emission Current to Presets Values
- Automatic Matching of Filament Current to various X-Ray Tubes
- Continuous Adjustment of High Voltage & Emission Current
- Low Stored Energy
- Overvoltage, Arc and Short Circuit Protected
- Fault Diagnostics and Display
- External Safety Circuitry

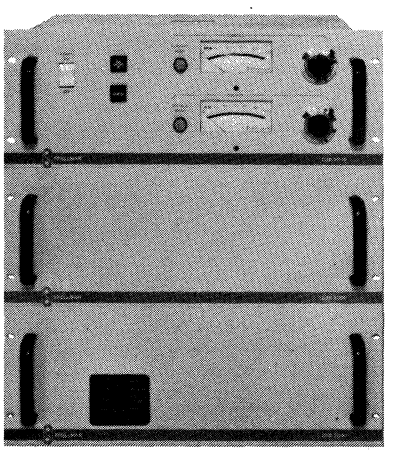
Options:

- Outputs to 75kV
- Constant Output Power Capability
- 208V AC Three-phase Input, 50-60Hz
- Remote Interface for All Analog and Digital Functions
- Fast Emission Current Response (stable to 0.1% within 50mS)
- Output Power Limit
- Output Power Regulation

Specifications:

- Input: 220V AC ±10% Single phase, 50-60Hz
- Output Voltage: 0-60kV
- Output Voltage Regulation: ±0.01% for ±10% input change
- Output Voltage Ripple: 0.1% RMS
- Output Voltage Stability: 0.01% per hour after 1/2 hour warm-up
- Emission Current: 0-50mA
- Emission Current Stability: 0.02% per hour
- Emission Current Regulation: 0.1% for a 50% voltage change
- Filament Compliance Voltage: 0-20Vdc
- Filament Current: 0-6Adc
- Metering: Analog voltage and current meters 2% accuracy
- Physical: Three chassis, each 7" H x 19" W x 20" D
- Weight: 180 lbs total

The DXR3000 offers a unique combination of low cost, high performance and compact size for x-ray diffraction systems and similar x-ray applications. Based upon the RHP series, the DXR3000 offers the same outstanding performance as its predecessor. The DXR3000 is field proven for custom applications, OEM designs and as retrofit for old x-ray generators.



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RHSR, RHR & UHR SERIES

RHSR Series Medium Power HV Power Supplies

Features:

- Exceptionally Good Regulation
- Very Low Ripple
- Remote Programming and Test Points
- Overload and Short Circuit Protected
- Low RFI
- Low Stored Energy

Specifications:

- Input: 105-125V AC, 50-60Hz
- Output: Voltage continuously adjustable over entire range from zero to maximum rated voltage by means of a 10-turn potentiometer
- Load Regulation: 0.001% for FL Change.
- Line Regulation: ±0.001% for a ±10% input change.
- Ripple: 0.001% RMS
- Stability: 0.005%/hr; 0.01%/8hrs
- Metering: Analog voltage and current meters, 2% accuracy.
- Physical: All units are 19" W x 16" D. See Chart for height.

Max. Rating kV	mA	W	Model Number	Height (in inches)
5	10	50	RHSR5PN50	5 1/4"
10	6	60	RHSR10PN60	5 1/4"
15	4	60	RHSR15PN60	5 1/4"
20	3	60	RHSR20PN60	5 1/4"
25	2.4	60	RHSR25PN60	5 1/4"
30	2	60	RHSR30PN60	5 1/4"
40	1.5	60	RHSR40*60	8 3/4"
50	1	50	RHSR50*50	8 3/4"
60	1	60	RHSR60*60	8 3/4"

* Specify "P" for positive, "N" for negative or "PN" for reversible polarity

RHR Series Medium Power HV Power Supplies

Features:

- Good Regulation
- Low Ripple
- Overload and Short Circuit Protected
- Low RFI
- Low Stored Energy
- Three Year Warranty

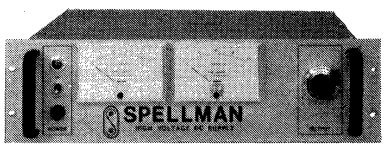
Options are available to adapt the unit to each specific requirement. Options include remote voltage programming, remote voltage and current monitoring, current regulation and external interlock. Contact factory for further details.

Specifications:

- Input: 105-125V AC, 50-60Hz
- Output: Voltage continuously adjustable over entire range from zero to maximum rated voltage by means of a 10-turn potentiometer.
- Load Regulation: 0.01% for FL change.
- Line Regulation: ±0.01% for a ±10% input change.
- Ripple: 0.02% RMS + 2V RMS, Models over 100kV are 0.1% RMS
- Stability: 0.02%+ 2V/hr; 0.05%+ 5V/8hrs
- Metering: Analog voltage and current meters, 2% accuracy.

All units up to 100kV are designed for 19" rack mounting. Units over 100kV consist of a driver chassis, high voltage stack and a rack mountable remote control panel with 15' of cable. See chart for dimensions.

If you don't see the model that your application require we invite you to contact us with your special requirements so we may discuss customizing our products to meet your needs.



Max. Rating kV	mA	W	Model Number	Height (in inches)
5	2	10	RHR5*10	5 1/4"
5	6	30	RHR5*30	5 1/4"
5	10	50	RHR5*50	5 1/4"
5	20	100	RHR5*100	5 1/4"
5	30	150	RHR5*150	5 1/4"
10	1	10	RHR10*10	5 1/4"
10	3	30	RHR10*30	5 1/4"
10	6	60	RHR10*60	5 1/4"
10	10	100	RHR10*100	5 1/4"
20	0.5	10	RHR20*10	5 1/4"
20	1.5	30	RHR20*30	5 1/4"
20	3	60	RHR20*60	5 1/4"
20	6	120	RHR20*120	5 1/4"
30	.33	10	RHR30*10	5 1/4"
30	1	30	RHR30*30	5 1/4"
30	2	60	RHR30*60	5 1/4"
30	4	120	RHR30*120	5 1/4"
30	5	150	RHR30*150	5 1/4"
40	.75	30	RHR40*30	5 1/4"
40	1.5	60	RHR40*60	5 1/4"
40	3	120	RHR40*120	5 1/4"

* Specify "P" for positive, "N" for negative or "PN" for reversible polarity

Max. Rating kV	mA	W	Model Number	Height (in inches)
50	.25	25	RHR50*25	5 1/4"
50	1	50	RHR50*50	5 1/4"
50	3	150	RHR50*150	8 3/4"
60	0.5	30	RHR60*30	5 1/4"
60	1	60	RHR60*60	5 1/4"
60	2	120	RHR60*120	5 1/4"
80	1	80	RHR80*80	8 3/4"
80	3	240	RHR80*240	10 1/2"
80	6	480	RHR80*480	15 3/4"
100	1	100	RHR100*100	8 3/4"
100	1.5	150	RHR100*150	8 3/4"
100	2	200	RHR100*200	10 1/2"
100	5	500	RHR100*500	15 3/4"
150	150	150	RHR150*150	34" STACK
150	2	300	RHR150*300	40" STACK
200	0.5	100	RHR200*100	34" STACK
200	1	200	RHR200*200	34" STACK
300	0.5	150	RHR300*150	48" STACK
300	1	300	RHR300*300	48" STACK
400	0.5	200	RHR400*200	48" STACK
400	1	400	RHR400*400	60" STACK

* Specify "P" for positive, "N" for negative or "PN" for reversible polarity

UHR Series Medium Power HV Power Supplies

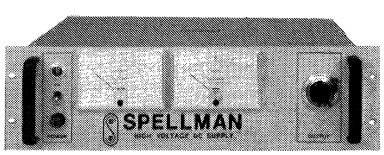
Features:

- Good Regulation
- 0.1% RMS Ripple
- Overload and Short Circuit Protected
- Low RFI
- Low Stored Energy

Options are available to adapt the unit to each specific requirement. Options include remote voltage programming, remote voltage and current monitoring, current regulation and external interlock. Contact factory for further details on options and custom designed models.

Specifications:

- Input: 105-125V AC, 50-60Hz
- Output: Voltage continuously adjustable over entire range from zero to maximum rated voltage by means of a one-turn potentiometer.
- Load Regulation: 0.05% for FL Change.



- Line Regulation: ±0.05% for a ±10% input change.
- Ripple: 0.1% RMS
- Stability: 0.05%/hr; 0.1%/8hrs
- Metering: Analog voltage and current meters, 2% accuracy.

All units up to 100kV are designed for 19" rack mounting. Units over 100kV consist of a driver chassis, high voltage stack and a rack mountable remote control panel with 15' of cable. See chart for dimensions.

Max. Rating kV	mA	W	Model Number	Height (in inches)
20	1.5	30	UHR20*30	5 1/4"
20	6	120	UHR20*120	5 1/4"
30	1	30	UHR30*30	5 1/4"
30	2	60	UHR30*60	5 1/4"
30	4	120	UHR30*120	5 1/4"
40	.75	30	UHR40*30	5 1/4"
40	1.5	60	UHR40*60	5 1/4"
40	3	120	UHR40*120	5 1/4"
50	0.5	25	UHR50*25	5 1/4"
50	3	150	UHR50*150	8 3/4"
60	0.5	30	UHR60*30	5 1/4"
60	1	60	UHR60*60	5 1/4"
60	2	120	UHR60*120	5 1/4"
80	1	80	UHR80*80	8 3/4"
80	3	240	UHR80*240	10 1/2"
80	6	480	UHR80*480	15 3/4"
100	1	100	UHR100*100	8 3/4"
100	2	200	UHR100*200	10 1/2"
100	5	500	UHR100*500	15 3/4"
150	1	150	UHR150*150	34" STACK
200	.75	150	UHR200*150	34" STACK
300	0.5	150	UHR300*150	48" STACK
400	.37	150	UHR400*150	48" STACK

* Specify "P" for positive, "N" for negative or "PN" for reversible polarity

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PTV & SMS SERIES

PTV Series 200W Modular HV Power Supplies

Features:

- Output voltages from 1kV to 60kV @ 200 watts continuous, 600 watts peak
- Auxiliary high voltage outputs
- Voltage programming from zero to rated output
- Inhibit control of output via TTL signal
- Test points for output voltage and current
- Designed to meet UL®, CSA and IEC 950 specifications
- Overvoltage protection
- Current Limit and Short Circuit protection
- Low stored energy

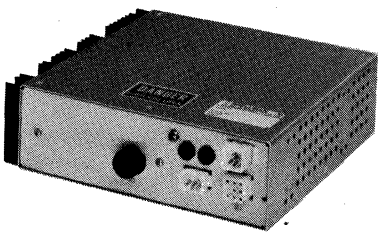
The PTV series utilizes a new quazi-resonant inverter design that provides over 85% efficiency, a very fast dynamic response and very high peak current capability. The PTV's fast response and high peak power capabilities make this power supply ideal for applications such as:

- Projection Television
- X-Ray
- Microwave
- Electron Beam
- Capacitor charging

Specifications:

- Input: 100/115/230V AC ±10% 50/60Hz
- Output: models from 1kV to 60kV. Each model is available in positive or negative polarity outputs.
- Load Regulation:
  Static: 0.01% of output voltage for NL to FL change.
  Dynamic: 50V/mA
- Line Regulation:
  ±0.01% for a ±10% input voltage change.
- Ripple:
  1-30kV: 0.05% p-p of output voltage.
  40-60kV: 0.1% p-p of output voltage.
- Physical: typically 10" x 10¾" x 3 3/16" Alternate mechanical packages available
- Input Connector: 9 pin AMP Metri-Mate
- Output Cable: 18" ±1" of UL® approved high voltage wire.
- Voltage Stability: 0.02% per 8 hours
- Voltage Temperature Coefficient: 0.01% per °C

All models can be customized to your application's requirements. Please contact the Sales Department with your needs.



Maximum Rating kV	Maximum Rating mA	Model Number
1	200	PTV1*200
3	66.7	PTV3*200
5	40	PTV5*200
10	20	PTV10*200
15	13.4	PTV15*200
20	10	PTV20*200
25	8	PTV25*200
30	6.7	PTV30*200
40	5	PTV40*200
50	4	PTV50*200
60	3.4	PTV60*200

* Specify "P" for positive polarity or "N" for negative polarity

SMS Series 60W Modular HV Power Supplies

Features:

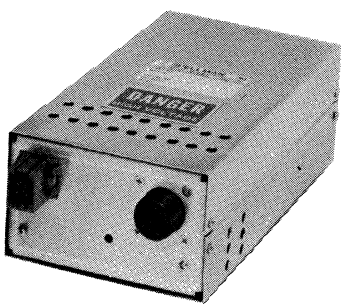
- Output voltages from 1kV to 60kV @ 60 watts
- Voltage programming from zero to rated output
- Current programming from zero to rated output
- Inhibit control of output via TTL signal
- Test points for output current and voltage
- Mode indicators for current and voltage control
- Overvoltage protection
- Overvoltage latch reset
- Designed to meet UL® requirements
- Low stored energy
- Compact package

The SMS series is based on a resonant flyback circuit that provides over 80% efficiency and high pulse current capability. This supply is ideal for applications requiring high peak current from a power supply that operates from a low voltage DC input. With the addition of optional circuitry, the SMS series has capability of delivering constant power down to 25% of the rated output voltage. Please consult the Sales Department for information on this and other options.

Specifications:

- Input: +28V DC ±10%
- Output: 10 models from 1kV to 60kV. Each model is available in positive or negative polarity outputs.
- Load Regulation:
  Static: 0.01% of output voltage for NL to FL change.
  Dynamic: 10V/100µA maximum NL to FL.
- Line Regulation:
  ±0.01% for a ±10% input voltage change.
- Ripple:
  1-30kV: 0.05% p-p of output voltage.
  40-60kV: 0.1% p-p of output voltage.
- Physical: 5" x 9" x 3"
- Input Connector: 9 pin AMP Metri-Mate
- Output Cable: 18" ±1" of UL® approved high voltage wire.
- Voltage Stability: 0.02% per 8 hours
- Voltage Temperature Coefficient: 0.01% per °C

The flexibility of the SMS series' design makes it ideal for customizing to fit OEM and special requirements.



Maximum Rating kV	Maximum Rating mA	Model number
1	60	SMS1*60
3	20	SMS3*60
5	12	SMS5*60
10	6	SMS10*60
15	4	SMS15*60
20	3	SMS20*60
30	2	SMS30*60
40	1.5	SMS40*60
50	1.2	SMS50*60
60	1	SMS60*60

* Specify "P" for positive polarity or "N" for negative polarity

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MM & MP SERIES

MP Series 10W High Stability HV Power Supplies

Designed as high performance DC to DC converters with output voltages up to 15kV, the MP Series power supplies combine linear and switched mode techniques minimizing internal dissipation and generated RFI. This gives improved output voltage stability and increased reliability. The high frequency oscillator may be synchronized to other MP modules or to an external source.

Applications:

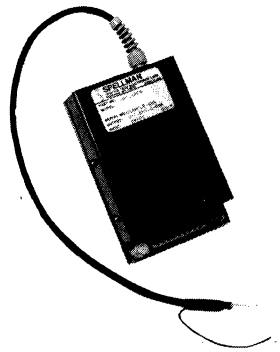
- Photo multiplier tubes
- Scintillators
- Electron guns
- Ion guns
- Nuclear instruments

Features:

- High stability - 0.001% line and load regulation
- Low output ripple - 0.001% p-p
- Remote Voltage Programming
- Output current and voltage monitor
- Arc and short circuit protected
- Internal oscillator may be synchronized externally
- Other options available

Specifications:

- Input Voltage: +24Vdc ±2V. Other input voltages available as option.
- Input Current: Less than 1A at full output.
- Output Voltage: Continuously adjustable over entire output range. Positive or negative output polarity.
- Line Regulation: 0.001% for input change of 1V.
- Load Regulation: 0.001% for 100μA to full load change (at maximum voltage).
- Temperature Coefficient: Better than .0025%/°C.
- Stability: 0.007%/hr at constant operating conditions after 1 hour warm up.
- Output Control:
  1) Internal 10-turn potentiometer
  2) External Potentiometer
  3) Remote Voltage Programming, 0 to 10V, accuracy 0.1% full scale
- Output Voltage Monitor: 0 to +10V represents zero to full output ±1%.
- Output Current Monitor: 0 to +10V represents zero to full output ±2%.
- Operating Temperature: 0°C to +50°C
- Storage Temperature: -35°C to +85°C
- Input: 10 pin connector (mating connector supplied)
- Output: 20" shielded cable with flying leads



- Size:
  5.83"L x 3.86"W x 1.65"H for units up to 3kV.
  7.44"L x 3.86"W x 1.65"H for units over 3kV.

Output Voltage	Max. Current	Ripple (full load)	Model
0 to 1kV	10mA	10mV p-p	MP1*
0 to 1.5kV	6mA	10mV p-p	MP1.5*
0 to 2kV	5mA	10mV p-p	MP2*
0 to 2.5kV	4mA	10mV p-p	MP2.5*
0 to 3kV	3mA	10mV p-p	MP3*
0 to 5kV	2mA	20mV p-p	MP5*
0 to 10kV	1mA	100mV p-p	MP10*
0 to 15kV	0.6mA	150mV p-p	MP15*

* Specify "P" for positive polarity or "N" for negative polarity

MM Series 1.5W PCB Mount HV Power Supplies

The MM Series high voltage power supplies are low cost, general purpose DC to DC converters, with output voltages up to 15kV, designed for direct PCB mounting. High reliability is designed into a compact and lightweight modular block intended for customer designed products at power levels up to 1.5 Watts.

The MM Series can be used with an external resistor feedback loop to provide regulated outputs. Application Notes are available from Spellman that show a range of voltage regulated circuits using the MM high voltage power supply.

Applications:

- Photomultiplier Tubes
- Solid State Detectors
- Flow Sensors
- Analytical Instruments
- Spectral Source Lamps
- Ink Jet Printers
- Gas Chromatography

Features:

- Outputs up to 15kV at 1.5 Watts
- Low cost
- Compact size
- Arc and short circuit protected
- Positive or Negative Outputs
- Output Voltage Proportional to Input Voltage

Specifications:

- Input Voltage: 9Vdc, 12Vdc, or 24Vdc. Other input voltages available upon special order.
- Output Voltages: Any preset maximum voltage between 500V and 15kV is available. Multiple outputs can also be supplied. Output voltage is proportional to the input voltage over the range 10% to 100%.
- Output Power: 1.5 Watts continuous; 3 Watts peak.
- Output Ripple: Less than 0.1% rms
- Load Regulation: 10% maximum
- Module Efficiency: 55% to 70%
- Isolated Outputs available
- Alternate Input Voltages available (6VDC to 28VDC)
- Modules are fully encapsulated in an ABS Box and may be wave soldered.
- Size:
  Up to 3kV: 1.57"L x 1.57"W x 0.79"H
  Over 3kV to 5kV: 1.97"L x 1.97"W x 1.18"H
  Over 5kV to 10kV: 2.95"L x 1.97"W x 1.38"H
  Over 10kV to 15kV: 3.74"L x 2.80"W x1.38"H

Spellman
High Voltage Electronics Corp
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EPM, LCM & UM SERIES

EPM Series 30W Modular HV Power Supplies

Features:

- Output voltages from 1kV to 30kV @ 30 watts
- Voltage programming from zero to rated output
- Current programming from zero to rated output
- Inhibit control of output via TTL signal
- Test points for output current and voltage
- Overvoltage protection
- Designed to meet UL® requirements
- Compact package
- Low stored energy

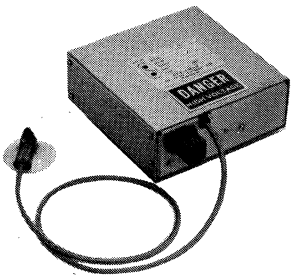
The EPM series utilizes proprietary circuitry enabling these high voltage power supplies to yield full output current from near zero to maximum output voltage. Current regulation is standard on all models and is particularly valuable in applications that require a current source into the load such as:

- Electrophoresis
- Electron Beam
- Ion Sources
- Photomultipliers
- Laboratory Applications

Specifications:

- Input: +24V DC ±10%
- Output: 8 models from 1kV to 30kV. Each model is available in positive or negative polarity outputs.
- Load Regulation:
  Static: 0.01% of output voltage for NL to FL change.
  Dynamic: 10V / 100µA NL to FL.
- Line Regulation:
  ±0.01% for a ±10% input voltage change.
- Ripple: 0.1% p-p of output voltage.
- Physical: 5.7" x 5.7" x 2"
- Input Connector: 9 pin AMP Metri-Mate
- Output Cable: 18" ±1" of UL® approved high voltage wire.
- Voltage Stability 0.01% per 8 hours
- Voltage Temperature Coefficient: 0.01% per °C
- Voltage Test Point: 10V ± 2% = Max. rated output
- Current Test Point: 10V ± 2% = Max. rated output

Spellman engineers designed the EPM to be very flexible so that it can be easily customized to fit your OEM and special requirements. Please contact Spellman's Sales Department to discuss your application's requirements.



Maximum Rating kV	Maximum Rating mA	Model Number
1	30	EPM1*30
3	10	EPM3*30
5	6	EPM5*30
10	3	EPM10*30
15	2	EPM15*30
20	1.5	EPM20*30
25	1.2	EPM25*30
30	1	EPM30*30

* Specify "P" for positive polarity or "N" for negative polarity

LCM Series CRT HV Power Supplies

Feature:

- Eight standard model from 2kV to 30kV
- Tight dynamic and static regulation
- Proven reliability
- Focus and Grid outputs up to ±1100 volts
- Short circuit and overload protected
- UL® recognized

The LCM series provides a low cost regulated high voltage source for applications such as powering CRT's. This design employs an ultrasonic resonant sinewave oscillator that reduces stored energy and minimizes RFI. All high voltage components are vacuum encapsulated in a high quality silicone elastomer ensuring corona-free operation.

Specifications:

- Input: +24V DC ±10% @ 800mA maximum at full load.
- Output voltage: See chart
- Load Regulation: 0.5% maximum
- Line Regulation: ±0.1% for a ±10% input change
- Ripple: see chart
- Operating Temperature: 0°C to 50°C case
- Output Cable: 15" ±1" of 40kV UL approved high voltage wire with anode cap.
- Case Dimensions: 4 5/32" L x 1 3/8" H x 3 5/32" W for 2-22kV models. 6" L x 2 1/8" H x 3 3/4" W for 30kV models.

Model	Maximum Rating voltage	Maximum Rating current	Ripple (V p-p)
LCM3.5	2 to 3.5kV	5mA @ 2kV 2.8mA @ 3.5kV	4
LCM5	3.5 to 5kV	2.8mA @ 3.5kV 2mA @ 5kV	4
LCM7.5	5 to 7.5kV	2mA @ 5Kv 1.3mA @ 7.5kV	4
LCM10	7.5 to 10kV	1.3mA @ 7.5kV 1mA @ 10kV	6
LCM14	10 to 14kV	1mA @ 10kV 0.7mA @ 14kV	6
LCM18	14 to 18kV	0.7mA @ 14kV 0.55mA @ 18kV	8
LCM22	18 to 22kV	0.55mA @ 18kV 0.45mA @ 22kV	8
LCM30	22 to 30kV	0.45mA @ 22kV 0.33mA @ 30kV	16

UM Series Unregulated Modular HV Power Supplies

Features:

- Low Cost
- Low Ripple
- Fully Enclosed Shielded Metal Case
- Encapsulated for Full Environmental Protection

The UM series provides compact, economical, unregulated high voltage for CRT's, PMT's, image intensifiers and scintillation counters. Maximum output voltages are from 1kV to 30kV and are proportional to input voltages.

Specifications:

- Input: +24V DC ±10% for maximum rated output
- Line regulation: Output voltage is approximately proportional to input voltage.
- Load Regulation: Less than 20%, no load to full load at maximum rating.
- Ripple: 0.1% RMS
- Output: Adjustable from zero to maximum rated voltage by adjustment of input
- Dimensions: Consult factory

Max. Rating Voltage	Max. Rating Current	Model Number
0-1kV	1ma	UM1*1000D
0-1.5kV	1ma	UM1.5*1500D
0-3kV	500µa	UM3*1500D
0-6kV	250µa	UM6*1500D
0-9kV	150µa	UM9*1500D
0-12kV	100µa	UM12*1500D
0-15kV	75µa	UM15*1500D
0-18kV	60µa	UM18*1500D
0-24kV	50µa	UM24*1500D
0-30kV	50µa	UM30*1500D

* Specify "P" for Positive polarity or "N" for negative polarity

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WRM Series, HVD Series & Custom Designs

WRM Well Regulated Modular HV Power Supplies

Specifications:

- Input: +28V DC ±10%
- Output: Controllable from zero to maximum rating via resistive divider or voltage source (floating or grounded). See chart for output voltage ratings.
- Line regulation: ±0.01% for a ±10% input voltage change
- Load regulation: 0.05% for a full load change
- Ripple:
  1500D/3000D - 0.01% RMS
  6000D - 0.02% RMS
  10KD - 0.03% RMS
  30KD - 0.1% RMS
- Protection: Overload, Arc and Short Circuit.
- Temperature:
  Operating: 0-50°C
  Storage:-30°C to +85°C
- Dimensions: Consult Factory

Max Rating kV	Max Rating mA	Model Number
0-1.5	1.0	WRM1.5*1500D
0-1.5	2.0	WRM1.5*3000D
0-1.5	4.0	WRM1.5*6000D
0-1.5	6.0	WRM1.5*10KD
0-1.5	10.0	WRM1.5*15KD
0-3	0.5	WRM3*1500D
0-3	1.0	WRM3*3000D
0-3	2.0	WRM3*6000D
0-3	3.0	WRM3*10KD
0-3	10.0	WRM3*30KD
0-6	0.25	WRM6*1500D
0-6	0.5	WRM6*3000D
0-6	1.0	WRM6*6000D
0-6	1.5	WRM6*10KD
0-6	5.0	WRM6*30KD

* Specify "P" for positive or "N" for negative polarity

Max Rating kV	Max Rating mA	Model Number
0-9	0.15	WRM9*1500D
0-9	0.3	WRM9*3000D
0-9	0.6	WRM9*6000D
0-9	1.0	WRM9*10KD
0-9	3.3	WRM9*30KD
0-12	0.15	WRM12*1500D
0-12	0.3	WRM12*3000D
0-12	0.6	WRM12*6000D
0-12	0.8	WRM12*10KD
0-12	2.5	WRM12*30KD
0-15	0.1	WRM15*1500D
0-15	0.2	WRM15*3000D
0-15	0.4	WRM15*6000D
0-15	0.6	WRM15*10KD
0-15	2.0	WRM15*30KD

* Specify "P" for positive or "N" for negative polarity

Max Rating kV	Max Rating mA	Model Number
0-18	0.08	WRM18*1500D
0-18	0.16	WRM18*3000D
0-18	0.3	WRM18*6000D
0-18	0.5	WRM18*10KD
0-18	1.6	WRM18*30KD
0-20	0.07	WRM20*1500D
0-20	0.15	WRM20*3000D
0-20	0.3	WRM20*6000D
0-20	0.5	WRM20*10KD
0-20	1.5	WRM20*30KD
0-24	0.06	WRM24*1500D
0-24	0.12	WRM24*3000D
0-24	0.24	WRM24*6000D
0-24	0.4	WRM24*10KD
0-24	1.25	WRM24*30KD
0-30	0.05	WRM30*1500D
0-30	0.1	WRM30*3000D
0-30	0.2	WRM30*6000D
0-30	0.3	WRM30*10KD
0-30	1.0	WRM30*30KD

* Specify "P" for positive or "N" for negative polarity

HVD Series Resistive Dividers

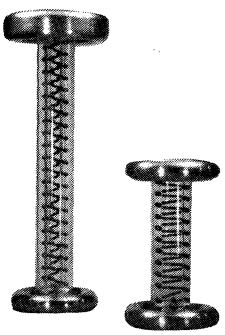
Features:

- High Input Impedance
- 25 ppm Temperature Coefficient
- High Accuracy
- Corona-Free Operation

Spellman's Resistive Voltage Dividers provide laboratory or production facilities with a convenient method of measuring up to 100kVdc or 200kVdc with accuracy better than 0.5%. The Dividers are designed for use with standard high impedance digital and differential voltmeters.

	HVD 100	HVD 200
Input Voltage	0-100kVdc	0-200kVdc
Input Impedance	1000M ohms	2000M ohms
Output Impedance	1 M; 100k ohms	10k ohms
Output Taps	100 V, 10V	2V
Accuracy	0.5%: (0.1% opt)[1]	0.5%: (0.25% opt)[2]
Temp. Coefficient	0.01%/8hrs	0.025%/8hrs
Height	17½" (44.5 cm)	33½" (84.5 cm)
Max. Diameter	10" (25.4 cm)	12" (30.5 cm)
Weight	6¾ lbs (3.1 kg)	12 lbs (5.5 kg)
Output Connector	BNC type	BNC type

(1) For accuracy of 0.1% specify HVD100-1
(2) For accuracy of 0.25% specify HVD200-1



Custom Designs

Homologation:

To homologate is to communicate, to concur, to act in harmony, from the Greek *"homologos."* At Spellman, we always blend our thinking with yours. We analyze your system, your needs and your plans. We nurture the technology and the hardware at the beginning - and throughout the product life.

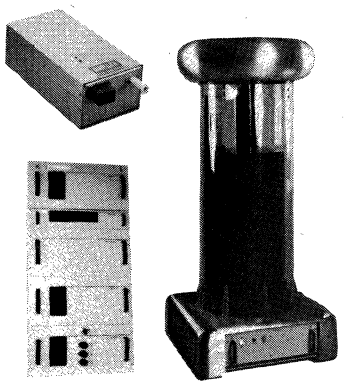
Through such homologation we now create each year more than 40 new power supply sub-systems. These sub-systems accelerate introduction, extend life and improve market share of a wide variety of OEM products. Custom power supplies have been homologized into OEM applications such as, Capillary Zone Electrophoresis, Projection Television and Analytical X-ray.

X-Ray Power Supplies

High peak power up to 100kW and continuous power up to 30kW is available using propriety circuitry to improve performance and reliability. Typical applications include CT scanners, radiological equipment, x-ray lithography and industrial x-ray systems. Spellman's HV generators include a floating filament supply, emission control and built in diagnostics.

Capacitor Chargers

Spellman's rack mounted models are available for current operation to permit capacitor charging at a linear rate. Special models can be ordered for high power when the capacitance and repetition rate is high.



SQM SERIES

SWITCHING SYSTEMS INTERNATIONAL

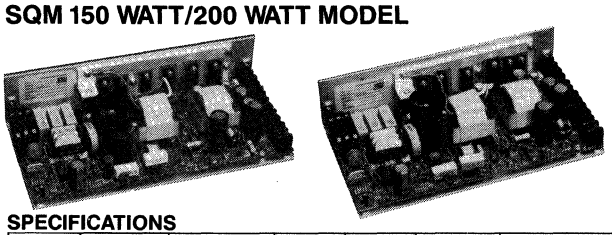
FEATURES FOR ALL MODELS

- International input capability (90-132/180-264 VAC, 47-440 Hz)
- Primary circuit protection against overvoltage
- Built-in line filtering meets the requirements of FCC Level B and VDE 0871 Level A
- 3750 VAC Safety Isolation, (4mm spacing primary to GND, 8mm spacing primary to secondary)
- Shielded power transformers
- Built-in overload and overvoltage protection
- Overtemperature shut-down
- Remote sense capability
- Vacuum impregnated magnetics
- Fixed frequency pulse-width modulation
- 24 hour high temperature burn-in AC cycled
- Designed to Meet VDE 0806, IEC 380, IEC 435, BS6301, IEC 950, UL1950, UL478, CSA22.2, FCC DOCKET 20780 LEVEL B, VDE0871 LEVEL A

Options include:

- "TTL-Hi" or "TTL-lo" power fail detect circuitry (customer specified)
- Power Valid Signal
- EMI/RFI Covers
- Universal Input "AUTO RANGER" (90-264 VAC Input)
- Remote Inhibit

SQM 150 WATT/200 WATT MODEL



SPECIFICATIONS

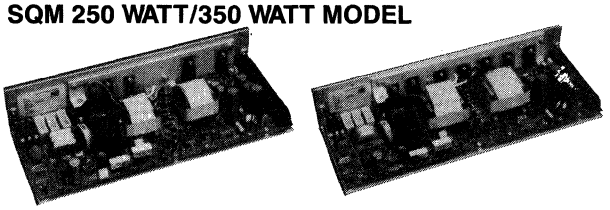
MODEL NO.	MAIN OUTPUT (V1) Vnom Imax	AUX #1 (V2) Vnom Imax	AUX #2 (V3) Vnom Imax	AUX #3 (V4) Vnom Imax	MAX OUTPUT POWER	OUTLINE DIMENSIONS
SQM 150	5V @ 20A	12V @ 5A/7A PK 15V @ 5A/7A PK 24V @ 5A/7A PK	5V @ 3A 12V @ 3A 15V @ 3A 24V @ 3A	5V @ 3A 12V @ 3A 15V @ 3A 24V @ 3A	150 WATTS (200 PEAK)	9.5″ × 5.0″ × 2.5″
SQM 200	5V @ 30A	12V @ 7A/10A PK 15V @ 7A/10A PK 24V @ 7A/10A PK	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	200 WATTS (250 PEAK)	10.5″ × 5.0″ × 2.5″

Input: 90-132 VAC/180-264VAC, 47-440Hz
Inrush: 15A @ 115V for ½ cycle
30A @ 230V for ½ cycle } Cold Start
Output: See output voltage table
Line Regulation: 0.2%, all outputs
Load Regulation: 1%, main output. 5%, aux no. 1. 1%, aux nos. 2 and 3
Adjustment Range: ±5%, aux nos. 2 and 3 and main output
Centering: ±3% aux no. 1
Cross Regulation: 3% aux no. 1 (change main output from 50% to 100% of max rated load)
Ripple and Noise: 50mV P-P max, main output (10MHz bandwidth)
1% of nominal, aux no. 1 (10MHz bandwidth)
100mV P-P max, aux no.'s 2 and 3 (10MHz bandwidth)
Efficiency: 75% typical
Operating Temperature: 0-50°C at full rated load. Derate to 50% of full rated load at 70°C. Unit requires 25CFM of forced air cooling at full rated load. Unit is equipped with overtemperature shutdown.
Temperature Coefficient: 0.02% per °C
Overvoltage Protection: OVP on main output is set between 6-6.5V. This protection is reset by recycling input power.
Overload Protection: All outputs are protected against overload and short circuit conditions. Recovery is automatic when load is reduced.
Holdover Storage: 16mSEC minimum at full rated load, nominal input voltage
Transient Response: Recovery to within 1% of nominal output voltage within 500μSEC for a 25% load step
Overshoot: No voltage spikes on turn-on, turn-off, or power fail
Remote Sense: Remote sense on the main output compensates for up to 0.5V in the load cable
Power Fail (Optional): A TTL signal (high or low, customer specified) appears within 5mSEC to warn of input voltage drop below minimum operating level
Power Valid (Optional): A TTL high signal appears when main output is within TTL operating range.
Outline Dimensions: 150W: 9.5″ × 5.0″ × 2.5″, 200W: 10.5″ × 5.0″ × 2.5″

OPERATIONAL SPECIFICATIONS

Load Requirements: Main output requires 10% minimum load **OR** aux no. 1 requires 10% minimum load to enable aux no.'s 2 and 3 to operate within specification.
DC Returns: Main output and aux no. 1 share common return.
Aux output no.'s 2 and 3 are fully independent and floating.
Output Power: Total continuous power 150 watts max/200 watts max.
Peak output power 200 watts max/250 watts max.
Safety Isolation: Primary to secondary, 3750VAC (8mm spacing)
Unit meets or exceeds the following specifications for safety: VDE 0806, IEC380, IEC435, UL 478, CSA22.2, ULI950, BS6301, IEC950
EMI/RFI: Input filtering: unit meets requirements of FCC 20780 Class B and VDE0871 Class A

SQM 250 WATT/350 WATT MODEL



SPECIFICATIONS

MODEL NO.	MAIN OUTPUT (V1) Vnom Imax	AUX #1 (V2) Vnom Imax	AUX #2 (V3) Vnom Imax	AUX #3 (V4) Vnom Imax	MAX OUTPUT POWER	OUTLINE DIMENSIONS
SQM 250	5V @ 40A	12V @ 8A/12A PK 15V @ 8A/12A PK 24V @ 8A/12A PK	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	250 WATTS (300 PEAK)	12.0″ × 5.0″ × 2.5″
SQM 350	5V @ 50A	12V @ 8A/16A PK 15V @ 8A/16A PK 24V @ 8A/16A PK	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	350 WATTS (400 PEAK)	13.5″ × 5.0″ × 2.5″

Input: 90-132 VAC/180-264VAC, 47-440Hz
Inrush: 15A @ 115V for ½ cycle
30A @ 230V for ½ cycle } Cold Start
Output: See output voltage table
Line Regulation: 0.2%, all outputs
Load Regulation: 1%, main output. 5%, aux no. 1. 1%, aux nos. 2 and 3
Adjustment Range: ±5%, aux nos. 2 and 3 and main output
Centering: ±3% aux no. 1
Cross Regulation: 3% aux no. 1 (change main output from 50% to 100% of max rated load)
Ripple and Noise: 50mV P-P max, main output (10MHz bandwidth)
1% of nominal, aux no. 1 (10MHz bandwidth)
100mV P-P max, aux no.'s 2 and 3 (10MHz bandwidth)
Efficiency: 75% typical
Operating Temperature: 0-50°C at full rated load. Derate to 50% of full rated load at 70°C. Unit requires 25CFM of forced air cooling at full rated load. Unit is equipped with overtemperature shutdown.
Temperature Coefficient: 0.02% per °C
Overvoltage Protection: OVP on main output is set between 6-6.5V. This protection is reset by recycling input power.
Overload Protection: All outputs are protected against overload and short circuit conditions. Recovery is automatic when load is reduced.
Holdover Storage: 16mSEC minimum at full rated load, nominal input voltage
Transient Response: Recovery to within 1% of nominal output voltage within 500μSEC for a 25% load step
Overshoot: No voltage spikes on turn-on, turn-off, or power fail
Remote Sense: Remote sense on the main output compensates for up to 0.5V in the load cable
Power Fail (Optional): A TTL signal (high or low, customer specified) appears within 5mSEC to warn of input voltage drop below minimum operating level
Power Valid (Optional): A TTL high signal appears when main output is within TTL operating range.
Outline Dimensions: 250W: 12.0″ × 5.0″ × 2.5″, 350W: 13.5″ × 5.0″ × 2.5″

OPERATIONAL SPECIFICATIONS

Load Requirements: Main output requires 10% minimum load **OR** aux no. 1 requires 10% minimum load to enable aux no.'s 2 and 3 to operate within specification.
DC Returns: Main output and aux no. 1 share common return.
Aux output no.'s 2 and 3 are fully independent and floating.
Output Power: Total continuous power 250 watts max/350 watts max.
Peak output power 300 watts max/400 watts max.
Safety Isolation: Primary to secondary, 3750VAC (8mm spacing)
Unit meets or exceeds the following specifications for safety: VDE 0806, IEC380, IEC435, UL 478, CSA22.2, ULI950, BS6301, IEC950
EMI/RFI: Input filtering: unit meets requirements of FCC 20780 Class B and VDE0871 Class A

SQV SERIES/

SWITCHING SYSTEMS INTERNATIONAL

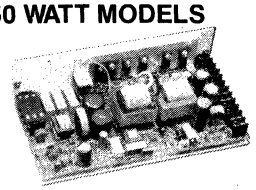
FEATURES FOR ALL MODELS

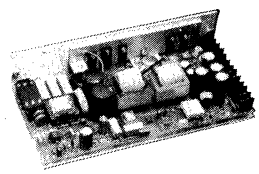
- International input capability (90-132/180-264 VAC, 47-440 Hz)
- Built-in line filtering meets the requirements of FCC Level B and VDE 0871 Level A
- 3750 VAC Safety Isolation (4mm spacing primary to GND, 8mm spacing primary to secondary)
- Shielded power transformers
- Built-in overload protection on all outputs
- Built-in overvoltage protection on main output
- Remote sense capability on main output
- Vacuum impregnated magnetics
- Fixed frequency pulse-width modulation
- 24 hour high temperature burn-in, AC cycled
- Designed to Meet VDE 0806, IEC 380, IEC 435, BS6301, IEC 950, UL1950, UL478, CSA22.2, FCC DOCKET 20780 LEVEL B, VDE0871 LEVEL A

Options include:

- "TTL-Hi" or "TTL-lo" power fail detect circuitry (customer specified)
- EMI/RFI covers (not available on 400 Watt models)
- Extended hold-up capability<None>
- Universal Input "AUTO RANGER" (90-264 VAC Input)
- Remote Inhibit

SQV 100 WATT/140 WATT / 175 WATT/ 250 WATT MODELS





SPECIFICATIONS

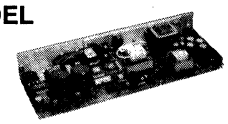
MODEL NO.	MAIN OUTPUT (V1) Vnom Imax	AUX #1 (V2) Vnom Imax	AUX #2 (V3) Vnom Imax	AUX #3 (V4) Vnom Imax	MAX OUTPUT POWER	OUTLINE DIMENSIONS
SQV 100	5V @ 12A	12V @ 5A 15V @ 4A 24V @ 3A	5V @ 1.5A 12V @ 1.5A 15V @ 1.5A 24V @ 1.5A	5V @ 1.5A 12V @ 1.5A 15V @ 1.5A 24V @ 1.5A	100 WATTS (130W PEAK)	9.5" × 5.0" × 2.5"
SQV 140	5V @ 20A	12V @ 5A/7A PK 15V @ 5A/7A PK 24V @ 5A/7A PK	5V @ 3A 12V @ 3A 15V @ 3A 24V @ 5A	5V @ 3A 12V @ 3A 15V @ 3A 24V @ 5A	140 WATTS (170W PEAK)	10.5" × 5.0" × 2.5"
SQV 175	5V @ 25A	12V @ 5A/8A PK 15V @ 5A/8A PK 24V @ 5A/8A PK	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	5V @ 3A 12V @ 3A 15V @ 3A 24V @ 3A	175 WATTS (225W PEAK)	12.0" × 5.0" × 2.5"
SQV 250	5V @ 35A	12V @ 5A/8A PK 15V @ 5A/8A PK 24V @ 5A/8A PK	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	5V @ 5A 12V @ 5A 15V @ 5A 24V @ 5A	250 WATTS (300W PEAK)	13.5" × 5.0" × 2.5"

Input 90-132 VAC/180-264VAC, 47-440Hz
Inrush: 15A @ 115V for ½ cycle, 30A @ 230V for ½ cycle } Cold Start
Output: See output voltage table
Line Regulation: 0.2%, all outputs
Load Regulation: 1%, main output. 5%, aux no. 1. 1%, aux nos. 2 and 3
Adjustment Range: ±5%, main output
Centering: ±3% aux no. 1
Cross Regulation: 3% aux no. 1 (change main output from 50% to 100% of max rated load)
Ripple and Noise: 50mV P-P max, main output (10MHz bandwidth)
1% of nominal, aux no. 1 (10MHz bandwidth)
100mV P-P max, aux no.'s 2 and 3 (10MHz bandwidth)
Efficiency: 75% typical
Operating Temperature: 0-50°C at full rated load. Derate to 50% of full rated load at 70°C. Unit requires 25CFM of forced air cooling at 50°C at full load.
Temperature Coefficient: 0.02% per °C
Overvoltage Protection: OVP on main output is set between 6-6.5V. This protection is reset by recycling input power.
Overload Protection: All outputs are protected against overload and short circuit conditions. Prolonged short circuit condition on main output or aux. no. 1 results in system shut-down. System is reset by recycling input power. Aux output no.'s 2 and 3 are foldback current limited. Recovery is automatic when load is reduced.
Holdover Storage: 16mSEC minimum at full rated load, nominal input voltage
Transient Response: Recovery to within 1% of nominal output voltage within 500μSEC for a 25% load step
Overshoot: No voltage spikes on turn-on, turn-off, or power fail
Remote Sense: Remote sense on the main output compensates for up to 0.5V in the load cable
Power Fail: (Optional) A TTL signal (high or low, customer specified) appears within 5mSEC to warn of input voltage drop below minimum operating level

OPERATIONAL SPECIFICATIONS

Load Requirements: Main output requires 10% minimum load **OR** aux no. 1 requires 10% minimum load to enable aux no.'s 2 and 3 to operate within specification.
DC Returns: Main output and aux no. 1 share common return. Aux output no.'s 2 and 3 are fully independent and floating.
Safety Isolation: Primary to secondary, 3750VAC (8mm spacing)
Unit meets or exceeds the following specifications for safety: VDE 0806, IEC380, IEC435, UL 478, CSA22.2, ULI950, BS6301, IEC950
EMI/RFI: Input filtering: unit meets requirements of FCC 20780 Class B and VDE0871 Class A

SQV 402 WATT MODEL



SPECIFICATIONS

MODEL NO.	MAIN OUTPUT (V1) Vnom Imax	AUX #1 (V2) Vnom Imax	AUX #2 (V3) Vnom Imax	AUX #3 (V4) Vnom Imax	MAX OUTPUT POWER	OUTLINE DIMENSIONS
SQV 402	5V @ 50A	12V @ 10A/16A PK 15V @ 10A/16A PK 24V @ 10A/16A PK	5V @ 5A/7A PK 12V @ 5A/7A PK 15V @ 5A/7A PK 24V @ 5A/7A PK	5V @ 5A/7A PK 12V @ 5A/7A PK 15V @ 5A/7A PK 24V @ 5A/7A PK	400 WATTS	15.0" x 5.0" x 2.5"

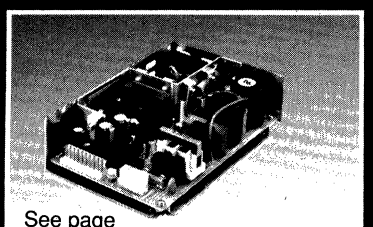
Input 90-132 VAC/180-264VAC, 47-440Hz
Inrush: 35A @ 115V for ½ cycle, 70A @ 230V for ½ cycle } Cold Start
Output: See output voltage table
Line Regulation: 0.2%, all outputs
Load Regulation: 1% main output. 5%, aux no. 1. 0.5%, aux no.'s 2 and 3
Adjustment Range: ±5%, aux no.'s 2 and 3 and main output
Centering: ±3%, aux no. 1
Ripple and Noise: 50mV P-P max, main output (10MHz bandwidth)
1% of nominal, aux no. 1 (10MHz bandwidth)
100mV P-P max, aux no.'s 2 and 3 (10MHz bandwidth)
Efficiency: 75% typical
Operating Temperature: 0-50°C at full rated load. Derate to 50% of full rated load at 70°C. Unit requires 50CFM of forced air cooling at full rated load at 50°C.
Thermal Protection: Unit is equipped with automatic thermal shutdown
Temperature Coefficient: 0.02% per °C
Overvoltage Protection: OVP on main output is set between 6-6.5V. This protection is reset by recycling input power.
Overload Protection: All outputs are individually foldback current limited and short circuit protected. Recovery is automatic when load is reduced.
Holdover Storage: 16mSEC minimum at full rated load, nominal input voltage
Transient Response: Recovery to within 1% of nominal output voltage within 500μSEC for a 25% load step
Overshoot: No voltage spikes on turn-on, turn-off, or power fail
Remote Sense: Remote sense on the main output compensates for up to 0.5V in the load cable
Power Fail: (Optional) A TTL signal (high or low, customer specified) appears within 5mSEC to warn of input voltage drop below minimum operating level
Outline Dimensions: 15.0" × 5.0" × 2.5"

OPERATIONAL SPECIFICATIONS

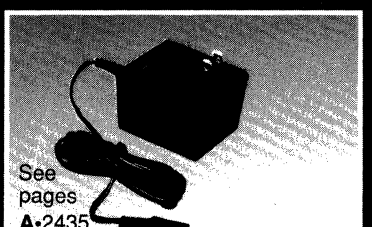
Load Requirements: Main output requires 10% minimum load to enable aux no.'s 2 and 3 to operate within specification.
DC Returns: Main output and aux no. 1 share common return. Aux output no.'s 2 and 3 are fully independent and floating.
Output Power: Total continuous power 400 watts max
Safety Isolation: Primary to secondary, 3750VAC (8mm spacing)
Unit meets or exceeds the following specifications for safety: VDE 0806, IEC380, IEC435, UL 478, CSA22.2, ULI950, BS6301, IEC950
EMI/RFI: Input filtering: unit meets requirements of FCC 20780 Class A and VDE0871 Class A

TAMURA

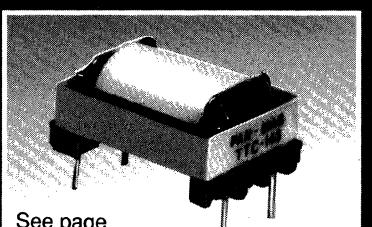
DELIVERS FROM STOCK



See page D•2062 **SINGLE AND MULTI–OUTPUT SWITCHERS**

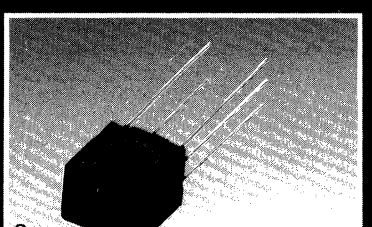


See pages A•2435, D•1495, D•2066 **WALL PLUG–IN, AC & DC POWER**



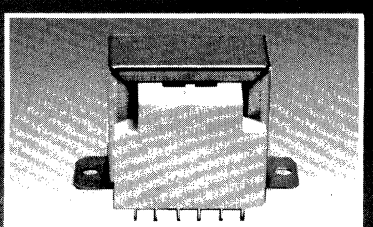
See page A•2428 **FCC PART 68 TELCOM LINE COUPLING**

See page D•2059 **DC/DC CONVERTERS SIP & DIP PKG**

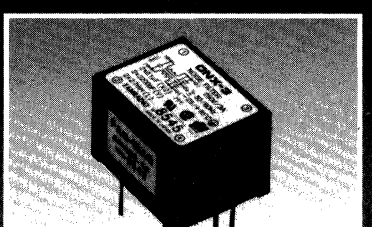


See page A•2430 **MINIATURE AUDIO & PART 68 COUPLING**

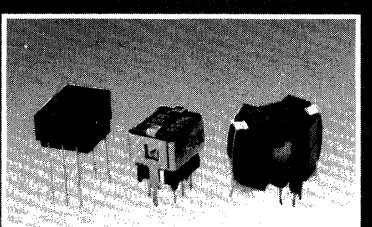
CONTACT FACTORY **COMPUTER NETWORKING BALUNS**



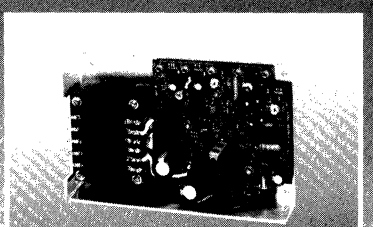
A•2432 **INT'L PCB POWER– UL 1411, IEC, VDE, & CSA**



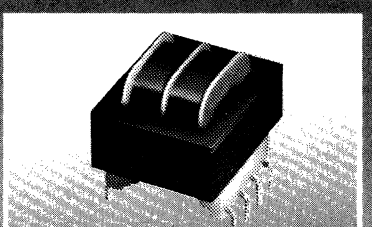
A•1643 **EMI LINE FILTERS**



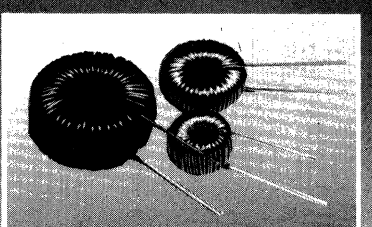
A•2431 **WIDE BAND PULSE– T1 & DIGITAL**



D•2064 **LINEAR POWER SUPPLIES**



A•2433 **UL/CSA PCB POWER**



A•1270 **NOISE, COMMON MODE & POWER COILS**

The strength of Tamura's AC and DC power conversion families lies in providing consistently dependable products. All Tamura power and magnetic devices are designed and manufactured to deliver lower AQL levels, guaranteeing you the lowest incoming rejection rates you've ever experienced. For example, last year we shipped over **100 million transformers**– most to customers using a **ship–to–stock** acceptance program.

At Tamura, we're already life testing (not just designing) tomorrow's products– today. Over 100 design engineers at our technology center are dedicated to this task, assuring you of having the most up–to–date technology in your products. Today we are already designing the robotics to build these quality products, in high volume and at low cost. Over 150 product support engineers at 16 Tamura factories see to it.

Satisfy your AC and DC requirements for today and tomorrow. Contact Tamura for your specific requirements.

Tamura quality circles the electron world.

TAMURA CORPORATION OF AMERICA

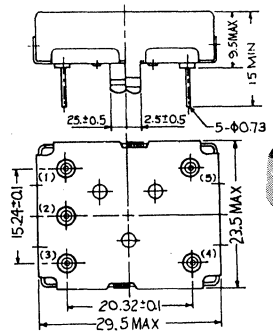
1150 DOMINGUEZ ST. ❑ CARSON, CA 90746-3518 ❑ 213/638-1790 ❑ FAX: 213 6389956

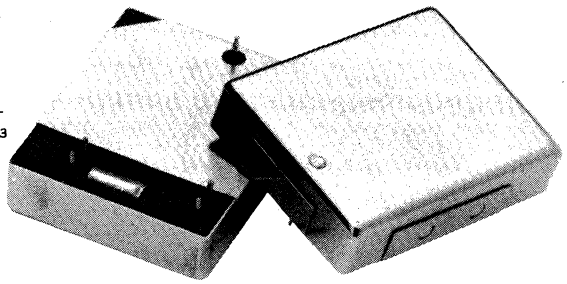
TAMURA LAN TYPE DC/DC CONVERTERS

The -9VDC output of Tamura's DC/DC converters makes them highly suitable for products designed for LAN applications. Two input ranges of +4.5VDC to +5.5VDC and +9.5VDC to +16.0VDC offer the designer a wide selection range.

FEATURES
- -9VDC Output.
- Two Input Ranges.
- 80 to 160ma Output.
- Load Reg: ±4% @ 25°C.
- Line Reg: ±2.5% max. at 110ma load.
- Shielded Case: Nickel plated copper.
- Temperature Coefficient: ±0.03%/°C.
- Ripple: 150mV p-p at FL.
- PC Board: UL94V-0 epoxy.

MECHANICAL DIMENSIONS





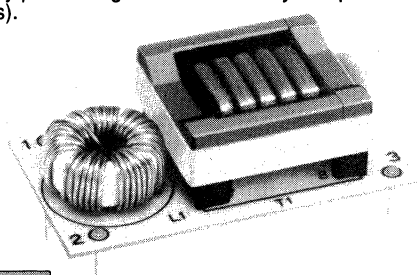
LAN TYPE DC/DC CONVERTERS

MODEL No.	INPUT (VDC)	OUTPUT (VDC)	OUTPUT (ma)	DIELECTRIC VOLT. (VDC)	PRICE (qty) 1-9	10-24	25-99	100up
LG-0509	+4.5≤+5.5	-9	80≤160	500	$40.60	$36.50	$34.50	$30.50
LGH-0509	+4.5≤+5.5	-9	80≤160	2000	40.60	36.50	34.50	30.50
LG-1209	+9.5≤+16.0	-9	80≤160	500	40.60	36.50	34.50	30.50
LGH-1209	+9.5≤+16.0	-9	80≤160	2000	40.60	36.50	34.50	30.50

TAMURA DC TO HIGH VOLTAGE AC INVERTERS

Tamura's CX-100 series inverter is ideally suited for computer display back light applications where small size and low cost are desired. These features are achieved through the use of a flat transformer and automated assembly processing. The inverter may be specified as a complete unit (CX series) or the transformer may be specified independently (SAT series).

FEATURES
- Low Cost.
- Small Size.
- Operating Temp: -20°C to +60°C.
- Storage Temp: -30°C to +85°C.
- Input Voltage: 5.00VDC ±10%.

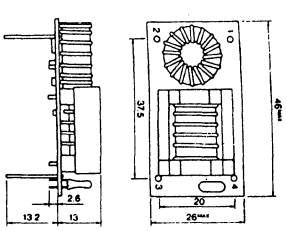


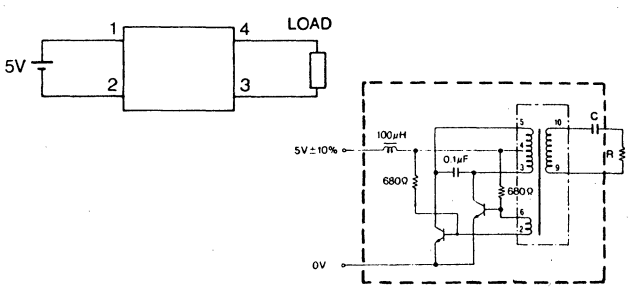
CX-100 SERIES INVERTER

MODEL[1] INVERT/ XFMR NO.	OPEN OUTPUT VOLTAGE	RATED OUTPUT CURRENT	RATED LOAD	WORKING FREQUENCY	SEC. CAP. (C)	TYP. EFF. (%)	PRICE (qty) 1-9	10-24	25-99	100up
CX-101	390Vrms	6mArms	33kΩ	36kHz±20%	68pF	75	$24.10	$21.70	$20.50	$18.10
SAT-340							10.90	9.80	9.30	8.20
CX-102	470Vrms	6mArms	39kΩ	40kHz±20%	47pF	78	24.10	21.70	20.50	18.10
SAT-341							10.90	9.80	9.30	8.20
CX-103	560Vrms	6mArms	47kΩ	36kHz±20%	47pF	81	24.10	21.70	20.50	18.10
SAT-342							10.90	9.80	9.30	8.20
CX-104	680Vrms	6mArms	56kΩ	40kHz±20%	33pF	77	24.10	21.70	20.50	18.10
SAT-343							10.90	9.80	9.30	8.20

Note 1: The inverter may be specified as a complete unit (CX series) or the transformer may be specified independently (SAT series).

MECHANICAL DIMENSIONS





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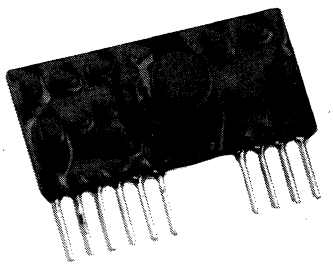
TAMURA SINGLE-IN-LINE DC to DC CONVERTERS

Polarity Reversing ■ Voltage Boosting ■ Voltage Decreasing ■ Direct Battery Input

Tamura DC/DC converters provide board level DC power conversion eliminating costly regulator circuitry, additional off-board power supplies and avoid time consuming safety agency certification. Single output SIP models complement the main power supply by providing polarity reversing, voltage boosting, voltage decreasing and direct battery input.



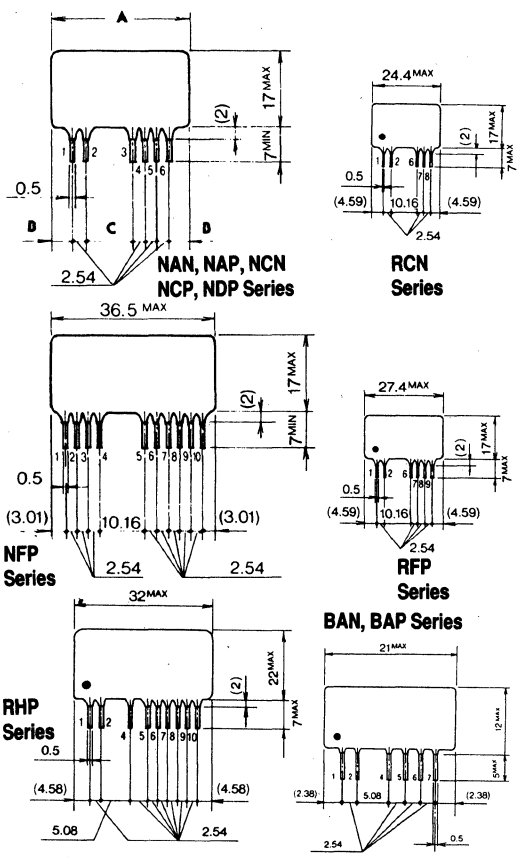
FEATURES

- Input Volt: ±20%; 5VDC, ±10%; 24VDC, ±30%.
- Output Volt: ±1%; Econo/Battery, ±5%.
- Line Reg: 0.8%; Econo, 1.2%; BAN/BAP.
- 5VDC, 2%; 12/15VDC, 1%.
- Load Reg: 1.5%, 30 -100% FL.
- Efficiency: 60% to 72% typ.
- Temp. Coef: ≤0.03%/°C; 5VDCout Econo, 0.05%/°C; 12VDCout Econo/Battery, 0.1%/°C.
- Operating Freq: 50-300kHz, FL to NL.
- Ripple/Noise: 60mV typ, ≤100mV p-p.
- Operating Temp: -10°C to +70°C, FL.
- Storage Temp: -30°C to +85°C.
- Humidity: 95% RH.
- Case Mat'l: UL94 -V0 epoxy.
- Insul. Resistance: ≥50MΩ at 500VDC.

TAMURA SINGLE-IN-LINE DC/DC CONVERTERS - SIP SERIES

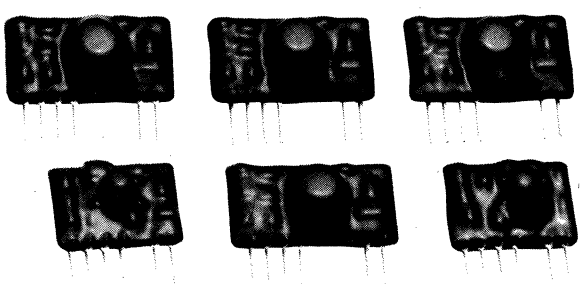
MODEL No.	Vin (VDC)	Vout (VDC)	Iout (ma)	PRICE (qty) 1-9	10-24	25-99	100up
POLARITY REVERSING							
NAN-0505	5	-5	20.0	$12.00	$10.80	$10.20	$9.00
NAN-0512	5	-12	8.5	12.00	10.80	10.30	9.00
NCN-0505	5	-5	60.0	12.80	11.50	10.90	9.60
NCN-0512	5	-12	25.0	12.80	11.50	10.90	9.60
VOLTAGE BOOSTING							
NAP-0512	5	12	8.4	12.00	10.80	10.20	9.00
NAP-0515	5	15	6.7	12.00	10.80	10.20	9.00
NAP-0524	5	24	4.2	12.00	10.80	10.20	9.00
NCP-0512	5	12	25.0	12.80	11.50	10.90	9.60
NCP-0515	5	15	20.0	12.80	11.50	10.90	9.60
NCP-0524	5	24	12.5	12.80	11.50	10.90	9.60
NDP-0512	5	12	42.0	13.70	12.30	11.60	10.30
NDP-0515	5	15	34.0	13.70	12.30	11.60	10.30
NDP-0524	5	24	21.0	13.70	12.30	11.60	10.30
NFP-0512	5	12	84.0	15.30	13.80	13.00	11.50
NFP-0515	5	15	67.0	15.30	13.80	13.00	11.50
NFP-0524	5	24	42.0	15.30	13.80	13.00	11.50
ECONOMY LINE							
RCN-0505	5	-5	60.0	8.20	7.40	7.00	6.20
RCN-0512	5	-12	25.0	8.20	7.40	7.00	6.20
RCN-0515	5	-15	20.0	8.20	7.40	7.00	6.20
RCN-1205	12	-5	60.0	8.20	7.40	7.00	6.20
RCN-1212	12	-12	25.0	8.20	7.40	7.00	6.20
RFP-2405	24	5	200.0	8.40	7.60	7.10	6.30
RHP-2405	24	5	400.0	9.30	8.40	7.90	7.00
BATTERY INPUT							
BAN-0205	1≤3.5	-5	10.00	11.10	10.00	9.40	8.30
BAN-0212	1≤3.5	-12	4.17	11.10	10.00	9.40	8.30
BAN-0215	1≤3.5	-15	3.33	11.10	10.00	9.40	8.30
BAP-0205	1≤3.5	5	10.00	11.10	10.00	9.40	8.30
BAP-0212	1≤3.5	12	4.17	11.10	10.00	9.40	8.30
BAP-0215	1≤3.5	15	3.33	11.10	10.00	9.40	8.30

MECHANICAL DIMENSIONS



SINGLE-IN-LINE DIMENSIONS

SERIES PREFIX	DIMENSIONS (mm) A (max)	B	C	WT (gm)
NAN, NAP	20.5	2.63	5.08	2.3
NCN, NCP	24.4	4.58	5.08	2.8
NDP	29.5	4.59	10.16	3.3
NFP	- See Diagram -			4.4
RCN	- See Diagram -			2.5
RFP	- See Diagram -			3.0
RHP	- See Diagram -			4.8
BAN, BAP	- See Diagram -			1.8



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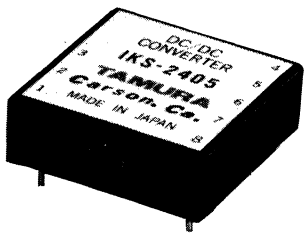
TAMURA ISOLATION TYPE DC/DC CONVERTERS

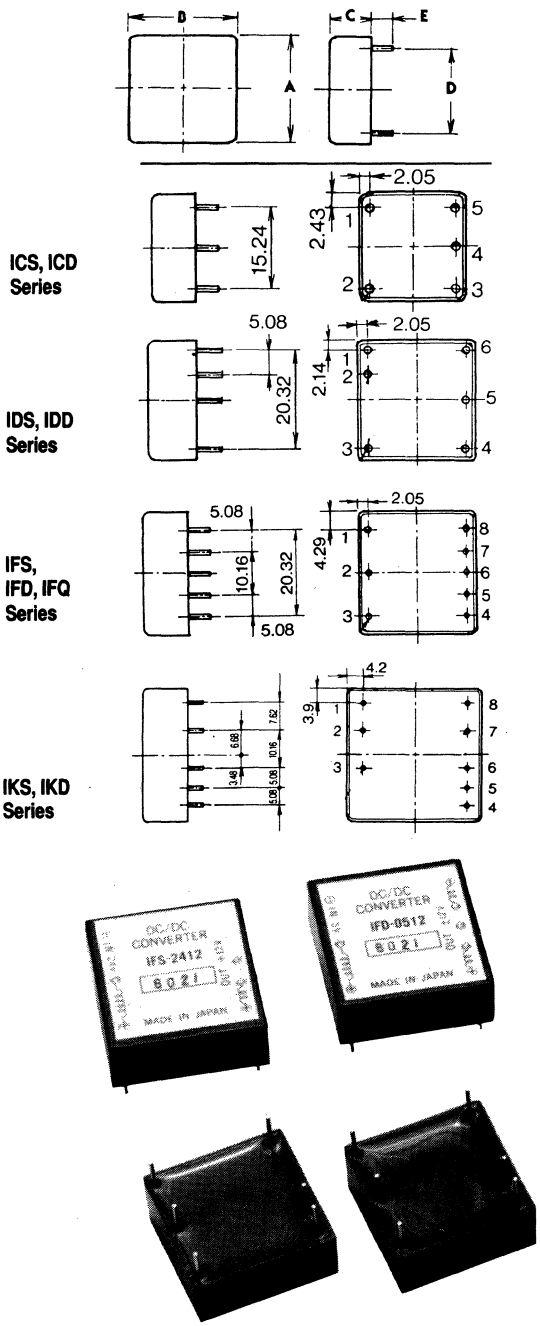
Tamura's isolation models in a Dual-In-Line package (DIP) have single and dual outputs from 300 to 3,000mW with built-in noise filter inductors and overload protection. For telcom requirements there are 48VDC quad output devices.



FEATURES

- Input Volt: 5VDC, ±10%; others ±20%.
- 48VDC range, 42 to 60V.
- Output Volt: ±1%, Telcom, ±2%.
- Line Reg: 0.5%; -0505, 0.8%; Telcom, 1%.
- Load Reg: 3.0%; 5VDC out, 6%; Telcom, 8%.
- Efficiency: 60% to 72% typ.
- Temp. Coef: <0.03/°C.
- Overload Protection: 130-200% FL.
- Operating Freq: 50 -300kHz, FL to NL.
- Ripple/Noise: 60mV typ, 100mV p-p max.
- Operating Temp: -10°C to +70°C.
- Storage Temp: -30°C to +85°C.
- Humidity: 95% RH.
- Case Mat'l: UL94V-0 epoxy; 0.3mm alum., 3.0W.

MECHANICAL DIMENSIONS



ISOLATION DC/DC CONVERTERS - DIP SERIES

MODEL No.	Vin (VDC)	Vout (VDC)	Iout (ma)	PRICE (qty) 1-9	10-24	25-99	100up
0.3 WATT							
ICS-0505	5	5	60	$16.40	$14.80	$13.90	$12.30
ICS-0512	5	12	25	16.40	14.80	13.90	12.30
ICD-0512	5	±12	12.5	17.70	15.90	15.00	13.30
ICS-1205	12	5	60	16.40	14.80	13.90	12.30
ICS-1212	12	12	25	16.40	14.80	13.90	12.30
ICD-1212	12	±12	12.5	17.70	15.90	15.00	13.30
ICS-2405	24	5	60	16.40	14.80	13.90	12.30
ICS-2412	24	12	25	16.40	14.80	13.90	12.30
ICD-2412	24	±12	12.5	17.70	15.90	15.00	13.30
0.5 WATT							
IDS-0505	5	5	100	19.30	17.40	16.40	14.50
IDS-0512	5	12	42	19.30	17.40	16.40	14.50
IDD-0512	5	±12	21	20.10	18.10	17.10	15.10
IDS-1205	12	5	100	19.30	17.40	16.40	14.50
IDS-1212	12	12	42	19.30	17.40	16.40	14.50
IDD-1212	12	±12	21	20.10	18.10	17.10	15.10
IDS-2405	24	5	100	19.30	17.40	16.40	14.50
IDS-2412	24	12	42	19.30	17.40	16.40	14.50
IDD-2412	24	±12	21	20.10	18.10	17.10	15.10
1.0 WATT							
IFS-0505	5	5	200	23.90	21.50	20.30	17.90
IFS-0512	5	12	84	23.90	21.50	20.30	17.90
IFD-0512	5	±12	42	24.70	22.20	21.00	18.50
IFS-0524	5	24	42	23.90	21.50	20.30	17.90
IFS-1205	12	5	200	23.90	21.50	20.30	17.90
IFS-1212	12	12	84	23.90	21.50	20.30	17.90
IFD-1212	12	±12	42	24.70	22.20	21.00	18.50
IFS-2405	24	5	200	23.90	21.50	20.30	17.90
IFS-2412	24	12	84	23.90	21.50	20.30	17.90
IFD-2412	24	±12	42	24.70	22.20	21.00	18.50
3.0 WATT							
IKS-0505	5	5	600	34.30	30.90	29.20	25.70
IKD-0512	5	±12	125	35.20	31.70	29.90	26.40
IKD-0515	5	±12	100	35.20	31.70	29.90	26.40
IKS-0524	5	24	125	34.30	30.90	29.20	25.70
IKS-1205	12	5	600	34.30	30.90	29.20	25.70
IKS-1212	12	12	250	34.30	30.90	29.20	25.70
IKD-1212	12	±12	125	35.20	31.70	29.90	26.40
IKS-2405	24	5	600	34.30	30.90	29.20	25.70
IKS-2412	24	12	250	34.30	30.90	29.20	25.70
IKD-2412	24	±12	125	35.20	31.70	29.90	26.40
48V - MULTI OUTPUT							
IFQ-48A	48	±5 ±12	33.0 7.1	26.50	23.90	22.50	19.90
IKQ-48A	48	±5 ±12	67.0 14.2	28.50	25.70	24.20	21.40

ISOLATION SERIES DIMENSIONS

SERIES PREFIX	DIMENSIONS[1] (mm) A	B	C max	D	E min	WT (gm)
ICS/ICD	20.1	20.1	8.5	16.0	4	6.3
IDS/IDD/IDQ	24.6	24.6	10.5	20.5	5	11.5
IFS/IFD/IFQ	26.9	28.9	10.5	22.8	5	14.7
IKS/IKD/IKQ	36.4	36.4	12.0	28.0	4	29.9

Note 1: Pin dia. = 0.75mm.

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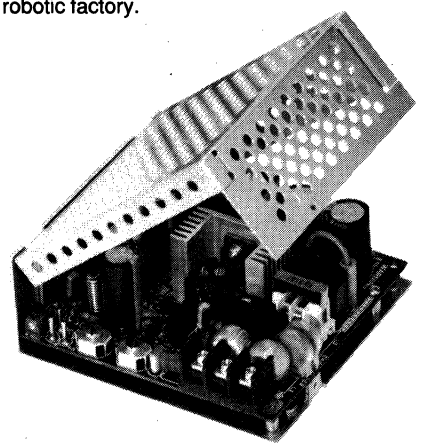
TAMURA SINGLE OUTPUT SWITCHING POWER SUPPLIES

file no. E102103 file no. LR64183 file nos. 2619, 2620, 2614, 2638, 2639

Tamura switching power supplies offer sound mechanical construction, excellent thermal management and fault tolerant electronic design resulting in high end-user reliability. Tooled for millions of units, they reflect true vertical manufacturing integration and are produced in a fully robotic factory.

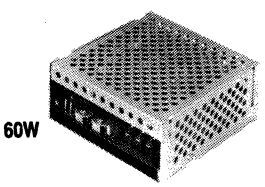


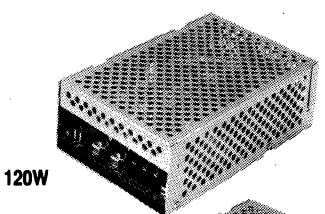
FEATURES

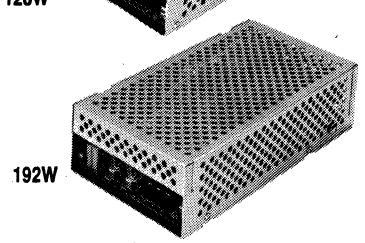
- UL/CSA/VDE File Nos.
- 90-132/180-264VAC.
- EMI Input Filter.
- AC Power Fail Signal.
- 100,000 -150,000 hrs MTBF.
- To 85% Efficiency.
- Turn-On Delay: <100msec.
- Input Surge: <30A, cold start.
- Voltage Adj: 10% of nominal.
- Line/Load Regulation: 0.5%.
- Noise/Ripple: ≤75mV p-p.
- Hold-Up Time: ≥20msec.
- Transient Response: ≤1msec (50-100% load chg).
- Remote/Local Sensing.
- Overload/No-Load Protection.
- OVP: All outputs.
- Stability: 0.1% for 8 hrs.
- Elevated Temp Burn-In/Stress Test.
- Convection Cooled.
- 50°C Rated.
- Storage Temp: -20°C to +85°C.
- Oper. Humdity: 0-95% RH.
- Temp. Coef: ±0.02%/°C max.
- Warranty: Two years.
- Removable Cover/Pem Nut Mtg.

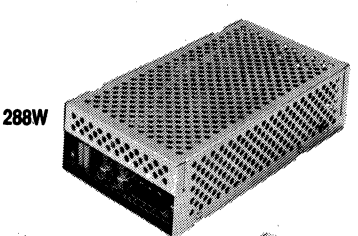
TAMURA 60W to 384W SINGLE OUTPUT SWITCHING POWER SUPPLIES

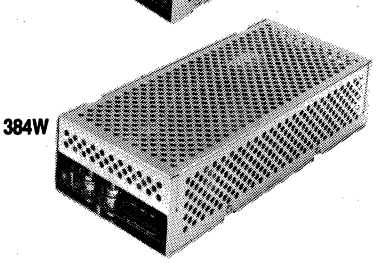
MODEL No.	RATINGS		VDE FILE	CASE SIZE	DIMENSIONS (H"xW"xL")	WT (lbs)	PRICE (qty)		
	VDC	AMPS					1-9	10-24	25-99
60W									
OVS-5E	5V	10A	2619	E	2.0x4.88x4.62	1.32	$96.20	$90.45	$82.75
OVS-12E	12V	5A	2619	E	2.0x4.88x4.62	1.32	96.20	90.45	82.75
OVS-15E	15V	4A	2619	E	2.0x4.88x4.62	1.32	96.20	90.45	82.75
OVS-24E	24V	2.5A	2619	E	2.0x4.88x4.62	1.32	96.20	90.45	82.75
120W									
OVS-5F	5V	20A	2620	F	2.37x4.88x7.1	2.42	148.55	139.65	127.75
OVS-12F	12V	10A	2620	F	2.37x4.88x7.1	2.42	148.55	139.65	127.75
0VS-15F	15V	8A	2620	F	2.37x4.88x7.1	2.42	148.55	139.65	127.75
0VS-24F	24V	5A	2620	F	2.37x4.88x7.1	2.42	148.55	139.65	127.75
192W									
OVS-5G	5V	30A	2614	G	2.37x4.88x8.6	2.86	195.05	183.35	167.75
OVS-12G	12V	15A	1614	G	2.37x4.88x8.6	2.86	195.05	183.35	167.75
OVS-15G	15V	12A	2614	G	2.37x4.88x8.6	2.86	195.05	183.35	167.75
OVS-18G	18V	10A	2614	G	2.37x4.88x8.6	2.86	195.05	183.35	167.75
OVS-24G	24V	8A	2614	G	2.37x4.88x8.6	2.86	195.05	183.35	167.75
288W									
OVS-5H	5V	45A	2639	H	2.6x4.88x10.6	4.62	284.60	267.50	244.75
OVS-12H	12V	22A	2639	H	2.6x4.88x10.6	4.62	284.60	267.50	244.75
OVS-15H	15V	18A	2639	H	2.6x4.88x10.6	4.62	284.60	267.50	244.75
OVS-24H	24V	12A	2639	H	2.6x4.88x10.6	4.62	284.60	267.50	244.75
384W									
OVS-5J	5V	60A	2638	J	2.75x4.88x12	5.5	341.55	321.05	293.75
OVS-12J	12V	30A	2638	J	2.75x4.88x12	5.5	341.55	321.05	293.75
OVS-15J	15V	25A	2638	J	2.75x4.88x12	5.5	341.55	321.05	293.75
OVS-24J	24V	16A	2638	J	2.75x4.88x12	5.5	341.55	321.05	293.75











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TAMURA LITE-SWITCHER™ SERIES

50W, 1" High, 85-264VAC, 1-3 Outputs

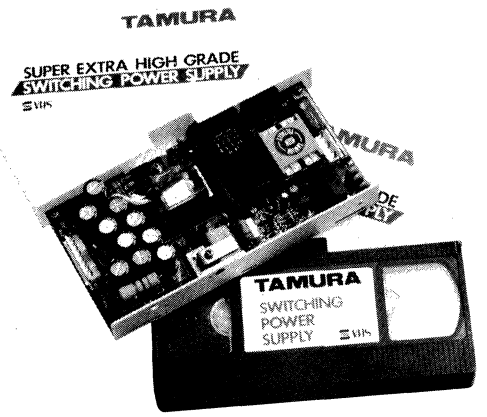
file nos. E133370, E132244 | file no. LR44447 | file no. 3817

Tamura's Lite-Switcher is smaller than a VHS cassette and weighs only 17 oz., yet delivers a full 50 watts of reliable DC power. You can easily design size and weight out of your products. A wide range universal AC input enables operation anywhere in the world. Certification to the new requirements of IEC, UL and CSA that takes effect in 1992 has been completed. Built-in EMI circuitry insures that FCC and VDE class B emission levels aren't exceeded.

FEATURES

- Input: World Wide 85-264VAC.
- Low Profile: 1" x 3.74" x 7.09".
- EMI Input Filter.
- UL 1950.
- CSA 22.2 No. 223.
- VDE (IEC 950).
- Hybrid Integrated Control Ckt (HIC).
- Operating Frequency: 150-200kHz.
- Input Current: 1.3/0.9A @ 120/220VAC.
- Surge: 24A/40A @ 120/220VAC.
- Line Regulation: <1%.
- Load Regulation: <2%, NL to FL.
- Ripple & Noise: 100mV; 48V, 200mV; 24V, FVM (V2, V3) 150mV.
- Voltage Adj: ±5%, FVS; +5% FVM (V1).
- Output Overshoot: None.
- Transient Response: <1msec to 2% of nom. VDC (50-100% load chg).
- Hold Up Time: 20msec typ (100VAC).
- OVP: All FVS; FVM (V1) only.
- Overload Protect: FVS, 120%; FVM, 200%.
- Temp. Coef: ±0.005%/°C; others, ±0.03%/°C.
- Stability: 0.1%; others 0.2%.
- Efficiency: 70% typ (120VAC).
- Convenction Cooled.
- Rated Temp: FVS, +60°C; FVM, +50°C.
- Operating Humidity: 30-90% RH.
- Leakage Current: 1.0ma rms.
- Insulation Resistance: ≥100MΩ at 500VDC.
- Vibration: 10-55Hz, 2G (all axis, 1 hr).
- Shock: 20msec, 20G (all axis, 3x ea).
- Weight: FVS, 17 oz; FVM, 24 oz.
- Elevated Temp. Burn-In/Stress Test.
- Warranty: 2 years

* Speciifications refer to all FVS single output and main FVM output (V1) except as noted.



SINGLE OUTPUT SWITCHERS WITH UL, CSA and VDE

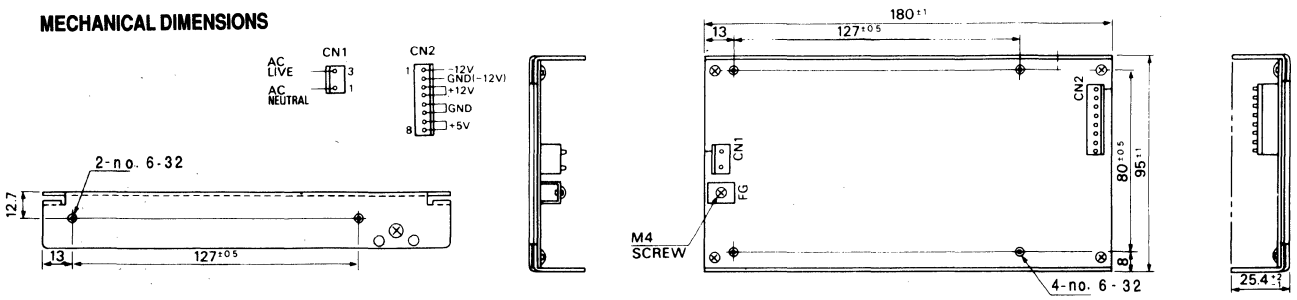
MODEL No.	RATINGS		POWER (max)	PRICE (qty)		
	VDC	AMPS		1-9	10-24	25-99
FVS-501	5V	10.0A	50.0W	$108.00	$101.50	$92.90
FVS-502	12V	4.2A	50.4W	107.00	100.60	92.00
FVS-503	15V	3.3A	49.5W	107.00	100.60	92.00
FVS-504	24V	2.1A	50.4W	107.00	100.60	92.00
FVS-505	48V	1.1A	52.8W	108.00	101.50	92.90

MULTI OUTPUT SWITCHERS WITH UL, CSA and VDE

MODEL No.	OUTPUT RATINGS			LOAD (min)	LOAD (max)[1]	PRICE (qty)		
	No.	VDC	AMPS			1-9	10-24	25-99
FVM-501	V1	+5V	4.0A	1.5A	7.0A	$112.00	$105.30	$96.30
	V2	+12V	1.5A	0A	1.5A			
	V3	-12V	1.0A	0A	1.0A			
FVM-502	V1	+5V	2.5A	1.5A	7.0A	112.00	105.30	96.30
	V2	+15V	1.5A	0A	1.5A			
	V3	-15V	1.0A	0A	1.0A			
FVM-503	V1	+5V	5.4A	1.5A	7.0A	112.00	105.30	96.30
	V2	+12V	1.5A	0A	1.5A			
	V3	-5V	1.0A	0A	1.0A			

Note 1: Maximum power of combined output is 50 watts.

MECHANICAL DIMENSIONS



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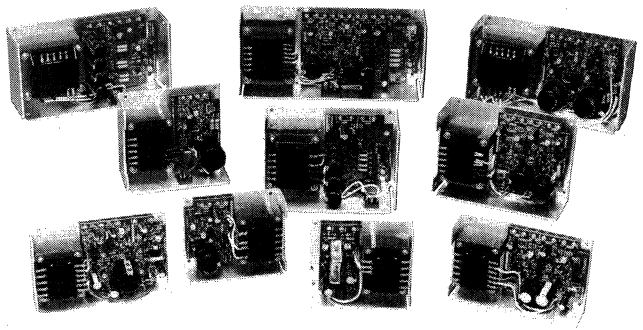
TAMURA DUAL OUTPUT LINEARS - WITH UL, CSA and VDE



TAMURA DUAL OUTPUT LINEARS - WITH UL, CSA and VDE

MODEL No.[1]	POWER-ONE TYPE	VOLTAGE, CURRENT[2,3] OUTPUT 1	OUTPUT 2	CASE SIZE	DIMENSIONS (L"xW"xH")	WT (lbs)	PRICE (qty) 1-9	10-24	25-99
±5 VOLTS									
OLD-5AAV	HAA5-1.5/OVP-A	5V, 1.5A*	-5V, 1.5A*	AA	6.50x4.00x2.07	2	$49.95	$47.45	$45.00
OLD-5BBV	HBB5-3/OVP-A	5V, 3.0A*	-5V, 3.0A*	BB	7.00x4.87x2.95	4	72.95	69.30	58.50
OLD-5CCV	HCC5-6/OVP-A	5V, 6.0A	-5V, 6.0A	CC	9.38x4.87x3.28	7	96.95	92.10	87.50
±12 or 15 VOLTS									
OLD-12B	HAD12-0.4-A	12V, 0.4A*	-12V, 0.4A*	B	4.87x4.00x2.07	2	36.95	35.10	33.50
OLD-15B	HAD15-0.4-A	15V, 0.4A*	-15V, 0.4A*	B	4.87x4.00x2.07	2	36.95	35.10	33.50
±12/15 VOLTS									
OLD-12/15AA	HAA15-0.8-A	12V, 1.0A jumper chg: 15V, 0.8A	-12V, 1.0A -15V, 0.8A or -5V, 0.4A	AA	6.50x4.00x2.07	2	42.95	40.80	38.50
OLD-12/15BB	HBB15-1.5-A	12V, 1.7A jumper chg: 15V, 1.5A	-12V, 1.7A -15V, 1.5A or -5V, 0.7A	BB	7.00x4.87x2.95	4	54.95	52.20	49.50
OLD-12/15CC	HCC15-3-A	12V, 3.4A jumper chg: 15V, 3.0A	-12V, 3.4A -15V, 3.0A	CC	9.38x4.87x3.28	7	87.95	83.55	79.00
±24 or 18 to 20 VOLTS									
OLD-24AA	HAA24-0.6-A	24V, 0.6A* jumper chg: 18≤ 20V, 0.4A	-24V, 0.6A* -18≤ 20V, 0.4A	AA	6.50x4.00x2.07	2	42.95	40.80	38.50
OLD-24BB	HBB24-1.2-A	24V, 1.2A* jumper chg: 18≤ 20, 0.9A	-24V, 1.2A* -18≤ 20V, 0.9A	BB	7.00x4.87x2.95	4	54.95	52.20	49.50
OLD-24CC	HCC24-2.4-A	24V, 2.4A jumper chg: 18≤20V, 1.8A	-24V, 2.4A -18≤ 20V, 1.8A	CC	9.38x4.87x3.28	7	87.95	83.55	79.00
5 & 12 to 15 VOLTS									
OLD-512AA	HAA512-A	5V, 2.0A*	+12≤15V, 0.5A*	AA	6.50x4.00x2.07	2	49.95	47.45	45.00
OLD-512BB	HBB512-A	5V, 3.0A	+12≤ 15V, 1.25A	BB	7.00x4.87x2.95	4	59.95	56.95	54.00
OLD-512CC	HCC512-A	5V, 6.0A	+12≤15V, 2.5A	CC	9.38x4.87x3.28	7	94.95	90.20	85.50

TAMURA TRIPLE OUTPUT LINEARS - WITH UL, CSA and VDE

MODEL No.[1]	POWER-ONE TYPE	VOLTAGE, CURRENT[2,3] OUTPUT 1	OUTPUT 2	OUTPUT 3	CASE SIZE	DIMENSIONS (L"xW"xH")	WT (lbs)	PRICE (qty) 1-9	10-24	25-99
5 & ±12 to 15 VOLTS										
OLT-522AA	HTAA-16W-A	5V, 2.0A* jumper chg:	12≤15V, 0.4A*	-(12≤15)V, 0.4A* -5V, 0.4A	AA	6.50x4.00x2.07	2	$54.95	$52.20	$49.50
OLT-522F	CP131-A	5V, 8.0A jumper chg:	12V, 1.7A 15V, 1.5A	-12V, 1.7A -15V, 1.5A - or - -5V, 0.7A	131	11.0x4.87x3.20	9	119.95	113.95	108.00

Note 1: OVP built-in on main 5V output of multiple output units. Use OVP-1 module (up to 34V combined) for other outputs.
Note 2: Other industry standard outputs available on a special, minimum quantity, order.
Note 3: * indicates remote sense not provided.

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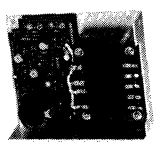
TAMURA LINEAR POWER SUPPLIES...THE POWER-ONE ALTERNATIVE

file no. E102103 file no. LR69809 file nos: 3206 3208 3210 3212 3214 3216 3218 3257 3259 3261

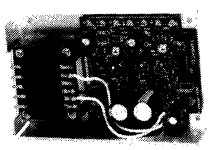
Tamura has set reliability standards through component upgrade design. Critical specs such as temperature, voltage and current have been derated so that, for example, 105°C instead of 85°C electrolytic caps are used. The result is the highest available MTBF as calculated by MIL-HDBK-217D at full load, 120VAC and 25°C.

FEATURES

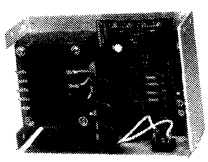
- MTBF to 460,000 Hrs.
- UL Recognized.
- CSA Certified.
- 100/120/220/230/240VAC.
- Remote Sensing.
- 2 Year Warranty.
- 5V OVP Built-in.
- Optional OVP Module.
- Short Circuit Protection.
- Overload Protection.
- Burn-in.
- Voltage Adjust: ± 5%.
- Line/Load Reg: ± 0.05% typ.
- Noise/Ripple: ≤5.0 mV p-p.
- Transient Response: <50 µsec (50% load chg).
- Stability: ± 0.3%.
- 50°C Rated.
- Temp coef: ± 0.3%/° C max.
- Vibration: MIL-STD-810C.
- Shock: MIL-STD-810C.



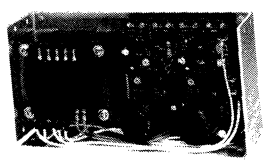
B CASE



N CASE



AA CASE



CC CASE

TAMURA SINGLE OUTPUT LINEARS - WITH UL, CSA and VDE

MODEL No.[1]	POWER-ONE TYPE	VOLTAGE,[2] CURRENT	CASE SIZE	DIMENSIONS (L"xW"xH")	WT (lbs)	PRICE (qty) 1-9	10-24	25-99
5 VOLTS								
OLS-5BV	HB5-3/OVP-A	5V, 3.0A	B	4.87x4.00x2.07	2	$32.95	$31.30	$29.50
OLS-5CV	HC5-6/OVP-A	5V, 6.0A	C	5.62x4.87x2.95	4	54.95	52.20	49.50
OLS-5NV	HN5-9/OVP-A	5V, 9.0A	N	7.00x4.87x3.20	6	74.95	71.20	67.50
OLS-5DV	HD5-12/OVP-A	5V, 12.0A	D	9.00x4.87x3.28	7.5	84.95	80.70	76.50
12 VOLTS								
OLS-12B	HB12-1.7-A	12V, 1.7A	B	4.87x4.00x2.07	2	32.95	31.30	29.50
OLS-12C	HC12-3.4-A	12V, 3.4A	C	5.62x4.87x2.95	4	49.95	47.45	45.00
OLS-12N	HN12-5.1-A	12V, 5.1A	N	7.00x4.87x3.20	6	69.95	66.45	63.00
OLS-12D	HD12-6.8-A	12V, 6.8A	D	9.00x4.87x3.28	7.5	79.95	75.95	72.00
15 VOLTS								
OLS-15B	HB15-1.5-A	15V, 1.5A	B	4.87x4.00x2.07	2	32.95	31.30	29.50
OLS-15C	HC15-3-A	15V, 3.0A	C	5.62x4.87x2.95	4	49.95	47.45	45.00
OLS-15N	HN15-4.5-A	15V, 4.5A	N	7.00x4.87x3.20	6	69.95	66.45	63.00
OLS-15D	HD15-6-A	15V, 6.0A	D	9.00x4.87x3.28	7.5	79.95	75.95	72.00
24 VOLTS								
OLS-24B	HB24-1.2-A	24V, 1.2A	B	4.87x4.00x2.07	2	32.95	31.30	29.50
OLS-24C	HC24-2.4-A	24V, 2.4A	C	5.62x4.87x2.95	4	49.95	47.45	45.00
OLS-24N	HN24-3.6-A	24V, 3.6A	N	7.00x4.87x3.20	6	69.95	66.45	63.00
OLS-24D	HD24-4.8-A	24V, 4.8A	D	9.00x4.87x3.28	7.5	79.95	75.95	72.00
OVP MODULE								
OVP-1	OVP-12	6.4V≤ 34V	OVP	1.58x1.58x0.50	-	7.95	7.55	7.00

Note 1: OVP built-in on 5V output. Use OVP-1 module for other outputs.
Note 2: Industry standard 2V, 28V, 48V, 120V, 200V and 250V outputs available on special order.

Power-One is a registered trademark of Power-One D.C. Power Supplies

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TAMURA VDE WALL PLUG-INS, 220VAC, 50Hz.

DC Unregulated & DC Regulated

file nos. 7969-330,331

Tamura wall plug-ins enable smaller, cooler running designs - with no safety agency restrictions. End-products will be lighter, more portable, easier to build and less costly. Over 30 million units shipped last year - no returns. 600 OEM models with UL, CSA, VDE, MITI, CEE and SAA listings are available. See more DC regulated models from 15 to 60 watts in this section, AC/AC models in Transformers and battery chargers in Batteries.

DC OUTPUT UNREGULATED - WITH VDE

VDE MODEL NO.	RATED OUTPUT		OUTPUT VDC [1]			PLUG TYPE	PRICE (qty)			
	VOLTS DC	ma DC	100% FL 198VAC	100% FL 242VAC	10% FL 242VAC		1-9	10-24	25-99	100up
818F4225	6.0	400	5.40	7.20	8.70	I	$16.70	$14.20	$13.40	$11.70
525F4421	6.0	1200	5.20	7.20	9.50	I	32.70	27.80	26.20	22.90
818F4120	9.0	500	7.90	10.60	13.90	I	17.60	15.00	14.10	12.30
818F4124	12.0	500	10.40	14.00	19.10	O	17.60	15.00	14.10	12.30
525F4425	12.0	1000	10.20	13.50	18.10	I	32.70	27.80	26.20	22.90

Note 1: Typical output voltage for % load (FL) and line (VAC) indicated.

DC OUTPUT REGULATED -

VDE MODEL No.	RATED OUTPUT		REGULATION		PLUG TYPE	PRICE (qty)			
	VOLTS DC	ma DC	LINE VDC	LOAD VDC		1-9	10-24	25-99	100up
818FR4104	6.0	400	±0.10	±0.15	I	$24.30	$20.70	$19.40	$17.00
818FR4107	9.0	300	±0.10	±0.15	I	24.30	20.70	19.40	17.00
818FR4109	12.0	250	±0.10	±0.15	I	24.30	20.70	19.40	17.00

FEATURES

- VDE Licensed (Europe). Input: 220VAC ±10%, 50Hz.
- EMI: Meets VDE 0871, Class B.
- Short Circuit Protection.
- Thermal Protection.
- 100% Testing.
- Temp Range: 0 to +40°C.
- Case Temp Rise: 35°C max.
- Oper Humidity: 10-90% RH.
- Mat'l: ABS resin/UL 94-V0.
- Color: Black.
- No Audible Noise.

REGULATED MODELS:

- Load Reg: Spec'd for ±20%
- chg from 80% FL.
- Line Reg: At FL, 10% Iline chg.
- Ripple: 10mv rms typ.

FIG. 1 UL/CSA

FIG. 3 VDE

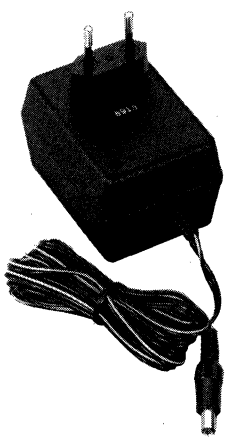
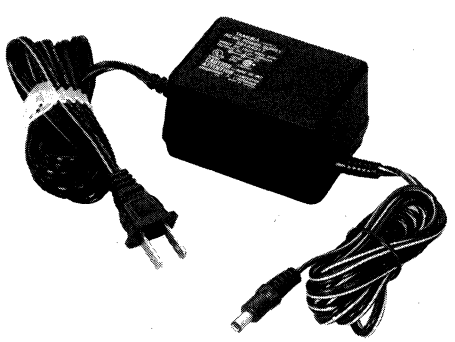


FIG. 2 PLUG TO PLUG



MECHANICAL DIMENSION TABLE

SERIES PREFIX	LENGTH (L) mm (inch)	WIDTH (W) mm (inch)	HEIGHT (H) mm (inch)	WEIGHT gm (oz)	FIG No.
212A	53 (2.09)	36 (1.42)	35 (1.38)	120 (4.23)	1
216A	53 (2.09)	36 (1.42)	38 (1.50)	140 (4.94)	1
310A	60 (2.36)	45 (1.77)	35 (1.38)	150 (5.29)	1
310F	58 (2.28)	45 (1.77)	39 (1.54)	190 (6.70)	2
318A	60 (2.36)	45 (1.77)	42 (1.65)	190 (6.70)	1
416A	61 (2.40)	55 (2.17)	41 (1.59)	230 (8.11)	1
420A	61 (2.40)	55 (2.17)	41 (1.59)	270 (9.52)	1
420AR	61 (2.40)	55 (2.17)	41 (1.59)	270 (9.52)	1
521A	85 (3.35)	63 (2.48)	52 (2.05)	520 (18.34)	3
525F	100 (3.94)	68 (2.68)	62 (2.44)	610 (21.52)	3
630A	114 (4.49)	75 (2.96)	61 (2.40)	1134 (40.00)	3
811A	84 (3.31)	56 (2.20)	35 (1.38)	260 (9.17)	1
816A, AR	81 (3.19)	59 (2.32)	52 (2.03)	297 (10.48)	1
818F, FR	75 (2.95)	55 (2.17)	50 (1.97)	370 (13.05)	2
820A	82 (3.23)	60 (2.36)	50 (1.97)	420 (14.81)	1
820A-G	82 (3.23)	60 (2.36)	55 (2.17)	420 (14.81)	1
825A	82 (3.23)	60 (2.36)	50 (1.97)	490 (17.28)	1
825A-G	82 (3.23)	60 (2.36)	55 (2.17)	490 (17.28)	1
825AR-G	86 (3.39)	69 (2.90)	57 (2.24)	630 (22.22)	1

OUTPUT PLUG DIMENSIONS

PLUG TYPE	D1 (mm)	D2 (mm)	L (mm)	MALE/ FEMALE	TIP (+/-)	FIG No.
I	5.5	2.10	9.5	FEMALE	-	4
F	5.0	2.50	11.5	FEMALE	-	4
L	5.5	2.10	16.0	FEMALE	+	4
O	5.5	2.55	12.40	FEMALE	-	4
SI	5 Pin DIN Connector				N/A	N/A
U	Universal/Reversible Connector				REV	6
Y	3.5	3.00	14.0	MALE	+	5

FIG. 4 FEMALE

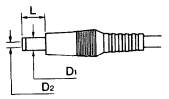


FIG 5. MALE

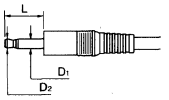
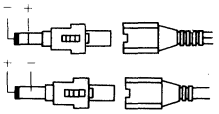


FIG. 6 "U" PLUG



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TAMURA WALL PLUG-INS, 120VAC, 60Hz.

DC Unregulated & DC Regulated

file no. E82180

file no. LR38236

FEATURES

- Input: 120VAC ±10%, 60Hz.
- EMI: Meets FCC Part 15.
- Short Circuit Protection.
- Thermal Protection.
- Transformer: 3 Flange Bobbin.
- 100% Testing.
- US 3 - Blade Ground Plug Avail
- Temp Range: 0 to +40°C.
- Case Temp Rise: ≤35°C.
- Oper Humidity: 10-90% RH.
- Mat'l: ABS resin/UL 94-V0.
- Color: Black.
- No Audible Noise.

REGULATED MODELS:

- Load Reg: Spec'd for ±20% chg from 80% FL.
- Line Reg: At FL, 10% line chg.
- Ripple: 10mv rms typ.

DC OUTPUT UNREGULATED - WITH UL & CSA

UL/CSA MODEL No.	RATED OUTPUT VOLTS DC	RATED OUTPUT ma DC	OUTPUT VDC [1] 100% FL 108VAC	100% FL 132VAC	10% FL 132VAC	UL [2]	CSA [3]	PLUG [4]	PRICE (qty) 1-9	10-24	25-99	100up
318A2212	3.0	500	2.60	3.70	5.40	UL*	L	I	$7.70	$6.50	$6.20	$5.40
212A2220	4.5	150	3.80	5.20	7.35	UL*C	L	Y	7.00	5.90	5.60	4.90
216A4222	4.5	350	3.50	5.20	8.70	UL*C	C	F	7.30	6.20	5.80	5.10
416A2219	4.5	600	4.10	5.60	7.40	UL*C	L	I	9.10	7.70	7.30	6.40
310A2223	6.0	200	5.00	6.90	10.40	UL*	L	I	6.90	5.90	5.50	4.80
318A2226	6.0	300	4.35	6.30	8.60	UL*	L	I	7.60	6.50	6.10	5.30
318A4227	6.0	400	5.10	7.10	9.60	UL*	L	I	8.10	6.90	6.50	5.70
416A2226	6.0	600	5.10	7.00	10.20	UL*C	L	I	9.10	7.70	7.30	6.40
820A4660	6.0	1200	5.10	7.00	9.40	UL	C	I	17.70	15.00	14.20	12.40
825A2617	6.0	2000	5.10	6.80	9.70	ULC	C	I	24.10	20.50	19.30	16.90
521A4318	7.0	1200	6.50	8.60	10.40	UL	L	I	20.70	17.60	16.60	14.50
310A2223	7.0	100	6.50	8.50	11.00	UL*	L	I	6.90	5.90	5.50	4.80
318A2138	7.0	300	5.80	7.90	12.00	UL*	L	I	7.70	6.50	6.20	5.40
420A2128	7.0	500	6.60	8.80	12.30	UL*	L	I	9.10	7.70	7.30	6.40
318A4248	8.5	100	7.50	9.70	11.10	UL*	L	I	7.90	6.70	6.30	5.50
310A2223	9.0	50	7.50	9.50	11.20	UL*	L	I	6.90	5.90	5.50	4.80
212A2136	9.0	100	7.40	10.60	16.20	UL*C	L	I	7.00	5.90	5.60	4.90
318A2138	9.0	150	7.90	10.20	12.40	UL*	L	I	7.70	6.50	6.20	5.40
420A2128	9.0	300	7.70	10.00	12.60	UL*	L	I	9.10	7.70	7.30	6.40
416A4136	9.0	500	7.90	10.60	14.40	UL*	L	I	11.40	9.70	9.10	8.00
820A4465	9.0	900	7.80	10.10	13.40	UL	C	I	15.60	13.30	12.50	10.90
521A4312	9.0	1200	7.10	10.00	12.40	UL	L	I	20.70	17.60	16.60	14.50
825A4620G	9.0	1200	7.80	10.40	13.70	ULC	L	I	16.90	14.40	13.50	11.80
420A4246	10.0	500	8.80	11.70	14.40	UL*	L	I	9.30	7.90	7.40	6.50
318A2045	12.0	150	10.50	13.80	17.80	UL*	L	I	7.60	6.50	6.10	5.30
318A4146	12.0	200	10.30	13.50	17.60	UL*C	L	L	8.90	7.60	7.10	6.20
416A2141	12.0	300	10.30	13.60	19.10	UL*C	L	F	8.90	7.60	7.10	6.20
420A4141	12.0	500	10.20	13.60	17.40	UL*	L	I	9.70	8.20	7.80	6.80
820A4470	12.0	700	10.40	13.70	17.50	UL	C	I	15.60	13.30	12.50	10.90
825A4425G	12.0	900	10.40	13.80	17.00	UL*C	L	I	17.40	14.80	13.90	12.20
521A4317	12.0	1000	10.20	13.80	17.10	UL	L	I	23.10	19.60	18.50	16.20
630A4304	12.0	1700	10.15	14.20	17.40	UL	L	I	41.40	35.20	33.10	29.00
630A4402	13.5	1500	11.70	15.80	18.50	UL	L	I	41.40	35.20	33.10	29.00
318A2045	13.8	70	11.10	15.60	18.10	UL*	C	I	7.60	6.50	6.10	5.30
420A2249	14.0	350	12.10	15.80	12.20	UL*	L	I	9.10	7.70	7.30	6.40
820A4276G	14.0	700	12.20	16.10	21.60	ULC	L	I	15.60	13.30	12.50	10.00
416A2081	15.0	90	11.70	15.90	17.80	UL*C	L	I	9.10	7.70	7.30	6.40
825A4429	15.0	800	13.00	17.35	21.40	UL*C	L	I	16.90	14.40	13.50	11.80
630A4703	15.2	1500	12.50	18.00	22.00	UL	L	I	41.40	35.20	33.10	29.00
820A4279G	16.0	400	13.90	18.10	21.70	ULC	L	I	15.60	13.30	12.50	10.90
420A4151	17.5	310	14.50	20.15	24.05	UL*C	L	I	10.30	8.80	8.20	7.20
416A2045	18.0	100	16.10	20.30	24.10	UL*C	C	I	8.90	7.60	7.10	6.20
820A4080G	18.0	500	15.30	21.00	24.90	ULC	L	I	14.70	12.50	11.80	10.30
420A4143	20.0	280	17.30	22.40	27.30	UL*	L	I	9.90	8.40	7.90	6.90
630A4201	23.0	1100	20.00	26.40	30.40	UL	L	I	41.40	35.20	33.10	29.00
318A4049	24.0	50	21.40	27.10	30.30	UL*	L	I	8.40	7.10	6.87	5.90
811A4214	3-9 [5]	300	4.60	6.25	8.10	UL*C	L	U	15.40	13.10	12.30	10.80

SINGLE & TRIPLE OUTPUT DC REGULATED - WITH UL & CSA

UL/CSA MODEL No.	RATED VDC	DC ma	REGULATION LINE VDC	LOAD VAC	UL [2]	CSA [3]	PLUG [4]	PRICE (qty) 1-9	10-24	25-99	100up
420AR3401	3.0	400	±0.10	+0.18	UL*	L	I	$14.00	$11.90	$11.20	$9.80
420AR4203	5.0	350	±0.15	+0.15	UL*	C	I	14.90	12.70	11.90	10.40
816AR4201	5.0	600	±0.10	+0.15	UL	C	I	22.10	18.80	17.70	15.50
420AR4207	6.0	400	±0.10	+0.15	UL*C	C	I	14.90	12.70	11.90	10.40
816AR4103	9.0	400	±0.10	+0.15	UL*	L	I	21.40	18.20	17.10	15.00
420AR4106	12.0	200	±0.18	+0.20	UL*	C	I	13.70	11.60	11.00	9.60
816AR4104	12.0	300	±0.10	+0.15	UL	C	I	22.00	18.70	17.60	15.40
	5.0	800	±0.10	+0.20							
825AR2401G	+12.0	100	±0.10	+0.15	UL	L	S	34.90	29.70	27.90	24.40
	-12.0	100	±0.10	+0.15							

Note 1: Typical output voltage for % load (FL) and line (VAC) indicated.
Note 2: "UL", UL 1310 listed; "UL*:, UL 1310 listing incl. UL 1411 recognized xfmr; "C", UL approved for battery chgr ckts (contact battery mfgr for recommended volt.)
Note 3: Complies (C) with or is listed (L) to CSA C22.2, No. 223,66
Note 4: See output plug table for dimensions, gender and polarity.
Note 5: Five switched output voltages of 3.0, 4.5, 6.0, 7.5 & 9.0VDC with universal, polarity reversing, output plugs. Ratings are for 6.0VDC setting.

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TAMURA 15 to 60 WATT SWITCH-MODE REGULATED DC POWER SOURCES

Wall Plug-In and Table Top Models.

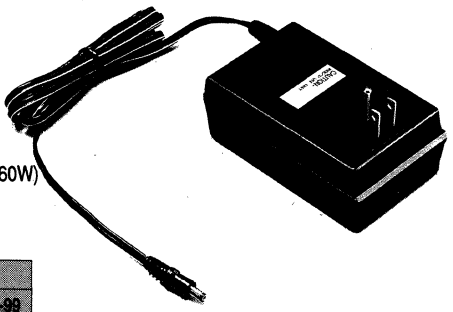
file nos. E132244 E82180 | file nos. LR65893 LR44447 | file no. 7969-3336 | file nos. 91-33935 91-36510 91-36511

For applications requiring more power from an external power source, Tamura offers 15, 20, 30, 40 and 60 watt output ratings in compact, light weight, wall plug-in and table top cases for world wide use. See other DC regulated and unregulated models in this section, AC/AC models in Transformers and battery chargers in Batteries.

FEATURES

- World Wide AC Input.
- UL 1310 Listed: 15/20/30W.
- UL 1950 Recognized: 40/60W.
- No Minimum Load.
- Input Surge: ≤50A; ≤20A, 20/30W.
- Efficiency: 65%-70% typ.
- Ripple/Noise (p-p): 100mV, 20/30W; 5V-6V, 40/60W; 150mV, 9V-17.5V 40/60W; 200mV, 15W.
- Hold-Up: ≥10msec; ≥5msec, 15W.
- Overload Protection: ≥110% FL.
- Operating Temp: 0°C to +40°C.
- Storage Temp: -10°C to +70°C.
- Operating Humidity: 10-90% RH.
- Storage Humidity: 5-95% RH.
- Withstand Voltage: 1.5kVrms; VDE model, 3kVrms.
- Insulation Resistance: ≥50MΩ @ 500VDC.
- EMI: FCC part 15J Class B; VDE 0871 Class B.
- AC Input Connector: IEC type #320 receptacle (40/60W)

FIG. 1 UL/CSA



15, 20 & 30 WATT MODELS: 90-132VAC, 47-63Hz.

MODEL No.	CASE SIZE	RATED VDC	DC AMP	LINE [1] REG.	LOAD REG. @ .5FL		PLUG	PRICE (qty)		
					VDC	AMP		1-9	10-24	25-99
SWA-0502	20W	5	3.5	±0.1	5.20	1.75	I	$54.80	$51.50	$47.10
SWA-0503	30W	5	4.0	±0.1	5.20	2.00	I	62.30	58.60	53.60
SWA-0601	15W	6	2.0	±0.2	6.60	1.00	I	45.40	42.70	39.00
SWA-0602	20W	6	3.5	±0.1	6.20	1.75	I	54.80	51.50	47.10
SWA-0603	30W	6	4.0	±0.1	6.20	2.00	I	62.30	58.60	53.60
SWA-0701	15W	7	1.7	±0.2	7.70	0.85	I	45.40	42.70	39.00
SWA-0901	15W	9	1.5	±0.3	9.50	0.75	I	45.40	42.70	39.00
SWA-0902	20W	9	2.5	±0.1	9.15	1.25	I	54.80	51.50	47.10
SWA-0903	30W	9	3.0	±0.1	9.15	1.50	I	62.30	58.60	53.60
SWA-1201	15W	12	1.3	±0.4	12.40	0.65	I	45.40	42.70	39.00
SWA-1202	20W	12	2.0	±0.1	12.10	1.00	I	54.80	51.50	47.10
SWA-1203	30W	12	2.5	±0.1	12.10	1.25	I	62.30	58.60	53.60
SWA-1501	15W	15	1.0	±0.4	15.50	0.50	I	45.40	42.70	39.00
SWA-1502	20W	15	1.6	±0.1	15.10	0.80	I	54.80	51.50	47.10
SWA-1503	30W	15	2.0	±0.1	15.10	1.00	I	62.30	58.60	53.60
SWA-1702	20W	17	1.25	±0.1	17.15	0.63	I	54.80	51.50	47.10

FIG. 2 VDE

40 & 60 WATT TABLE-TOP MODELS: WORLD WIDE 90-264VAC, 47-63Hz.

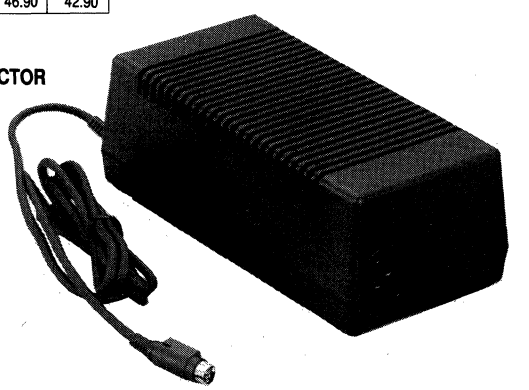
SWA-0504W	40W	5	5.0	±0.2	5.30	2.50	I	91.60	86.10	78.80
SWA-0506W	60W	5	7.5	±0.2	5.35	3.75	I	113.40	106.60	97.70
SWA-0604W	40W	6	4.2	±0.2	6.25	2.10	I	91.60	86.10	78.80
SWA-0606W	60W	6	6.3	±0.2	6.30	3.15	I	113.40	106.60	97.50
SWA-0904W	40W	9	3.0	±0.2	9.20	1.50	I	91.60	86.10	78.70
SWA-0906W	60W	9	4.5	±0.2	9.25	2.25	I	113.40	106.60	97.50
SWA-1204W	40W	12	3.0	±0.2	12.20	1.50	I	91.60	86.10	78.80
SWA-1206W	60W	12	4.5	±0.2	12.25	2.25	I	113.40	106.60	97.50
SWA-1504W	40W	15	2.5	±0.2	15.20	1.25	I	91.60	86.10	78.80
SWA-1506W	60W	15	4.0	±0.2	15.25	2.00	I	113.40	106.60	97.50
SWA-1704W	40W	17.5	2.3	±0.2	17.65	1.15	I	91.60	86.10	78.80
SWA-1706W	60W	17.5	3.5	±0.2	17.70	1.75	I	113.40	106.60	97.50

15 WATT VDE WALL MODELS: 198-264VAC, 47-63Hz.

SWA-0601AE	15W	6	2.0	±0.2	6.60	1.00	I	49.94	46.90	42.90
SWA-0901AE	15W	9	1.5	±0.2	9.55	0.75	I	49.94	46.90	42.90
SWA-1201AE	15W	12	1.3	±0.2	12.50	0.65	I	49.94	46.90	42.90
SWA-1501AE	15W	15	1.0	±0.2	15.50	0.50	I	49.94	46.90	42.90

Note 1: Line regulation in VDC, over rated VAC input.

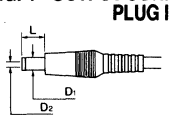
FIG. 3 40W & 60W



MECHANICAL DIMENSION TABLE

CASE SIZE	LENGTH (L) mm (inch)	WIDTH (W) mm (inch)	HEIGHT (H) mm (inch)	WEIGHT gm (oz)	FIG No.
15W	94 (3.70)	67 (2.64)	41 (1.61)	283 (10)	1
15W (VDE)	102 (4.02)	70 (2.76)	50 (1.97)	340 (12)	2
20W	107 (4.21)	71 (2.80)	44 (1.73)	368 (13)	1
30W	120 (4.72)	76 (2.99)	46 (1.81)	425 (15)	1
40W	160 (6.30)	80 (3.15)	65 (2.56)	680 (24)	3
60W	200 (7.87)	100 (3.94)	66 (2.60)	851 (30)	3

FIG. 4 OUTPUT CONNECTOR PLUG I



O.D. = 5.50mm
I.D. = 2.10mm
L = 9.5mm
Tip = (-)

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- Highly efficient, high density.
- High reliability.
- Printed circuit board.

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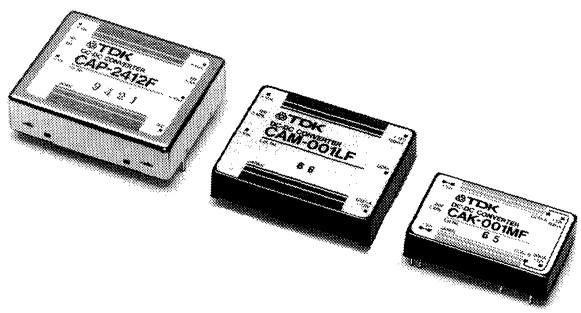
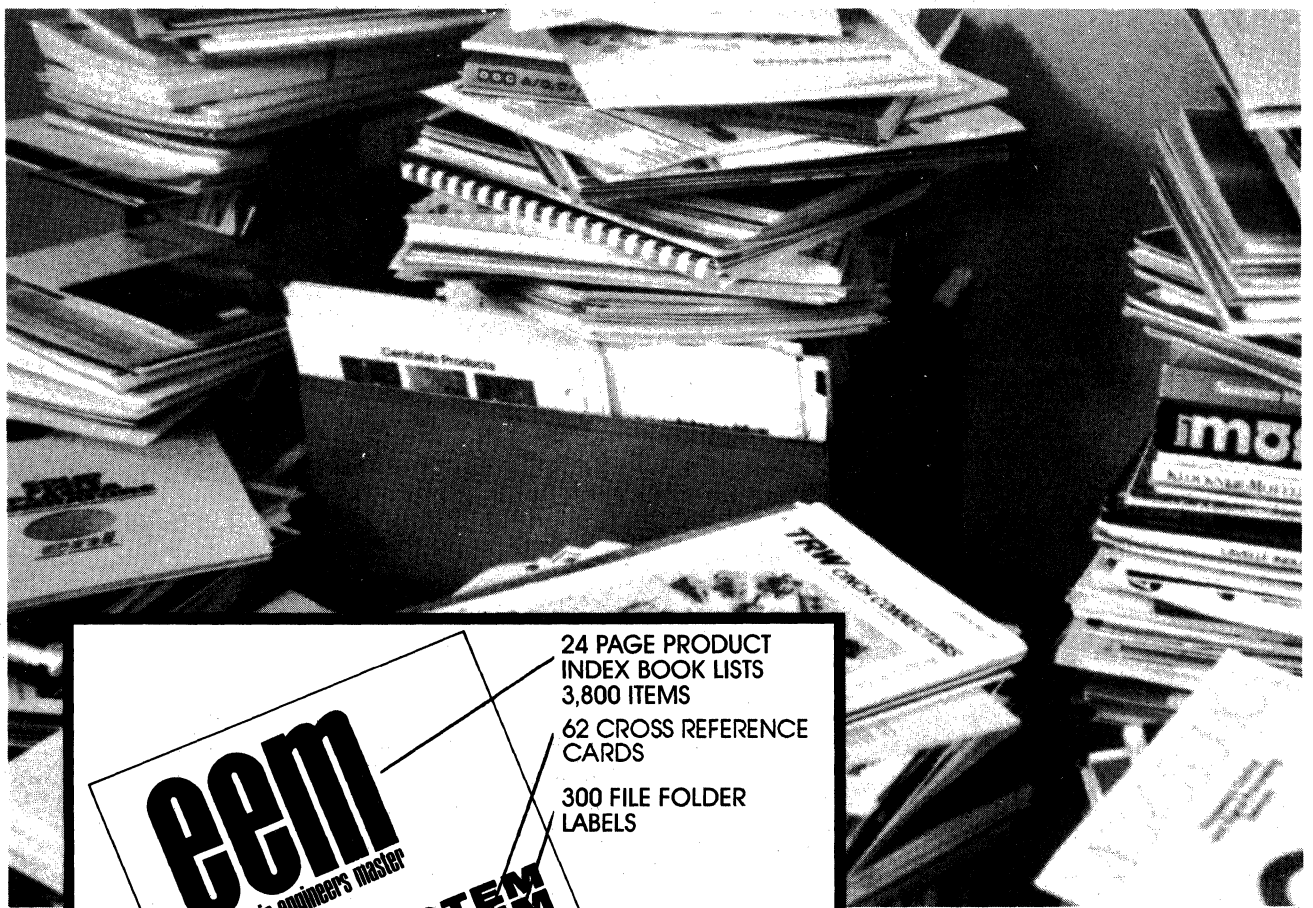
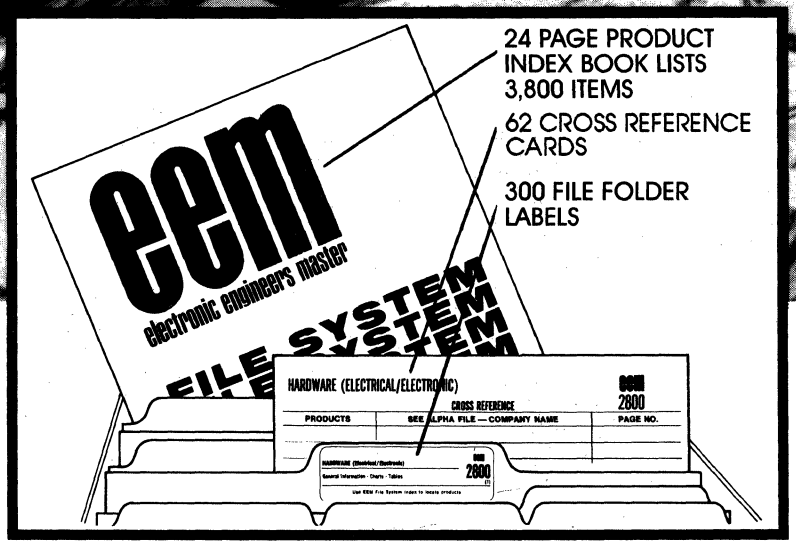


Series	Dimensions (mm)	Terminal (mm)
CB	30.5×13.3×12.2	ϕ0.6×4
CC	35.5×20.0×6.55	ϕ0.5×4
CN	30.5×25.4×12	ϕ0.6×5
CHG	30.0×12.5×8.5	□0.5×0.3×3.5
CAK	40.5×25.4×9	□0.3×0.5×8
CAM	46.5×37.5×10	ϕ1.0×5
CBM	42.0×29.0×8.9	□0.6×0.6×3.5
CAP	49.5×39.5×13.1	ϕ0.8×5 or □0.64×5

Electrical specifications

Series	Output power (W)	Input-output isolation	Output (V)	+5	+12	+15	−15	−12	−9	−5	5	12	15	±5	±12	±15
			Input (V)													
CB	0.3	No isolation	+4 to +7							3810						
			+3 to +7		3801	3802	3812	3811								
CC	0.25	No isolation	+5±5%		3801	3802	3853	3852		3851						
CN	0.8	No isolation	+5±10%		3801	3802	3852	3851		3850						
			+12±10%	3803			3855	3854		3853						
			+24±10%	3804			3858	3857		3856						
CHG	0.8	No isoaltion	+4.5 to +9	0505P	0512P	0515P	0515N	0512N		0505N			0515P	003AC	001AC	002AC
CAK	1.5	Isolation	5±10%								0505F	0512F	0515F		001AF	002AF
			12±10%								1205F	1212F	1215F		001LF	002LF
			24±10%								2405F	2412F	2415F		001MF	002MF
CAM	3	Isolation	5±10%								0505F	0512F	0515F		001AF	002AF
			12±10%								1205F	1212F	1215F		001LF	002LF
			24±10%								2405F	2412F	2415F		001MF	002MF
			48±10%								4805F	4812F	4815F		001HF	002HF
CBM	3	Isolation	4.5 to 6								0505SF				0512DF	
CAP	8	Isolation	18 to 28								2405F					
			36 to 56								4805F					
	10	Isolation	18 to 28									2412F				
			36 to 56									4812F				
CD series for driving fluorescent display		No isolation	Products are made in accordance with fluorescent displays.													





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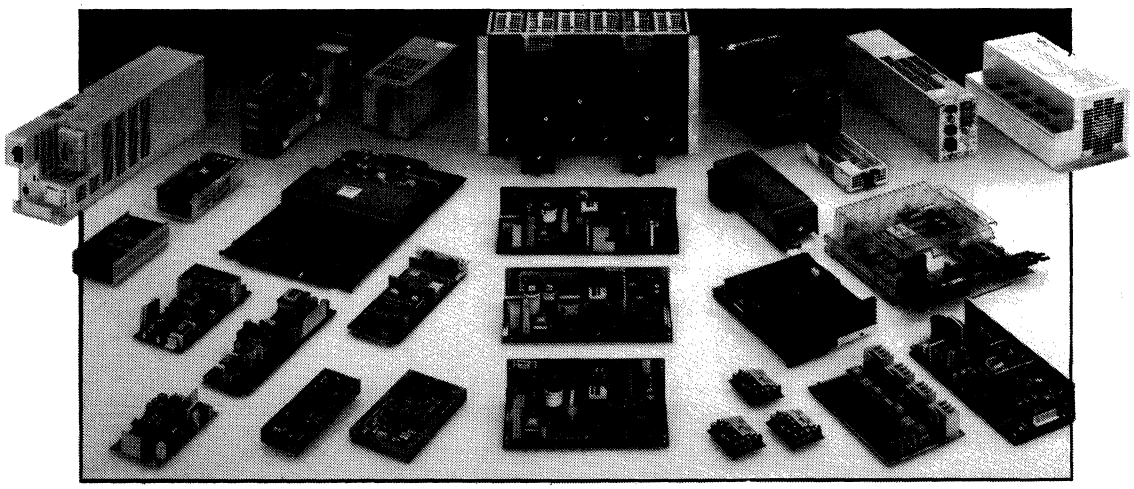

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FEATURES		MODEL	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	DIMENSION
SP0840 SERIES - 115/230 VAC OPERATION SWITCH SELECTABLE, MULTI-OUTPUT SWITCHING POWER SUPPLY								
- FULLY REGULATED OUTPUT, ADJUSTABLE, FLOATING - EFFICIENCY ABOVE 75% - FORCED CURRENT SHARING (FCS) CIRCUIT OUTPUTS 1-4 - ACTIVE PRE-LOAD ON MAIN OUTPUT- NO MIN. LOAD - AC POWER FAIL WARNING AND DC - OK SIGNALS	300W	SP0840/10 SP0840/15 SP0840/16 SP0840/17 SP0840/18 SP0840/19	5V 40A 5V 40A 5V 40A 5V 40A 5V 40A 5V 40A	12V 7A 12V 7A 12V 7A 12V 7A 12V 7A 15V 7A	12V 7A 12V 7A 12V 7A 12V 7A 12V 7A 15V 7A	5V 10A 5V 10A 12V 7A 12V 7A 12V 7A 15V 7A	12V 7A 24V 5A 12V 7A 5V 10A 24V 5A 24V 5A	5.0x13.75x2.8 127x350x71

NOTE: DIMENSIONS ARE IN INCHES AND MILLIMETER

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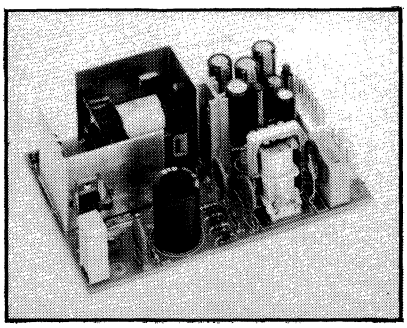
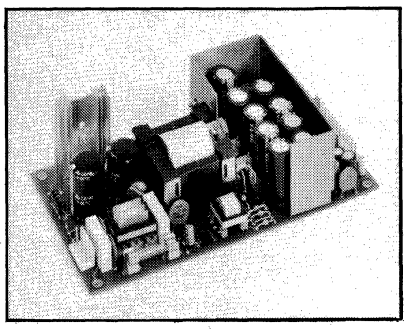
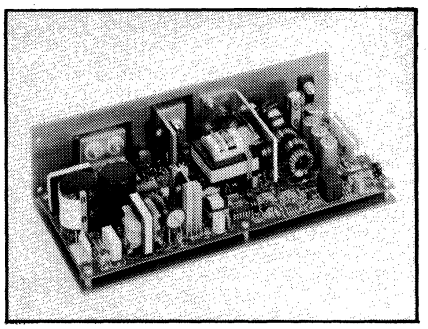
UNIVERSAL INPUT SERIES (90-264 VAC)



TO41 / TO51



TO70



TO172

STANDARD FEATURES:
- EFFICIENCY ABOVE 70%
- SHORT CIRCUIT PROTECTED
- MEETS FCC, VDE EMI STANDARDS
- LOW RIPPLE & NOISE
- UL, CSA (TUV) VDE APPROVED (OR IN PROCESS OF APPROVAL)
- OVER VOLTAGE PROTECTION
- CURRENT & POWER LIMITED
- INRUSH CURRENT LIMITED & SOFT START

FEATURES		MODEL	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	DIMENSION
TO-31, TO-41, TO-51 SERIES - UNIVERSAL INPUT, SINGLE/MULTI-OUTPUT								
- VERY LOW CROSS-REGULATION BETWEEN MAIN AND AUXILIARY RAILS	30W	TO-31/10	5V 3A	+12V 1.5A	-12V .35A			3.0x5.0x1.45
		TO-31/11	5V 3A	+24V 0.8A	-12V .35A			76x127x37
		TO-31/12	5V 3A	+15V 1.5A	-15V .35A			
	40W	TO-41/10	5V 5A	+12V 1.5A	-12V .35A	-5V 0.1A		3.75x5.7x1.4
		TO-41/12	5V 5A	+15V 1.5A	-15V .35A	-5V 0.1A		95x145x36
		TO-41/11	12V 3A	+24V 1A	-12V .35A	-5V 0.1A		
	50W	TO-51/10	5V 6A	+12V 2A	-12V 0.5A	-5V 0.1A		3.75x5.7x1.7
		TO-51/12	5V 6A	+15V 1.5A	-15V 0.5A	-5V 0.1A		95x145x43
		TO-51/11	12V 3A	+24V 1A	-12V 0.5A	-5V 0.1A		
TO-70 SERIES - 115/230 VAC SELECTABLE, MULTI-OUTPUT								
- POWER TRADING BETWEEN SECONDARIES - UL,CSA &VDE 0806/IEC380(TUV) & IEC950 - MEETS FCC & VDE EMI STANDARDS - UP TO 5 REGULATED OUTPUTS	70W	TO-70/10	5V 8A	+12V 3.5A	+24V 1A	-12V 1.5A	-5V 1A	4.25x7.75x1.9
		TO-70/11	5V 8A	+15V 3A	+24V 1A	-12V 1.5A	-5V 1A	108x197x48
		TO-70/12	5V 10A	+12V 2A	+24V 1A	-12V 1.5A	-5V 1A	
		TO-70/13	5V 6A	+12V 4A	+24V 1A	-12V 1.5A	-5V 1A	
		TO-70/14	5V 8A	+15V 3A	+24V 1A	-15V 1.5A	-12V 1A	
TO-81, TO-101, TO-131, TO151, TO161, TO221 SERIES - UNIVERSAL INPUT, MULTI-OUTPUT								
- VERY LOW CROSS-REGULATION BETWEEN MAIN AND AUXILIARY RAILS - POWER GOOD SIGNAL	80W *	TO-81/10	5V 10A	+12V 3A	-12V 1.25A	-5V 0.5A	+12V 1A	4.0x6.5x1.6
		TO-81/11	5V 10A	+12V 3A	-12V 1.25A	-5V 0.5A	+24V 1A	102x165x41
	100W	TO-101/10	5V 12A	+12V 3.5A	-12V 1.5A	-5V 0.3A		4.25x7.75x1.9
		TO-101/11	5V 12A	+12V 3.5A	-12V 1.5A	+24V 1.5A		108x197x48
		TO-101/12	5V 12A	+15V 3.5A	-15V 1.5A	-5V 0.3A		
		TO-101/14	5V 10A	+24V 3.5A	-12V 1A	+12V 1.5A		
		TO-101/13	12V 5A	+24V 4A	-12V 1.5A	-5V 0.3A		
*NOTE: FOR TO81 SERIES. EITHER OUTPUT 3 OR 4 IS AVAILABLE, BUT NOT BOTH AT THE SAME TIME.	130W	TO-131/10	5V 15A	+12V 4A	-12V 1.5A	-5V 0.3A		4.5x7.75x2.3
		TO-131/11	5V 15A	+12V 4A	-12V 1.5A	+24V 1.5A		114x197x58
		TO-131/12	5V 15A	+15V 4A	-15V 1.5A	-5V 0.3A		
		TO-131/14	5V 12A	+24V 4A	-12V 1A	+12V 1.5A		
		TO-131/13	12V 6A	+24V 4A	-12V 1.5A	-5V 0.3A		
** NOTE: TO149 HAS 115/230V SELECTABLE INPUT RANGE.	150W **	TO-149/10	5V 25A	+12V 3A	-12V 3A			4.45 x 7.5 x 2
								113 x 191 x 51
	150W	TO-151/10	5V 25A	+12V 3A	-12V 3A			4.45 x 7.5 x 2
								113 x 191 x 51
	160W	TO-161/10	5V 25A	+12V 4A	-12V 1.5A	-5V 0.8A		5.0x9.0x2.5
		TO-161/11	5V 25A	+24V 3A	-12V 1.5A	+12V 1A		127x229x63.5
		TO-161/12	5V 25A	+15V 1.5A	-15V 1.5A	-5V 0.8A		
		TO-161/13	5V 15A	+12V 8A	-12V 1.5A	-5V 0.8A		
	220W	TO-221/10	5V 30A	+12V 6A	-12V 1.5A	-5V 1A		5.0x9.0x2.5
		TO-221/11	5V 25A	+24V 4A	-12V 1.5A	+12V 1.5A		127x229x63.5
		TO-221/12	5V 30A	+15V 6A	-15V 1.5A	-5V 1A		
		TO-221/13	5V 15A	+12V 10A	-12V 2.5A	-5V 1A		
TO-172 SERIES - 110/220 VAC SELECTABLE, MULTI-OUTPUT								
- POWER TRADING BETWEEN SECONDARIES	175W	TO-172/10	5V 15A	+12V 4A	-12V 4A	24V 3A	-5V 0.1A	10.5x5.0x2.5
		TO-172/25	5V 15A	+12V 4A	-12V 4A	5V 6A	-5V 0.1A	267x127x63.5
		TO-172/21	12V 7.5A	-12V 7.5A				
		TO-172/22	15V 6A	-15V 6A				

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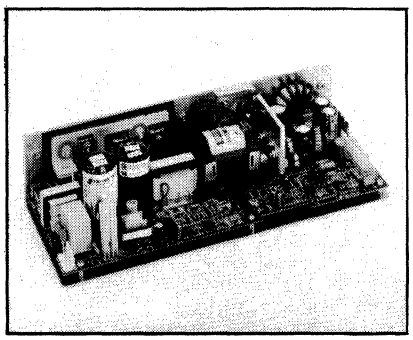
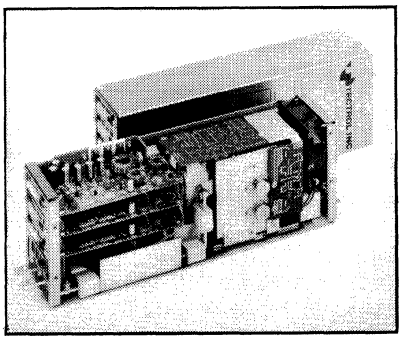
FAX: (416) 638-0553

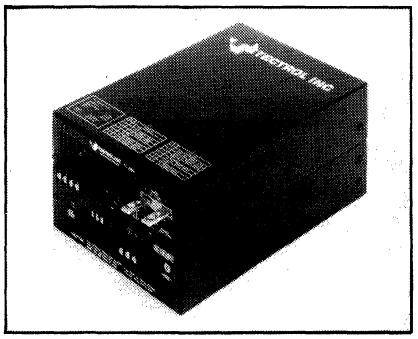
SEMI-MODULAR & MODULAR POWER SUPPLIES



TO204 / TO304



TM600



TO825

STANDARD FEATURES:

- 77-86% EFFICIENCY
- INHIBIT - ACTIVE LOW
- CURRENT LIMITED OUTPUTS
- POWER TRADING BETWEEN SECONDARIES
- OVER TEMPERATURE PROTECTION
- OVER VOLTAGE PROTECTION
- UL, CSA & (TUV)VDE APPROVED (OR IN PROCESS OF APPROVAL)
- MEETS FCC & VDE EMI STANDARDS

FEATURES		MODEL	OUTPUT 1	OUTPUT 2	OUTPUT 3	OUTPUT 4	OUTPUT 5	DIMENSION
TO-204, TO-304, TO-404 SERIES - SEMI-MODULAR POWER SUPPLY								
- SHORT CIRCUIT PROTECTED - INRUSH CURRENT LIMITED & SOFT START - NO CROSS REG. BETWEEN MAIN & AUX. - HIGH SURGE LOAD CAPABILITY - REMOTE SENSING ON MAIN OUTPUT	200W 250W	TO-204/11 TO-204/10 TO-204/17 TO-204/12 TO-204/13 TO-204/14 TO-204/15 TO-204/16	5V 40A 5V 30A 5V 30A 12V 21A 15V 17A 24V 11A 28V 9A 48V 5.5A	12V 8A 15V 8A	12V 8A 15V 8A		SEE NOTE	5.0x10.5x2.6 127x267x66
	350W	TO-304/10 TO-304/17 TO-304/18 TO-304/19 TO-304/11 TO-304/12 TO-304/13 TO-304/14 TO-304/15 TO-304/16	5V 30A 5V 30A 5V 40A 5V 40A 5V 60A 12V 25A 15V 20A 24V 13A 28V 11A 48V 7A	12V 12A 15V 12A 12V 12A 15V 10A	12V 12A 15V 6A 12V 12A 15V 10A	24V 12A 24V 12A 24V 12A 24V 12A	SEE NOTE	5.0x12.0x2.6 127x305x66
	450W	TO-404/10 TO-404/17 TO-404/11 TO-404/12 TO-404/13 TO-404/14 TO-404/15 TO-404/16	5V 50A 5V 50A 5V 80A 12V 38A 15V 30A 24V 19A 28V 16A 48V 10A	12V 10A 15V 10A	12V 10A 15V 10A	+24V 12A +24V 12A	SEE NOTE	5.0x14.0x2.6 127x356x66
TM-600 SERIES - MODULAR SWITCHING POWER SUPPLY								
- FULLY REGULATED & ADJUSTABLE OUTPUTS - OVER VOLTAGE SHUTDOWN ON ALL OUTPUTS - REMOTE SENSING ON ALL OUTPUTS - REDUNDANT (N+1), PARALLELABLE - MASTER & AUX. OUTPUT INHIBIT - UP TO 7 INDEPENDENTLY CONFIGURABLE OUTPUTS - FORCED CURRENT SHARING ON ALL SINGLE REGULATORS - UPS SYSTEM CAPABILITY	600W	TM-600/10 TM-600/21 TM-600/22 TM-600/23 TM-600/24 TM-600/25 TM-600/11 TM-600/12 TM-600/13 TM-600/14 TM-600/15 TM-600/16	5V 80A 5V 80A 5V 80A 5V 80A 5V 80A 5V 80A 5V 100A 12V 50A 15V 40A 24V 25A 28V 22A 48V 13A	12V 10A 12V 10A 15V 7A 15V 7A +/-12V 5A +/-15V 4A	12V 10A 12V 10A 15V 7A 15V 7A 5V 5A 5V 4A	24V 4A 5V 15A 24V 4A 5V 15A 2.2V 15A 2.2V 15A	MODULAR PLUG-IN REGULATORS FOR TM-600 5V 15A 12V 10A 15V 8A 24V 5A 48V 3A +/-12V 5A +/-15V 4A -5V,-2V 10A	5.0x14.25x3.5 127X362X89
TO-825 SERIES - HIGH-POWER SINGLE/MULTIPLE OUTPUT								
- UP TO 5 FULLY REGULATED OUTPUTS - FORCED CURRENT SHARING FOR PARALLEL REDUNDANT OPERATION - POWER FAIL WARNING - FRONT PANEL AC SELECT	825W	TO-825/10 TO-825/18 TO-825/19 TO-825/20 TO-825/25 TO-825/12 TO-825/14	5V 150A 5V 100A 5V 100A 5V 100A 5V 100A 12V 70A 24V 35A	24V 10A 24V 10A 24V 10A 24V 10A 12V 12A	12V 12A 12V 12A 15V 10A 12-15V 10A 12V 10A	12V 8A 12V 8A 15V 6A 12-15V 6A 5V 15A	5V 15A 5V 15A 5V 15A 5V 15A 2.2V 15A	8.0x5.0x11.75 203X127X298
TRM-1000 SERIES - MODULAR SWITCHING POWER SUPPLY								
- POWER FACTOR CORRECTED	1000W	TRM-1000/10 TRM-1000/18 TRM-1000/19	5V 150A 5V 150A 5V 150A	12V 15A 12V 10A 15V 10A	12V 10A 12V 10A 15V 10A	5V 15A 24V 10A 24V 5A		8.0x15.0x3.2 203x381x81

*** NOTE :**

MODULAR REGULATORS AVAILABLE FOR TO-204, TO-304, TO-404 (OUTPUT 4, 5 AND/OR 6)

SINGLE	DUAL
2.2V 15A	+/-15V 8A
5V 15A	+/-12V 8A
12V 12A	+/-15V 8A
15V 10A	
24V 8A	

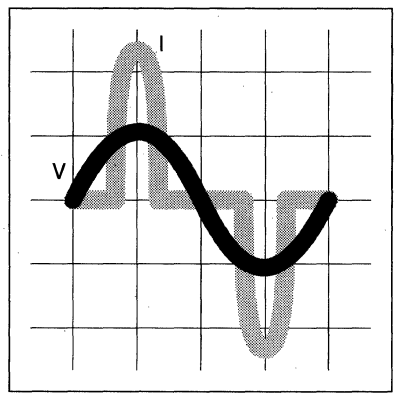
FOR FURTHER INFORMATION ON STANDARD, CUSTOM, SEMI-CUSTOM AND MILITARY POWER PRODUCTS, PLEASE CONTACT TECTROL

TECTROL INC
SWITCHING POWER PRODUCTS

39 KODIAK CRESCENT
DOWNSVIEW, ONT. M3J 3E5
TEL: (416) 630-8108
FAX: (416) 638-0553

POWER FACTOR CORRECTED SWITCHING POWER SUPPLIES

Tectrol designs and manufactures Power Factor Corrected Power Supplies for medium to high power applications.



Some Advantages are:

a) **Maximum power is made available for end system use for any given branch circuit current rating.**

b) **Compliance with pending regulatory requirements (eg. IEC-555) for line current harmonic content limits.**

c) **Elimination of Neutral conductor current overload in 3-phase systems due to the additive nature of the harmonic current content generated by switching power supplies with no power factor correction.**

d) **Elimination of the unnecessary stress on the power distribution system caused by the "Wattless" component of the line current in an uncorrected power supply.**

On a 15 ampere setrvice, UL limits current draw to 80% of the branch circuit rating, i.e. 12A.

Output power is defined as Vin (rms) x Iin (rms) x Power Factor x Efficiency.

The typical Power Factor x Efficiency (PFE) product for an uncorrected supply is about (0.65 x 0.75) = 0.48. This results in a maximum output power available for system use of about 670W from a 115VAC/15A line.

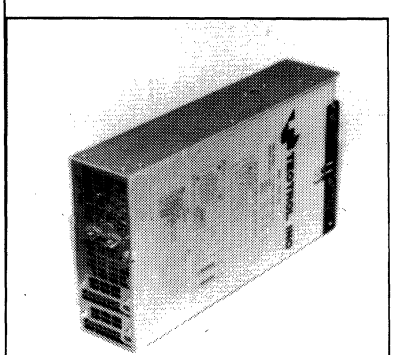
If the power factor is improved to 0.99 the available power is increased to 1024W, an increase of 53%.

Power Factor Corrected Unit - 1000W model

Input Ratings
Voltage: 85 - 265VAC / 47 - 63Hz
Current: Less than 12A rms
Power Factor: 0.99 typical.
Hold Up Time: 20msec minimum at 90VAC
Efficiency: 75% minimum
Surge withstand capability: To IEEE-587, Category A/B

Output Ratings
Single output models: 1000W; 5VDC / 200A to 48VDC / 21A
Multiple output models: Output 1: up to 750W, votages from 2.2VDC - 48VDC
Outputs 2 - 5: 150W or 250W per output, 2.2VDC - 48VDC

All outputs have low ripple and noise characteristics (<1%), and are fully regulated and adjustable.



Features
- Built in PFC circuity
- UL, CSA, & TUV approved
- FCC 20780 A & VDE 0871, level A
- Forced current sharing on main & single output modules
- Master remote ON / OFF
- Master remote latching shut down
- Advance thermal warning output
- AC power fail output
- Overload / Short circuit protected, all outputs
- Over voltage protected, all outputs
- Built in Forced-Air fan cooling

Tectrol is a leader in standard or custom packaged Power Factor Corrected multiple output power supplies for single unit stand alone applications or for parallel-redundant system applications with hot-plug-in capability.

Standard units are offered for 1000 - 1500W, in an 8" x 5" x 11 to 13" package.

Contact Tectrol for your PFC Power Supply solutions.

FOR FURTHER INFORMATION ON POWER FACTOR CORRECTED SWITCHING POWER SUPPLIES, PLEASE CONTACT TECTROL

GOSSEN

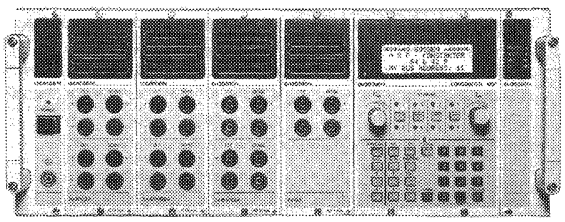
Precision Programmable DC Lab Power Supplies

TEXMATE

Also Texmate ad in Meters:Digital, EEM Vol. D

Lab Power Supplies

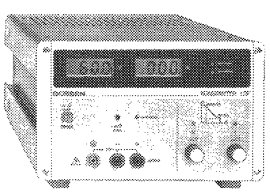
Built to exacting IEC and DIN standards, Gossen bus programmable DC lab power supplies are representative of the finest quality instrumentation from Europe's leading manufacturer. Most Gossen products are now stocked and available in the USA from Texmate. See other excellent Gossen products in the Texmate Short Form Catalog in EEM Vol D.



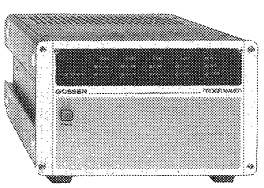
MSP Konstanter
Especially suited for demanding medical applications

MSP-Konstanter from $3500 to $15,000.00

Four selectable DC output modules with up to 8 isolated outputs • Front panel manual and bus programmability • Up to 8 isolated outputs (4 single or dual supplies) • Constant voltage or constant current operation • Integral metering all outputs : voltage, current, power • Features low ripple, isolated outputs, remote sensing, 0-40°C operation, 2-speed cooling fan, series or parallel operation • Interface IEC-625, IEEE-488, RS-232C • Dimensions: 18"W x 7"H x 15.4" deep • Modules include: Single output 0-7VDC; dual 0-7amp; dual 0-8VDC; dual 0-3amp; dual 0-16VDC; 0-1.5amp; dual 0-40VDC, 0-0.6amp • 120/220VAC power input.



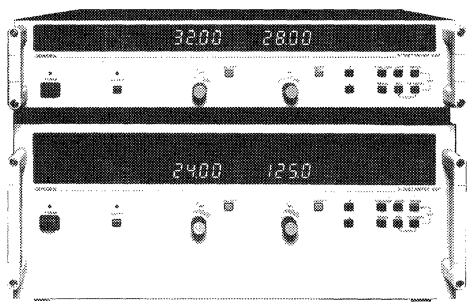
LSP-Konstanter
0-60V 0-15A 250W max.



IEEE 488 Programmer
to control 8 supplies

LSP-Konstanter from $2265.00
Programmer from $2135.00

Features wide output range • High efficiency primary switching regulation • Integral volts/amps/power meters (4-digit LED) • Output ungrounded/isolated • Remote sensing • Fast setting by capacitive discharge • Remote control via analog (0-5V) inputs • (Up to 8 outputs provided by programmer which interfaces with IEC 625/IEEE 488) • Dimensions: 19"W x 3.5"H x 20" deep • Both the LSP-Konstanter & the Programmer can be 19" Rack Mounted • 120/220AC Power input.



SSP-Konstanter 0-40V DC Output

62N2151	0 to 25A	500w max	$2765
62N2150	0 to 50A	1000w max	$3575
64N2151	0 to 100A	2000w max	$5665
64N2150	0 to 150A	3000w max	$7575

Single output system power supplies • Manual and bus programmability • Integral volts/amps/power meters (4-digit LED) • Optional IEC-625, IEEE-488, RS-232C interfaces • Efficient primary switching regulation • Output ungrounded/isolated • Remote sensing • On/off fast response setability • Non-volatile memory of 99 settings • Master slave configurable • Dimensions: 19"W x 3.5"/7"H x 20" deep, 19" rack mountable • Model 62N power input: 208/240 VAC; Model 64N power input: 3Ø 208/240 VAC

Other Gossen Power Supply Products

Please call for information.

Konstanter Hi Current & Hi Voltage Systems

Voltage	6.5V-350V	3kV-12.5kV	3.5kV-6.5kV
Power	35W-250kW	7kW-250kW	14W-4.2kW

DC to DC Converters 24V to 12V, 80 & 195W
For commercial vehicle applications. Most prestigious German vehicle manufacturers use Gossen DC to DC converters.

Solid State Lighting Ballasts
For metal-halide lamps 125 through 575W approved for OSROM Series HTI and HMI.

OEM Power Supplies
For more than 30 years, Gossen has been a leader in high quality economical power supply designs that meet the most stringent European standards. Please contact us for a trouble free solution to your international power supply problems.

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CALL (619) 598-9899
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eem SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

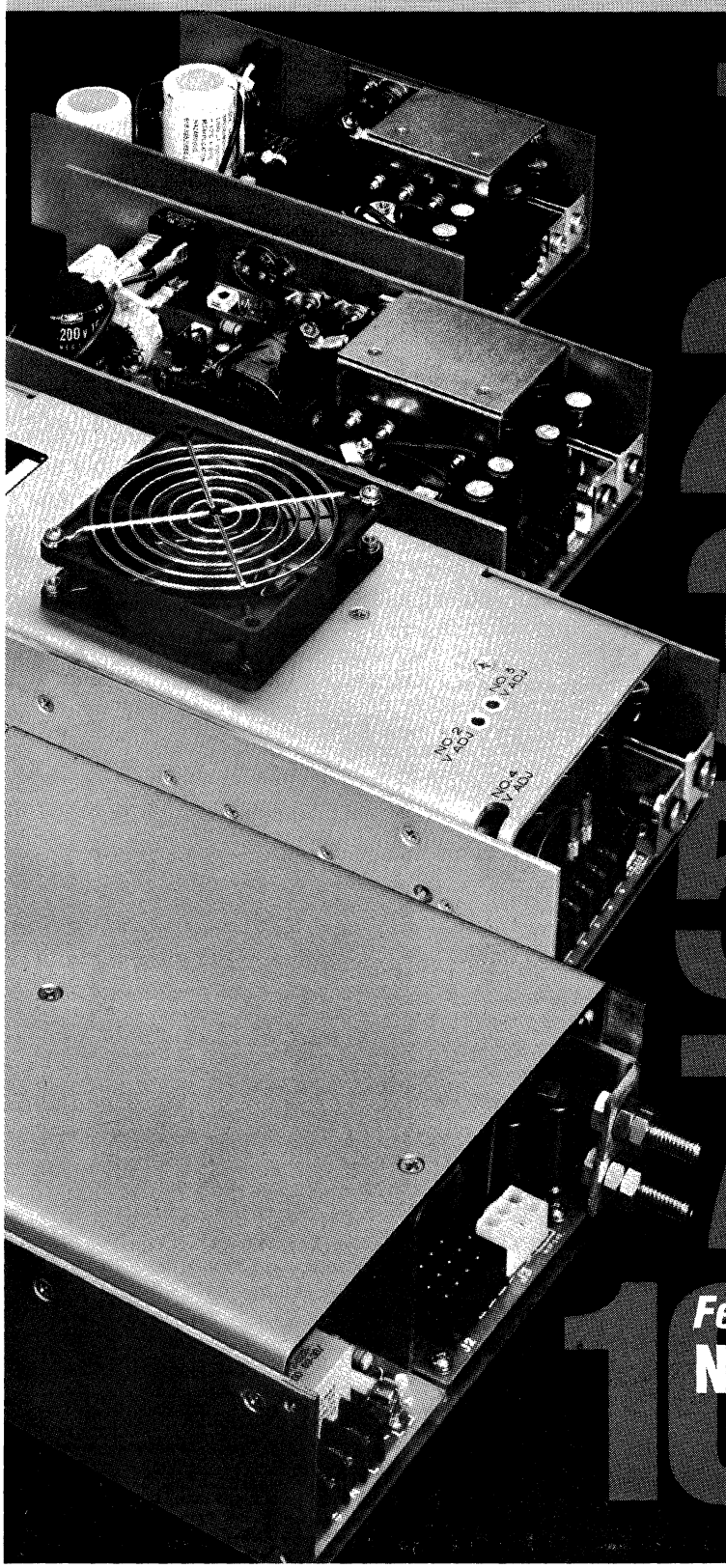
United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

TODD

SWITCHING POWER SUPPLIES FOR OEM PRODUCTS



160W
220W
350W
500W
750W
1000W

Featuring:
New Global Products for the 1990's

TODD

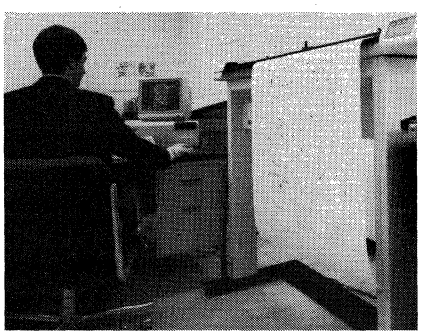
The Todd Team

Regardless of job function, each and every Todd employee contributes directly to the goal of complete customer satisfaction in sharing a personal responsibility for the quality and performance of every power supply manufactured. Individual concern and the pursuit of excellence are the factors that enable Todd to provide superior power products at extremely reasonable cost.

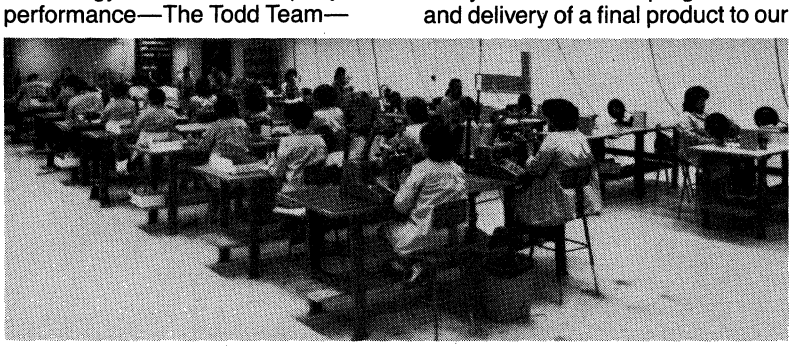
Meeting The Quality Challenge

When we began business in 1968, our goal was to become a leading supplier of quality power supplies to the OEM marketplace. Over the years as the concept of quality has changed, we have continually strived to meet the increasing quality challenge in an ever demanding environment. Our approach to quality today is all encompassing and includes people, products, technology, and overall company performance—The Todd Team—dedicated to meeting or exceeding the expectations of our customers.

At every level of the company, from design, development, production, and marketing to sales, we are oriented to total customer support, and operate under the principle of Total Quality Control (TQC). This approach has resulted in becoming working partners with our customers, establishing just-in-time manufacturing procedures for rapid customer response, qualification in many "dock to stock" programs, and delivery of a final product to our customer that meets his quality and marketing requirements.



In-house CAD enhances our ability to design new products and modify existing products, with greater efficiency and accuracy.



Total in-house control of magnetic design assures fast turnaround and improved reliability.

Today, Todd Products is recognized as one of the fastest growing technology leaders in high efficiency switching power supplies. We think our approach to quality, combined with our belief that building relationships is as important as building products, is the reason why.

A Market and Customer Driven Focus

Working in partnership with our customers provides us with a full understanding of their individual

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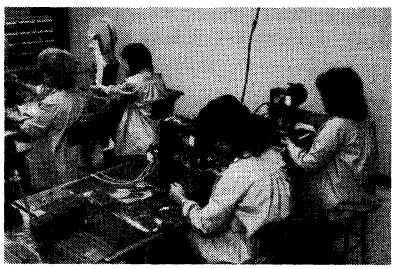
MEETING THE QUALITY CHALLENGE

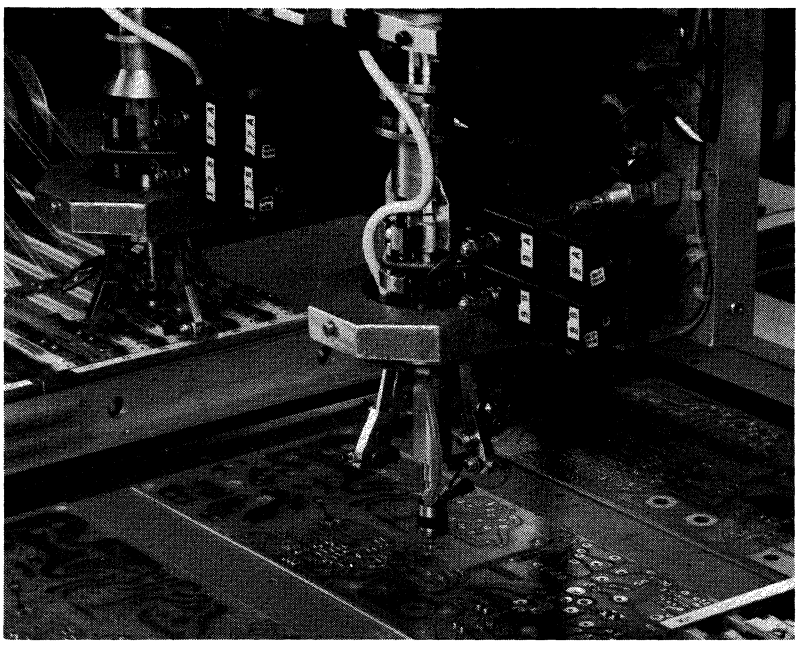


markets, business and products which enables us to develop appropriate products, technology, and company capabilities to meet their needs. Our ability to consistently provide innovative, quality solutions to our customers, gives them a significant competitive advantage in their markets.

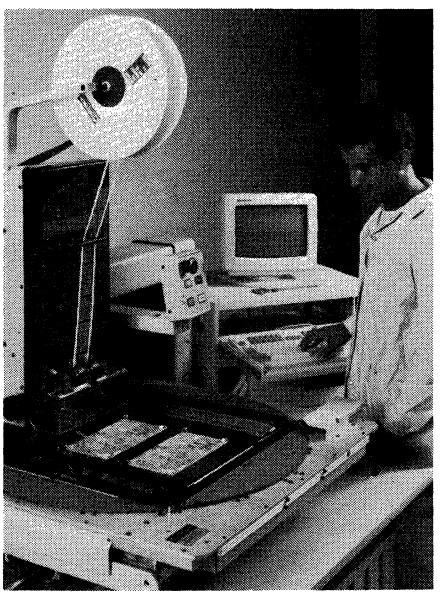
On these pages, we will take you through a guided tour of our 52,000 square foot facility in Brentwood, New York, for a look at the Todd Team approach to producing the wide range of products featured in our catalog that meet a diverse range of OEM applications.

Quality Solutions at Affordable Prices

To ensure that we maintain quality products while remaining competi-



Robotic assembly of surface mounted chip components assures reliable performance and low cost.



Automatic axial leaded component insertion equipment for reduced cost and improved consistency.

Dedicated U.S. assembly lines provide the flexibility to respond quickly to customer needs.

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TODD

tively priced, we have taken several actions to lower production costs:

- Automated assembly and test operations, for consistent results and low production costs.
- Reduced inventory by the use of standard designs with common material usage.
- Computerized the MRP system and tailored it to the unique requirements of our factory, customers, and vendors.
- Reduced the production cycle time with the concurrent reduction of work-in-process inventory.
- Incorporated Statistical Process Control for the prevention of manufacturing defects at their source.

The largest cost reducer of all is the effectiveness of our product manufacturing quality system.

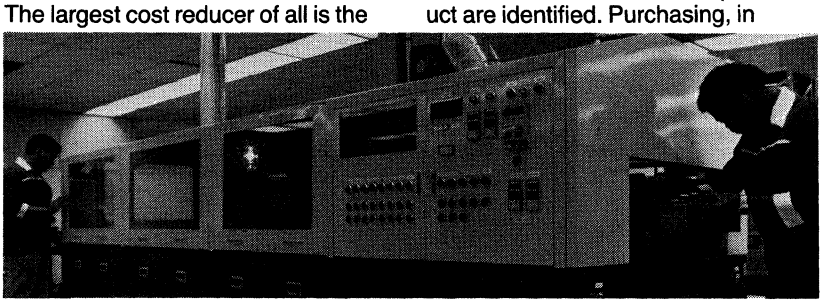
QC Starts at the Design Stage

While still in the design stage, special reliability tests and pilot runs are made to analyze the design, and assure that the product will meet its performance and intended life objectives under the defined conditions of use. These tests establish specifications to the shop operations and inspection people.

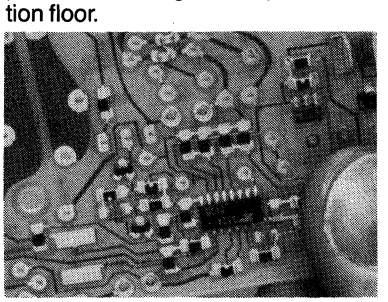
Prior history and special studies of processes are used to eliminate possible quality problems before manufacture. Critical quality characteristics of the component parts used in the fabrication of the product are identified. Purchasing, in conjunction with engineering and quality, establishes vendors who have demonstrated their ability to provide consistent quality material.

Incoming Material Control

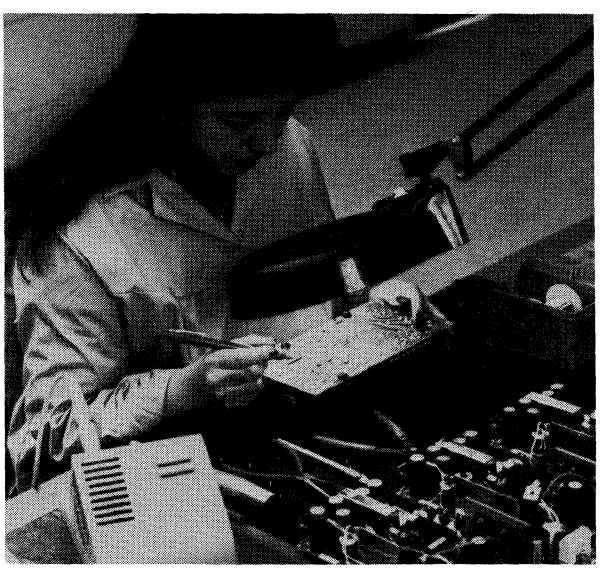
The new design control procedures establish critical parameters for incoming material. Careful checks are made on initial incoming lots of parts to determine conformance to requirements. Where parts are unsatisfactory, immediate contact is made with the vendor to obtain corrective action. The contact is continued until the parts are of satisfactory quality or the vendor in question has been replaced. Only material of acceptable quality is processed through to the production floor.



Advanced computerized dual wave solder system assures precise solder flow and positive connections.



Surface mounted chip components are positioned where they function best.



Every member of the Todd Team is responsible for quality at each step of the manufacturing process.

In-line, in-process testing assures that potential problems are discovered early in the production cycle and corrective action is taken immediately.

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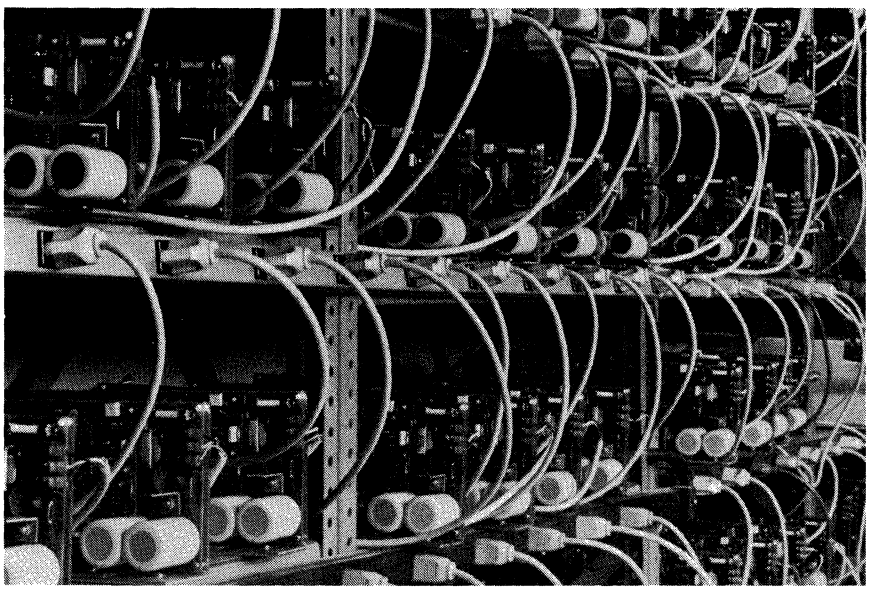
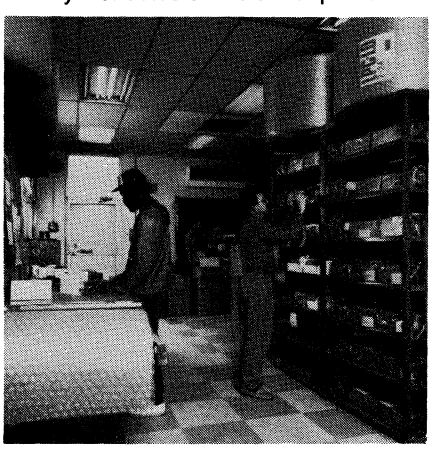


Step stress burn-in for 20 hours average assures long MTBF.

Every power supply is computer tested for critical performance verification. A print-out of the power supply performance is shipped with every product.

Production Control

Our preventative maintenance program assures that machines, tools, fixtures and measuring instruments used in the manufacturing processes will not present a quality problem. As the product is started in production each operator is carefully instructed on his or her part of the job. Suitable information and, as required, measuring equipment is available to each operator to verify the correctness of their activity.



Whether your requirements are for a standard, modified, or custom power supply, you can be assured that the product shipped to you will achieve the ultimate quality objective—your seal of approval.

Roving inspectors and process auditors give additional assurance that nonconforming or defective material will be located at its source. Control charts alert the shop supervisors of the location and magnitude of any quality problems. The completed product is tested for customer specifications as well as requisite safety agency requirements. Packaging and shipping are controlled to insure delivery of a quality product.

Special Process Studies

In the majority of cases the control charts, roving inspectors, process auditors, in-line testing procedures and final testing will signal the presence of a quality problem that typically can be cleared up by the shop supervisor early in the production cycle. However, occasionally a quality problem will arise that requires the talents of the entire organization. In these instances, we all work together to analyze the problem and take corrective action to prevent defective material from being delivered to our customers.

Continued Improvement Studies

An ongoing program is maintained to locate non-value-adding manufacturing operations and to plan their elimination. In addition we continually look for methods of improving product and company quality characteristics.

The Results—Low Cost Reliability

Our customers tell us: "Our market is very competitive. We must price competitively. We can't afford product failures. We need power supplies that are reliable and cost effective."

And that's the bottom line the Todd Team delivers. Our power supplies achieve MTBF in excess of 100,000 hours—with competitive product costs and selling prices.

Whether your interest is standard catalog power supplies, modified standards, or custom designs, our goal is to the achieve the ultimate quality objective....customer satisfaction.

TODD PRODUCTS CORP., 50 EMJAY BLVD., BRENTWOOD, NEW YORK 11717 • (516) 231-3366 • 1-800-223-TODD • FAX (516) 231-3473

TODD

How to Use This Power Supply Locator.

Todd Products Corp. has a wide range of switching power supplies. Available models range from 150 to 1000 watts; single and multiple output; AC or DC input. This Locator makes selection of the best power supply for your application simple. Here's how it works:

1. Determine your Input Voltage requirements: AC or DC.
2. Decide on your output needs: Single, Triple, or Quad output.
3. Calculate the maximum power the power supply must deliver.
4. Locate the appropriate section meeting these criteria.
5. Review the output current ratings of the products available within your needs.
6. Find detailed specifications for the model selected on the page shown in the locator.

Custom Designs

Custom Designs ..... Page 28
If you cannot locate a standard product meeting your needs, please review the information on pages 28 and 29, and contact the factory.

Prices

Prices shown are list prices for small quantities. Companies needing production quantities can receive quantity pricing by contacting a Todd Products Area Business Manager, at the factory.

To Order

Terms and Conditions ..... Page 30
Orders can be placed through your local representative or directly through the factory by calling 1-800-223-TODD, or 516-231-3366.

Technical Support

You can talk to an Engineer regarding applications, technical problems, etc., simply by calling our Toll Free Hot Line 1-800-223-TODD.

AC INPUT – SINGLE OUTPUT SERIES

	OUTPUT RATING	PWR OUT	SIZE	MODEL	LIST PRICE	PG
5-VOLT	5V @ 30A	150w	9" x 5" x 2.5"	SC5-30	$215	24
	5V @ 50A	250w	9" x 5" x 2.5"	SC5-50	$285	24
	5V @ 70A	350w	11.5" x 5" x 2.5"	SC5-70	$345	26
	5V @ 100A	500w	11.5" x 5" x 2.5"	SC5-100	$465	26
12-VOLT	12V @ 15A	180w	9" x 5" x 2.5"	SC12-15	$215	24
	12V @ 21A	250w	9" x 5" x 2.5"	SC12-21	$285	24
	12V @ 30A	360w	11.5" x 5" x 2.5"	SC12-30	$345	26
	12V @ 42A	500w	11.5" x 5" x 2.5"	SC12-42	$465	26
15-VOLT	15V @ 12A	180w	9" x 5" x 2.5"	SC15-12	$215	24
	15V @ 17A	250w	9" x 5" x 2.5"	SC15-17	$285	24
	15V @ 24A	360w	11.5" x 5" x 2.5"	SC15-24	$345	26
	15V @ 34A	500w	11.5" x 5" x 2.5"	SC15-34	$465	26
24-VOLT	24V @ 7.5A	180w	9" x 5" x 2.5"	SC24-7.5	$215	24
	24V @ 11A	250w	9" x 5" x 2.5"	SC24-11	$285	24
	24V @ 15A	360w	11.5" x 5" x 2.5"	SC24-15	$345	26
	24V @ 21A	500w	11.5" x 5" x 2.5"	SC24-21	$465	26
28-VOLT	28V @ 6.5A	180w	9" x 5" x 2.5"	SC28-6.5	$215	24
	28V @ 9A	250w	9" x 5" x 2.5"	SC28-9	$285	24
	28V @ 13A	360w	11.5" x 5" x 2.5"	SC28-13	$345	26
	28V @ 18A	500w	11.5" x 5" x 2.5"	SC28-18	$465	26
48-VOLT	48V @ 3.7A	180w	9" x 5" x 2.5"	SC48-3.7	$215	24
	48V @ 5.5A	250w	9" x 5" x 2.5"	SC48-5.5	$285	24
	48V @ 8A	360w	11.5" x 5" x 2.5"	SC48-8	$345	26
	48V @ 11A	500w	11.5" x 5" x 2.5"	SC48-11	$465	26

DC INPUT – SINGLE OUTPUT SERIES

	OUTPUT RATING	PWR OUT	SIZE	MODEL	LIST PRICE	PG
DC-DC	5V @ 50A	250w	9" x 5" x 2.5"	DC5-50	$375	22
	12V @ 21A	250w	9" x 5" x 2.5"	DC12-21	$375	22
	15V @ 17A	250w	9" x 5" x 2.5"	DC15-17	$375	22
	24V @ 11A	250w	9" x 5" x 2.5"	DC24-11	$375	22
	28V @ 9A	250w	9" x 5" x 2.5"	DC28-9	$375	22
	48V @ 5.5A	250w	9" x 5" x 2.5"	DC48-5.5	$375	22

DC INPUT–MULTIPLE OUTPUT SERIES

	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4	SIZE	MODEL	LIST PRICE	PG
DC-DC	250	+5V @ 30A	+15V @ 4.0A	−15V @ 4.0A		9" x 5" x 2.5"	DCT-253-0515	$425	22
	250	+5V @ 30A	+12V @ 5.0A	−12V @ 5.0A		9" x 5" x 2.5"	DCT-253-0512	$425	22
	350	+5V @ 45A	+12V @ 6.0A	−12V @ 6.0A		9" x 5" x 2.5"	DCT-353-0512	$525	22
	350	+5V @ 45A	+15V @ 5.0A	−15V @ 5.0A		9" x 5" x 2.5"	DCT-353-0515	$525	22
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A		9" x 5" x 2.5"	DCX-353-0512	$525	22
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	24V @ 1.5A	9" x 5" x 2.5"	DCX-354-1224	$525	22
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	5.2V @ 2.0A	9" x 5" x 2.5"	DCX-354-1205	$525	22

Prices Subject to Change

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POWER SUPPLY LOCATOR

AC INPUT–MULTIPLE OUTPUT SERIES

	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4	SIZE	MODEL	PRICE	PG
DUAL/TRIPLE OUTPUT–AC INPUT	160	+5V @ 25A	+12V @ 4/9 Apk	12V @ 1.5A	—	9" x 5" x 2.5"	MDT-163-0512R	$225	18
	160	+5V @ 30A	+12V @ 1.50A	−12V @ 1.5A	—	9" x 5" x 2.5"	MTC-163-0512	$225	18
	160	+5V @ 30A	+15V @ 1.50A	−15V @ 1.5A	—	9" x 5" x 2.5"	MTC-163-0515	$225	18
	220	+5V @ 10A	+12V @ 10/16 Apk	−12V @ 1.0A	—	9" x 5" x 2.5"	MDT-223-1212R	$275	18
	220	+5V @ 30A	+12V @ 6/10 Apk	12V @ 2.5A	—	9" x 5" x 2.5"	MDT-223-0512R	$275	18
	250	+5V @ 30A	+12V @ 5.0A	−12V @ 5.0A	—	9" x 5" x 2.5"	MTC-253-0512	$355	12
	250	+5V @ 30A	+15V @ 4.0A	−15V @ 4.0A	—	9" x 5" x 2.5"	MTC-253-0515	$355	12
	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	—	9" x 5" x 2.5"	MTX-253-0512	$285	12
	350	+5V @ 30A	+12V @ 20/26 Apk	−12V @ 4.0A	—	9" x 5" x 2.5"	MSC-353-0512	$450	12
	350	+12V @ 30/36 Apk	+5V @ 20.0A	−12V @ 4.0A	—	9" x 5" x 2.5"	MSC-353-1205	$450	12
	350	+5V @ 45A	+12V @ 6.0A	−12V @ 6.0A	—	9" x 5" x 2.5"	MTC-353-0512	$425	12
	350	+5V @ 45A	+15V @ 5.0A	−15V @ 5.0A	—	9" x 5" x 2.5"	MTC-353-0515	$425	12
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	—	9" x 5" x 2.5"	MAX-353-0512	$425	12
	400	+5V @ 30A	+12V @ 20/26 Apk	−12V @ 4.0A	—	9" x 5.5" x 3.83"	MSC-353-0512F	$485	12
	400	+12V @ 30/36 Apk	+5V @ 20.0A	−12V @ 4.0A	—	9" x 5.5" x 3.83"	MSC-353-1205F	$485	12
	400	+5V @ 20A	+12V @ 25/36 Apk	—	—	11.5" x 5" x 2.5"	MSC-402-0512	$485	14
	400	+5V @ 50A	+15V @ 6.5A	−15V @ 6.5A	—	11.5" x 5" x 2.5"	MTC-403-0515	$525	14
	400	+5V @ 60A	+12V @ 10/16 Apk	12V @ 2.0A	—	11.5" x 5" x 2.5"	MTX-403-0512	$485	20
	400	+5V @ 70A	+12V @ 1.0A	−12V @ 1.0A	—	11.5" x 5" x 2.5"	MTX-403-5012	$485	20
	400	+5V @ 70A	+12V @ 10/16 Apk	−12V @ 6.0A	—	11.5" x 5" x 2.5"	MAX-403-0512	$525	14
	500	+5V @ 70A	+15V @ 8.0A	−15V @ 8.0A	—	11.5" x 5" x 2.5"	MTC-503-0515	$565	14
	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	—	11.5" x 5" x 2.5"	MAX-503-0512	$565	14
	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	—	13.5" x 5" x 2.6"	MAX-703-0512	$695	16
	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	—	13.5" x 5" x 3.83"	MAX-753-0512	$745	16
	750	+5V @ 120A	+12V @ 20/27 Apk	−12V @ 6.0A	—	13.5" x 5" x 3.83"	MSC-753-0512	$745	16
	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10.0A	—	12" x 8" x 3.38"	MAX-1003-0512	$1150	10
QUAD OUTPUT–AC INPUT	160	+5V @ 20A	+24V @ 3/6 Apk	+12V @ 1.0A	−12V @ 1.0A	9" x 5" x 2.5"	MDT-164-2412R	$225	18
	160	+5V @ 25A	+12V @ 4/9 Apk	+12V @ 1.0A	−12V @ 1.0A	9" x 5" x 2.5"	MDT-164-1212R	$225	18
	220	+5V @ 25A	+24V @ 4/8 Apk	+12V @ 1.5A	−12V @ 1.5A	9" x 5" x 2.5"	MDT-224-2412R	$275	18
	220	+5V @ 30A	+12V @ 6/10 Apk	+12V @ 1.5A	−12V @ 1.5A	9" x 5" x 2.5"	MDT-224-1212R	$275	18
	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 4.0A	−5.2V @ 2.0A	9" x 5" x 2.5"	MAX-254-1205	$355	12
	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	5V @ 1.5A	9" x 5" x 2.5"	MTX-254-1205	$285	12
	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	12V @ 2.0A	9" x 5" x 2.5"	MTX-254-1212	$285	12
	250	+5V @ 35A	+12V @ 8/12 Apk	−15V @ 1.5A	15V @ 1.5A	9" x 5" x 2.5"	MTX-254-1215	$285	12
	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	24V @ 1.5A	9" x 5" x 2.5"	MTX-254-1224	$285	12
	350	+5V @ 50A	+12V @ 8/12 Apk	−5.2V @ 10.0A	−12V @ 2.0A	9" x 5" x 2.5"	MAX-354-1252	$425	12
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	−5.2V @ 2.0A	9" x 5" x 2.5"	MAX-354-1205	$425	12
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	12V @ 2.0A	9" x 5" x 2.5"	MAX-354-1212	$425	12
	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	+24V @ 1.5A	9" x 5" x 2.5"	MAX-354-1224	$425	12
	350	+5V @ 50A	+24V @ 5/8 Apk	−12V @ 4.0A	12V @ 2.0A	9" x 5" x 2.5"	MAX-354-2412	$425	12
	400	+5V @ 55A	+24V @ 5/10 Apk	+12V @ 10.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MDX-404-2412R	$485	20
	400	+5V @ 60A	+12V @ 10/16 Apk	−5.2V @ 2.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MTX-404-1205	$485	20
	400	+5V @ 60A	+12V @ 10/16 Apk	−5.2V @ 2.0A	+24V @ 2.0A	11.5" x 5" x 2.5"	MTX-404-2405	$485	20
	400	+5V @ 60A	+12V @ 10/16 Apk	12V @ 2.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MTX-404-1212	$485	20
	400	+5V @ 60A	+12V @ 10/16 Apk	+24V @ 2.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MTX-404-1224	$485	20
	400	+5V @ 70A	+12V @ 10/16 Apk	−5.2V @ 6.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MAX-404-1252	$525	14
	400	+5V @ 70A	+12V @ 10/16 Apk	−12V @ 5.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MAX-404-1212	$525	14
	500	+5V @ 80A	+12V @ 10/16 Apk	−5.2V @ 10.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MAX-504-1252	$565	14
	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	5.2V @ 2.0A	11.5" x 5" x 2.5"	MAX-504-1205	$565	14
	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MAX-504-1212	$565	14
	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	+24V @ 2.0A	11.5" x 5" x 2.5"	MAX-504-1224	$565	14
	500	+5V @ 80A	+15V @ 10/16 Apk	− 5V @ 10.0A	15V @ 2.0A	11.5" x 5" x 2.5"	MAX-504-1552	$565	14
	500	+5V @ 80A	+24V @ 5/10 Apk	−12V @ 10.0A	12V @ 2.0A	11.5" x 5" x 2.5"	MAX-504-2412	$565	14
	700	+5V @ 100A	+12V @ 12/20 Apk	−5.2V @ 10.0A	12V @ 2.0A	13.5" x 5" x 2.6"	MAX-704-1252	$695	16
	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	5.2V @ 2.0A	13.5" x 5" x 2.6"	MAX-704-1205	$695	16
	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	12V @ 2.0A	13.5" x 5" x 2.6"	MAX-704-1212	$695	16
	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	+24V @ 2.0A	13.5" x 5" x 2.6"	MAX-704-1224	$695	16
	700	+5V @ 100A	+24V @ 6/10 Apk	−12V @ 10.0A	12V @ 2.0A	13.5" x 5" x 2.6"	MAX-704-2412	$695	16
	750	+5V @ 120A	+12V @ 12/20 Apk	−5.2V @ 10.0A	12V @ 2.0A	13.5" x 5" x 3.83"	MAX-754-1252	$745	16
	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	5.2V @ 2.0A	13.5" x 5" x 3.83"	MAX-754-1205	$745	16
	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	12V @ 2.0A	13.5" x 5" x 3.83"	MAX-754-1212	$745	16
	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	+24V @ 2.0A	13.5" x 5" x 3.83"	MAX-754-1224	$745	16
	750	+5V @ 120A	+15V @ 8.0A	−15V @ 8.0A	12V @ 2.0A	13.5" x 5" x 3.83"	MAX-754-1512	$745	16
	750	+5V @ 120A	+24V @ 6/10 Apk	−12V @ 10.0A	12V @ 2.0A	13.5" x 5" x 3.83"	MAX-754-2412	$745	16
	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10.0A	3.3V @ 10.0A	12" x 8" x 3.38"	MAX-1004-1203	$1150	10
	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10.0A	5V @ 10.0A	12" x 8" x 3.38"	MAX-1004-1205	$1150	10
	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10.0A	12V @ 10.0A	12" x 8" x 3.38"	MAX-1004-1212	$1150	10
	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10.0A	24V @ 5.0A	12" x 8" x 3.38"	MAX-1004-1224	$1150	10
	1000	+5V @ 150A	+15V @ 20/30 Apk	−15V @ 10.0A	12V @ 10.0A	12" x 8" x 3.38"	MAX-1004-1512	$1150	10
	1000	+5V @ 150A	+15V @ 20/30 Apk	−15V @ 10.0A	24V @ 5.0A	12" x 8" x 3.38"	MAX-1004-1524	$1150	10

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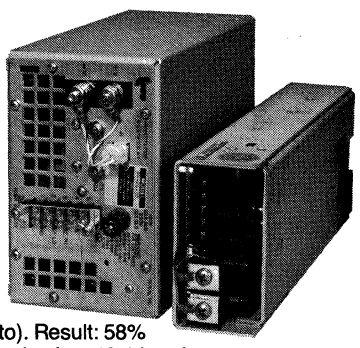
TODD

MARKET DRIVEN– CUSTOMER FOCUSED

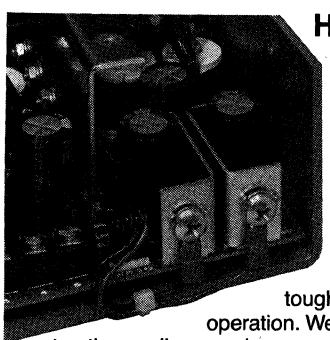
Establishing working partnerships with each of our customers gives us critical insight into their needs and expectations. By listening, understanding and responding to these needs, we are able to offer an array of unique features and new design alternatives that provide our customers with innovative solutions to difficult system problems. Here are a few examples of our market-driven, customer focused solutions.

Small Size

Pack 50% More Power Into Your Next System



Our customers are able to pack more features into their systems. For example, typical 5″x8″x11″ 750 watt "shoebox" switchers are being replaced by our 2.6″x5″x13.5″ MAX 750 series (see comparison photo). Result: 58% savings in space. 30% cost reduction, 12% less heat.



Heavy Duty Construction

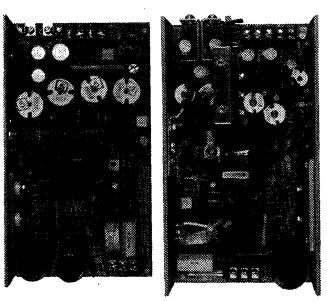
Clean, Simple, Rugged and Reliable

Reliability in operation is important, but for true reliability, you need rugged construction.

TODD switchers are ruggedized to anticipate tough handling in shipping or in operation. We use heavy sheet metal construction, well secured components, and heavy duty output terminations. In addition, our extensive use of surface mount devices and single PC board design contributes to the overall ruggedness of these power supplies.

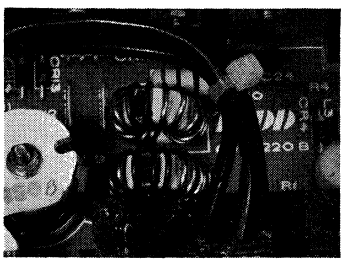
Power Upgradable

150 Watts to 350 Watts in the Same Package



Your market is a fickle one. You design a system using 150 or 200 watts of power only to find that the market wants add-ons–boosting power needs to 250 or 350 watts.

TODD engineers design for upgrade. The MDT-160 or the MDT-220 and the MAX-350 fit in the same space and use the same mounting holes. The same concept is used for the MTX-300, MAX-400, and MAX-500–allowing upgrades from 300 to 500 watts in the same space.



High Efficiency

Simple Cooling, Optimum Thermal Management

Heat...the killer of electronic equipment. Avoiding it seems simple: Improve efficiency, reduce heat.

But this takes innovative design. TODD engineers developed VERI-DRIVE PLUS inverter topology, and MAGNA-FLUX switching mag amp post regulation to achieve 80% efficient high power switchers. This is particularly important when handling high current auxiliary outputs which require tight regulation.

World Class Products

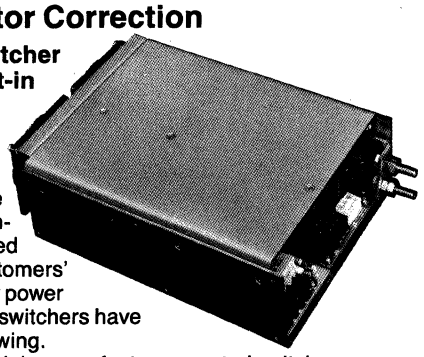
International Support for Your World Markets

Understanding the needs of our customers to market worldwide has resulted in standardizing our power supplies to meet international requirements. Final product destination is not a problem for our customers when they select and specify a TODD switcher.

All TODD power supplies have AC inputs that meet all international line requirements and built-in line filters to meet international RFI requirements. They are also certified to meet the most severe international safety standards, like UL, CSA, IEC, and VDE, class 1 SELV.

Power Factor Correction

1000 Watt Switcher Features Built-in Power Factor Corrector



As electronic systems become increasingly complex and marketed globally, our customers' requirements for power factor corrected switchers have been on the upswing.

Because we think power factor corrected switchers should not be an afterthought, we designed our new SUPERMAX 1000 open frame switching power supply series from the ground up, starting with a power factor corrected base.

With active power factor correction to 0.99, the SUPERMAX 1000 is the first 1000 watt power supply to incorporate pf correction in the basic design and is also the smallest pf corrected switcher available today.

Understanding and addressing the needs of our customers to help them respond to today's rapidly changing markets is the heart of our market driven, customer focused philosophy. We will continue to seek unique features and innovative products that meet our customers' needs.

TODD PRODUCTS CORP., 50 EMJAY BLVD., BRENTWOOD, NEW YORK 11717 • (516) 231-3366 • 1-800-223-TODD • FAX (516) 231-3473

1000 WATTS
3.38″ x 8″ x 12″
SUPER MAX

Introducing SUPERMAX... A New Concept in Power Supply Technology

1000 watts...Open frame technology...Designed-in power factor correction...Meets IEC 555-2... It's the new SUPERMAX series of switching power supplies and a whole new concept in power supply technology. With SUPERMAX, Todd Products has brought its advanced open frame switching power supply technololgy to the high power shoe box world. Now users of 1000 watt shoe box switchers have a superior alternative—the SUPERMAX 1000 with power factor correction to 0.99 designed-in, and the same flexible, high reliability, low cost designs that have made Todd's MAX series product line the industry standard in open frame switchers.

Designed-in Power Factor Correction

The SUPERMAX 1000 is the first 1000 watt power supply that incorporates power factor correction in the basic design. Unlike traditional shoe box switchers where power factor correction is an add-on, the SUPERMAX series was designed around a power factor correction base. The series incorporates a proprietary Todd design that optimizes both power factor and efficiency to achieve active power factor correction to 0.99 with efficiencies of over 75%, making it one of the best in the industry.

Operated from Standard AC Power Receptacles

As electronic systems have become more complex, the demand for power supplies with higher outputs, increased efficiencies, and lower power consumption has increased. A power factor of 0.99 and an efficiency of over 75% allows the SUPERMAX to be used in systems that must operate from standard AC power receptacles and draw less than 12 amps at 120 VAC. The SUPERMAX also meets the requirements of IEC 555-2 for harmonic line distortion, a specification that will be imposed on all systems sold in Europe by 1992.

The Smallest Power Factor Corrected 1000W Switcher

Housed in a low profile package, measuring 3.38″ × 8″ × 12″ versus traditional shoe box switchers that measure 5″ × 8″ × 12-15″, the SUPERMAX 1000 is the smallest power factor corrected 1000 watt unit available today. The package allows great flexibility in system mechancial design. Industry standard mounting allows three units to be mounted where two shoe box units were before.

High Reliability, Quick System Assembly, Low Cost

The SUPERMAX series was designed with several unique features and capabilities that ensure high reliability, lower cost, and improved system assembly. For example, customers have the option of self-cooling with internal ball-bearing fans, or a no-fan configuration for systems with supplied air cooling. Connectors are provided for AC input, outputs 2, 3 and 4, and status and control lines to facilitate high speed production assembly. This feature eliminates the barrier strip assembly process needed to install ring terminals during production and test.

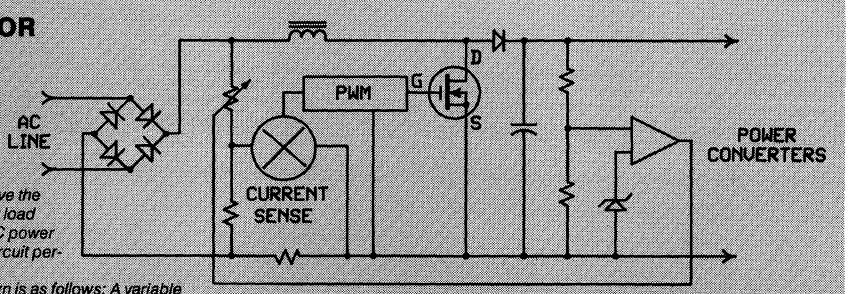
The SUPERMAX features the proven and field tested reliability features that have made the MAX product lines an industry standard. These include MAGNA-FLUX mag amp control for 1% regulation on all outputs; true remote inhibit for system On/Off functions; VDE and FCC Class A RFI filtering; and International safety agency approvals (including IEC 950). All this at prices competitive with standard shoe box switchers without power factor correction.

Todd's SUPERMAX 1000 series is destined to be a super star.

SIMPLIFIED POWER FACTOR CORRECTOR CIRCUIT

Power factor is the ratio of power in watts to the product of volts and amperes flowing into a load. To minimize the amount of current required to supply power to the load, power factor should approach one. Unity power factor requires that the voltage and current be in phase as well as have the identical wave shape. The true unity power factor load looks purely resistive to the driving source, the AC power line. The Todd front end power factor corrector circuit performs this function.

The operation of the simplified schematic shown is as follows: A variable attenuator, controlled by a voltage regulating circuit, provides an attenuated replica of the line voltage to the AC line current sensing circuit. The current sensing circuit controls the charge and discharge of an energy storage choke to force the line current to track the line reference voltage. The circuit operates at a constant high frequency and forces continuous conduction of the choke when significant power is being drawn by the power supply load.



The output of the power factor corrector circuit is a regulated high voltage DC that feeds the output power converters of the power supply. Regulation is provided by sensing the voltage and controlling the attentuation of the variable attenuator which adjusts the reference to the current circuit. Regulation is maintained while keeping the power factor of the power supply at close to unity.

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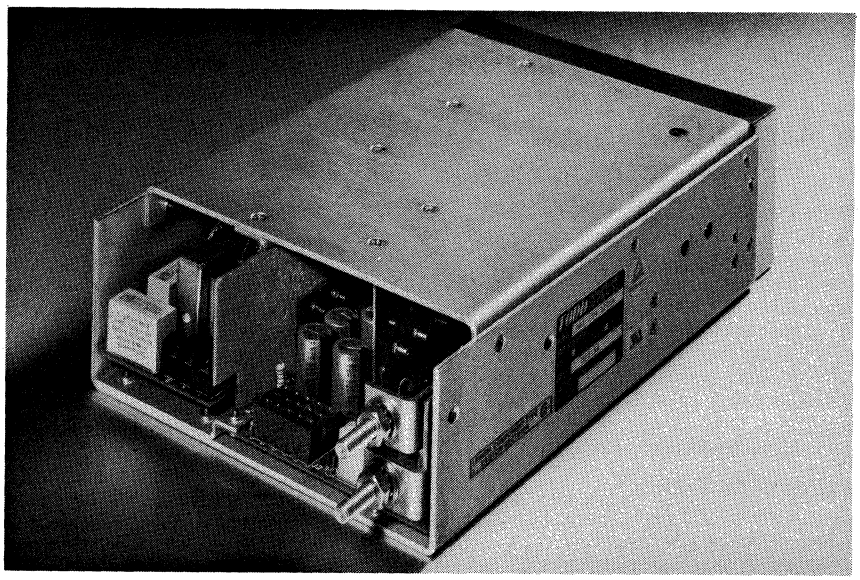
TODD

MULTI-OUTPUT 1000 WATT SWITCHING POWER SUPPLIES



The SUPERMAX 1000

Featuring:

- Active Power Factor Correction to 0.99
- Draws under 12 Amps at 120 VAC and 1000 watts load
- Designed for low AC line distortion per IEC 555-2
- Low profile package, 3.38″H x 8″W x 12″L
- Connectors provided for quick system assembly
- High reliability, low cost, open frame technology
- Uses system air in "no-fan" configuration
- True remote inhibit for system on/off
- All auxiliary outputs mag amp regulated with Todd MAGNA-FLUX
- Built-in RFI Class A filters meet VDE0871 and FCC, Class A

The new SUPERMAX 1000 series is a breakthrough in open frame switching power supply technology. For the first time, users of 1000 watt shoe box switchers (5″ x 8″ x 11-15″) have a superior alternative—a low profile (3.38″ x 8″ x 12″) open frame switcher, that features the flexibility, high reliability, and low cost designs that have made Todd's MAX series of products the industry's open framed standard.

Featuring active power factor correction to 0.99, *the SUPERMAX 1000 is the smallest power factor corrected 1000 watt unit available today, and the first 1000 watt power supply incorporating pf correction in the basic design.* Designed for low AC line distortion per IEC 555-2, the units draw under 12 Amps at 120 VAC and 1000 watt load, and under 6 Amps at 230 VAC. Other features are the optional use of system air for cooling, remote inhibit, mag amp regulated auxiliary outputs, and built-in RFI filtering.

All this at prices no higher than those usually seen on standard shoe box switchers without power factor correction. Check out the specs of the SUPERMAX today.

1000 WATT 3.38″ x 8″ x 12″

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MAX-1003-0512	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10A	—
MAX-1004-1203	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10A	3.3V @ 10A
MAX-1004-1205	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10A	5V @ 10A
MAX-1004-1212	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10A	12V @ 10A
MAX-1004-1224	1000	+5V @ 150A	+12V @ 20/30 Apk	−12V @ 10A	24V @ 5A
MAX-1004-1512	1000	+5V @ 150A	+15V @ 20/30 Apk	−15V @ 10A	12V @ 10A
MAX-1004-1524	1000	+5V @ 150A	+15V @ 20/30 Apk	−15V @ 10A	24V @ 5A

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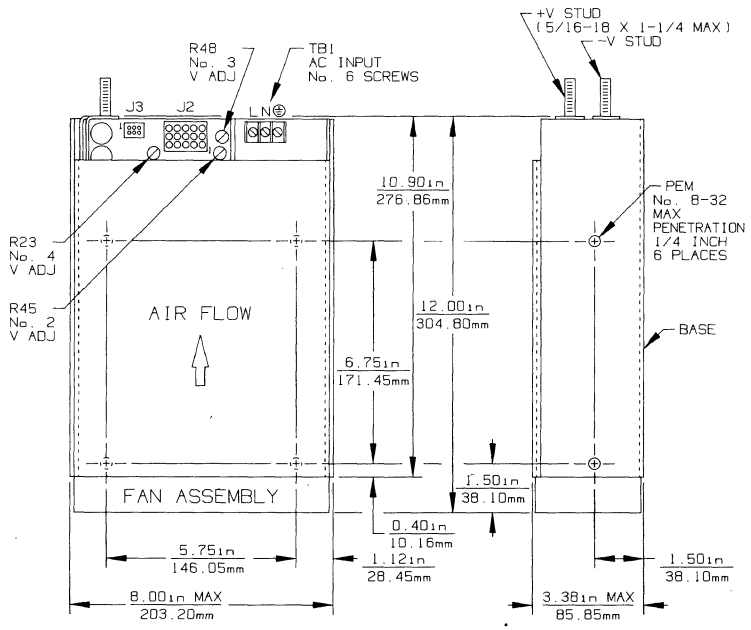
1000 WATTS 3.38" x 8" x 12" SUPERMAX



SPECIFICATIONS: ALL MODELS.

AC Input: 90-264 Vac continuous range, 47 to 63 Hz. Internally fused for 20 A.
Power Factor: 0.99 typical at full load.
Input Current: 12A max @ 120 Vac under full load conditions.
Adjustability: All outputs user adjustable.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change. Main +5V output requires minimum load of 10%.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense Output #1: Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response (+5V): Output voltage returns to within 1% in less than 500 µsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection (All outputs): Protects load against power supply induced overvoltage. Trip point is set at maximum 136% of nominal voltage.
Peak Output Current: Dual current ratings define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Soft Start: Inrush AC current is less than 90 A at 115 Vac, 180 A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 20 ms minimum after removal of power, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 75% typical.
Safety Agencies: Contact factory for status of UL1950 recognition, CSA22.2 #234 certification, and licensing by TUV to IEC950, VDE 0805, and Class 1, SELV.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc.
Power Fail: Provide TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power, VMEbus compatible, provides 48ma sink current capability.
Cooling: Self-cooled with internal ball-bearing fans. Can be operated without fans with sufficient customer-supplied air flow.
Reliability: Over 100,000 hours, when calculated in accordance with MIL-HDBK-217E, and in Option "X" configuration.
Remote Inhibit: True inhibit shuts unit off with TTL "0" signal, or contact closure.

OPTIONS:

Option "X", System Cooling: Customer supplied air of 100 CFM through end of unit provides sufficient cooling for full power operation. Fans are not included with unit.

Consult factory for other available options.

AC INPUT (90-264 Vac Continuous Range)

FUNCTION	115 Vac	230 Vac	CONNECTOR
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

DC OUTPUT

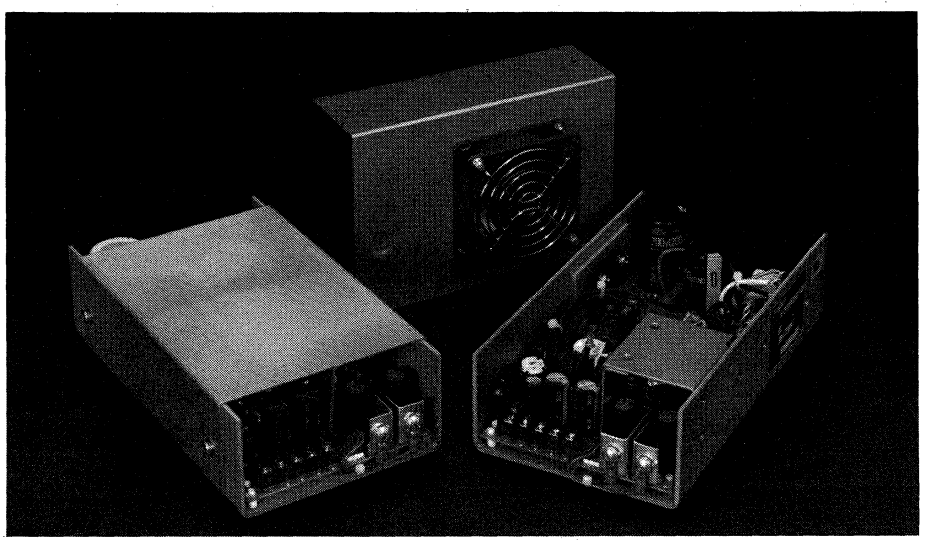
FUNCTION	LOCATION	NOTES	CONNECTOR
Output #1	Terminal marked +V	Main output	Stud 5/16-18 x 1 1/4"
	Terminal marked −V	5 Volt Rtn (common)	
Output #2	J2-1, J2-2 and J2-3(+)	Aux output	Pin header AMP MATE-N-LOK Type 350830-1. Mates with plug housing 350736-1 with Pins.
	J2-4, J2-5, and J2-6 (RTN)	Aux Return (common)	
Output #3	J2-7, J2-8, and J2-9(−)	Aux output	
	J2-4, J2-5 and J2-6 (RTN)	Aux Return (common)	
Output #4	J2-10, J2-11 and J2-12(+)	Floating output	
	J2-13, J2-14, and J2-15(−)		

STATUS AND CONTROL

FUNCTION	LOCATION	NOTES	CONNECTOR
Remote Sense	J3-1	Output #1 Sense	Pin header Molex 1625-6 Series with Sockets 1779 Series. Mates with plug housing 1625-6 Series with Pins Series 1560.
	J3-4	Output #1 Sense Rtn	
DC Power Good	J3-3	Reference to J3-4	
AC Power Fail	J3-5	Reference to J3-4	
Inhibit Input	J3-6	Short to J3-4	

TODD

MULTI-OUTPUT 250 – 350 WATT SWITCHING POWER SUPPLIES



The 9-Inch Powerhouse

Featuring:

- Over 3 watts/in³ Power Density
- 80% Overall Efficiency
- Over 100,000 hours MTBF
- International Safety Requirements
- All outputs regulated ± 1%
- High Peak Currents for Motor Starting
- System Air or Self-Cooling Option
- AC Automatic Line Selection Option
- Available in 48V dc input (See pg. 22)

STANDARD MAX SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MAX-254-1205	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 4.0A	−5.2V @ 2.0A
MAX-353-0512	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	
MAX-354-1205	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	−5.2V @ 2.0A
MAX-354-1212	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	12V @ 2.0A
MAX-354-1224	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	+24V @ 1.5A
MAX-354-1252	350	+5V @ 50A	+12V @ 8/12 Apk	−5.2V @ 10.0A	−12V @ 2.0A
MAX-354-2412	350	+5V @ 50A	+24V @ 5/8 Apk	−12V @ 4.0A	+12V @ 2.0A
MAX-354-1512	350	+5V @ 40A	+15V @ 4.0A	−15V @ 4.0A	12V @ 2.0A

TELECOM MTC SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3
MTC-253-0512	250	+5V @ 30A	+12V @ 5.0A	−12V @ 5.0A
MTC-253-0515	250	+5V @ 30A	+15V @ 4.0A	−15V @ 4.0A
MTC-353-0512	350	+5V @ 45A	+12V @ 6.0A	−12V @ 6.0A
MTC-353-0515	350	+5V @ 45A	+15V @ 5.0A	−15V @ 5.0A

MASS STORAGE MSC SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3
MSC-353-0512	350	+5V @ 30A	+12V @ 20/26 Apk	−12V @ 4.0A
MSC-353-1205	350	+12V @ 30/36 Apk	+5V @ 20.0A	−12V @ 4.0A
MSC-353-0512F	400	+5V @ 30A	+12V @ 20/26 Apk	−12V @ 4.0A
MSC-353-1205F	400	+12V @ 30/36 Apk	+5V @ 20.0A	−12V @ 4.0A

SMALL COMPUTER MTX SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MTX-253-0512	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	
MTX-254-1205	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	5V @ 1.5A
MTX-254-1212	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	12V @ 2.0A
MTX-254-1215	250	+5V @ 35A	+12V @ 8/12 Apk	−15V @ 1.5A	15V @ 1.5A
MTX-254-1224	250	+5V @ 35A	+12V @ 8/12 Apk	−12V @ 2.0A	24V @ 1.5A

The appropriate 9-inch Powerhouse in your telecom product gives you the outputs you need for ISDN, LAN, and T1 applications, and standard voice and data networks. High current auxiliary outputs provide regulation characteristics for proper operation of line drivers, network interfaces and RS232 type outputs. Or, use a 9-inch Powerhouse in your computer-based product for needed output regulation, power for 50 Amps of Logic and four hard disk drives requirements.

And, you can increase power by 40% as you add peripherals– without redesigning for a larger power supply by upgrading from the MDT 160/220 series.

Check the specifications of these low-profile, 9-inch Powerhouse switchers that give you more design freedom.

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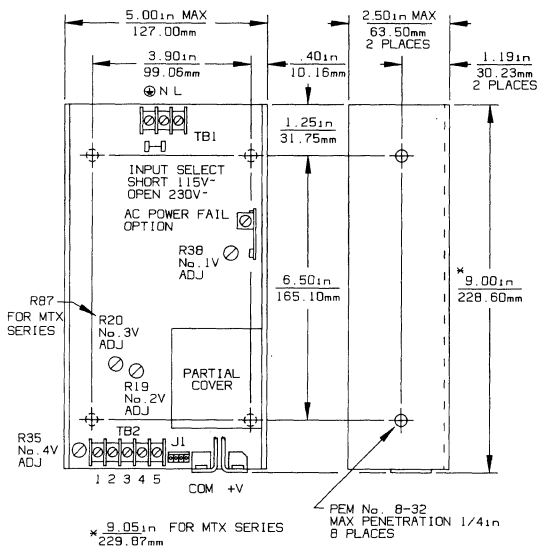
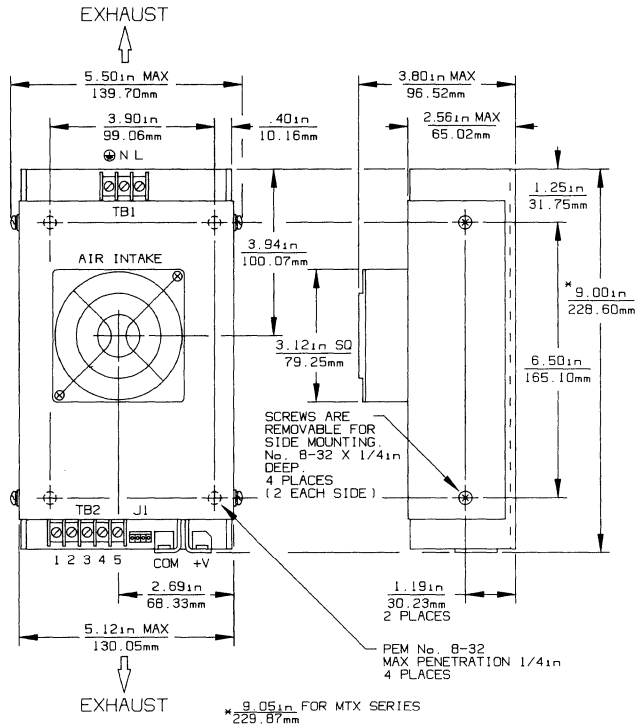
250-350 WATTS 9" x 5" x 2.5"
MAX MTC MSC MTX





SPECIFICATIONS:

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. See Option "A" for automatic line selection. Internally fused for 10 A.
Adjustability: All outputs user adjustable ±5% minimum.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change. Output #1 requires minimum load of 10%.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense (Output #1): Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response (Output #1): Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection (Output #1): Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 136% of nominal.
Peak Output Current: Dual current ratings define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Soft Start: Inrush AC current limiting circuitry holds peak current to less than 10 A at 115 Vac, 18 A at 230 Vac. For MTX, 10A at 115 Vac, 20A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 80% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full ratings.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero.

OPTIONS:

Option "A", AC Auto-Range: Automatically selects proper AC line voltage range to enable power operation at either 115 or 230 Vac, without user intervention.
Option "C", Cover: Limits contact with power supply interior. Add "C" suffix to model number.
Option "F", Fan/Cover Assembly: Cover with integral ball-bearing fan provides proper cooling to achieve full ratings, at 50° C ambient temperature.
Option "G", DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc. Not available if Option "P" is selected.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability. Not available if option "G" is selected.
Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select*	Short	Open	0.187 Male Fastons
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

*Not applicable when Option "A" is selected.

DC OUTPUT

FUNCTION	MAX, MTC, MTX	MSC	CONNECTOR
Output #1	Terminal marked +V	Terminal marked +V	Bus Bars #10-32 Screws
	Terminal marked COM	Terminal marked COM	
Output #2	TB2-3 (+)	TB2-2	Barrier Strip #6-32 Screws 3/8" centers
	TB2-4 (RTN)	TB2-1 (RTN)	
Output #3	TB2-5 (−)	TB2-3 (−)	
	TB2-4 (RTN)	TB2-1 (RTN)	
Output #4 (if provided)	TB2-1 (+)		
	TB2-2 (−)		

Note: Return (RTN) lines are connected to power supply common.

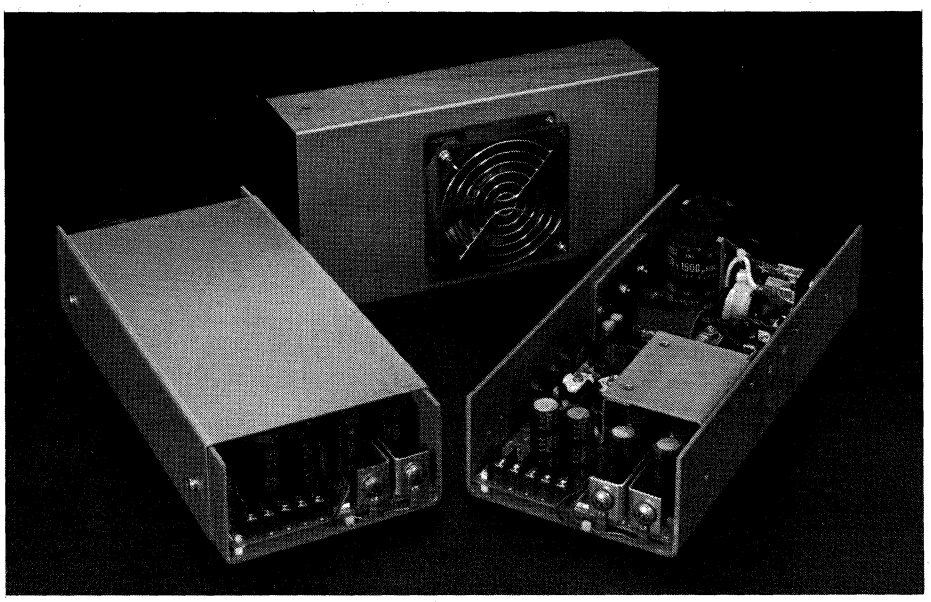
STATUS AND CONTROL

FUNCTION	LOCATION	NOTES	CONNECTOR
Remote Sense	J1-1 (+S)	Output #1 Sense	AMP MTA Type #640456-4 Pin Header (locking)
	J1-2 (−S)	Output #1 Sense Rtn	
*AC Power Fail, or DC Power Good	J1-3 (PF)	Reference to J1-2 (−S)	
Inhibit Input	J1-4 (IH)	Short to J1-2 (−S)	

*Optional Function.

TODD

MULTI-OUTPUT 400 – 500 WATT SWITCHING POWER SUPPLIES



The Bus Drivers

Featuring:

- 11.5″ x 5″ x 2.5″ Package
- Up to 3.5 watts/in³ Power Density
- 80% Overall Efficiency
- VMEbus and Multibus II System Compatibility
- Over 100,000 hours MTBF
- Meets International Safety Agency Requirements
- High Efficiency MAGNA-FLUX ± 1% Post Regulators
- System Air or Self-Cooling Option
- AC Automatic Line Selection Option

STANDARD MAX SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MAX-403-0512	400	+5V @ 70A	+12V @ 10/16 Apk	−12V @ 6.0A	
MAX-404-1212	400	+5V @ 70A	+12V @ 10/16 Apk	−12V @ 5.0A	12V @ 2.0A
MAX-404-1252	400	+5V @ 70A	+12V @ 10/16 Apk	−5.2V @ 6.0A	12V @ 2.0A
MAX-503-0512	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	
MAX-504-1205	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	5.2V @ 2.0A
MAX-504-1212	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	12V @ 2.0A
MAX-504-1224	500	+5V @ 80A	+12V @ 10/16 Apk	−12V @ 10.0A	+24V @ 2.0A
MAX-504-1252	500	+5V @ 80A	+12V @ 10/16 Apk	−5.2V @ 10.0A	12V @ 2.0A
MAX-504-1552	500	+5V @ 80A	+15V @ 10/16 Apk	−5V @ 10.0A	15V @ 2.0A
MAX-504-2412	500	+5V @ 80A	+24V @ 5/10 Apk	−12V @ 10.0A	12V @ 2.0A

TELECOM MTC SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3
MTC-403-0515	400	+5V @ 50A	+15V @ 6.5A	−15V @ 6.5A
MTC-503-0515	500	+5V @ 70A	+15V @ 8.0A	−15V @ 8.0A

MASS STORAGE MSC SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2
MSC-402-0512*	400	+5V @ 20A	+12V @ 25/36 Apk

*Contact factory for detailed mechanical and electrical specifications. The drawings on opposite page do not represent this MSC product. The MSC-402 features input and output connectors, remote sense on Output #1 and Output #2, and remote on/off—all standard.

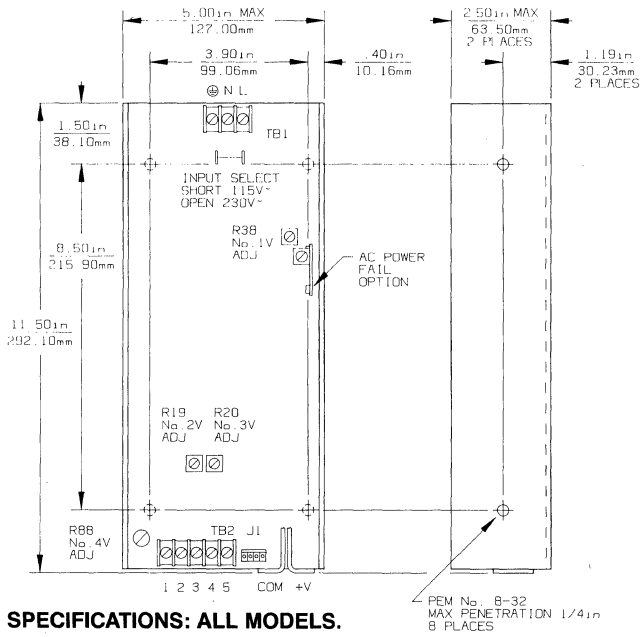
VMEbus and Multibus compatibility is only one feature of this series. You'll find switchers to power up to 80 Amps of Logic and four hard disk drives–with up to 16 Amps peak current to meet peripheral startup needs.

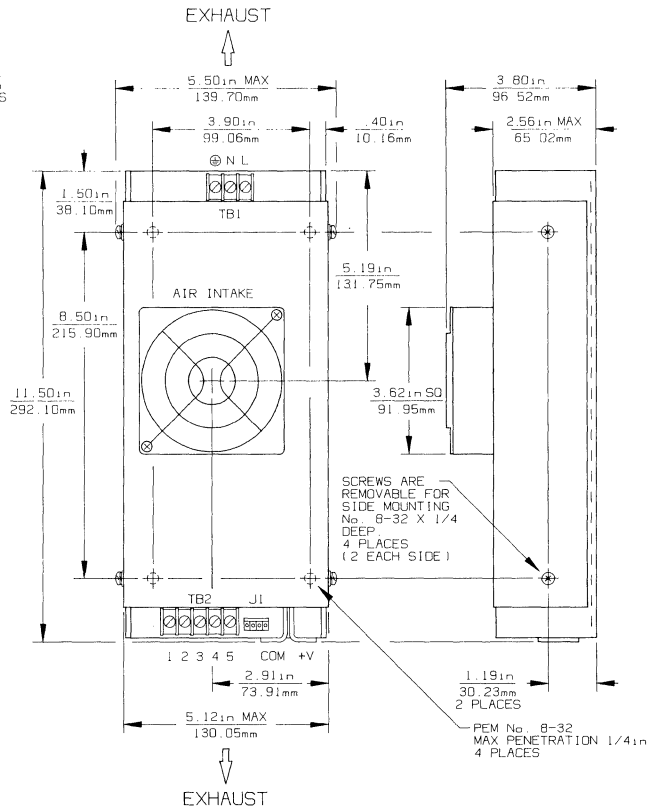
You'll find the outputs you need for ISDN, LAN, T1 applications and for standard voice and data networks. High current auxiliary outputs provide regulation characteristics for proper operation of line drivers, network interfaces, and RS232 type outputs. And, you can upgrade power output by 25% without redesigning for a larger power supply.

Check the specifications of these bus driving switching power supplies to find the right one for your products.

TODD PRODUCTS CORP., 50 EMJAY BLVD., BRENTWOOD, NEW YORK 11717 • (516) 231-3366 • 1-800-223-TODD • FAX (516) 231-3473

400-500 WATTS 11.5" x 5" x 2.5" MAX MTC MSC





SPECIFICATIONS: ALL MODELS.

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. See Option "A" for automatic line selection. Internally fused for 12 A.
Adjustability: All outputs user adjustable ±5% minimum, except where noted.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change. Main +5V output requires minimum load of 10%.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense (+5V): Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response (+5V): Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection (+5V): Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 6.8V.
Peak Output Current: Dual current ratings define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Soft Start: Inrush AC current is less than 80 A at 115 Vac, 20 A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 80% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full ratings.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero.

OPTIONS:

Option "A", AC Auto-Range: Automatically selects proper AC line voltage range to enable power operation at either 115 or 230 Vac, without user intervention.
Option "C", Cover: Limits contact with power supply interior. Add "C" suffix to model number.
Option "F", Fan/Cover Assembly: Cover with integral ball-bearing fan provides proper cooling to achieve full ratings, at 50°C ambient temperature. 2.5" dim. increases to 3.8".
Option "G", DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc. Not available if Option "P" is selected.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability. Not available if option "G" is selected.
Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select	Short	Open	0.250 Male Fastons
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

DC OUTPUT

FUNCTION	MAX & MTC	MSC	CONNECTOR
Output #1	Terminal marked +V	Terminal marked +V	Bus Bars #1/4-20 Screws
	Terminal marked COM	Terminal marked COM	
Output #2	TB2-3 (+)	TB2-2 and TB2-3 (+)	Barrier Strip #6-32 Screws 3/8" centers
	TB2-4 (RTN)	TB2-1 and TB2-4 (RTN)	
Output #3	TB2-5 (−)	TB2-5 (−)	
	TB2-4 (RTN)	TB2-4 (RTN)	
Output #4 (if provided)	TB2-1 (+)		
	TB2-2 (−)		

Note: Return (RTN) lines are connected to power supply common.

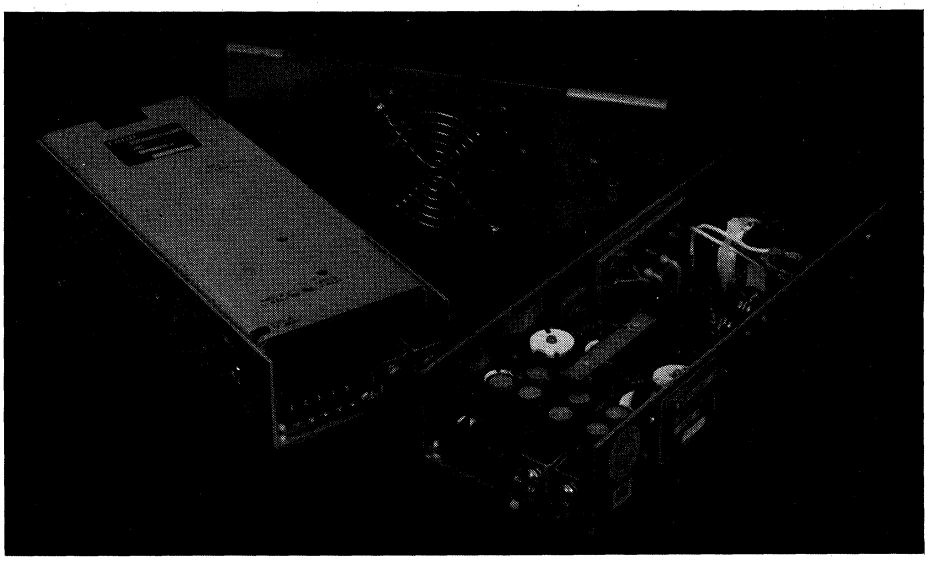
STATUS AND CONTROL

FUNCTION	LOCATION	NOTES	CONNECTOR
Remote Sense	J1-1 (+S)	Output #1 Sense	AMP MTA Type #640456-4 Pin Header (locking)
	J1-2 (−S)	Output #1 Sense Rtn	
*AC Power Fail, or DC Power Good	J1-3 (PF)	Reference to J1-2 (−S)	
Inhibit Input	J1-4 (IH)	Short to J1-2 (−S)	

*Optional Function.

TODD

MULTI-OUTPUT 700 – 750 WATT SWITCHING POWER SUPPLIES



The Shoe Box Alternative

Featuring:

- Cost/Watt Savings of 30%
- 58% Smaller than Equivalent Shoe Box
- 4 watts/in^3
- Meets International Safety Agency Requirements
- All Outputs Fully Regulated
- High Peak Current for Motor Starting
- High Efficiency MAGNA-FLUX Post Regulators
- Reliability Approaching 100,000 hours MTBF
- AC Automatic Line Selection Option

Specify in the appropriate MAX-700 or MAX-750 and get new design freedom for your high-end computer products. Use a system air cooled MAX-700, an optional self-cooled MAX-700 or standard self-cooled MAX-750. You can reduce your product size by replacing a 5″ x 8″ x 11″ shoe box with a 58% smaller MAX-750. Build in power supply redundancy by replacing one shoe box switcher with two MAX-700's in the same space.

Check the specifications and dimensions of these alternatives to shoe box power supplies.

STANDARD MAX SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MAX-703-0512	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	
MAX-704-1205	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	5.2V @ 2.0A
MAX-704-1212	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	12V @ 2.0A
MAX-704-1224	700	+5V @ 100A	+12V @ 12/20 Apk	−12V @ 10.0A	+24V @ 2.0A
MAX-704-1252	700	+5V @ 100A	+12V @ 12/20 Apk	−5.2V @ 10.0A	12V @ 2.0A
MAX-704-2412	700	+5V @ 100A	+24V @ 6/10 Apk	−12V @ 10.0A	12V @ 2.0A
MAX-753-0512	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	
MAX-754-1205	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	5.2V @ 2.0A
MAX-754-1212	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	12V @ 2.0A
MAX-754-1224	750	+5V @ 120A	+12V @ 12/20 Apk	−12V @ 10.0A	+24V @ 2.0A
MAX-754-1252	750	+5V @ 120A	+12V @ 12/20 Apk	−5.2V @ 10.0A	12V @ 2.0A
MAX-754-1512	750	+5V @ 120A	+15V @ 8.0A	−15V @ 8.0A	12V @ 2.0A
MAX-754-2412	750	+5V @ 120A	+24V @ 6/10 Apk	−12V @ 10.0A	12V @ 2.0A

MASS STORAGE MSC SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3
MSC-753-0512	750	+5V @ 120A	+12V @ 20/27 Apk	−12V @ 6A

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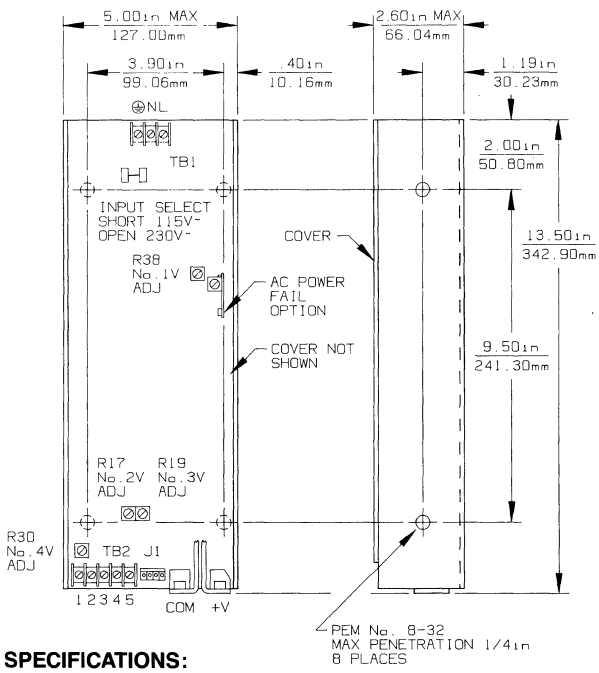
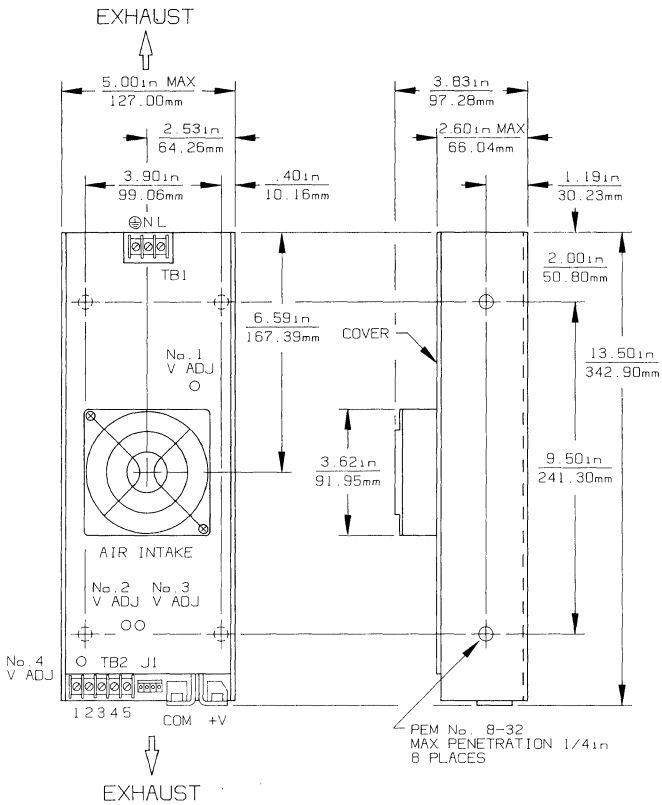
700-750 WATTS 13.5" x 5" x 2.6" MAX MSC





SPECIFICATIONS:

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. See Option "A" for automatic line selection. Internally fused for 15 A.
Adjustability: All outputs user adjustable ±5% minimum, except where noted.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change. Main +5V output requires minimum load of 10%.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense (+5V): Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response (+5V): Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection (+5V): Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 6.8V.
Peak Output Current: Dual current ratings define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Soft Start: Inrush AC current is less than 90 A at 115 Vac, 30 A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 80% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: MAX-700 models require 60 CFM of air to achieve full ratings except when specifying option "F", Fan Assembly. 750 watt models have built-in ball-bearing fan.
Reliability: Over 80,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero.

OPTIONS:

Option "A", AC Auto-Range: Automatically selects proper AC line voltage range to enable power operation at either 115 or 230 Vac, without user intervention.
Option "F", Fan Assembly: Integral ball-bearing fan provides proper cooling to achieve full ratings, at 50° C ambient temperature. 750 watt models have built-in ball-bearing fan.
Option "G", DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc. Not available if Option "P" is selected.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability. Not available if option "G" is selected.

Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select	Short	Open	0.250 Male Fastons
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⊕	Safety Ground	Safety Ground	

DC OUTPUT

FUNCTION	MAX & MTC	MISC	CONNECTOR
Output #1	Terminal marked +V	Terminal marked +V	Bus Bars #1/4-20 Screws
	Terminal marked COM	Terminal marked COM	
Output #2	TB2-3 (+)	TB2-2 and TB2-3 (+)	Barrier Strip #6-32 Screws 3/8" centers
	TB2-4 (RTN)	TB2-1 and TB2-4 (RTN)	
Output #3	TB2-5 (−)	TB2-5 (−)	
	TB2-4 (RTN)	TB2-4 (RTN)	
Output #4 (if provided)	TB2-1 (+)		
	TB2-2 (−)		

Note: Return (RTN) lines are connected to power supply common.

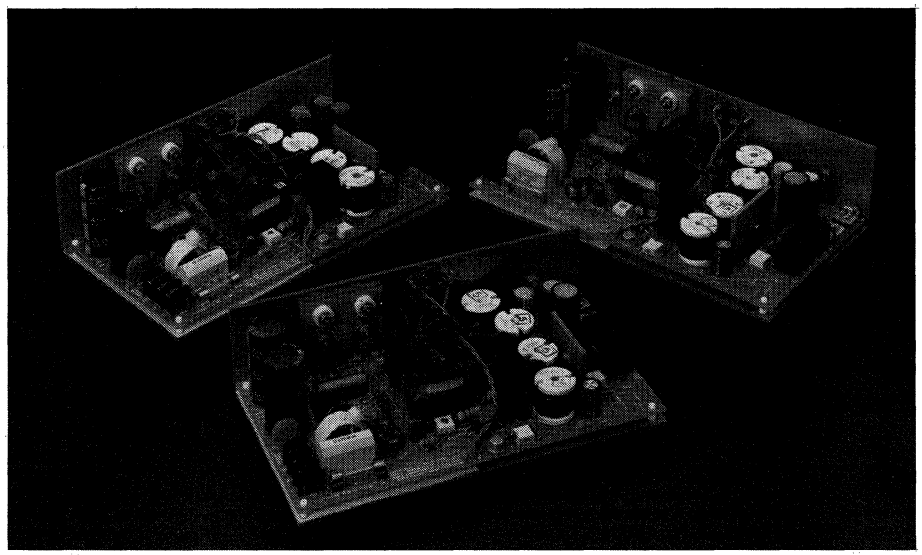
STATUS AND CONTROL

FUNCTION	LOCATION	NOTES	CONNECTOR
Remote Sense	J1-1 (+S)	Output #1 Sense	AMP MTA Type #640456-4 Pin Header (locking)
	J1-2 (−S)	Output #1 Sense Rtn	
*AC Power Fail, or DC Power Good	J1-3 (PF)	Reference to J1-2 (−S)	
Inhibit Input	J1-4 (IH)	Short to J1-2 (−S)	

*Optional Function.

TODD

MULTI-OUTPUT 160 – 220 WATT SWITCHING POWER SUPPLIES



The Price Leaders

Featuring:

- 9″ x 5″ x 2.5″ Package
- TODD's Lowest-Cost Power Supplies
- Over 100,000 hours MTBF
- High Power Densities
- Meets International Safety Agency Requirements
- High Peak Currents for Motor Starting
- AC Automatic Line Selection Option

The leaders of TODD's lower priced switching power supplies, these units are ideal for new OEM Products which are designed for future expansions. Outputs start at 160 Watts and power needs can go to 350 Watts by using the MAX-350 series without changing the footprint.

You'll get up to 30 Amps for logic and memory and peak currents up to 16 Amps for motor starting in a package measuring only 9″ x 5″ x 2.5″. Other features like 100,000 hours MTBF reliability, high power densities, AC autoline select option, and meeting international safety requirements, give design flexibility, low price, and world-wide marketability.

Check the specifications of these "Price Leaders" for your next OEM computer-based or Telecom product design.

STANDARD MDT SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MDT-163-0512R	160	+5V @ 25A	+12V @ 4/9 Apk	12V @ 1.5A	
MDT-164-1212R	160	+5V @ 25A	+12V @ 4/9 Apk	+12V @ 1.0A	−12V @ 1.0A
MDT-164-2412R	160	+5V @ 20A	+24V @ 3/6 Apk	+12V @ 1.0A	−12V @ 1.0A
MDT-223-0512R	220	+5V @ 30A	+12V @ 6/10 Apk	12V @ 2.5A	
MDT-223-1212R	220	+5V @ 10A	+12V @ 10/16 Apk	−12V @ 1.0A	
MDT-224-1212R	220	+5V @ 30A	+12V @ 6/10 Apk	+12V @ 1.5A	−12V @ 1.5A
MDT-224-2412R	220	+5V @ 25V	+24V @ 4/8 Apk	+12V @ 1.5A	−12V @ 1.5A

TELECOM MTC SERIES

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3
MTC-163-0512	160	+5V @ 30A	+12V @ 1.5A	−12V @ 1.5A
MTC-163-0515	160	+5V @ 30A	+15V @ 1.5A	−15V @ 1.5A

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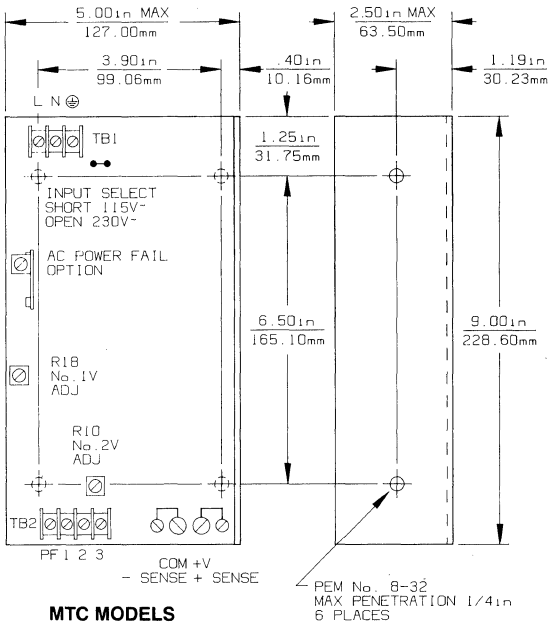
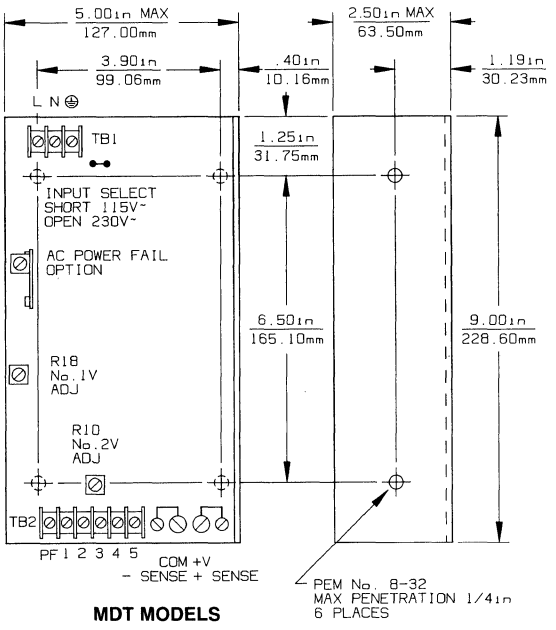
160-220 WATTS
9″ x 5″ x 2.5″
MDT MTC



MTC MODELS



MDT MODELS

SPECIFICATIONS: ALL MODELS.

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. Internally fused for 7 A.
Adjustability: Main output and output #3 user adjustable ±5% minimum. Output #4 (Output #3 on MTC series) is not adjustable, and has ±5% initial accuracy.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change. On MDT series only, Output #2 holds ±5% total regulation band, including the combined effects of line regulation, load regulation for a load change of ±40% from 60% initial load, and cross regulation due to a load change of ±25% on the +5V line from 60% initial load. Maximum combined currents on Output #1 and #2 cannot exceed Output #1 rating, except for MDT-223-1212R. Main +5V output requires a minimum load of 20%, for all models.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense (+5V): Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response (+5V): Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection (+5V): Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 6.8V.
Peak Output Current: Dual current ratings define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Soft Start: Inrush AC current is less than 16 A at 115 Vac, 32 A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 75% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full ratings at 220 watts. 160 watt models are convection cooled.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.

OPTIONS:

Option "A", AC Auto-Range: Automatically selects proper AC line voltage range to enable power operation at either 115 or 230 Vac, without user intervention.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability.
Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select	Short	Open	#16 Bus jumper
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8″ Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

DC OUTPUT

FUNCTION	MDT-163 & MDT-223	MDT-164/224	MTC-163
Output #1	Terminal marked +5	Terminal marked +5	Terminal marked +5
	Terminal marked COM	Terminal marked COM	Terminal marked COM
Output #2	TB2-3 (+)	TB2-4 (+)	TB2-3 (+)
	TB2-4 (RTN)	TB2-5 (RTN)	TB2-2 (RTN)
Output #3	TB2-2 (+)	TB2-3 (+)	TB2-1 (−)
	TB2-1 (−)	TB2-2 (RTN)	TB2-2 (RTN)
Output #4 (if provided)		TB2-1 (−)	
		TB2-2 (RTN)	

Note: Return (RTN) lines are connected to power supply common.
Connector: All Outputs, #6-32 Screws.

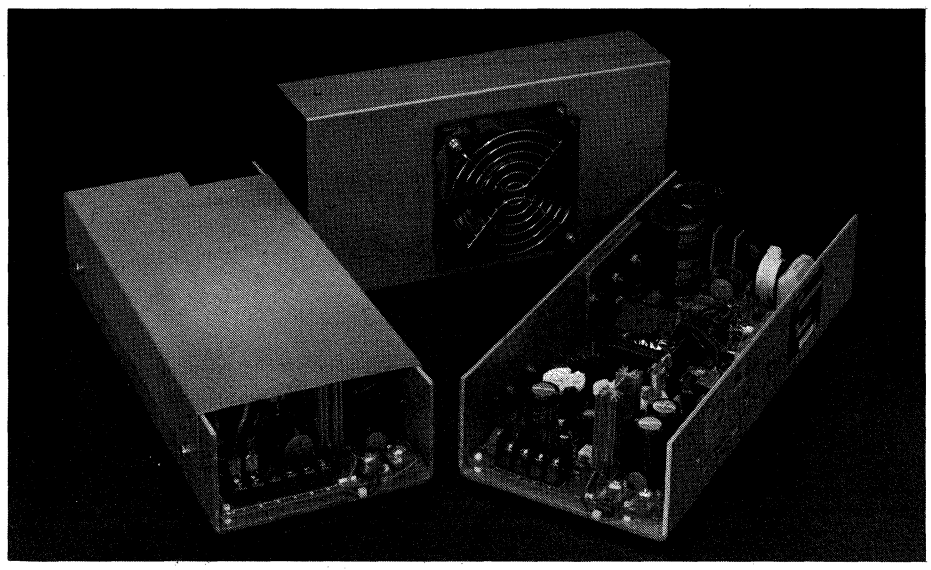
STATUS AND CONTROL

FUNCTION	LOCATION	NOTES	CONNECTOR
Remote Sense (+5V line)	Terminal marked +S	Output #1 Sense	#6-32 Screws
	Terminal marked −S	Output #1 Sense Rtn	
* AC Power Fail	TB2-PF	Reference to −S	

*Optional Function

TODD

MULTI-OUTPUT 400 WATT SWITCHING POWER SUPPLIES



The Mature Performer

Featuring:

- 11.5″ x 5″ x 2.5″ Package
- High Power Densities
- Proven in Thousands of Applications
- More than 100,000 hours MTBF
- Total Regulation Band of less than ±1%
- Meets International Safety Agency Requirements

These units are specifically designed for optimum cost/performance characteristics in OEM computer-based equipment ranging from engineering workstations to AI computers. Fully regulated outputs power up to 70 Amps of Logic and provide +12 volts, 16 Amps peak for up to four hard disk drives.

Check the specifications of these Mature Performers when you need the assurance of power supplies proven in thousands of applications.

400 WATTS 11.5″ x 5″ x 2.5″

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
MTX-403-0512	400	+5V @ 60A	+12V @ 10/16 Apk	12V @ 2.0A	
MTX-403-5012	400	+5V @ 70A	+12V @ 1.0A	−12V @ 1.0A	
MTX-404-1205	400	+5V @ 60A	+12V @ 10/16 Apk	−5.2V @ 2.0A	12V @ 2.0A
MTX-404-1212	400	+5V @ 60A	+12V @ 10/16 Apk	12V @ 2.0A	12V @ 2.0A
MTX-404-1224	400	+5V @ 60A	+12V @ 10/16 Apk	+24V @ 2.0A	12V @ 2.0A
MTX-404-2405	400	+5V @ 60A	+12V @ 10/16 Apk	−5.2V @ 2.0A	+24V @ 2.0A
*MDX-404-2412R	400	+5V @ 55A	+24V @ 5/10 Apk	+12V @ 10.0A	12V @ 2.0A

*Note 1: Minimum load for Outputs #1 and #2 is 20%. Total regulation band for Output #2 is ±10%.

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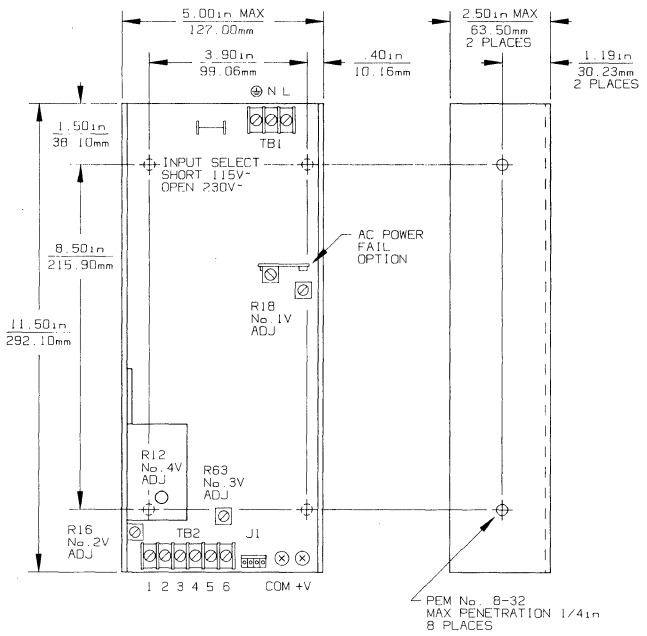
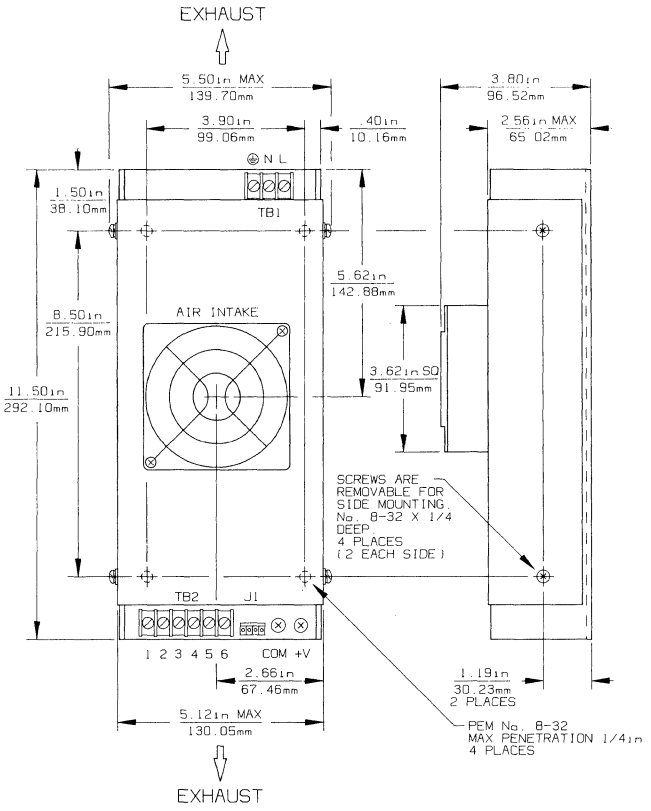
400 WATTS
11.5" x 5" x 2.5"
MTX MDX





SPECIFICATIONS: ALL MODELS.

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. Internally fused for 10 A.
Adjustability: All outputs user adjustable ±5%. See Note 1 for MDX-404-2412R.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change. Main +5V output requires minimum load of 10%. See Note 1 for MDX-404-2412R.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense (+5V): Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response (+5V): Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection (+5V): Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 6.8V.
Peak Output Current: Dual current ratings, define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Soft Start: Inrush AC current is less than 16 A at 115 Vac, 16 A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 75% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full ratings. MDX models require 60 CFM.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero. Available on MTX models.

OPTIONS:

Option "C", Cover: Limits contact with power supply interior. Add "C" suffix to model number.
Option "F", Fan/Cover Assembly: Cover with integral ball-bearing fan provides proper cooling to achieve full ratings, at 50°C ambient temperature.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability.

Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select	Short	Open	#18 Bus
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

DC OUTPUT

FUNCTION	MTX Series	MTX-403-5012	MDX-404 Series
Output #1	+V Terminal	+V Terminal	+V Terminal
	COM Terminal	COM Terminal	COM Terminal
Output #2 **	TB2-5(+ or −)	TB2-1 (+)	TB2-5 (+)
	TB2-6(RTN)	TB2-2 (RTN)	TB2-6 (−)
Output #3 **	TB2-3 (+)	TB2-3 (RTN)	TB2-3 (+)
	TB2-4 (−)	TB2-4 (−)	TB2-4 (−)
Output #4 ** (if provided)	TB2-1 (+)		TB2-1 (+)
	TB2-2 (−)		TB2-2 (−)

Connector: Output #1, Bus Bars, #10-32 Screws/All others, Barrier Strip, #6-32 Screws, 3/8" centers. **(Output return line is connected at factory to power supply common, to provide polarity shown in product listing.)

STATUS AND CONTROL

FUNCTION	MTX Series	MTX-403-5012	MDX-404 Series
Remote Sense (+5V line)	J1-1 (+S)	J1-1 (+S)	J1-1 (+S)
	J1-2 (−S)	J1-2 (−S)	J1-2 (−S)
AC Power Fail	J1-3 (PF)	J1-3 (PF)	J1-3 (PF)
Power Inhibit	J1-4 (IH)	J1-4 (IH)	Not Available
Connector AMP MTA Type	# 3640456-4 Locking	# 3640456-4 Locking	# 640098-3 Non-Locking

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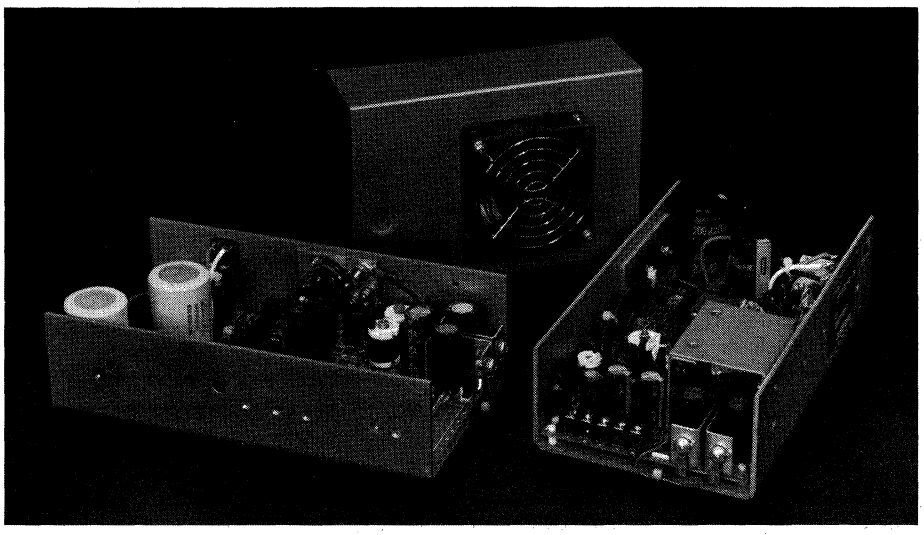
TODD

DC/DC CONVERTERS 250 WATT SINGLE OUTPUT 350 WATT MULTI-OUTPUT



The DC/DC Powerhouse

Featuring:

- 9″ x 5″ x 2.5″ Package
- 3 watts/in³ Power Density
- Over 100,000 hours MTBF
- Fully Regulated, High Efficiency Mag Amp Outputs
- Expandable to Include Isolation Diodes and Modified Current Sharing
- High Efficiency MAGNA-FLUX Post Regulators
- System Air or Self-Cooling Option

In single and multiple-outputs, these highly efficient, low profile converters were designed for critical applications in telecommunications equipment, computers, industrial control machinery and medical electronic equipment, where power failure cannot be tolerated.

With fully regulated high efficiency mag-amp outputs, and up to 12 Amps peak, the converters can power up to four disk drives. Units can be expanded to include isolation diodes and modified current sharing for redundancy. Optional DC power fail is available, as are optional fan/cover assemblies.

Check the specifications of these DC/DC Powerhouses when you're designing your next "Can't Fail" product.

SINGLE OUTPUT – DC INPUT 9″ x 5″ x 2.5″

MODEL	OUTPUT RATING	PWR OUT
DC5-50	5V @ 50A	250w
DC12-21	12V @ 21A	250w
DC15-17	15V @ 17A	250w
DC24-11	24V @ 11A	250w
DC28-9	28V @ 9A	250w
DC48-5.5	48V @ 5.5A	250w

MULTI-OUTPUT–DC INPUT 9″ x 5″ x 2.5″

MODEL	PWR	OUTPUT #1	OUTPUT #2	OUTPUT #3	OUTPUT #4
DCT-253-0515	250	+5V @ 30A	+15V @ 4.0A	−15V @ 4.0A	
DCT-253-0512	250	+5V @ 30A	+12V @ 5.0A	−12V @ 5.0A	
DCT-353-0512	350	+5V @ 45A	+12V @ 6.0A	−12V @ 6.0A	
DCT-353-0515	350	+5V @ 45A	+15V @ 5.0A	−15V @ 5.0A	
DCX-353-0512	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	
DCX-354-1224	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	24V @ 1.5A
DCX-354-1205	350	+5V @ 50A	+12V @ 8/12 Apk	−12V @ 4.0A	5.2V @ 2.0A

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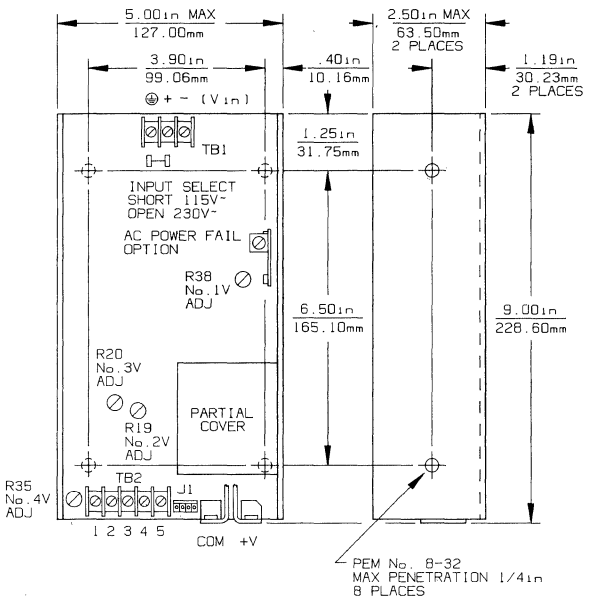
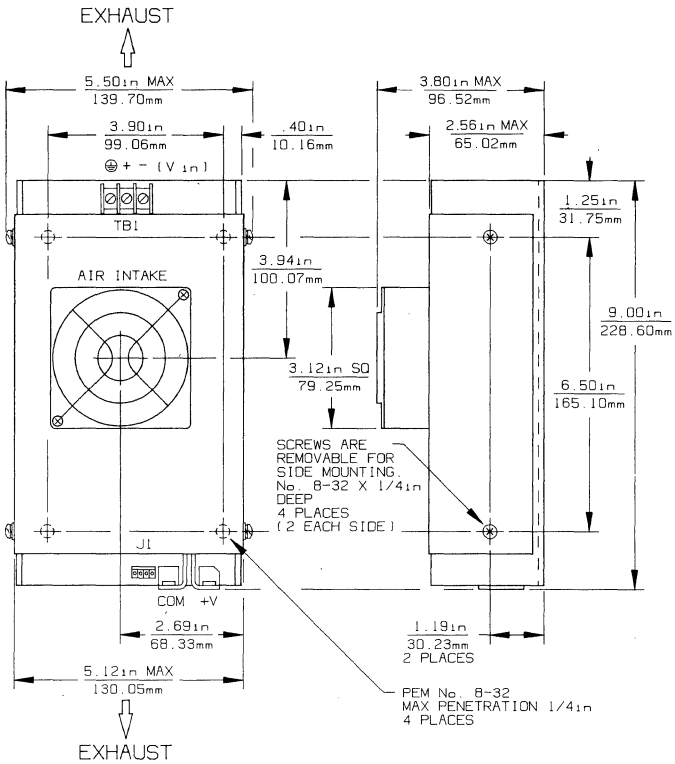
250-350 WATTS
9" x 5" x 2.5"
DC DCT DCX





SPECIFICATIONS: ALL MODELS.

DC Input: 48 Vdc, nominal. 40.8 Vdc to 60 Vdc Range (See Note 1).
Adjustability: All outputs user adjustable ±5% minimum, except where noted.
Line & Load Reg: ±1% over DC input range and 0 to 100% load change. Multiple output units require a minimum load of 10% on the +5 V output when drawing full load on the auxiliary outputs.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense: Compensates for 250 mV total line drop. Multioutput units provide remote sense on main (+5V) output only. Open sense lead protection is standard.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response: Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection: Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 6.8V on +5V output of multi-output models. Single output models are set to limit overvoltage to 136% of nominal.
Peak Output Current: Dual current ratings define continuous and peak currents. The peak current shown can be delivered for a maximum period of 30 seconds.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 75% typical.
Output Isolation: Isolated from ground 50 V. Single output models rated at 48 V nominal have 100V isolation.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full ratings.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero.

OPTIONS:

Option "C", Cover: Limits contact with power supply interior. Add "C" suffix to model number.
Option "F", Fan/Cover Assembly: Cover with integral ball-bearing fan provides proper cooling to achieve full ratings, at 50° C ambient temperature.
Option "G", DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc.
Note 1: Consult factory for other available options, and input voltage range.

DC INPUT

FUNCTION	−48 Vdc	CONNECTOR
TB1-(−)	−48Vdc Input	Barrier #6-32 Screws 3/8" Centers
TB1-(+)	−48Vdc Return	
TB1-⏚	Safety Ground	

DC OUTPUT

FUNCTION	LOCATION	NOTES	CONNECTOR
Output #1 (DC, DCX & DCT)	Terminal marked +V		Buss Bars #10-32 Screws
	Terminal marked COM	5 Volt Common line	
Output #2 (DCX & DCT only)	TB2-3 (+)		Barrier Strip #6-32 Screws 3/8" centers
	TB2-4 (RTN)	Aux Common	
Output #3 (DCX & DCT only)	TB2-5 (−)		
	TB2-4 (RTN)	Aux Common	
Output #4 (DCX Series) (If provided)	TB2-1 (+)	Return leg connected to Aux Common line (See product listing)	
	TB2-2 (−)		

STATUS AND CONTROL

FUNCTION	LOCATION	NOTES	CONNECTOR
Remote Sense	J1-1 (+S)	Output #1 Sense	AMP MTA Type #640456-4 Pin Header (locking)
	J1-2 (−S)	Output #1 Sense Rtn	
*DC Power Good	J1-3 (PF)	Reference to J1-2 (−S)	
Inhibit Input	J1-4 (IH)	Short to J1-2 (−S)	

*Optional Function

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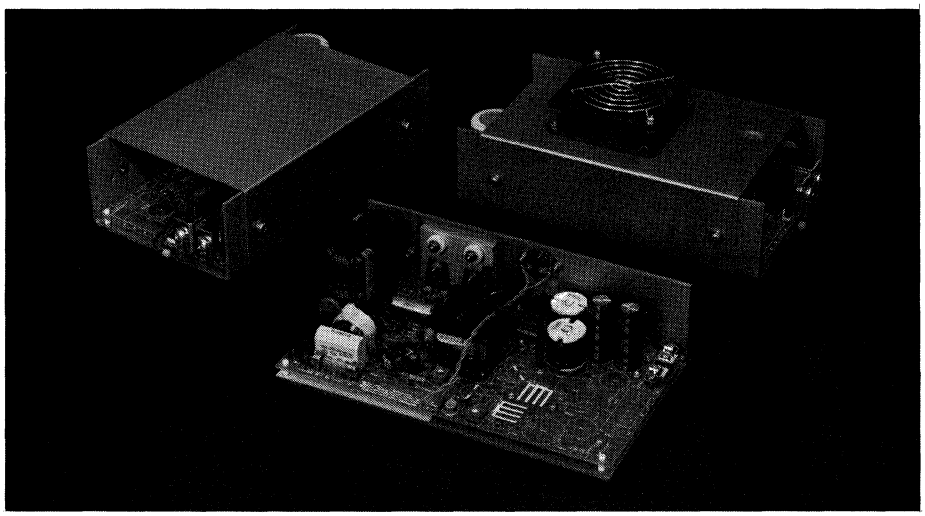
TODD

SINGLE OUTPUT, MULTI-PURPOSE 150 – 250 WATT SWITCHING POWER SUPPLIES



The Single Choice

Featuring:

- 9″ x 5″ x 2.5″ Package
- Output Voltages from 5V to 48V
- Meets International Safety Agency Requirements
- More than 100,000 hours MTBF
- Remote Sense, Thermal Protection, and OVP
- Units Cannot be Damaged by No-load or Low Line Conditions
- System Air or Self-Cooled Option
- AC Automatic Line Selection Option

Switchers in this series are the single choice for power supplies that must withstand the harsh environments that typify industrial control applications. Yet, they include the sophistication and advance design features that are needed to power computer and telecommunications systems.

Designed around TODD's proprietary VERI-DRIVE PLUS current fed inverter topology and unique monocoque construction, these switching power supplies are up to 31% smaller than competitive products and have efficiencies of up to 85%.

All of these SC Series Models are the single choice for worldwide marketability.

150 WATT 9″ x 5″ x 2.5″ L FRAME

MODEL	OUTPUT RATING	PWR OUT
SC5-30	5V @ 30A	150w
SC12-15	12V @ 15A	180w
SC15-12	15V @ 12A	180w
SC24-7.5	24V @ 7.5A	180w
SC28-6.5	28V @ 6.5A	180w
SC48-3.7	48V @ 3.7A	180w

250 WATT 9″ x 5″ x 2.5″ U FRAME

MODEL	OUTPUT RATING	PWR OUT
SC5-50	5V @ 50A	250w
SC12-21	12V @ 21A	250w
SC15-17	15V @ 17A	250w
SC24-11	24V @ 11A	250w
SC28-9	28V @ 9A	250w
SC48-5.5	48V @ 5.5A	250w

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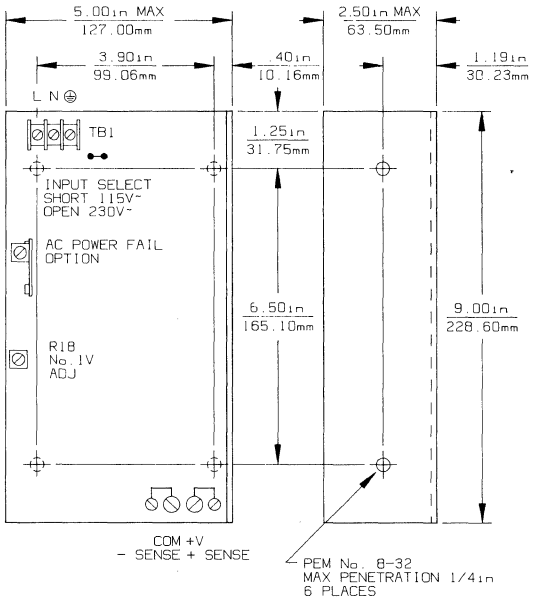
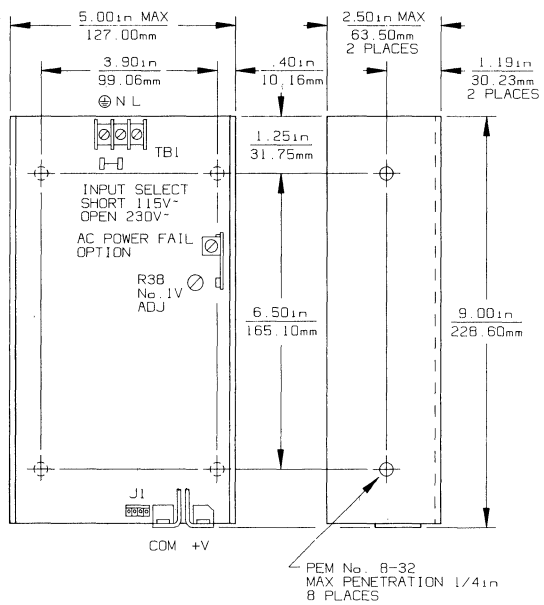
150-250 WATTS 9" x 5" x 2.5" SC





SPECIFICATIONS: ALL MODELS.

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. See Option "A" for automatic line selection. 150 watt units fused for 7 A, 250 watt units fused for 10 A.
Adjustability: ±10% minimum.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense: Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response: Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection: Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 136% of nominal.
Soft Start: Inrush AC current is less than 16 A at 115 Vac, 32 A at 230 Vac on 150 watt models, and 10 A at 115 Vac, 18 A at 230 Vac on 250 watt models.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 80% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V, except 100V for 48 Vdc models.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full rating.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero. Not available in 150 or 180 watt units.

OPTIONS (ALL MODELS):

Option "A", AC Auto-Range: Automatically selects proper AC line voltage range to enable power operation at either 115 or 230 Vac, without user intervention.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability. Not available if option "G" is selected.

OPTIONS (250 WATT MODELS ONLY):

Option "C", Cover: Limits contact with power supply interior. Add "C" suffix to model number.
Option "F", Fan/Cover Assembly: Cover with integral ball-bearing fan provides proper cooling to achieve full ratings, at 50°C ambient temperature.
Option "G", DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc. Not available if Option "P" is selected.
Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select	Short	Open	#18 Bus jumper
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

DC OUTPUT

FUNCTION	150 Watt SC Series	250 Watt SC Series
Output Voltage	Terminal marked +5	Terminal marked +5
	Terminal marked COM	Terminal marked COM
Termination	Bus Bars #6-32 screws	Bus Bars #10-32 Screws

STATUS AND CONTROL

FUNCTION	150 Watt SC Series	250 Watt SC Series	CONNECTOR
Remote Sense	Terminal marked +S	J1-1 (+S)	150 Watt: #6-32 screws 3/8" centers 250 Watt: AMP MTA Locking Type #640456-4 Pin Header
	Terminal marked −S	J1-2 (−S)	
*AC Power Fail, or DC Power Good	TB2-PF (Ref to −S)	J1-3 (PF) Ref to −S	
Inhibit Input	Not Available	J1-4 (IH) Short to −S	

*Optional Function

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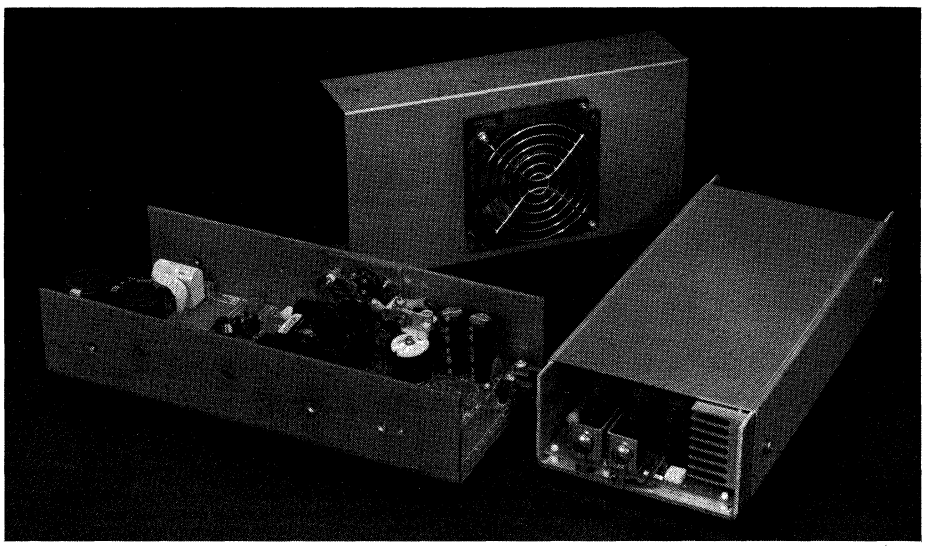
TODD

SINGLE OUTPUT, MULTI-PURPOSE 350 – 500 WATT SWITCHING POWER SUPPLIES



The Single Choice

Featuring:

- 11.5″ x 5″ x 2.5″ Package
- Output Voltages from 5V to 48V
- Power Density to 3 watts/in³
- Meets International Safety Agency Requirements
- More than 100,000 hours MTBF
- Remote Sense, Thermal Protection, and OVP
- Units Cannot be Damaged by No-load or Low Line Conditions
- AC Automatic Line Selection Option

Consider this series for your single choice of switching power supplies used in the design of high end OEM products ranging from process controls to sophisticated telecommunications systems.

Incorporating TODD design features such as surface mount components and single PCB construction for high reliability, these switchers are rugged enough to withstand the harsh environments that typify industrial control applications and also incorporate the sophistication and advance design features needed to power computer and telecommunications systems.

Check out the specifications of this series, your single choice for single output switchers.

350 WATT SERIES 11.5″ x 5″ x 2.5″

MODEL	OUTPUT RATING	PWR OUT
SC5-70	5V @ 70A	350w
SC12-30	12V @ 30A	360w
SC15-24	15V @ 24A	360w
SC24-15	24V @ 15A	360w
SC28-13	28V @ 13A	360w
SC48-8	48V @ 8A	360w

500 WATT SERIES 11.5″ x 5″ x 2.5″

MODEL	OUTPUT RATING	PWR OUT
SC5-100	5V @ 100A	500w
SC12-42	12V @ 42A	500w
SC15-34	15V @ 34A	500w
SC24-21	24V @ 21A	500w
SC28-18	28V @ 18A	500w
SC48-11	48V @ 11A	520w

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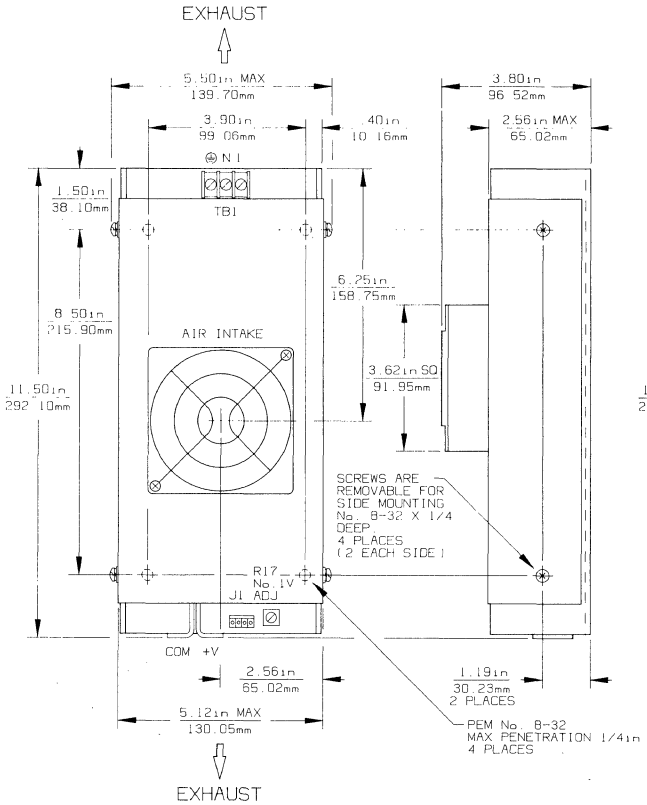
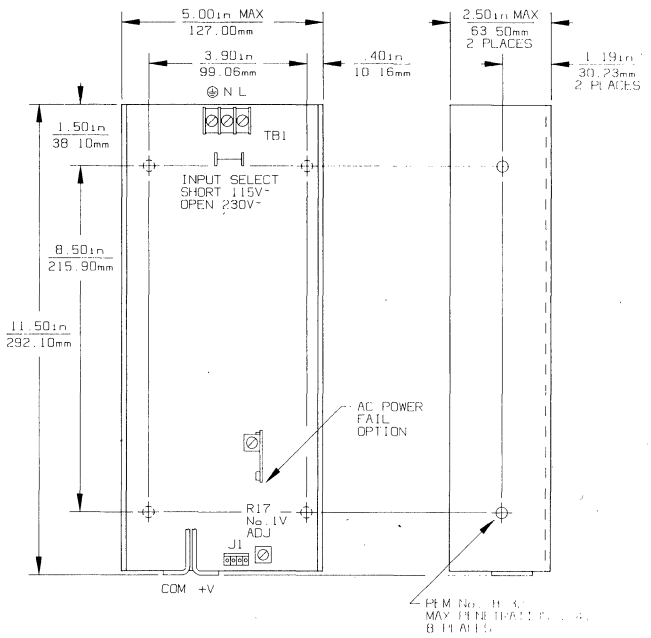
350-500 WATTS 11.5" x 5" x 2.5" SC





SPECIFICATIONS: ALL MODELS.

AC Input: 90-132 Vac/180-264 Vac, 47 to 63 Hz. User selectable. See Option "A" for automatic line selection. 350 watt units fused for 10 A, 500 watt units fused for 15 A.
Adjustability: ±10% minimum.
Line & Load Reg: ±1% over AC input range and 0 to 100% load change.
Ripple & Noise: Less than 0.2% rms, 1% p-p or 100 mV, whichever is greater.
Remote Sense: Compensates for 250 mV total line drop. Open sense lead protection.
Temperature Coefficient: 0.02% per degree C.
Stability: 0.1% over 8 hours after 30 minutes warm-up.
Transient Response: Output voltage returns to within 1% in less than 500 μsec for a 50% load change. Peak transient does not exceed 5%.
Overload Protection: All outputs are protected against overload and short circuit. Automatic recovery upon removal of fault.
Overvoltage Protection: Protects load against power supply induced overvoltage. Trip point is factory set so that output voltage cannot exceed 136% of nominal.
Soft Start: Inrush AC current limiting circuitry holds peak current to less than 80 A at 115 Vac, 20 A at 230 Vac.
Brownout Protection: Holds regulation to 85 Vac or 170 Vac.
Thermal Protection: Shuts down power supply if overheated. Automatic recovery.
Holdup Time: 16 ms minimum after removal of power, at nominal line, full load.
Temperature Range: 0 to 50°C full ratings. Derate to half power at 70°C.
Efficiency: 80% typical.
Safety Agencies: Approved to UL478, UL 1950, CSA22.2 bulletins 1402c and #234, IEC950, VDE 0805 / VDE 0806 class 1 SELV and EN 60 950.
Conducted RFI: Meets FCC Part 15, Subpart J, and VDE 0871, Class A. Contact factory for information on VDE 0871 Class B compliance.
Output Isolation: Isolated from ground 50 V, except 100V for 48Vdc models.
Reverse Voltage: Protected against reverse voltage up to supply current rating.
Cooling: 30 CFM required to achieve full ratings.
Reliability: Over 100,000 hours MTBF, when calculated in accordance with MIL-HDBK-217.
Remote Inhibit: Contact closure to the negative sense line, drops output power to nominal zero. Not available in 150 watt units.

OPTIONS:

Option "A", AC Auto-Range: Automatically selects proper AC line voltage range to enable power operation at either 115 or 230 Vac, without user intervention.
Option "C", Cover: Limits contact with power supply interior. Add "C" suffix to model number.
Option "F", Fan/Cover Assembly: Cover with integral ball-bearing fan provides proper cooling to achieve full ratings, at 50°C ambient temperature.
Option "G", DC Power Good: Provides a TTL "0" when output #1 is below 4.6 Vdc. Not available if Option "P" is selected.
Option "P", Power Fail: Provides TTL "0", 5 ms before output voltage goes out of regulation band, upon loss of AC power. VMEbus compatible, provides 48ma sink current capability. Not available if option "G" is selected.
Consult factory for other available options.

AC INPUT

FUNCTION	115 Vac	230 Vac	CONNECTOR
Input Select	Short	Open	#18 Bus jumper
TB1-L	Line	Line 1	Barrier Strip #6-32 Screws 3/8" Centers
TB1-N	Neutral	Line 2	
TB1-⏚	Safety Ground	Safety Ground	

DC OUTPUT

FUNCTION	350 Watt SC Series	500 Watt SC Series
Output Voltage	Terminal marked +5	Terminal marked +5
	Terminal marked COM	Terminal marked COM
5 Volt Unit Termination	Bus Bars #1/4-20 Screws	Bus Bars #1/4-20 Screws
12 Through 48 Volt unit Termination	Bus Bars #1/4-20 Screws	Bus Bars #1/4-20 Screws

STATUS AND CONTROL

FUNCTION	350 W and 500 W	NOTES	CONNECTOR
Remote Sense	J1-1 (+S)		AMP MTA Locking Type #640456-4 Pin Header
	J1-2 (−S)		
*AC Power Fail, or DC Power Good	J1-3 (PF)	Reference to −S	
Inhibit Input	J1-4 (IH)	Short to −S	

*Optional Function

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TODD

OPTIMUM POWER SOLUTIONS

Quality starts with understanding customers' needs so that we can provide the optimum solution to meet their requirements. By developing close partnerships with our customers, we've been able to provide power solutions for hundreds of applications. With Todd as your power supply engineering partner, you'll have access to the best combination of a broad line of standard products, a low-cost modified or repackaged product, or a fully customized product designed specifically for your application.

MODIFIED STANDARDS

Our standard catalog product line is a comprehensive mix of over 100 units configured for applications in power ranges from 160 watts to 1000 watts. Since all of our standard products within a given series utilize a platform type of design, we are often able to easily modify a standard product to meet a customer's unique application. Each mother board is configurable to many different voltages and will support components and magnetics for a wide range of power. We can also modify performance features, mechanical and electrical characteristics, and options as the customer requires.

FROM BLOOD ANALYZERS TO ATMs

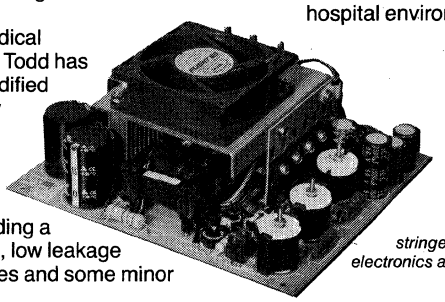
From our standard line to our highly customized designs, we've produced power supplies for hundreds of specialized applications. For example:

- Blood Analyzers
- Blood Processors
- Patient Attached Monitors
- VXIbus Computers
- Work Stations
- Graphics Processors
- Ruggedized Computer Systems
- Automobile Diagnostics
- Automatic Teller Machines
- Lottery Terminals
- High Definition TV Transmitters
- PBX Systems
- Paging Systems

MEDICAL ELECTRONICS

Very demanding requirements are imposed on power supplies used in medical electronics equipment, with reliability being paramount. The requirements of UL544 and IEC601 for patient attachment, for example, impose stringent AC line leakage limits.

Working closely with medical equipment manufacturers, Todd has provided cost-effective modified standards as well as highly customized designs that meet their requirements. For example, Todd engineers were able to modify a standard supply by including a special transformer design, low leakage RFI filters, AC input changes and some minor repackaging with no transformer isolation required. The results were a reliable, field proven unit, meeting the medical leakage requirements, and incorporating the special line transient suppression to survive line voltage transients sometimes found in hospital environments.

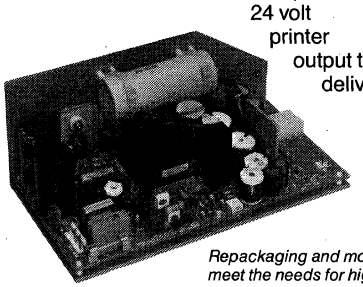


Designed from the ground up, this power supply meets the needs of a stringent medical electronics application.

HIGH PEAK CURRENT PRINTERS

Impact printers used in applications ranging from lottery terminals to ATM machines, place unusual load requirements on the power supply. For example, a system using a 4 output power supply, with an average power demand of 200 watts would require the 24 volt printer output to deliver peak currents of 55 amps, or over 1300 watts. How the power supply handles these peak currents impacts greatly on cost, reliability, and system performance.

Todd engineers were able to identify the critical factors required by the customer for his marketplace, and offer a modified standard to meet his needs. Modifications included incorporating high peak power capability to the inverter, adding an averaging filter, and special control functions to indicate proper DC output. Input and output connectors were added for faster system assembly, and the chassis was custom shaped for easy mounting.



Repackaging and modifications to a standard supply meet the needs for high peak current printers.

TODD PRODUCTS CORP, 50 EMJAY BLVD., BRENTWOOD, NEW YORK 11717 • (516) 231-3366 • 1-800-223-TODD • FAX (516) 231-3473

OPTIMUM POWER SOLUTIONS

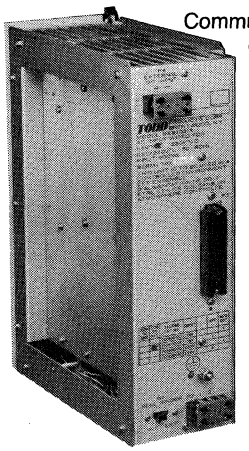
REPACKAGED STANDARDS

Many times we can offer our customers a repackaged standard to meet specific system requirements. For example, we can repackage a standard product to include a special electrical feature, or a "bell or whistle" by revising the pc board artwork. Or we can repackage a standard product for a special mechanical requirement, such as connectivity. We can convert a standard power supply into a very low profile unit to fit into a pre-existing envelope or mounting arrangement. A "repackaged" standard is often the best solution to a customer's special need.

FULL CUSTOM POWER SUPPLIES

Sometimes a customer's requirements are so unique that the power supply must be designed from the ground up. With Todd as your power supply partner, you'll have access to one of the best and most experienced engineering teams in the power supply industry. Since our inception we have been specialists in producing fully captive designs with customized form, fit, and functions. Working closely with our customers' engineering and program management people, our goal is to ensure that each power supply will be the optimum design.

COMMUNICATIONS EQUIPMENT



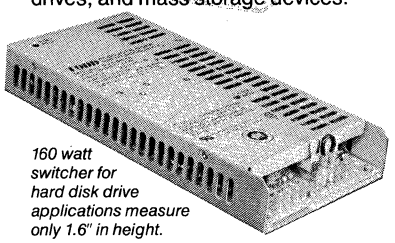
Communications equipment manufacturers of PBX, central office equipment and other critical applications, require a high degree of reliability from their power sources.

A unique plug-in switching power supply provided the optimum solution for a leading telecom manufacturer. For this PBX application, Todd engineers designed a 395 watt, plug-in chassis, switching power supply. The unit connects into the backplane to provide DC power to the PBX cards. It features free convection cooling, DC battery back-up and meets the customer's critical reliability requirements.

Custom-design plug-in switcher for PBX systems.

PERIPHERALS

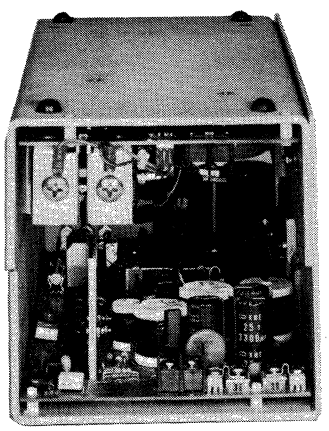
The Todd standard product line includes an extensive series of power supplies that meet a broad range of computer applications. When a recent customer requirement for a low profile switcher could not be met with a standard product, Todd engineers designed a 160 watt switcher, measuring only 1.6" in height, that met all of the customer's requirements for use in SCSI drives, removeable hard drives, and mass storage devices.



160 watt switcher for hard disk drive applications measure only 1.6" in height.

FAULT TOLERANT SYSTEMS

One of the key requirements of this market is N + 1 redundancy and power sharing. While there are a number of workable methods to achieve redundancy, a concern is cost-effectiveness. Analyzing the requirements for cost-effective reliability, Todd engineers were able to incorporate an innovative "zero-wire" power sharing system and built-in diode isolation into a standard product. The end result was an N + 1 redundant system that was more effective and reliable than other proposed systems.



Modified standard product features N + 1 redundancy.

CALL THE SWITCHER SPECIALISTS

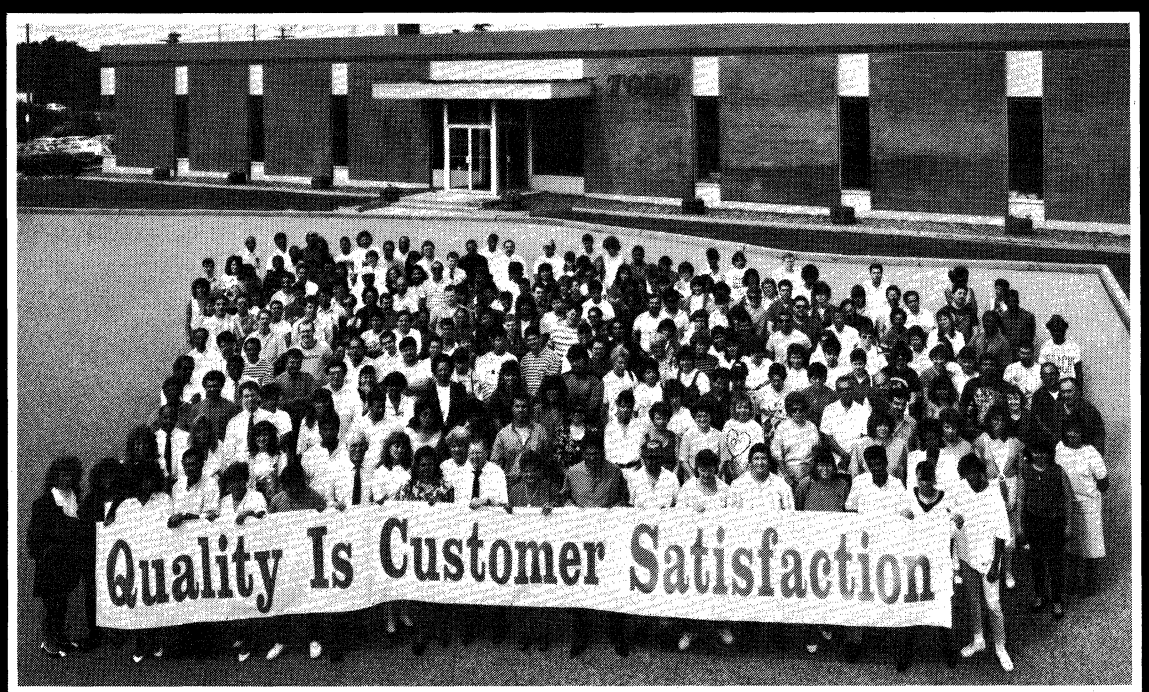
The solution to your specific power supply problems begins by dialing our 800 number. This is an easy way to contact one of our switcher specialists. Many times, we can solve a problem with a standard product, or a modified or repackaged standard. Or we'll work with you on a custom design. Working with Todd as your power supply partner, you'll be assured of the optimum power supply solution.

TODD PRODUCTS CORP., 50 EMJAY BLVD., BRENTWOOD, NEW YORK 11717 • (516) 231-3366 • 1-800-223-TODD • FAX (516) 231-3473

TODD

SWITCHING POWER SUPPLIES FOR OEM PRODUCTS

Put the TODD Team On Your Team Today.



At TODD, building relationships is as important as building products.

FOR MORE INFORMATION, OR TO PLACE YOUR ORDER, CONTACT:

TODD
PRODUCTS CORP.
50 EMJAY BLVD., BRENTWOOD, NEW YORK 11717
1-800-223-TODD (516) 231-3366
FAX (516) 231-3473

TOTAL POWER INTERNATIONAL, INC.

418 Bridge Street, Lowell, MA 01850 Telephone (508) 453-7272
FAX (508) 453-7395

- **SWITCHERS**
- **LINEARS**
- **DC/DC CONVERTERS**

THE COMPANY

Total Power is a leading supplier of switching and linear power supplies and DC-DC converters with manufacturing facilities in the USA, Europe and Taiwan. Our present product line consists of open frame and cased power supplies from 1 to 600 watts and DC-DC converters from 1 to 100 watts.

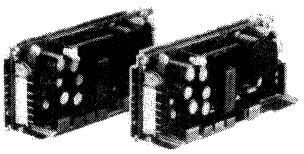
Many products are UL/CSA/TUV or VDE approved and meet medical I/O leakage current (less than 10 ua) requirements. We manufacture a very wide range of industry standard products and specialize in custom-design power supplies which are based on proven standard designs. Typical turn around time is from 4 to 8 weeks for prototypes.

WORLDWIDE MARKETING AND SALES

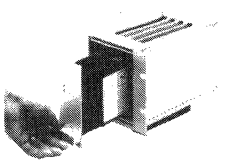
Total Power International, Inc. markets products in the USA and Canada and is associated with Klaasing Electronics B.V. of the Netherlands. This organization markets the same product line throughout Europe. An immediate advantage to our exporting customers in both the USA and Europe is that standard products are available off-the-shelf in many locations around the world.

UNIVERSAL INPUT SWITCHING POWER SUPPLIES

FEATURES:
- Universal Input 90-264 VAC
- Compact Size
- Single, Dual, Triple Outputs
- 10-60 Watts
- 30 Models Available
- UL, CSA, TUV (VDE) Approved



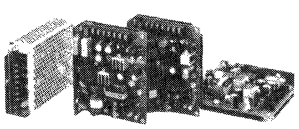
EUROCARD/VME SWITCHING POWER SUPPLIES



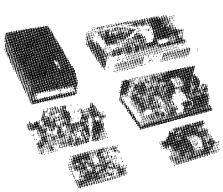
FEATURES:
- Designed for VME-Bus System Rack
- High Efficiency 100KHz MosFet Design
- Standard Eurocard Box Construction
- Over 50 Models Available
- 45 to 200 Watts
- Meets VDE 0806 Safety Requirements
- Meets VDE 0871 Curve B EMI Limits

LOW PROFILE SWITCHING POWER SUPPLIES

FEATURES:
- High Efficiency up to 85%
- Single, Dual and Triple Outputs
- Over 50 Models Available
- 8 to 150 Watts
- UL/CSA Approved



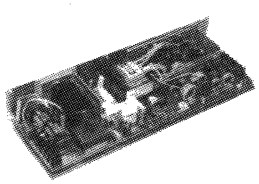
INTERNATIONAL SWITCHING POWER SUPPLIES



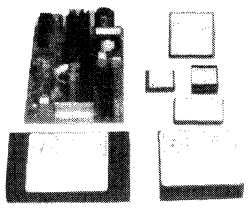
FEATURES:
- Meets International EM/RFI Standards
- UL, CSA, TUV (VDE) Recognition
- Up to 4 Output Combinations
- Over 100 Standard Models Available
- PCB, L-Bracket, Box Constructions

HIGH POWER SWITCHING POWER SUPPLIES

FEATURES:
- 165 to 600 Watts
- Up to 5 Output Combinations
- UL, CSA, TUV (VDE) Recognition
- Short Circuit and Overload Recognition
- Remote Sense, Logic Inhibit, Power Fail Signal
- Auto Select Input Available



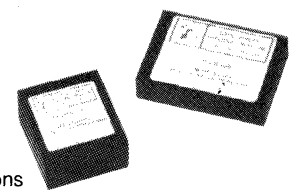
DC-DC CONVERTERS



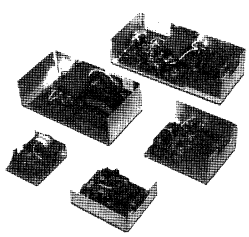
FEATURES:
- Industry Standard Packages
- Up to 50 Watts
- 7:1 Input Ranges Available
- Encapsulated and Open Frame Models
- Over 200 Models Available
- Six-Sided Shielding
- PI Input Filter
- Single, Dual and Triple Output Models

ENCAPSULATED AC/DC POWER SUPPLIES

FEATURES:
- Industry Standard Packages
- Switching and Linear Designs
- Up to 25 Watts
- Excellent Regulation
- Single, Dual and Triple Outputs
- Over 50 Models Available
- PC and Chassis Mountable Versions



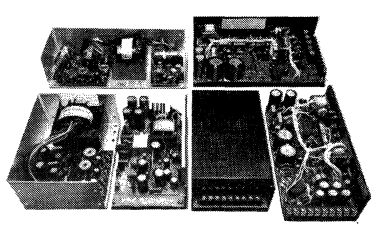
LINEAR OPEN FRAME DC POWER SUPPLIES



FEATURES:
- Industry Standard Packages
- OVP Optional on 12V, 15V, 24V and 28V
- Foldback Current Limiting
- Over 40 Models Available
- 6 to 90 Watts
- UL Recognition & European Safety Design

CUSTOM DESIGN

TPI has successfully built custom design for point of sale terminals, modems, digital communications, thermal printer, mobile satellite communication, and other.

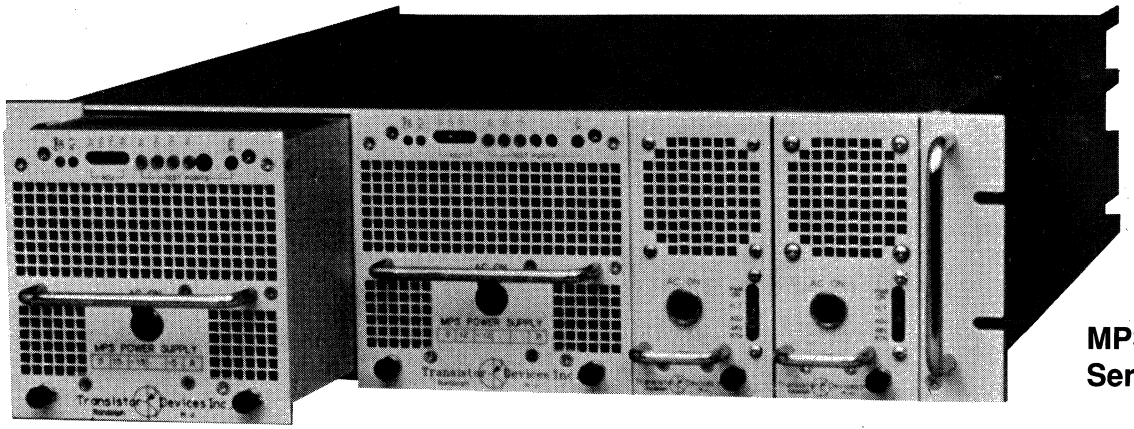


When a custom specification is received from a customer it is studied and evaluated for its feasibility. The design concept is chosen and project meetings are conducted. The initial design is begun and presented to the design review board. After the design topology has been approved and finalized, raw material and parts are ordered. Prototype samples are assembled and tested to customer specifications. During prototype development periodic quality evaluations are made. Once the prototype has been reviewed by the customer, comment on improvement and changes are made to prepare for production.

Prior to release for shipment to a customer units are processed thru the Quality Assurance Department. The Quality Assurance Department acts on behalf of the customer by testing to specifications, shock and environmental requirements.

LET US BE YOUR PARTNERS IN POWER • CALL US WITH YOUR CUSTOM REQUIREMENTS

Power Factor Corrected Modular Power Supplies



MPS Series

- WORLD CLASS - Line Current Harmonic Reduction Per IEC 555.2, / FAA 2100E, and DOD-STD-1399/300
- WORLD POWER - Input 88-264V, 47-63 Hz or 40-60V DC
- N+1 PARALLEL REDUNDANCY - With battery backup
- HOT BUS PLUG-IN - For Zero Down Time
- ONE TO FIVE OUTPUTS - For each module as selected by the customer

500W Modules are 1/6 Rack Wide by 4 7/8" High

1000W Modules are 1/3 Rack Wide by 4 7/8" High

3000W Modules are 1/3 Rack Wide by 6 5/8" High

INPUT SPECIFICATIONS

INPUT VOLTAGE: 88-264V AC or 40-60V DC

INPUT FREQUENCY: 47-63 Hz - Single phase

INPUT PROTECTION: Front panel circuit breaker on each module

EFFICIENCY: 72-80% including cooling and redundant diodes

POWER FACTOR: .98 Typical

LINE CURRENT HARMONICS: <5% THD @ full load

PEAK INRUSH CURRENT: 5 times full load operating current

CONDUCTED EMI: FCC-15, Subpart J, Class A and VDE 0871, Class A

SAFETY STANDARDS: UL1950, IEC950, CSA 22.2 #950

OUTPUT SPECIFICATIONS

LINE REGULATION: ±.1% + 10mV

LOAD REGULATION: ±.1% + 10mV

RIPPLE AND NOISE: Less than 50mV P-P or .5% +25mV, whichever is greater.

OVERVOLTAGE AND OVERCURRENT PROTECTION: Factory adjustable

HOLDUP TIME: 20 msec at any input line voltage.

PARALLEL LOAD SHARING - MAIN OUTPUT: Single wire interconnect.

PARALLEL LOAD SHARING - OTHER OUTPUTS: Droop of regulation characteristics 200mV or 1% of the output voltage, which ever is greater.

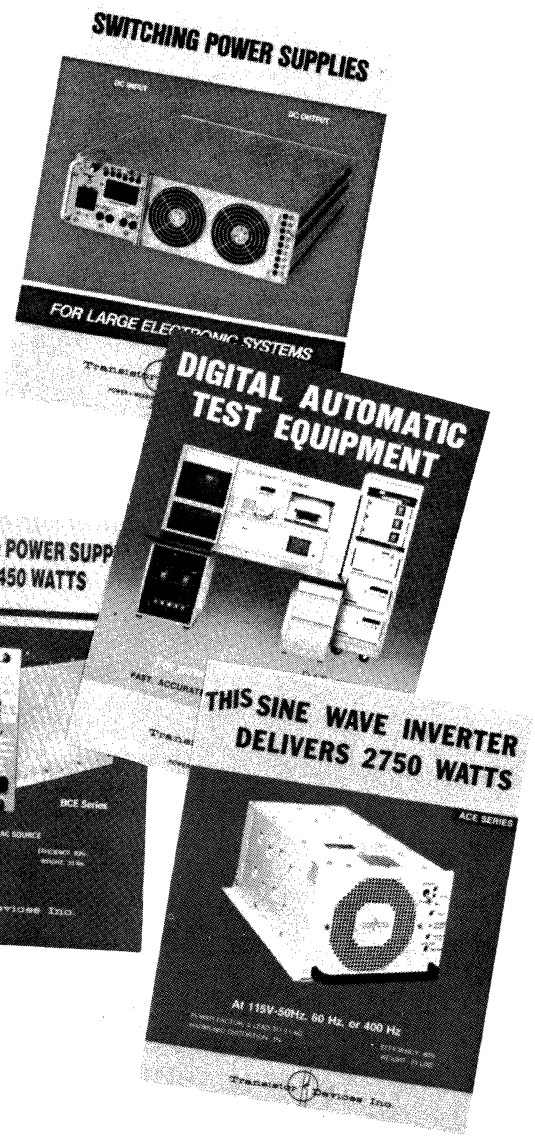
Transistor Devices Inc.

85 Horsehill Rd., Cedar Knolls, N.J. 07927
Phone: (201) 267-1900 FAX: (201) 267-2047

274 S. Salem St., Randolph, N.J. 07869-1698
Phone: (201) 361-6622 FAX: (201) 361-7665

STANDARD PRODUCT LINES

- Power Factor Corrected Power Supplies
- Static Inverters and Frequency Changers
- Dynamic Loads
- Uninterruptible Systems
- Digitally Programmed Power Supplies, Loads, and Automatic Test Equipment



SPECIAL TECHNOLOGY

- N+1 PARALLEL REDUNDANCY with battery backup for UNITERRUPTABLE POWER SYSTEMS
- LINE CURRENT HARMONIC REDUCTION per IEC 555.2, FAA 2100E and DOD-STD-1399/300
- STATIC INVERTERS which will operate from zero power factor lead to zero power factor lag.
- FET DYNALOADS for fast transient response and wide dynamics range from 0 to 400 volts.
- Standard and custom software is offered to support digital programming of power supplies, loads and automatic test equipment.

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Phone: (201) 361-6622 FAX: (201) 361-7665

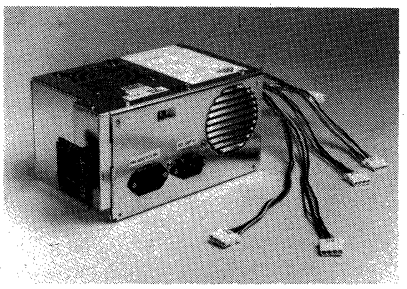
TRI-MAG, Inc.
your POWER Specialists

1601 N. CLANCY CT.
VISALIA, CA 93291
(209) 651-2222

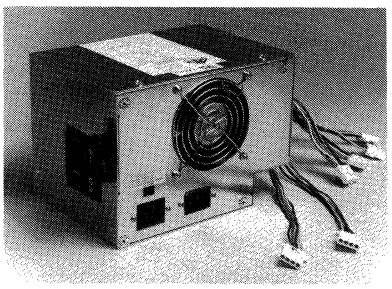
ITT TELEX NUMBER: 4994462
CABLE ADDRESS: "TRIMAG"
FAX NUMBER: (209) 651-0188

BM SERIES

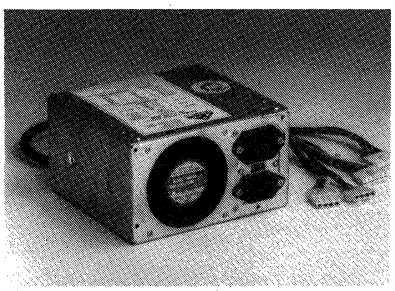
SWITCHING POWER SUPPLY



A L8.35 × W5.59 × H4.67



B L8.35 × W5.90 × H5.90



C L5.93 × W5.51 × H3.40

FEATURES:
- SHORT CIRCUIT PROTECTION
- OVER VOLTAGE PROTECTION
- OVER CURRENT PROTECTION
- BUILT-IN EMI FILTER TO MEET FCC PART 15 SUBPART J, CLASS B, OR VDE CLASS B
- MEETS UL/CSA/VDE SAFETY REQUIREMENTS
- 100% BURN-IN TEST

APPLICATIONS
- CLONE COMPUTERS
- INDUSTRIAL CONTROL COMPUTERS
- INSTRUMENTATION
- GENERAL PURPOSE

In addition to the above features, this power supply incorporates a "Power Good" signal output. This signal output indicates proper operation of the power supply.

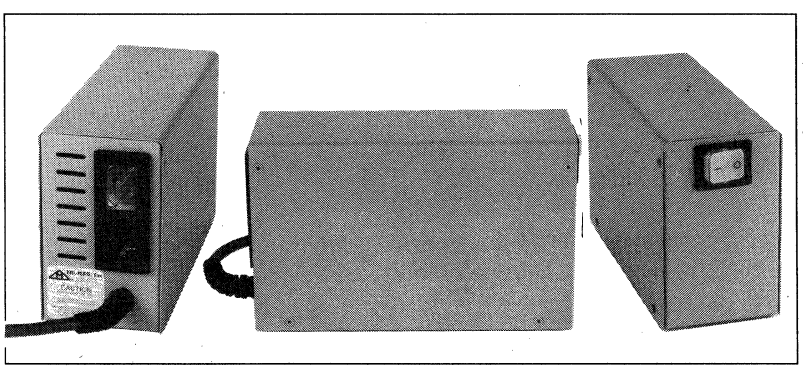
OUTPUT POWER

PART NUMBER	+5V	+12V	−5V	−12V	WATTS	FIGURE
BM-2150	18A	4.2A	0.3A	0.3A	150W	C
BM-5150E	15A	5.7A	0.5A	0.5A	150W	A
BM-7220	23A	8.0A	0.5A	0.5A	220W	B
SUPER 2150	18A	4.2A	0.3A	0.3A	150W	C
SUPER 2200	20A	7.3A	0.3A	0.3A	200W	C

TRI-MAG, Inc.

TABLETOP

POWER SUPPLIES



FEATURES:
- INRUSH CURRENT, OVER CURRENT, OVER VOLTAGE PROTECTED
- HIGH EFFICIENCY
- 100% COMPUTER CONTROLLED ON-OFF BURN-IN TEST
- 20MS HOLD-UP TIME
- 115V/230V SELECTABLE
- IEC FUSED CONNECTOR
- BUILT-IN EMI FILTER TO MEET FCC CLASS B
- LIGHTED ON-OFF SWITCH
- SHIELDED OUTPUT CABLE
- DESIGNED TO MEET UL AND CSA

APPLICATIONS:
- MILITARY APPLICATIONS
- COMMUNICATIONS SYSTEMS
- INSTRUMENTATION
- PROCESS CONTROL EQUIPMENT
- HARD DISK SYSTEMS
- EXTERNAL FLOPPY SYSTEMS
- TAPE BACK-UP SYSTEMS
- TERMINALS
- MODEMS
- SMALL COMPUTER SYSTEMS

SERIES NUMBER	WATTS	DC VOLTAGE AVAILABLE	L × W × H
MF-330-XTT	30W	±5V ±12V ±15V ±24V	7.0 × 2.6 × 4.3
MF-339-XTT	40W	±5V ±12V ±15V ±24V	7.0 × 2.6 × 4.3
UV-330-XTT	30W	±5V ±12V ±15V ±24V	7.0 × 2.6 × 4.3
UV-340-XTT	40W	±5V ±12V ±15V ±24V	7.0 × 2.6 × 4.3

DESCRIPTION:
TRI-MAG, Switching Power Supplies includes the MF330-XTT, UV330-XTT Series (30 Watts) and the MF339-XTT, UV340-XTT Series (40 Watts) These Series have a unique flyback circuit design. This technology efficiently delivers the maximum output of continuous power and lower minimum load requirements. This topology also assures very high reliability and performance. All models feature soft start circuitry to limit inrush current and eliminate turn-on overshoot. These series have single or multiple outputs to meet your power requirements. Connections to your system are made with either a DIN or MOLEX Connector.

TRI-MAG, Inc.
your POWER Specialists

1601 N. CLANCY CT.
VISALIA, CA 93291
(209) 651-2222

ITT TELEX NUMBER: 4994462
CABLE ADDRESS: "TRIMAG"
FAX NUMBER: (209) 651-0188

MF SERIES

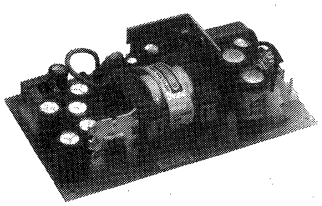
OPEN FRAME SWITCHING POWER SUPPLIES

FEATURES

- *High Surge Output*
- *115/230V Selectable*
- *Main Output Adjustable*
- *Compact & Low Cost*
- *Overload Protection*
- *Overvoltage Protection*
- *Short Circuit Protection*
- *100% Hi-Pot Tested*
- *100% Cycling Burn-In*
- *High Efficiency*
- *Built-In Line Filter, FCC Level A*

APPLICATIONS

- *Portable Computer Systems*
- *Instrumentation*
- *CRT Terminal*
- *Color Monitor*
- *Plotter*
- *Printer*
- *Robotics*
- *General Purpose*



MF330 SERIES: 30 WATTS, BOARD SIZE - 5.12" LONG X 2.76" WIDE X 1.30" HIGH

MODEL NUMBER	OUTPUT LOAD CURRENT (AMPS) +5VDC MIN	+5VDC RATED	-5VDC MIN	-5VDC RATED	+12VDC MIN	+12VDC RATED	-12VDC MIN	-12VDC RATED	+15VDC MIN	+15VDC RATED	-15VDC MIN	-15VDC RATED	+24VDC MIN	+24VDC RATED	RIPPLE & NOISE (pk-pk) V1	V2	V3	LINE REGULATION % V1	V2	V3	LOAD REGULATION % V1	V2	V3
MF330-1	0.30	3.00	–	–	0.00	1.00	0.00	0.25	–	–	–	–	–	–	50mV	100mV	100mV	0.5	1.0	1.0	1.0	3.0	8.0
MF330-2	0.30	3.00	0.00	0.05	0.00	1.00	–	–	–	–	–	–	–	–	50mV	100mV	100mV	0.5	1.0	1.0	1.0	3.0	8.0
MF330-3	–	–	–	–	0.00	2.50	–	–	–	–	–	–	–	–	100mV			0.2			0.3		
MF330-4	0.30	3.00	0.00	0.20	–	–	–	–	0.00	1.00	–	–	–	–	50mV	100mV	100mV	0.5	1.0	1.0	1.0	5.0	8.0
MF330-5	0.00	6.00	–	–	–	–	–	–	–	–	–	–	–	–	50mV			0.5			1.0		
MF330-6	0.35	3.50	–	–	–	–	–	–	–	–	–	–	0.05	0.50	50mV	100mV		0.5	0.5		1.0	1.0	
MF330-7	0.20	2.00	–	–	0.00	1.75	–	–	–	–	–	–	–	–	50mV	100mV		0.5	0.5		1.0	3.0	
MF330-8	0.20	2.00	–	–	–	–	–	–	0.07	0.70	0.07	0.70	–	–	50mV	100mV	100mV	0.5	0.5	0.5	1.0	5.0	5.0
MF330-9	–	–	–	–	–	–	–	–	0.10	1.00	0.10	1.00	–	–	100mV	100mV		0.5	0.5		0.5	5.0	
MF330-10	–	–	–	–	–	–	–	–	–	–	–	–	0.00	1.25	100mV			0.5			0.5		
MF330-11	0.60	3.00	–	–	–	–	0.00	0.25	0.00	1.00	–	–	–	–	50mV	100mV	100mV	0.5	5.0	5.0	1.0	5.0	8.0

NOTE: EACH OUTPUT CAN PROVIDE A PEAK LOAD CURRENT FOR 30 SECONDS, BUT TOTAL CONTINUOUS LOAD CANNOT EXCEED 40 WATTS
NOTE: MF330 SERIES ONLY HAS UL APPROVALS

MF339 SERIES: 40 WATTS, BOARD SIZE-5.00" LONG X 3.00" WIDE X 1.57" HIGH

MODEL NUMBER	OUTPUT LOAD CURRENT (AMPS) +5VDC MIN	+5VDC RATED	-5VDC MIN	-5VDC RATED	+12VDC MIN	+12VDC RATED	-12VDC MIN	-12VDC RATED	+15VDC MIN	+15VDC RATED	-15VDC MIN	-15VDC RATED	+24VDC MIN	+24VDC RATED	RIPPLE & NOISE (pk-pk) V1	V2	V3	LINE REGULATION % V1	V2	V3	LOAD REGULATION % V1	V2	V3
MF339-1	0.60	3.00	–	–	0.00	2.00	0.00	0.30	–	–	–	–	–	–	50mV	100mV	100mV	1.0	3.0	3.0	1.0	3.0	3.0
MF339-2	0.60	3.00	–	–	–	–	–	–	0.00	1.60	0.00	0.30	–	–	50mV	100mV	100mV	1.0	3.0	3.0	1.0	3.0	3.0
MF339-3	0.60	3.00	0.00	0.30	0.00	2.00	–	–	–	–	–	–	–	–	50mV	100mV	100mV	1.0	3.0	3.0	1.0	3.0	3.0
MF339-4	0.80	8.00	–	–	–	–	–	–	–	–	–	–	–	–	100mV			1.0			1.0		
MF339-5	–	–	–	–	–	–	0.40	3.50	–	–	–	–	–	–	100mV			1.0			1.0		
MF339-6	–	–	–	–	–	–	–	–	0.04	2.50	–	–	–	–	100mV			1.0			1.0		
MF339-7	–	–	–	–	–	–	–	–	–	–	–	–	0.20	1.50	100mV			1.0			1.0		
MF339-8	0.00	0.50	–	–	–	–	–	–	–	–	–	–	0.20	1.50	100mV	50mV		1.0	1.0		1.0	1.0	
MF339-9	0.60	3.00	–	–	–	–	0.00	0.20	–	–	–	–	0.00	1.00	50mV	120mV	50mV	1.0	5.0	1.0	1.0	5.0	1.0

NOTE: EACH OUTPUT CAN PROVIDE A PEAK LOAD CURRENT FOR 30 SECONDS, BUT TOTAL CONTINUOUS LOAD CANNOT EXCEED 40 WATTS

UV SERIES

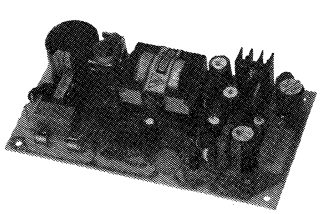
UNIVERSAL INPUT SWITCHING POWER SUPPLIES

FEATURES

- *90 To 260 VAC Universal Input*
- *Compact & Low Cost*
- *Overload Protection*
- *Overvoltage Protection*
- *Short Circuit Protection*
- *100% Hi-Pot Tested*
- *100% Cycling Burn-In*
- *Built-In Line Filter To Meet Class B*
- *High Efficiency*

APPLICATIONS

- *Hard Disk Subsystems*
- *External Floppy Disk Systems*
- *External Tape Backup*
- *Terminals*
- *Modems*
- *Printers And Plotters*



UV330 SERIES: 30 WATTS, BOARD SIZE-5.12" LONG X 2.76" WIDE X 1.14" HIGH

MODEL NUMBER	OUTPUT LOAD CURRENT (AMPS) +5VDC MIN	+5VDC RATED	-5VDC MIN	-5VDC RATED	+12VDC MIN	+12VDC RATED	-12VDC MIN	-12VDC RATED	+15VDC MIN	+15VDC RATED	-15VDC MIN	-15VDC RATED	+24VDC MIN	+24VDC RATED	RIPPLE & NOISE (pk-pk) V1	V2	V3	LINE REGULATION % V1	V2	V3	LOAD REGULATION % V1	V2	V3
UV330-1	0.20	1.50	–	–	0.00	1.50	0.00	0.30	–	–	–	–	–	–	50mV	100mV	100mV	1.0	1.0	1.0	1.0	3.0	5.0
UV330-2	0.20	1.50	0.00	0.30	0.00	1.50	–	–	–	–	–	–	–	–	50mV	100mV	100mV	1.0	1.0	1.0	1.0	3.0	5.0
UV330-3	0.20	2.00	–	–	0.10	1.50	–	–	–	–	–	–	–	–	50mV	100mV		1.0	1.0		1.0	3.0	
UV330-4	0.20	1.50	–	–	–	–	–	–	0.10	1.20	0.10	0.30	–	–	50mV	100mV	100mV	1.0	1.0	1.0	1.0	3.0	5.0
UV330-5	0.20	2.00	–	–	–	–	–	–	–	–	–	–	0.10	0.75	50mV	150mV		1.0	1.0		1.0	5.0	
UV330-6	0.20	6.00	–	–	–	–	–	–	–	–	–	–	–	–	50mV			1.0			1.0		
UV330-7	–	–	–	–	0.10	2.50	–	–	–	–	–	–	–	–	100mV			1.0			1.0		
UV330-8	–	–	–	–	–	–	–	–	0.10	2.00	–	–	–	–	100mV			1.0			1.0		
UV330-9	–	–	–	–	–	–	–	–	–	–	–	–	0.10	1.30	150mV			1.0			1.0		

NOTE: EACH OUTPUT CAN PROVIDE A PEAK LOAD CURRENT FOR 30 SECONDS, BUT TOTAL CONTINUOUS LOAD CANNOT EXCEED 30 WATTS

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UV SERIES

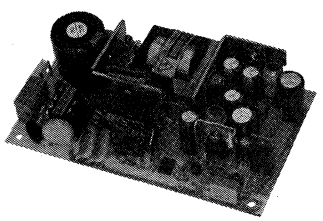
UNIVERSAL INPUT SWITCHING POWER SUPPLIES

FEATURES

- *90 To 260 VAC Universal Input*
- *Compact & Low Cost*
- *Overload Protection*
- *Overvoltage Protection*
- *Short Circuit Protection*
- *100% Hi-Pot Tested*
- *100% Cycling Burn-In*
- *Built-In Line Filter*
- *High Efficiency*
- *Short Circuit Protection*

APPLICATIONS

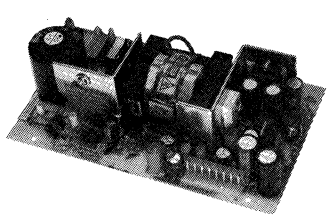
- *Robotics, Instrumentation*
- *Color Monitor, CRT Terminal*
- *External Tape Backup*
- *Terminals*
- *Portable Computer Systems*
- *Printers And Plotters*



UV 340 SERIES: 40 WATTS, BOARD SIZE-5.00" LONG X 3.00" WIDE X 1.18" HIGH

MODEL NUMBER	OUTPUT LOAD CURRENT (AMPS) +5VDC MIN	+5VDC RATED	-5VDC MIN	-5VDC RATED	+12VDC MIN	+12VDC RATED	-12VDC MIN	-12VDC RATED	+15VDC MIN	+15VDC RATED	-15VDC MIN	-15VDC RATED	+24VDC MIN	+24VDC RATED	RIPPLE & NOISE (pk-pk) V1	V2	V3	LINE REGULATION % V1	V2	V3	LOAD REGULATION % V1	V2	V3
UV340-1	0.60	3.00	–	–	0.00	2.00	0.00	0.30	–	–	–	–	–	–	50mV	100mV	100mV	1.0	3.0	3.0	1.0	3.0	3.0
UV340-2	0.60	3.00	–	–	–	–	–	–	0.00	1.60	0.00	0.30	–	–	50mV	100mV	100mV	1.0	3.0	3.0	1.0	3.0	3.0
UV340-3	0.60	3.00	0.00	0.30	0.00	2.00	–	–	–	–	–	–	–	–	50mV	100mV	100mV	1.0	3.0	3.0	1.0	3.0	3.0
UV340-4	0.80	8.00	–	–	–	–	–	–	–	–	–	–	–	–	100mV			1.0			1.0		
UV340-5	–	–	–	–	0.40	3.50	–	–	–	–	–	–	–	–	100mV			1.0			1.0		
UV340-6	–	–	–	–	–	–	–	–	0.40	2.70	–	–	–	–	100mV			1.0			1.0		
UV340-7	–	–	–	–	–	–	–	–	–	–	–	–	0.20	1.70	100mV			1.0			1.0		
UV340-12	0.40	3.00	–	–	0.20	2.00	–	–	–	–	–	–	–	–	50mV	100mV		1.0	3.0		1.0	3.0	

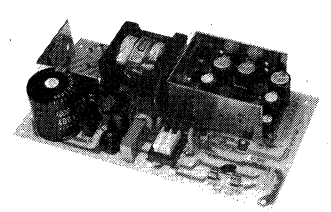
NOTE: EACH OUTPUT CAN PROVIDE A PEAK LOAD CURRENT FOR 30 SECONDS, BUT TOTAL CONTINUOUS LOAD CANNOT EXCEED 40 WATTS



UV365 SERIES: 65 WATTS, BOARD SIZE-6.00" LONG X 3.50" WIDE X 1.69" HIGH

MODEL NUMBER	OUTPUT LOAD CURRENT (AMPS) +5VDC MIN	+5VDC RATED	-5VDC MIN	-5VDC RATED	+12VDC MIN	+12VDC RATED	-12VDC MIN	-12VDC RATED	+15VDC MIN	+15VDC RATED	-15VDC MIN	-15VDC RATED	+24VDC MIN	+24VDC RATED	RIPPLE & NOISE (pk-pk) V1	V2	V3	V4	LINE/LOAD REGULATION % V1	V2	V3	V4
UV365-1	0.50	5.50	0.00	0.50	0.20	2.50	0.00	0.50	–	–	–	–	–	–	50mV	100mV	100mV	100mV	1.0	6.0	3.0	6.0
UV365-2	0.50	6.00	–	–	0.20	2.50	0.00	0.50	–	–	–	–	–	–	50mV	100mV	100mV		1.0	3.0	6.0	
UV365-3	0.50	5.50	0.00	0.50	0.20	3.00	–	–	–	–	–	–	–	–	50mV	100mV	100mV		1.0	6.0	3.0	
UV365-4	0.50	6.00	–	–	0.20	3.00	–	–	–	–	–	–	–	–	50mV	100mV			1.0	3.0		
UV365-5	0.50	13.00	–	–	–	–	–	–	–	–	–	–	–	–	100mV				1.0			
UV365-6	–	–	–	–	0.30	5.50	–	–	–	–	–	–	–	–	100mV				1.0			
UV365-7	–	–	–	–	–	–	–	–	0.30	4.50	–	–	–	–	100mV				1.0			
UV365-8	–	–	–	–	–	–	–	–	–	–	–	–	0.20	3.00	100mV				1.0			

NOTE: EACH OUTPUT CAN PROVIDE A PEAK LOAD CURRENT FOR 30 SECONDS, BUT TOTAL CONTINUOUS LOAD CANNOT EXCEED 65 WATTS



UV385 SERIES: 85 WATTS, BOARD SIZE-7.75" LONG X 4.25" WIDE X 1.69" HIGH

MODEL NUMBER	TB2 +5VDC MIN	+5VDC RATED	-5VDC MIN	-5VDC RATED	+12VDC MIN	+12VDC RATED	-12VDC MIN	-12VDC RATED	+15VDC MIN	+15VDC RATED	-15VDC MIN	-15VDC RATED	+24VDC MIN	+24VDC RATED	RIPPLE & NOISE (pk-pk) V1	V2	V3	V4	LINE/LOAD REGULATION % V1	V2	V3	V4
UV385-1	0.50	8.00	0.00	0.50	0.20	3.00	0.00	0.50	–	–	–	–	–	–	50mV	100mV	100mV	100mV	1.0	6.0	3.0	6.0
UV385-2	0.50	8.50	–	–	0.20	3.00	0.00	0.50	–	–	–	–	–	–	50mV	100mV	100mV		1.0	3.0	6.0	
UV385-3	0.50	8.00	0.00	0.50	0.20	3.50	–	–	–	–	–	–	–	–	50mV	100mV	100mV		1.0	3.0	6.0	
UV385-4	0.50	8.50	–	–	0.20	3.50	–	–	–	–	–	–	–	–	50mV	100mV			1.0	3.0		
UV385-5	0.50	8.00	–	–	–	–	–	–	0.10	1.50	0.10	1.50	–	–	50mV	100mV	100mV		1.0			
UV385-6	0.50	17.00	–	–	–	–	–	–	–	–	–	–	–	–	100mV				1.0			
UV385-7	–	–	–	–	0.30	7.00	–	–	–	–	–	–	–	–	100mV				1.0			
UV385-8	–	–	–	–	–	–	–	–	0.30	6.00	–	–	–	–	100mV				1.0			
UV385-9	–	–	–	–	–	–	–	–	–	–	–	–	0.20	3.80	100mV				1.0			
UV385-10	0.50	4.00	–	–	–	–	–	–	0.00	.050	0.00	0.50	0.10	2.00	50mV	100mV	100mV		1.0	3.0	6.0	

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DC/DC CONVERTERS

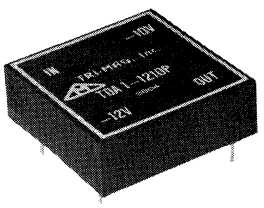
FEATURES

- *Compact Design*
- *PC Board Mounted*
- *Operating Temp: 0°C To +70°C*
- *Option For Output Shutdown*
- *Option For Output Voltage Adjustment*

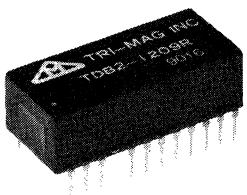
APPLICATIONS

- *Pos Terminals*
- *Plasma Gas Discharge Display*
- *Disk Drive Systems*
- *Electroluminescent Display*
- *Computer Equipment*
- *Vacuum Fluorescent Display*
- *Industrial And Process Control*
- *Telecommunications Equipment*

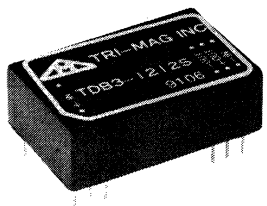
These converters operate over a wide range of input voltages while maintaining excellent output regulation. The power supplies are capable of withstanding simultaneous and continuous short circuits across their outputs.



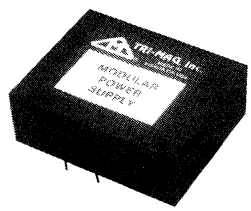
TDA1 SERIES
1.50" long X 1.50" wide X 0.50 high



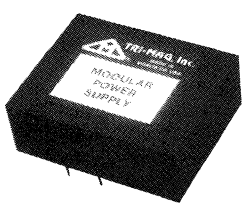
TDB2 SERIES
1.27" long X 0.58" wide X 0.40 high



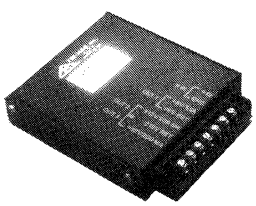
TDB3 SERIES
1.25" long X 0.80" wide X 0.40 high



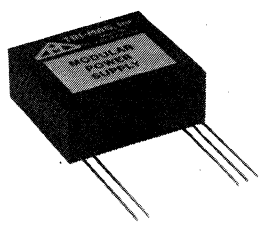
200Z SERIES
2.50" long X 2.00" wide X 0.90 high



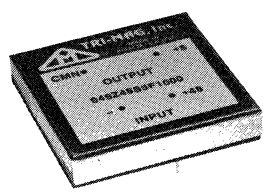
950Z SERIES
3.00" long X 2.56" wide X 0.90 high



951Z SERIES
4.85" long X 3.91" wide X 1.00 high



200Z650 SERIES
1.26" long X 0.50" wide X 1.13 high



949Z SERIES
2.00" long X 2.00" wide X 0.40 high

INPUT VOLTAGE	OUTPUT POWER	OUTPUT VOLTAGE(S)	CONVERTER SERIES	ISOLATED OUTPUT
5V	1-2W	24V, 30V, 40V	200Z600	NO
	2W	5V, 9V, 10V, 12V	TDA1	YES
	2W	5V, 9V, 12V, 15V, ±5V, ±12V, ±15V	TDB2	YES
	2W	5V, 9V, 12V, 15V, ±5V, ±12V, ±15V	TDB3	YES
	5-6W	55V TO 250V	200ZCDQ	NO
	5-6W	±5V, ±12V, ±15V, 12V, 24V	200ZDCP	NO
12V	1-2W	24V, 30V, 40V	200Z650	NO
	2W	5V, 9V, 10V	TDA1	YES
	2W	5V, 9V, 12V, 15V, ±5V, ±12V, ±15V	TDB2	YES
	2W	5V, 9V, 12V, 15V, ±5V, ±12V, ±15V	TDB3	YES
	12W	130V TO 350V	200ZDCQ	NO
	12W	55V TO -190V/, 20V TO -160V	200ZDCQ	NO
	5-6W	5V, 12V, 15V	949Z	YES
	5-6W	5V, 12V, 15V	950Z	YES
	12-15W	5V, ±12V	950Z	YES
	15W	5V, 12V, 15V	950Z	YES
	15W	5V, 12V, 15V	951Z	YES

INPUT VOLTAGE	OUTPUT POWER	OUTPUT VOLTAGE(S)	CONVERTER SERIES	ISOLATED OUTPUT
15V	10W	±200V	200ZDCQ	NO
24V	2W	5V, 12V, 15V, ±12V, ±15V	TDB2	YES
	2W	5V, 12V, 15V, ±12V, ±15V	TDB3	YES
	5-6W	5V, 12V, 15V,	949Z	YES
	5-6W	5V, 12V, 15V,	950Z	YES
	12-15W	5V, ±12V	950Z	YES
	15W	5V, 12V, 15V,	950Z	YES
	15W	5V, 12V, 15V,	951Z	YES
28V	5W	±100V	200ZDCQ	NO
	12W	180V, 200V	200ZDCQ	NO
48V	2W	5V, 12V, 15V, ±12V, ±15V	TDB2	YES
	2W	5V, 12V, 15V, ±12V, ±15V	TDB3	YES
	5W	±5V	200ZDCP	NO
	5-6W	5V, 12V, 15V,	949Z	YES
	15W	5V, 12V, 15V	950Z	YES
	15W	5V, 12V, 15V	951Z	YES

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

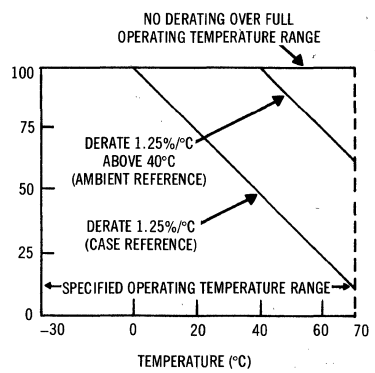


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

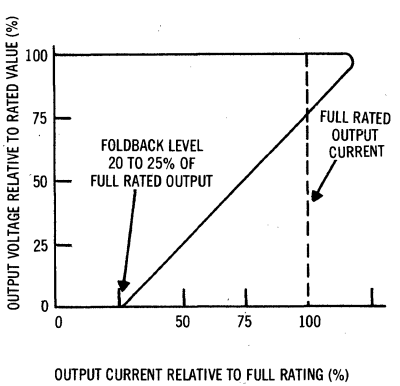


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

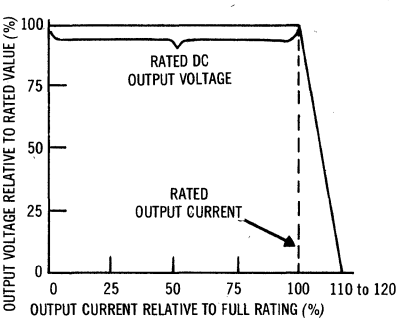


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

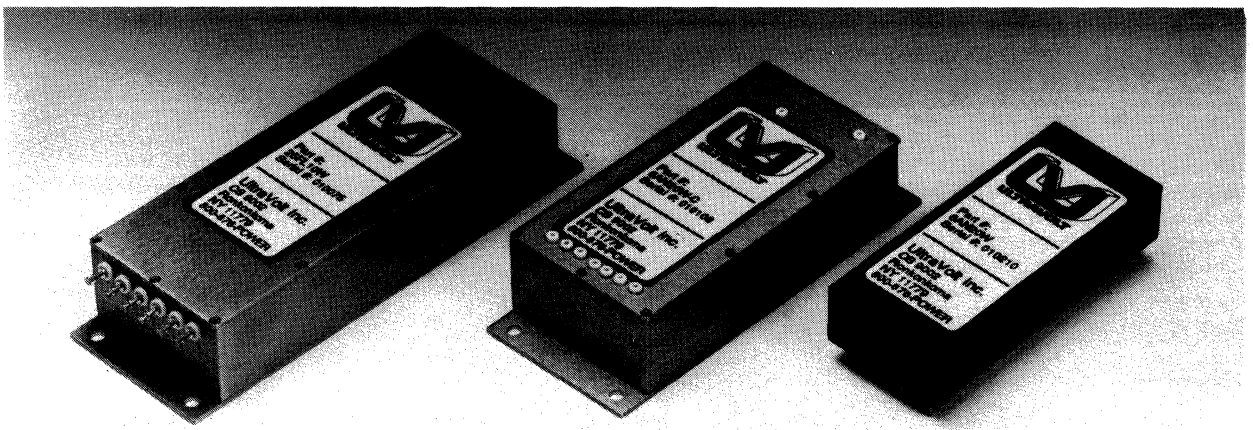
Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

High voltage is easier with
ULTRAVOLT



1-800-876-POWER

A SAMPLE OF OUR PRODUCTS

MODEL	0	500v	1 Kv	1.5 Kv	2 Kv	3 Kv	4 Kv	5 Kv	6 Kv	1.5 Watt	3 Watt	6 Watt	20 Watt
2 A	▬	▬	▬	▬	▬						●	●	●
4 A	▬	▬	▬	▬	▬	▬	▬				●	●	●
6 A	▬	▬	▬	▬	▬	▬	▬	▬	▬		●	●	●
1.5 C		▬	▬	▬						●			
3 C		▬	▬	▬	▬	▬				●			
1.5 K		▬	▬	▬						●			
3 K		▬	▬	▬	▬	▬				●			

Off the shelf:

- **Power densities up to 5 Watts/in³**
- **Ultra-reliability**
- **Competitive pricing**
- **Efficiencies of 75 to 90%**

FLEXIBLE ACCESSORIES:

Ripple stripper modules provide Ultra-low output voltage noise for sensitive applications along with a precision test point.

DAC control modules directly interface computers to all Ultravolt power supplies providing up to 12 bit resolution.

SPECIALIZED CONFIGURATIONS:

We manufacture floating LVPS with **25 Kv isolation** that power filaments or digital circuits up to 10 Watts.

Ultra-low inputs configurations designed for **battery operated** applications.

CUSTOM PRODUCTS:

Our stock of components along with standardized HVPS designs allows us to satisfy most of your custom requirements in **30 days.** Configurations with voltage outputs as high as 30 Kv, power outputs up to 100 Watts.

All units burned in before shipment.

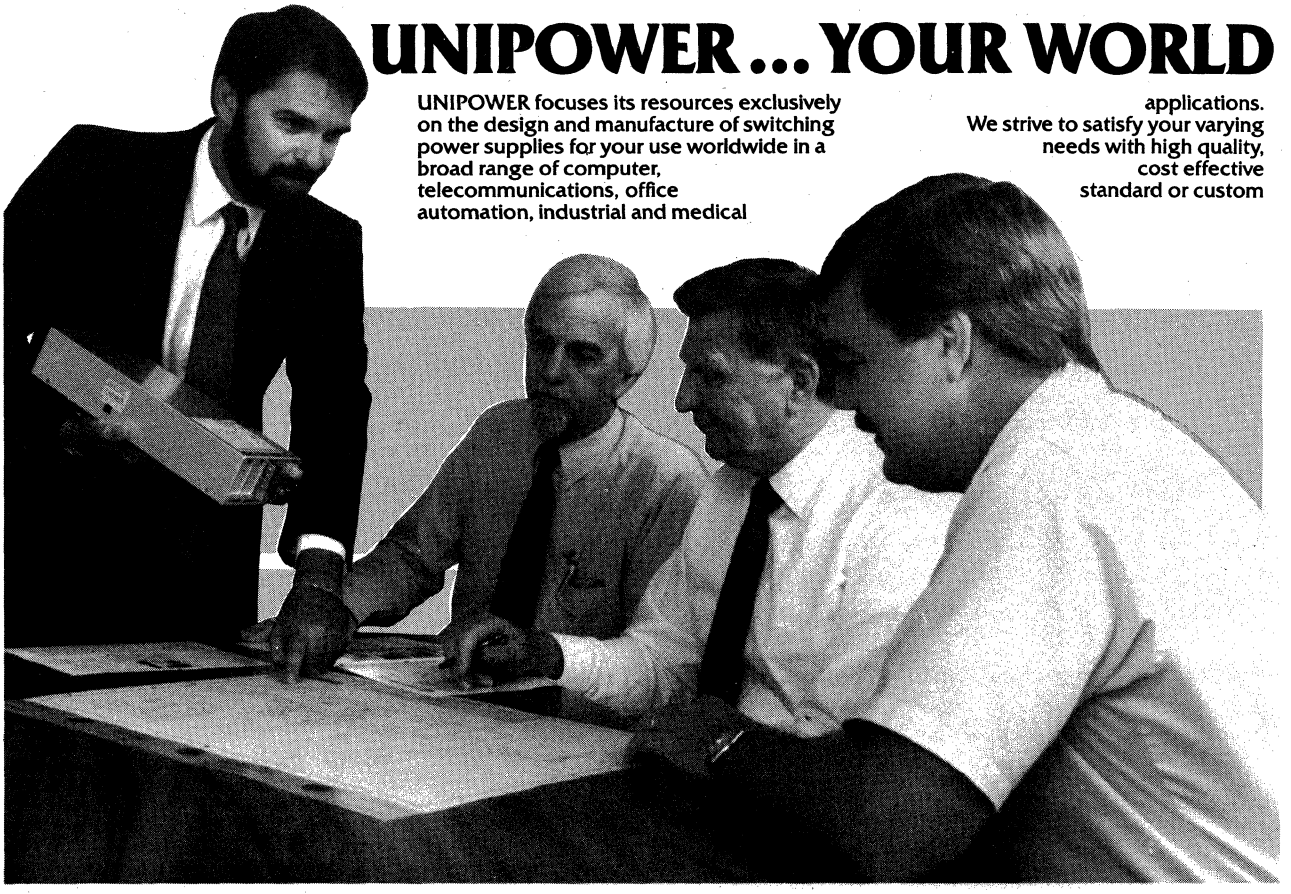
ULTRAVOLT

CS 9002
RONKONKOMA, NY 11779

1-800-876-POWER
FAX 516-363-2423

UNIPOWER... YOUR WORLD

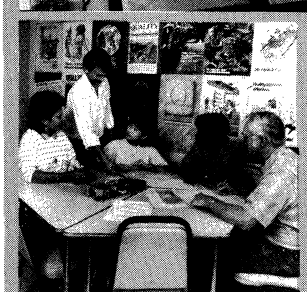
UNIPOWER focuses its resources exclusively on the design and manufacture of switching power supplies for your use worldwide in a broad range of computer, telecommunications, office automation, industrial and medical applications. We strive to satisfy your varying needs with high quality, cost effective standard or custom



WORLD CLASS MANUFACTURING

SPC TECHNIQUES

Key parameters are controlled throughout our manufacturing process with the use of Statistical Process Control (SPC) techniques including control charts and Pareto analysis.

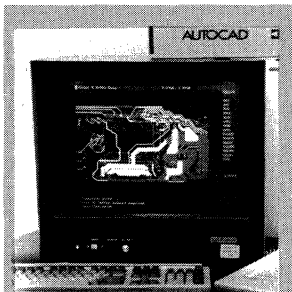


JIT PROGRAM

Our Just-In-Time (JIT) manufacturing program precisely controls material allocation and production line logistics. You benefit from reduced cycle time and reliable delivery.

EMPLOYEE INVOLVEMENT

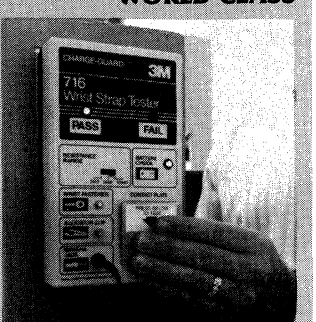
Our Employee Involvement (EI) program ensures the enthusiastic participation of our people in identifying opportunities to constantly improve our processes.



COMPUTER AIDED DESIGN

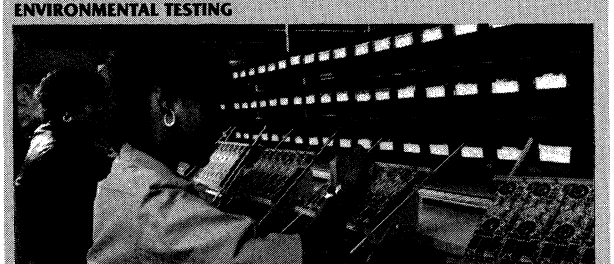
ENVIRONMENTAL TESTING

WORLD CLASS



ESD CONTROL

UNIPOWER employs state-of-the-art tools and equipment throughout our design and manufacturing processes. From computer aided design



PROGRESSIVE ASSEMBLY

CLASS POWER SUPPLIER

products specifically tailored to your unique requirements.

The entire UNIPOWER team is dedicated to meeting your expectations for continuous improvement in quality, cost and service.

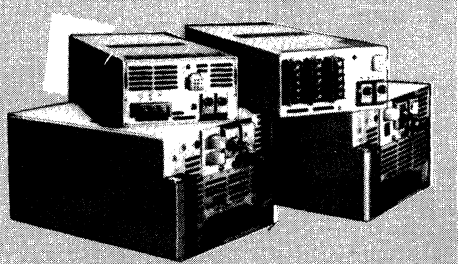
And, you have our total commitment to World Class Manufacturing with a level of excellence competitive with any company in our industry, worldwide.

WORLD CLASS FACILITIES

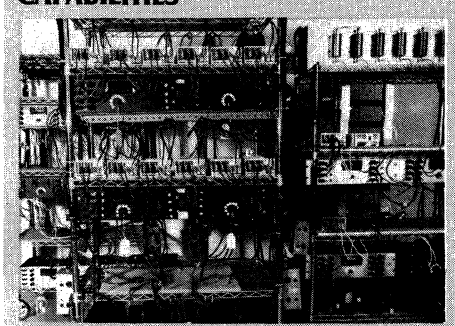
UNIPOWER'S engineering, manufacturing and administrative operations are headquartered in a modern 30,000 square foot facility.

WORLD CLASS QUALITY

World Class companies are dedicated to continuous improvement in the quality of their products and services. Here at UNIPOWER we call it "Unsurpassed Never-ending Improvement" (UNI). We have built it into our name as a statement of our commitment to quality and what it takes to compete in today's global market.



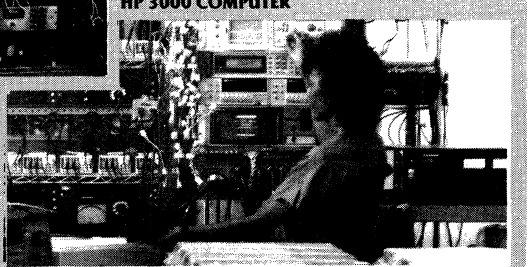
CAPABILITIES



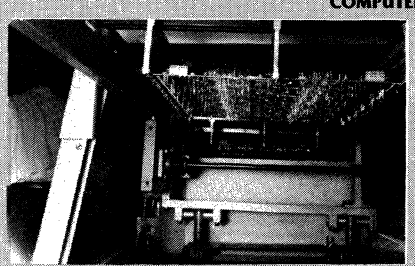
24 HOUR BURN-IN

HP 3000 COMPUTER

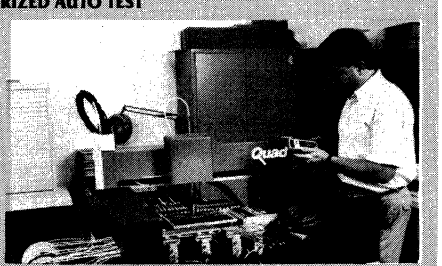
and surface mount production to automated testing, you get the benefits of our World Class investments in talent and facilities.



COMPUTERIZED AUTO TEST



WAVE SOLDER SYSTEM



SURFACE MOUNT PRODUCTION

Contents

LOW PROFILE
250-800 Watts
D•2118

UNIMOD
400-800 Watts
D•2120

POWER FACTOR
650-1000 Watts
D•2122

INDUSTRY STANDARD
500-1200 Watts
D•2124

BATTERY BACKUP
250-750 Watts
D•2126

FAULT TOLERANT
Up To 3000 Watts
D•2128

CUSTOM SOLUTIONS
D•2129

UNIPOWER CORPORATION

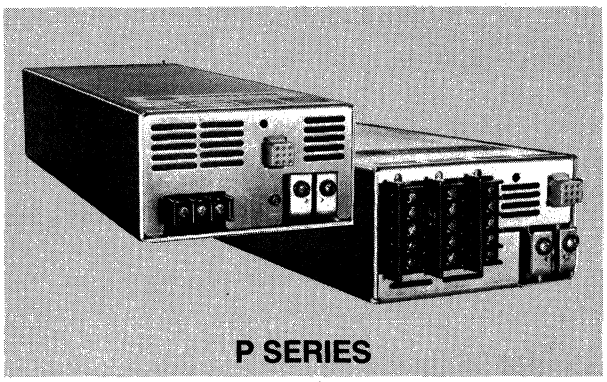
UNIPOWER's World Class team is eager to help you solve your Power Conversion problems.

For price and delivery, quotations, design assistance and technical data, contact:

UNIPOWER SALES
2981 Gateway Drive
Pompano Beach, FL 33069
Tel: (305) 974-2442
Fax: (305) 971-1837

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069-4803
TEL: (305) 974-2442
FAX: (305) 971-1837

LOW PROFILE SWITCHERS
250 TO 800 WATTS
1 THRU 7 OUTPUTS



KEY FEATURES
- Low Profile Cases (From 2.75")
- Power Density To 3.6W/Cubic Inch
- Switch Selectable 115/230VAC
- 100Khz MOSFET Switching
- Efficiency To 85%
- MTBF To 110,000 Hours
- Surface Mount Technology
- Hi-Rel Hybrid Control Circuits
- 12V Main On Multi For Disc Drives
- Current Share On All Outputs
- No Load Oper (Single, Aux. On Multi)
- Modular Auxiliary Outputs
- MAG AMP Regulation

UNIFEATURES
- Outputs From 2VDC To 48VDC
- Full Output Power To 50°C
- Fully Isolated Outputs
- Special Output Configurations
- Current Sharing Parallel Operation
- Redundant N + 1 Capability
- Rear Mounted DC Ball Bearing Fan
- Soft Start
- Electronic Inrush Current Limiting
- Tight Regulation, Low Noise
- Overload And Overvoltage Protection
- Thermal Warning And Protection
- EMI Input Filter
- Remote Sense, Inhibit, Margin
- Power Good Signal
- 24 Hour Power-Cycle Burn-In At 50°C
- Full Test Data With Each Unit
- Safety Agency Approvals
- Manufactured In U.S.A.
- Two Year Warranty

AVAILABLE OPTIONS
- Worldwide Autorange 115/230VAC
- DC Input (42V To 56V)
- Battery Backup Connector
- DC "OK" Signal
- No Load Operation (Main On Multi)
- Current Share/Monitor (Main Output)
- Current Share (Auxiliary Outputs)
- Reverse Air Flow

SPECIFICATIONS
Typical at Nominal Line, Full Load and 25°C Unless Otherwise Noted.

OUTPUT SPECIFICATIONS

Output Voltage Adjustment Range, All Outputs	±5%
Line Regulation[1]	0.2% or 10 mV, max.
Load Regulation[2], NL-50% FL, 50%FL-FL.	0.2% or 10 mV, max.
Cross Regulation[2], Multi-Output	0.2% or 10 mV, max.
Ripple and Noise[3]	
Main Output	1.0% or 50 mV, max.
Auxiliary Outputs	1.5% or 75 mV, max.
Hold-Up Time	20 msec., min.
Dynamic Response[4]	500 usec., max.
Temperature Coefficient	0.02%/°C, max.
Overvoltage Protection, All outputs	Power Shutdown
Remote Sense[5]	All Outputs except 2A auxiliaries

INPUT SPECIFICATIONS
AC OPERATION

Voltage Range, user selectable (switch)	90 to 132 VAC 180 to 264 VAC
Input Frequency	47 to 63 Hz
Electronic Inrush Current Limiting	40A Peak
Input EMI Filter, Conducted	FCC & VDE Class A
Input Protection	Internal Fuse

DC OPERATION

Input Voltage	42 to 56 VDC
Input Protection	Internal Fuse

GENERAL SPECIFICATIONS

Efficiency	70 to 85%
Switching Frequency	100 kHz
MTBF[6]	Up to 110,000 hrs.
Input To Output Isolation	3000 VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	0°C to 65°C
Derating 50°C to 65°C	2.4%/°C
Storage Temperature Range	−40°C to +85°C
Cooling	Internal DC Ball Bearing Fan
Vibration	Per MIL-STD 810D, Method 514-3, Cat-I, Proc I
Shock	Per MIL-STD 810D, Method 516-3, Proc II, IV, VI

PHYSICAL SPECIFICATIONS

Case Material	Aluminum
Dimensions	See Case Drawings
Weight:	
250W Single	5.5 lbs.
400W, 500W, 600W Singles	6.0 lbs.
500W Multi	8.0 lbs.
650W Multi	8.5 lbs.
800W Multi	9.0 lbs.

NOTES:
1. Whichever figure is greater. Measured over AC input range.
2. Whichever figure is greater. Remote sense must be connected.
3. Whichever figure is greater. 20 MHz bandwidth.
4. 4% maximum deviation with recovery to within 1% for 25% step change at 75% rated load.
5. 0.25V maximum load cable voltage drop on all outputs.
6. Full load @ 25°C per MIL HDBK 217E.

UL 1950 CSA 22.2, No. 220 TUV IEC 950/VDE 0806

All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER

2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069
TEL: (305) 974-2442
FAX: (305) 971-1837

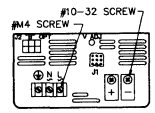
STANDARD MODELS (The following models are standard configurations of main and auxiliary modules. For special configurations of available auxiliary modules consult factory).

MAX WATTS[1]	MODEL NUMBER[2]	OUTPUT V1	OUTPUT V2[3]	OUTPUT V3[3]	OUTPUT V4[3]	OUTPUT V5[3]	CASE
250	PD 1000 PD 2000 PD 3000 PD 4000 PD 5000 PD 7000	2V65A 5V50A 12V21A 15V17A 24V11A 48V5A					10
400	PF 1000 PF 9000 PF 2000 PF 3000 PF 4000 PF 5000 PF 7000	2V100A 3.3V80A 5V80A 12V34A 15V27A 24V17A 48V8.5A					
500	PG 9000 PG 2000 PG 5000 PM 7000	3.3V100A 5V100A 24V21A 48V10.5A					
600	PH 5000 PH 7000	24V25A 48V12.5A					
400	PF 2330 PF 2440 PF 3250	5V60A 5V60A 12V25A	12V8A(12) 15V7A 5V10A	12V8A(12) 15V7A 24V4A(6)			15
500	PG 2330 PG 2440	5V75A 5V75A	12V8A(12) 15V7A	12V8A(12) 15V7A			
650	PJ 2330 PJ 2440	5V85A 5V85A	12V10A(15) 15V7A	12V10A(15) 15V7A			25
800	PM 2330 PM 2440	5V100A 5V100A	12V10A(15) 15V7A	12V10A(15) 15V7A			
400	PF 2233 PF 2244 PF 2335 PF 2445	5V60A 5V60A 5V60A 5V60A	5V10A 5V10A 12V8A(12) 15V7A	12V8A(12) 15V7A 12V8A(12) 15V7A	12V8A(12) 15V7A 24V4A(6) 24V4A(6)		15
500	PG 2233 PG 2244 PG 2335 PG 2445	5V75A 5V75A 5V75A 5V75A	5V10A 5V10A 12V8A(12) 15V7A	12V8A(12) 15V7A 12V8A(12) 15V7A	12V8A(12) 15V7A 24V4A(6) 24V4A(6)		
650	PJ 2233 PJ 2244 PJ 2335 PJ 2445	5V85A 5V85A 5V85A 5V87A	5V20A 5V20A 12V10A(15) 15V7A	12V10A(15) 15V7A 12V10A(15) 15V7A	12V10A(15) 15V8A 24V5A(7) 24V5A(7)		25
800	PM 2233 PM 2244 PM 2335 PM 2445	5V100A 5V100A 5V100A 5V100A	5V20A 5V20A 12V10A(15) 15V7A	12V10A(15) 15V7A 12V10A(15) 15V7A	12V10A(15) 15V8A 24V5A(7) 24V5A(7)		
400	PF 21233 PF 22333 PF 22335	5V60A 5V60A 5V60A	2V10A 5V10A 5V2A	5V10A 12V2A 12V2A	12V2A 12V2A 12V8A(12)	12V2A 12V8A(12) 24V4A(6)	15
500	PG 21233 PG 22333 PG 22335	5V75A 5V75A 5V75A	2V10A 5V10A 5V2A	5V10A 12V2A 12V2A	12V2A 12V2A 12V8A(12)	12V2A 12V8A(12) 24V4A(6)	

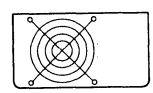
AVAILABLE AUXILIARY MODULES		
2V10A	12V2A	24V4A(6)
2V20A[4]	12V8A	24V5A(7)[4]
5V2A	12V8A(12)	12/12V2A
5V10A	12V10A(15)[4]	15/15V2A
5V20A[4]	15V7A	5/12V2A

OPTIONS[2]	
A	Auto Range 115/230VAC[5]
B	Battery Backup Connector (250/500W)
D	DC "OK" Signal
E	No Load Operation (Main of Multi)
F	Current Share/Monitor (Main)
H	Current Share (Aux. Outputs)
Q	DC Input (Consult Factory)
R	Reverse Air Flow

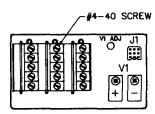
NOTES:
1. Maximum continuous total output power must not exceed the maximum power rating.
2. Add suffix letters to model number for options.
3. Auxiliary output number does not represent output location.
4. 650-800 Watt only.
5. Standard on 650 and 800 Watt
( ) Peak Current for 30 seconds Max.



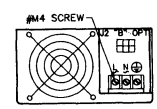
FRONT VIEW CASE #10



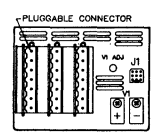
REAR VIEW CASE #10



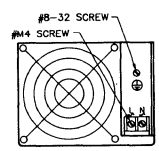
FRONT VIEW CASE #15



REAR VIEW CASE #15

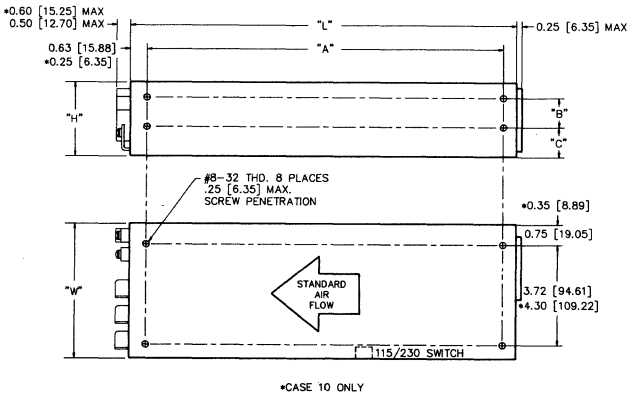


FRONT VIEW CASE #25



REAR VIEW CASE #25

CASE STYLE	DIMENSIONS INCHES (mm) H	W	L	A	B	C
10	2.75 (69.8)	5.00 (127)	12.15 (308.6)	11.62 (295.15)	1.00 (25.4)	0.75 (19.05)
15	2.75 (69.8)	5.00 (127)	14.30 (363.2)	13.20 (335.28)	1.10 (27.94)	1.10 (27.94)
25	3.80 (96.52)	5.00 (127)	14.30 (363.2)	12.38 (314.45)	1.10 (27.94)	1.33 (33.78)



*CASE 10 ONLY

ALL DIMENSIONS IN INCHES (mm). All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069-4803
TEL: (305) 974-2442
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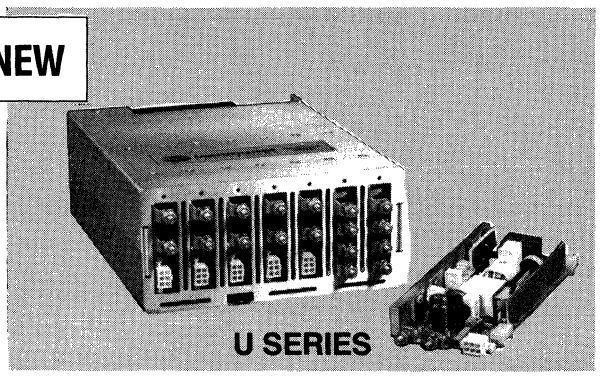
UNIMOD SWITCHERS
400 TO 800 WATTS
UP TO 14 OUTPUTS

NEW



KEY FEATURES
- Fully Modular UNIMOD Construction
- Custom Configuration Of Std Modules
- Two Week Prototype Delivery
- Total Output Selection Flexibility
- Dual And Single Output Modules
- Worldwide Auto Range (115/230VAC)
- Wide Output Adjust Range
- Single Outputs Can Be Paralleled
- Independent Switching Regulators
- Global Inhibit, Remote On-Off
- No Load Operation
- 100Khz MOSFET Switching
- Efficiency To 85%
- MTBF To 100,000 Hours
- Surface Mount Technology
- Ideal For VME/VXI Applications

UNIFEATURES
- Outputs From 2VDC To 48VDC
- Full Output Power To 50°C
- Fully Isolated Outputs
- Special Output Configurations
- Current Sharing Parallel Operation
- Redundant N + 1 Capability
- Rear Mounted DC Ball Bearing Fan
- Soft Start
- Electronic Inrush Current Limiting
- Tight Regulation, Low Noise
- Overload And Overvoltage Protection
- Thermal Warning And Protection
- EMI Input Filter
- Remote Sense, Inhibit, Margin
- Power Good Signal
- 24 Hour Power-Cycle Burn-In At 50°C
- Full Test Data With Each Unit
- Safety Agency Approvals
- Manufactured In U.S.A.
- Two Year Warranty

AVAILABLE OPTIONS
- DC "OK" Signal
- Current Share On Single Modules
- Reverse Air Flow

SPECIFICATIONS
Typical at Nominal Line, Full Load and 25°C Unless Otherwise Noted.

OUTPUT SPECIFICATIONS

Output Voltage Adjustment Range	See Table Next Page
Line Regulation[1]	0.2% or 10 mV, max.
Load Regulation[2]	0.2% or 10 mV, max.
Cross Regulation[2]	0.2% or 10 mV, max.
Ripple and Noise[3]	1% or 50 mV, max.
Hold-Up Time	20 msec., min.
Dynamic Response[4]	500 usec., max.
Temperature Coefficient	0.02%/°C, max.
Overvoltage Protection, All Outputs	Power Shutdown
Remote Sense[5]	All single output modules

INPUT SPECIFICATIONS

Voltage Range, (Auto Range)	90 to 132 VAC 180 to 264 VAC
Input Frequency	47 to 63 Hz
Inrush Current	80A Peak
Input EMI Filter, Conducted	FCC & VDE Class A
Input Protection	Internal Fuse

GENERAL SPECIFICATIONS

Efficiency	70 to 85%
Switching Freuqency	100 kHz
MTBF[6]	Up to 100,000 hrs.
Input To Output Isolation	3000 VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	0°C to 65°C
Derating 50°C to 65°C	3.3%/°C
Storage Temperature Range	– 40°C to + 85°C
Cooling	Internal DC Ball Bearing Fan
Vibration	Per MIL-STD 810D, Method 514-3, Cat-I, Proc I
Shock	Per MIL-STD 810D, Method 516-3, Proc II, IV, VI

PHYSICAL SPECIFICATIONS

Case Material	Aluminum
Dimensions	3.8″H × 8″W × 11″L
Weight	8.0-10.0 lbs.

NOTES:
1. Whichever figure is greater. Measured over AC input range.
2. Whichever figure is greater. Remote sense must be connected.
3. Whichever figure is greater. 20 MHz bandwidth.
4. 4% maximum deviation with recovery to within 1% for 25% step change at 75% rated load.
5. 0.25V maximum load cable voltage drop on all outputs.
6. Full load @ 25°C per MIL HDBK 217E.

UL 1950 CSA 22.2, No. 220 TUV IEC 950/VDE 0806

All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069
TEL: (305) 974-2442
FAX: (305) 971-1837

HOW TO ORDER

The UNIMOD configurable multi output power supply allows the user to specify up to seven of the sixteen available output modules in virtually any combination within the 800 watt total output power[1] capability of the supply. Determining the model designation of the desired configurations is as simple as listing the output modules selected.

Slot: (1) (2) (3) (4) (5) (6) (7)

UM – ___ ___ ___ ___ ___ ___ ___ – _____

Series **Outputs** **Options**

Example: Six output supply as follows:

1 ea 2V40A (Module designation B)
2 ea 5V40A (Module designation G)
2 ea 12V10A (Module designation H)
1 ea 24V5A (Module designation M)
Options: DC OK (D), Current share (H)

Model Designation = UM-XBGGHHM-DH

The letter X indicates an emply slot which will be filled by a removeable panel.

The modules will normally be positioned, left to right, in the sequence indicated by the model designation.

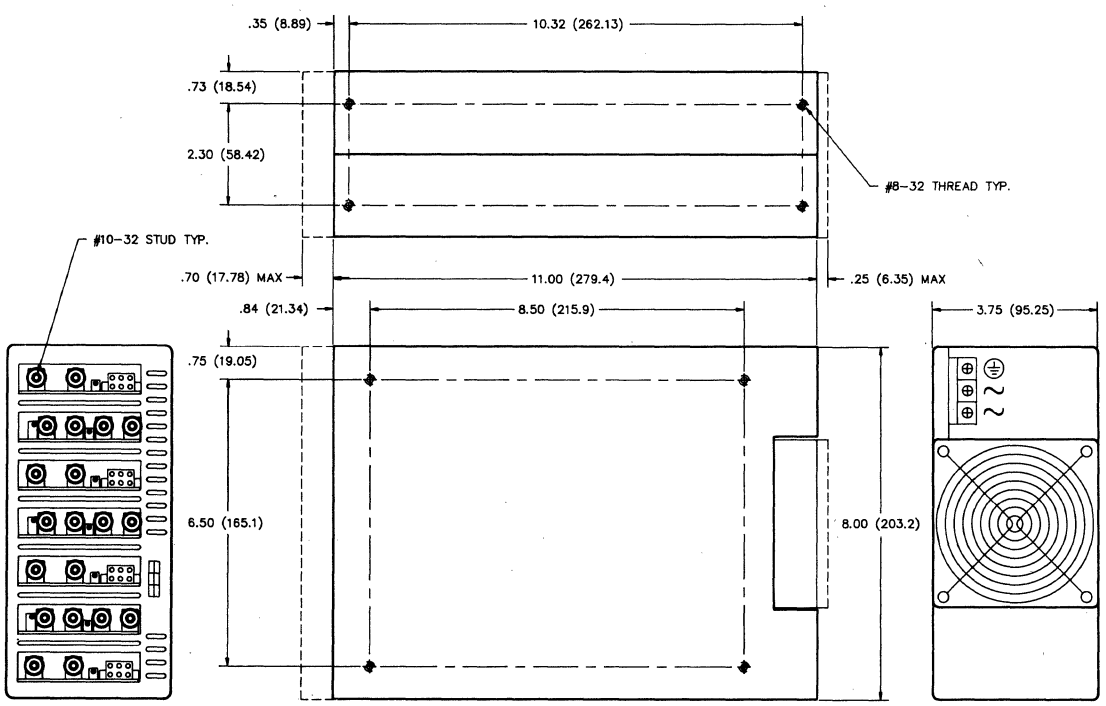
NOTES:
1. The maximum total load for all modules must not exceed 800 watts.
2. The maximum load power and current must not exceed the rated values for each module.

AVAILABLE OUTPUT MODULES[2]

VOLTAGE/ CURRENT	WATTS	ADJUST RANGE	DESIG-NATION
2V20A	40	±10%	A
2V40A	80	±10%	B
3.3V20A	66	±10%	C
5V10A	50	4.5-6.5V	E
5V20A	100	4.5-6.5V	F
5V40A	200	4.5-6.5V	G
12V10A	120	10.8-16.5V	H
12V20A	240	10.8-16.5V	J
15V8A	120	10.8-16.5V	K
15V16A	240	10.8-16.5V	L
24V5A	120	20-30V	M
24V10A	240	20-30V	N
48V5A	240	±10%	Q
5/12V5A	85	±10%	R
12/12V5A	120	±10%	S
15/15V4A	120	±10%	T
UNUSED SLOT(S)			X

OPTIONS

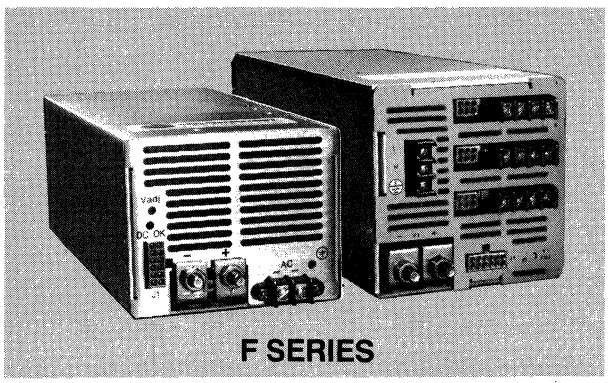
D	DC "OK" Signal
H	Current Share (Single modules)
R	Reverse Air Flow (Consult factory)



ALL DIMENSIONS IN INCHES (mm). All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069-4803
TEL: (305) 974-2442
FAX: (305) 971-1837

POWER FACTOR SWITCHERS
650 TO 1000 WATTS
1 THRU 7 OUTPUTS



KEY FEATURES
- .98 Power Factor (UNIFACTOR)
- Patented Circuit (U.S. Pat 4,831,508)
- Low Harmonic Current Distortion
- Designed To Meet IEC 555-2
- Worldwide Auto Range (115/230VAC)
- 4″ & 5″ × 5″ × 12″ Cases
- Power Density To 3.3W/Cubic Inch
- 100Khz MOSFET Switching
- Efficiency To 85%
- MTBF To 100,000 Hours
- Surface Mount Technology
- Current Share On All Outputs
- No Load Operation
- LED Output Power Indicator
- Wide Range Auxiliary Outputs
- Independent Switching Regulators
- 3.3, 5, 12 Or 24 VDC Main Output On Multi[7]

UNIFEATURES
- Outputs From 2VDC To 48VDC
- Full Output Power To 50°C
- Fully Isolated Outputs
- Special Output Configurations
- Current Sharing Parallel Operation
- Redundant N + 1 Capability
- Rear Mounted DC Ball Bearing Fan
- Soft Start
- Electronic Inrush Current Limiting
- Tight Regulation, Low Noise
- Overload And Overvoltage Protection
- Thermal Warning And Protection
- EMI Input Filter
- Remote Sense, Inhibit, Margin
- Power Good Signal
- 24 Hour Power-Cycle Burn-In At 50°C
- Full Test Data With Each Unit
- Safety Agency Approvals
- Manufactured In U.S.A.
- Two Year Warranty

AVAILABLE OPTIONS
- DC "OK" Signal With Inverse
- Current Share/Monitor (Main Output)
- Current Share (Auxiliary Outputs)
- Reverse Air Flow

SPECIFICATIONS
Typical at Nominal Line, Full Load and 25°C Unless Otherwise Noted.

OUTPUT SPECIFICATIONS
Output Voltage Adjustment Range
- Main Output . . . . . ± 10%
- Auxiliary Outputs. . . . . See Aux. Table Next Page

Line Regulation[1] . . . . . 0.2% or 10 mV, max.
Load Regulation[2]. . . . . 0.2% or 10 mV, max.
Cross Regulation[2], Multi-Output . . . . . 0.2% or 10 mV, max.
Ripple and Noise[3]
- Main Output . . . . . 1% or 50 mV, max.
- Auxiliary Outputs . . . . . 1% or 50 mV, max.

Hold-Up Time . . . . . 20 msec., min.
Dynamic Response[4] . . . . . 500 usec., max.
Temperature Coefficient . . . . . 0.02%/°C, max.
Overvoltage Protection, All Outputs . . . . . Power Shutdown
Remote Sense[5]. . . . . All Outputs

INPUT SPECIFICATIONS
Voltage Range, (Auto Range). . . . . 90 to 132 VAC
180 to 264 VAC
Input Frequency. . . . . 47 to 63 Hz
Inrush Current. . . . . 80A Peak
Input EMI Filter, Conducted . . . . . FCC & VDE Class A
Input Protection. . . . . Internal Fuse
Power Factor. 98

GENERAL SPECIFICATIONS
Efficiency . . . . . .70 to 85%
Switching Frequency. . . . . 100 kHz
MTBF[6]. . . . . Up to 100,000 hrs.
Input To Output Isolation . . . . . .3000 VAC

ENVIRONMENTAL SPECIFICATIONS
Operating Temperature. . . . . 0°C to 65°C
Derating 50°C to 65°C. . . . . .3.3%/°C
Storage Temperature Range . . . . . – 40°C to + 85°C
Cooling . . . . . Internal DC Ball Bearing Fan
Vibration . . . . . Per MIL-STD 810D, Method 514-3, Cat-I, Proc I
Shock . . . . . Per MIL-STD 810D, Method 516-3, Proc II, IV, VI

PHYSICAL SPECIFICATIONS
Case Material. . . . . Aluminum
Dimensions. . . . . See Case Drawings
Weight:
- Single Output . . . . . 13.0 lbs.
- Multi Output . . . . . 15.0 lbs.

NOTES:
1. Whichever figure is greater. Measured over AC input range.
2. Whichever figure is greater. Remote sense must be connected.
3. Whichever figure is greater. 20 MHz bandwidth.
4. 4% maximum deviation with recovery to within 1% for 25% step change at 75% rated load.
5. 0.25V maximum load cable voltage drop on all outputs.
6. Full load @ 25°C per MIL HDBK 217E.
7. 5VDC standard, consult factory for 3.3, 12, or 24VDC

UL 1950 CSA 22.2, No. 220 TUV IEC 950/VDE 0806

All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069
TEL: (305) 974-2442
FAX: (305) 971-1837

STANDARD MODELS (The following models are standard configurations of main and auxiliary modules. For special configurations of available auxiliary modules consult factory).

MAX WATTS[1]	MODEL NUMBER[2]	OUTPUT V1[3]	OUTPUT V2[3]	OUTPUT V3[3]	OUTPUT V4[3]	OUTPUT V5[3]	CASE
650	FJ 1000	2V130A					40
	FJ 9000	3.3V130A					
	FJ 2000	5V130A					
	FJ 3000	12V55A					
	FJ 4000	15V44A					
	FJ 5000	24V28A					
	FJ 6000	28V24A					
	FJ 7000	48V14A					
800	FM 1000	2V160A					42
	FM 9000	3.3V160A					
	FM 2000	5V160A					
	FM 3000	12V67A					
	FM 4000	15V54A					
	FM 5000	24V34A					
	FM 6000	28V29A					
	FM 7000	48V17A					
1000	FN 1000	2V200A					
	FN 9000	3.3V200A					
	FN 2000	5V200A					
	FN 3000	12V84A					
	FN 4000	15V67A					
	FN 5000	24V42A					
	FN 6000	28V36A					
	FN 7000	48V21A					
800	FM 2330	5V120A	12V20A	12V10A			45
	FM 2440	5V120A	15V16A	15V8A			
1000	FN 2330	5V150A	12V20A	12V20A			
	FN 2440	5V150A	15V16A	15V16A			
800	FM 2332	5V120A	12V20A	12V10A	5V10A		
	FM 2335	5V120A	12V20A	12V10A	24V5A		
	FM 2442	5V120A	15V16A	15V8A	5V10A		
	FM 2445	5V120A	15V16A	15V8A	24V5A		
1000	FN 2332	5V150A	12V20A	12V20A	5V20A		
	FN 2335	5V150A	12V20A	12V20A	24V10A		
	FN 2442	5V150A	15V16A	15V16A	5V20A		
	FN 2445	5V150A	15V16A	15V16A	24V10A		
800	FM 23321	5V120A	12V20A	12V5A	5V5A	2V20A	
	FM 23325	5V120A	12V20A	12V5A	5V5A	24V5A	
	FM 24425	5V120A	15V16A	15V4A	5V5A	24V5A	
1000	FN 23321	5V150A	12V20A	12V5A	5V5A	2V20A	
	FN 23325	5V150A	12V20A	12V5A	5V5A	24V10A	
	FN 24425	5V150A	15V16A	15V4A	5V5A	24V10A	

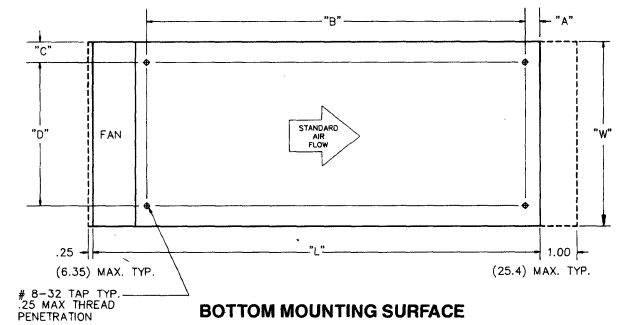
ALL DIMENSIONS IN INCHES (mm). All specifications subject to change without notice.

AVAILABLE AUXILIARY MODULES	
MODULE	ADJUST RANGE
2V20A	± 10%
2V40A	± 10%
5V10A	4.5–6.5V
5V20A	4.5–6.5V
5V40A	4.5–6.5V
12V10A	10.8–16.5V
12V20A	10.8–16.5V
15V8A	10.8–16.5V
15V16A	10.8–16.5V
24V5A	20–30V
24V10A	20–30V
48V5A	± 10%
5/12V5A	± 10%
12/12V5A	± 10%
15/15V4A	± 10%

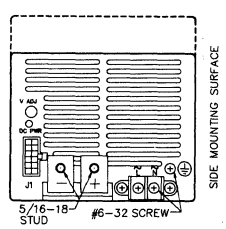
	OPTIONS[2]
D	DC "OK" With Inverse
F	Current Share/Monitor (Main)
H	Current Share (Aux. Outputs)
R	Reverse Air Flow[4]

NOTES:
1. Maximum continuous total output power must not exceed the maximum power rating.
2. Add suffix letters to new model numbers for additional options.
3. Auxiliary output number does not represent output location.
4. Requires Derating From 40°C to 65°C of 1.7%/°C.
5. Consult factory for 3.3, 12, or 24VDC main output on multi.

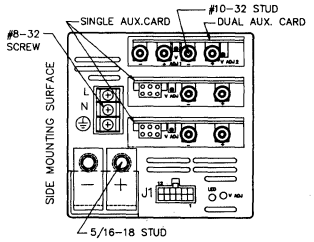
DIMENSIONS INCHES (mm)	CASE STYLE 40	42	45
H	4.00 (101.6)	5.00 (127.0)	5.00 (127.0)
W	5.00 (127.0)	5.00 (127.0)	5.00 (127.0)
L	12.00 (304.80)	12.00 (304.80)	12.00 (304.80)
A	.40 (10.16)	.40 (10.16)	.93 (23.62)
B	10.27 (260.86)	10.27 (260.86)	9.70 (246.38)
C	.56 (14.22)	.56 (14.22)	.59 (14.99)
D	3.89 (98.81)	3.89 (98.81)	3.60 (91.44)



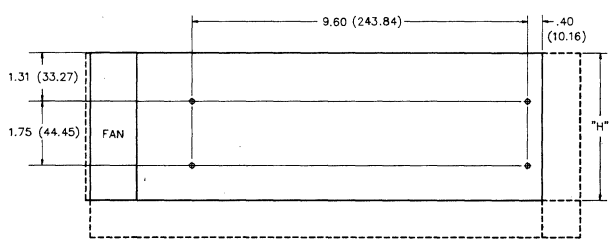
BOTTOM MOUNTING SURFACE



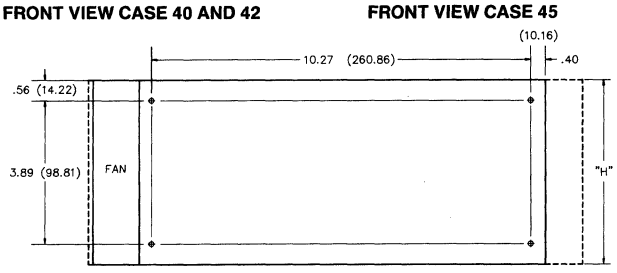
FRONT VIEW CASE 40 AND 42



FRONT VIEW CASE 45



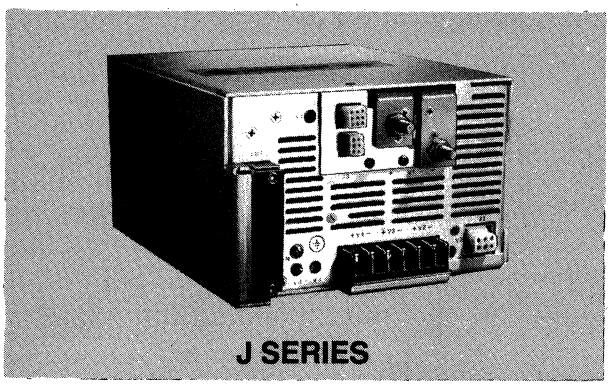
SIDE MOUNTING SURFACE FOR CASE 40 AND 42



SIDE MOUNTING SURFACE FOR CASE 45

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069-4803
TEL: (305) 974-2442
FAX: (305) 971-1837

INDUSTRY STANDARD SWITCHERS
500 TO 1200 WATTS
1 THRU 4 OUTPUTS



KEY FEATURES
- Industry Standard 5″ x 8″ Cases
- Power Density To 3.3W/Cubic Inch
- Jumper Selectable 115/230VAC
- Efficiency To 75%
- MTBF To 85,000 Hours
- Unique Integral Thermal Design
- No Load Operation (Single)
- Synchronous Switching Regulators

UNIFEATURES
- Outputs From 2VDC To 48VDC
- Full Output Power To 50°C
- Fully Isolated Outputs
- Special Output Configurations
- Current Sharing Parallel Operation
- Redundant N + 1 Capability
- Rear Mounted DC Ball Bearing Fan
- Soft Start
- Electronic Inrush Current Limiting
- Tight Regulation, Low Noise
- Overload And Overvoltage Protection
- Thermal Warning And Protection
- EMI Input Filter
- Remote Sense, Inhibit, Margin
- Power Good Signal
- 24 Hour Power-Cycle Burn-In At 50°C
- Full Test Data With Each Unit
- Safety Agency Approvals
- Manufactured In U.S.A.
- Two Year Warranty

AVAILABLE OPTIONS
- DC "OK" Signal
- Current Share/Monitor (Main Output)
- Reverse Air Flow

SPECIFICATIONS
Typical at Nominal Line, Full Load and 25°C Unless Otherwise Noted.

OUTPUT SPECIFICATIONS
Output Voltage Adjustment Range, All Outputs . . . . . ±5%
Line Regulation[1] . . . . . 0.2% or 10 mV, max.
Load Regulation[2], NL-FL . . . . . 0.2% or 10 mV, max.
Cross Regulation[2], Multi-Output . . . . . 0.2% or 10 mV, max.
Ripple and Noise[3]
Main Output . . . . . 1.0% or 50 mV, max.
Auxiliary Outputs . . . . . 1.5% or 75 mV, max.
Hold-Up Time . . . . . 20 msec., min.
Dynamic Response[4] . . . . . 200 µsec., max.
Temperature Coefficient . . . . . 0.02%/°C, max.
Overvoltage Protection, All outputs . . . . . Power Shutdown
Remote Sense[5] . . . . . All Outputs

INPUT SPECIFICATIONS
Voltage Range, user selectable (jumper) . . . . . 90 to 132 VAC
180 to 264 VAC
Input Frequency . . . . . 47 to 63 Hz
Inrush Current: 500W, 700W . . . . . 30A Peak
800 W . . . . . 40A Peak
1000W, 1200W . . . . . 75A Peak
Input EMI Filter, Conducted . . . . . FCC & VDE Class A
Input Protection . . . . . Internal Fuse

GENERAL SPECIFICATIONS
Efficiency . . . . . 70 to 75%
Switching Frequency . . . . . 20 KHz
MTBF[6] . . . . . Up to 85,000 hrs.
Input To Output Isolation . . . . . 3000 VAC

ENVIRONMENTAL SPECIFICATIONS
Operating Temperature . . . . . 0°C to 71°C
Derating 50°C to 71°C . . . . . 2.4%/°C
Storage Temperature Range . . . . . −40°C to +85°C
Cooling . . . . . Ball Bearing Internal Fan
Vibration . . . . . Per MIL-STD 810D, Method 514-3, Cat-I, Proc I
Shock . . . . . Per MIL-STD 810D, Method 516-3, Proc II, IV, VI

PHYSICAL SPECIFICATIONS
Case Material . . . . . Aluminum
Dimensions . . . . . See Case Drawings

Weight:		
	500W Single . . . . 12 lbs.	500W Multi . . . . 14 lbs.
	800W Single . . . . 12 lbs.	800W Multi . . . . 18 lbs.
	1200W Single . . . . 15 lbs.	1200W Multi . . . . 21 lbs.

NOTES:
1. Whichever figure is greater. Measured over AC input range.
2. Whichever figure is greater. Remote sense must be connected.
3. Whichever figure is greater. 20 MHz bandwidth.
4. 4% maximum deviation with recovery to within 1% for 25% step change at 75% rated load.
5. 0.25V maximum load cable voltage drop on all outputs.
6. Full load @ 25°C per MIL HDBK 217E.

UL 478 CSA 22.2 TUV IEC 380/VDE 0806

All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069
TEL: (305) 974-2442
FAX: (305) 971-1837

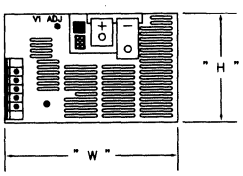
STANDARD MODELS (Consult factory for non-standard configurations).

MAX WATTS[1]	MODEL NUMBER[2]	OUTPUT V1	OUTPUT V2	OUTPUT V3	OUTPUT V4	CASE
500	JG 1000	2V160A				50
	JG 2000	5V100A				
	JG 3000	12V42A				
	JG 4000	15V33A				
	JG 5000	24V21A				
	JG 6000	28V18A				
	JG 7000	48V10A				
800	JM 1000	2V180A				
	JM 2000	5V160A				
	JM 3000	12V67A				
	JM 4000	15V54A				
	JM 5000	24V34A				
	JM 6000	28V29A				
	JM 7000	48V17A				
1000	JN 1000	2V210A				
	JN 2000	5V200A				
	JN 3000	12V83A				
	JN 4000	15V66A				
	JN 5000	24V42A				
	JN 6000	28V36A				
	JN 7000	48V21A				
1200	JP 1000	2V240A				
	JP 2000	5V240A				
	JP 3000	12V100A				
	JP 4000	15V80A				
	JP 5000	24V50A				
	JP 6000	28V42A				
	JP 7000	48V25A				
500	JG 2330	5V80A	12V10A	12V5A		
	JG 2440	5V80A	15V10A	15V5A		
700	JK 2303	5V80A	12V12A	12V12A		
	JK 2330	5V100A	12V10A	12V5A		
800	JM 2330	5V120A	12V10A	12V10A		55
	JM 2440	5V120A	15V10A	15V10A		
500	JG 2133	5V80A	2V10A	12V5A	12V3A	50
	JG 2233	5V80A	5V10A	12V5A	12V3A	
	JG 2332	5V80A	12V10A	12V5A	5V3A	
	JG 2335	5V80A	12V10A	12V5A	24V3A	
	JG 2442	5V80A	15V10A	15V5A	5V3A	
700	JK 2133	5V100A	2V10A	12V5A	12V3A	
	JK 2233	5V100A	5V10A	12V5A	12V3A	
	JK 2332	5V100A	12V10A	12V5A	5V3A	
	JK 2335	5V100A	12V10A	12V5A	24V3A	
800	JM 2133	5V120A	2V15A	12V10A	12V6A	55
	JM 2233	5V120A	5V15A	12V10A	12V6A	
	JM 2332	5V120A	12V10A	12V10A	5V6A	
	JM 2335	5V120A	12V10A	12V10A	24V6A	
	JM 2442	5V120A	15V10A	15V10A	5V6A	
1200	JP 2233	5V175A	5V20A	12V10A	12V6A	60
	JP 2332	5V175A	12V20A	12V10A	5V6A	

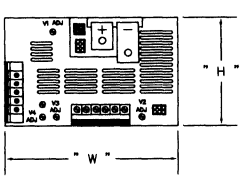
OPTIONS[2]	
D	DC "OK" Signal
F	Current Share/Monitor (Main)
R	Reverse Air Flow

NOTES:
1. Maximum continuous total output power must not exceed the maximum power rating.
2. Add suffix letters to model number for options.

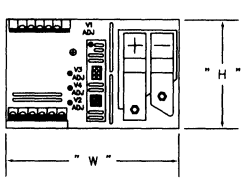
DIMENSIONS INCHES (mm)	CASE STYLE		
	50	55	60
H	5.00 (127.0)	5.00 (127.0)	5.00 (127.0)
W	8.00 (203.2)	8.00 (203.3)	8.00 (203.3)
L	9.00 (228.6)	12.00 (304.2)	13.50 (203.2)
A	6.75 (171.45)	6.75 (171.45)	9.00 (228.6)



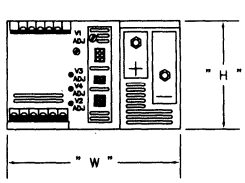
FRONT VIEW CASE #50



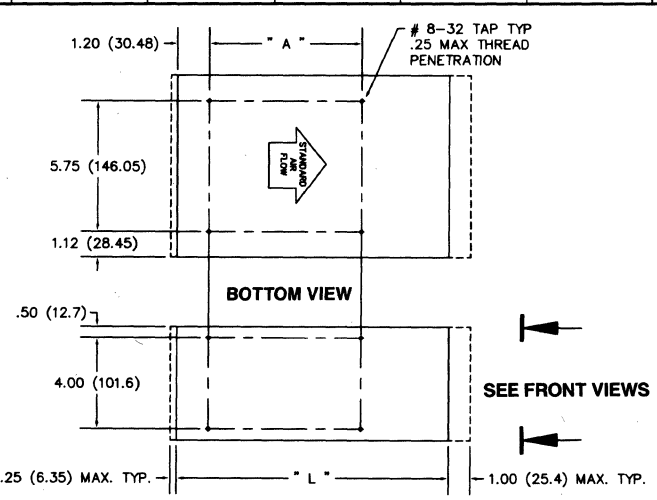
FRONT VIEW CASE #50



FRONT VIEW CASE #55



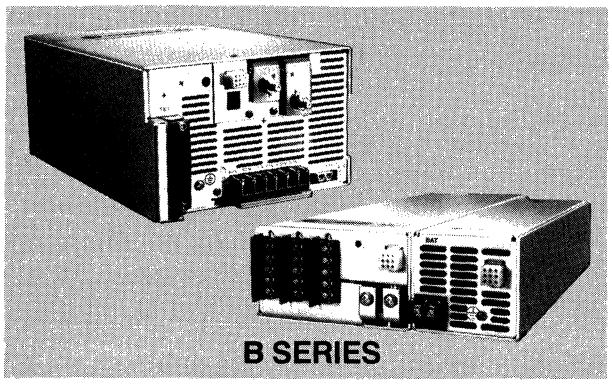
FRONT VIEW CASE #60



ALL DIMENSIONS IN INCHES (mm).
All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069-4803
TEL: (305) 974-2442
FAX: (305) 971-1837

BATTERY BACKUP SWITCHERS
250 TO 750 WATTS
1 THRU 7 OUTPUTS



BENEFITS OVER CONVENTIONAL UPS
- Lower Total System Cost
- No Added External Package
- Less Space, Lower Weight
- Simpler, No Inverter Needed
- Higher System Efficiency
- Smaller Battery For Same Output

GENERAL FEATURES
- Provides UPS Capability
- AC And DC Battery Input
- Auto AC To Battery Switchover
- Integral Battery Charger
- Battery Charger Monitoring
- Charge Control Circuitry
- Charge Supervision Circuitry
- Deep Discharge Battery Protection
- Precise Control Of Float Voltage
- Protective Circuits For PS & Battery
- Ideal For Fault Tolerant Systems
- 19″ Rack Packaging Available
- Batteries Included In Rack Package

OTHER FEATURES/OPTIONS (250W To 500W)
- Remotable Backup Module
- Same As Low Profile P Series

OTHER FEATURES/OPTIONS (750W)
- Integral Backup Circuitry
- Same As Industry Standard J Series

(UL, CSA, TUV approvals pending)

SPECIFICATIONS
Typical at Nominal Line, Full Load and 25°C Unless Otherwise Noted.

OUTPUT SPECIFICATIONS

Output Voltage Adjustment Range, All Outputs	±5%
Line Regulation[1]	0.2% or 10 mV, max.
Load Regulation[2], 250–500W	0.2% or 10mV, max.
750W (V1 Main Output)	0.2% or 50mV, max.
(V2 Aux. Output)	1.0% or 50mV, max.
(V3 Aux. Output)	1.0% or 50mV, max.
(V4 Aux. Output)	5.0% or 250mV, max.
Cross Regulation[2], Multi-Output	0.2% or 10 mV, max.
Ripple and Noise[3]	
Main Output	1.0% or 50 mV, max.
Auxiliary Outputs	1.5% or 75 mV, max.
Hold-Up Time	20 msec., min.
Dynamic Response[4], 250–500W	500µsec, max.
750W	200 µsec, max.
Temperature Coefficient	0.02%/°C, max.
Overvoltage Protection, All Outputs	Power Shutdown
Remote Sense[5]	All Outputs Except 2A Auxiliaries

INPUT SPECIFICATIONS

AC OPERATION

Voltage Range, user selectable	90 to 132 VAC 180 to 264 VAC
Input Frequency	47 to 63 Hz
Inrush Current: 250–500W	40A Peak
750W	75A Peak
Input EMI Filter, Conducted	FCC & VDE Class A
Input Protection	Internal Fuse

DC OPERATION

Type of DC Source	24 Cell Sealed Lead Acid Battery
Input Voltage Range	40.5 to 56 VDC
Turn-on Voltage—DC Operation, 250–500W	46–50 VDC
750W	51–54 VDC
Low DC (Battery) Shutdown	DC Input Shuts Down at 37.5 to 40 VDC
Input Protection	External Fuse or Circuit Breaker (consult factory)
Reverse Voltage Protection	Internal Shunt Diode External Fuse/Circuit Breaker

GENERAL SPECIFICATIONS

Efficiency	70 to 85%
Switching Frequency, 250–500W	100KHz
750W	20KHz
MTBF[6]	Up to 85,000 hrs.
Input To Output Isolation	3000 VAC

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	0°C to 65°C
Derating 50°C to 65°C	2.5%/°C
Storage Temperature Range	−40°C to +85°C
Cooling	Ball Bearing Internal DC Fan
Vibration	Per MIL-STD 810D, Method 514-3, Cat-I, Proc I
Shock	Per MIL-STD 810D, Method 516-3, Proc II, IV, VI

PHYSICAL SPECIFICATIONS

Case Material	Aluminum
Dimensions	See Case Drawings
Weight: 250W to 500W Power Supply	6 to 8 lbs.
Backup Module	3.5 lbs.
750W	18 lbs.

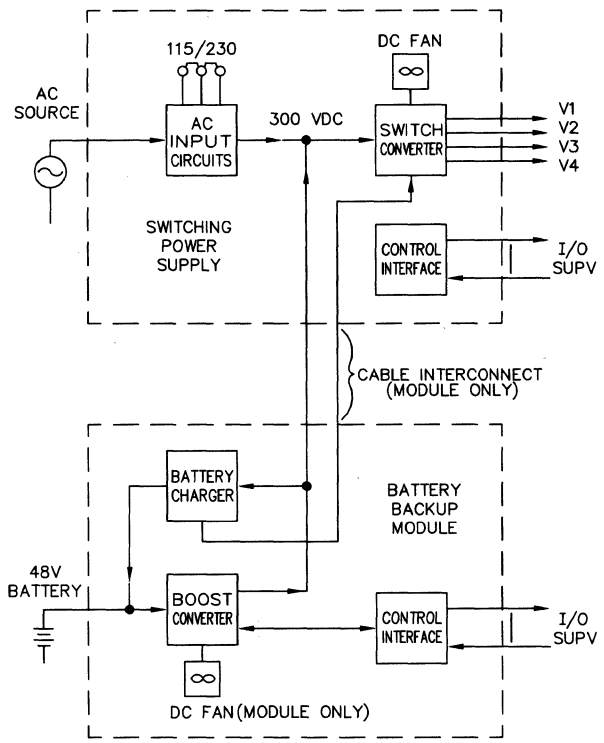
NOTES:
1. Whichever figure is greater. Measured over AC input range.
2. Whichever figure is greater. Remote sense must be connected.
3. Whichever figure is greater. 20 MHz bandwidth.
4. Maximum deviation with recovery to within 1% for 25% FL at 75% of rated load (4% for 250–500W, 2% for 750W).
5. 0.25V maximum load cable voltage drop on all outputs.
6. Full load @ 25°C per MIL HDBK 217E.

All specifications subject to change without notice.

UNIPOWER CORPORATION
THE WORLD CLASS POWER SUPPLIER
2981 GATEWAY DRIVE
POMPANO BEACH, FL 33069
TEL: (305) 974-2442
FAX: (305) 971-1837

PRINCIPLES OF OPERATION

The B Series accept 115/230 VAC and 48V DC input from an externally connected sealed lead-acid battery. Power to the output is normally provided by power flow from the AC input through a conventional off-line switching circuit. The battery is charged by an internal charging circuit. When AC failure is sensed, energy is drawn from the battery through a switching up-converter to keep the main converter operational to supply its rated output. The unit has control and monitor features to assure proper transfer of power between the AC source and the battery without disturbing the load.

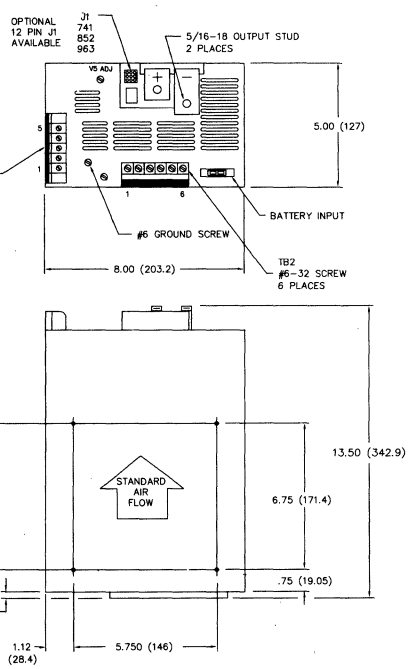


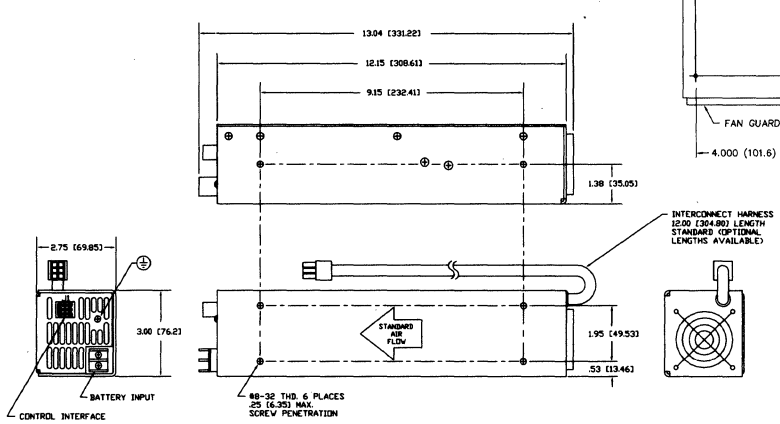
SINGLE OUTPUT RATING TABLE (250–500 Watts) (1)		
	Output Voltage	Max. Output (2) Current
Output V1	2–48V	100A

MULTIPLE OUTPUT RATING TABLE (250–500 Watts) (1)		
	Output Voltage	Max. Output (2) Current
Main V1	5V	40–75A
Aux. V2–V4	2–24V	2–10A
Aux. V5–V7	5–15V	2A

750W OUTPUT RATING TABLE (3)		
	Output Voltage	Max. Output (2) Current
Main V1	5V (1)	120A
Aux. V2	2–28V	20A
Aux. V3	2–28V	5A
Aux. V4	2–48V	1A

NOTES:
(1) Available in most P Series configurations.
(2) Each output channel is rated to provide maximum current as listed. Current rating of each channel will depend on output voltage.
(3) The total output power shall not exceed 750 watts.





(See P Series case drawings for 250-500W power supply)

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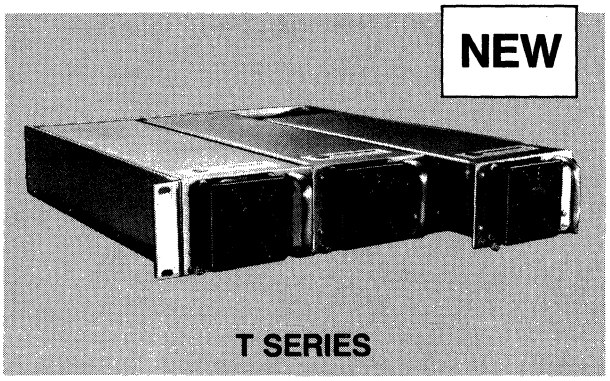
FAULT TOLERANT SYSTEMS
UP TO 3000 WATTS
1 THRU 12 OUTPUTS



KEY FEATURES
- P Series Units In A Pluggable Case
- 250 To 600 Watts Per Unit
- 1 To 4 Outputs Per Unit
- Outputs From 2VDC To 48VDC
- N + 1 Redundancy
- Current Share On All Outputs
- Integral Isolation Diodes
- Hot Plug Replacement
- High Reliability Connectors
- Backplane System Interface or Individual Unit Connection
- Interlocking On-Off Switch
- 1, 2, 3, 4, or 6 Units Per System
- Standard 19″ Rack Mountable
- Standard 3.5″ and 7″ Panel Height
- LED Power Good and DC OK Indicators
- Each Unit Independently Cooled
- User Serviceable DC Ball Bearing Fan

UNIFEATURES
- Same As Low Profile Series

AVAILABLE OPTIONS
- Worldwide Autorange 115/230VAC
- Individual Unit System Connectors
- No Load Operation (Main On Multi)
- Rack Mounting Brackets
- DC Input (42V To 56V)
- Reverse Air Flow

OPTIONS	
A	Worldwide Autorange 115/230VAC
C	Individual Unit System Connectors
E	No Load Operation (Main On Multi)
M	Rack Mounting Brackets
Q	DC Input (42V To 56V)
R	Reverse Air Flow

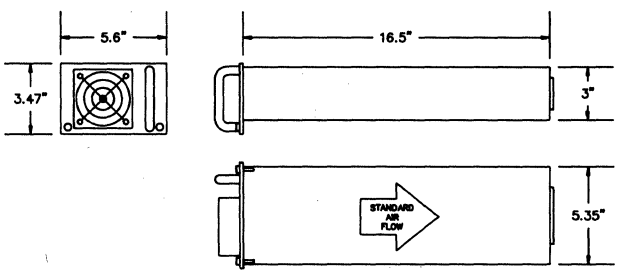
SPECIFICATIONS
All output, input, general and environmental specifications are the same as the P Series.

PHYSICAL SPECIFICATIONS
Case Material
Power Supply . . . . . .Aluminum
System Chassis . . . . . .Aluminum & Steel
Dimensions. . . . . .See Case Drawings

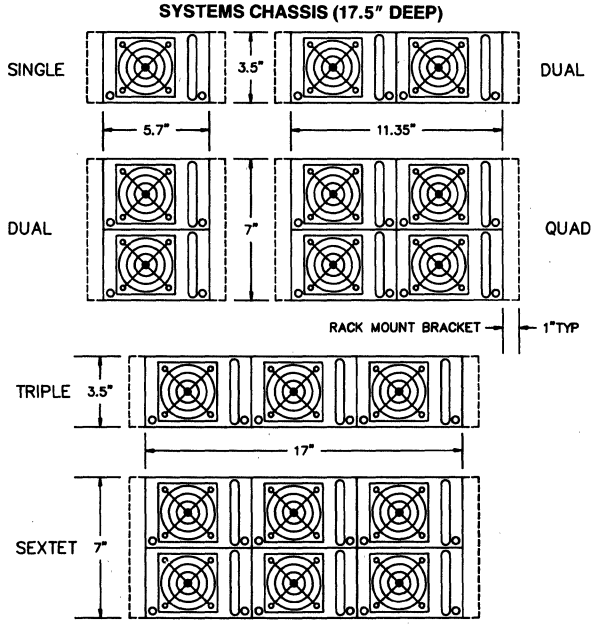
STANDARD MODEL NUMBERS
Power Supplies: Any P Series 250 to 600 watt model. Substitute "T" for "P" in model number (i.e., a PF2330 in a hot plug case is a TF2330).

Chassis Systems: T-X X
- X: # of slots (1,2,3,4,6)
- X: # of rows (1, 2)

POWER SUPPLY CASE



SYSTEMS CHASSIS (17.5″ DEEP)



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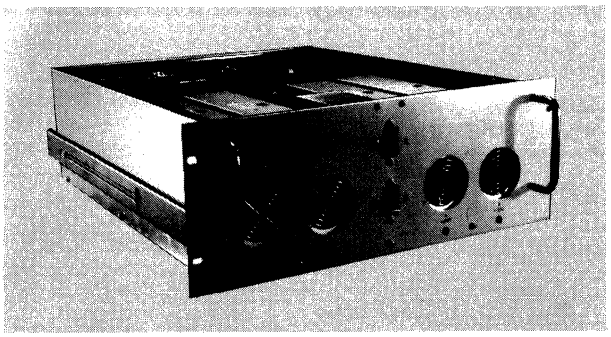
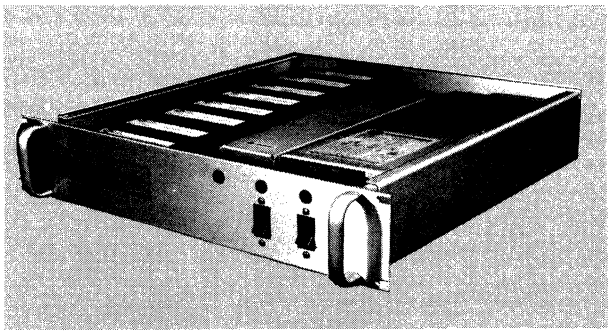
"CUSTOMIZED" SOLUTIONS

UNIPOWER engineers "customized" power solutions based on our standard products to satisfy a broad range of unique customer requirements.



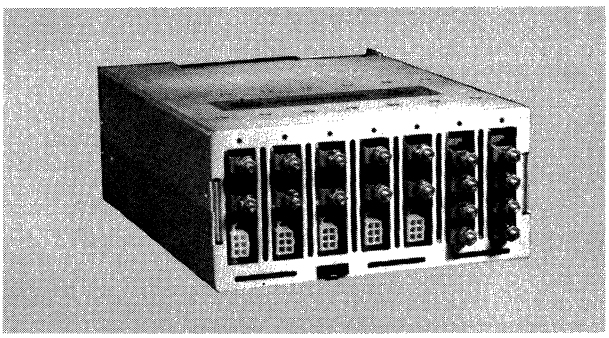
RACK MOUNT POWER SYSTEM

This 19" rack mount power system was engineered for a remote communications station. Four standard P Series units are connected in a redundant configuration. Circuit breakers, alarm circuits, indicator lights and rear mounted terminal strips complete the package.



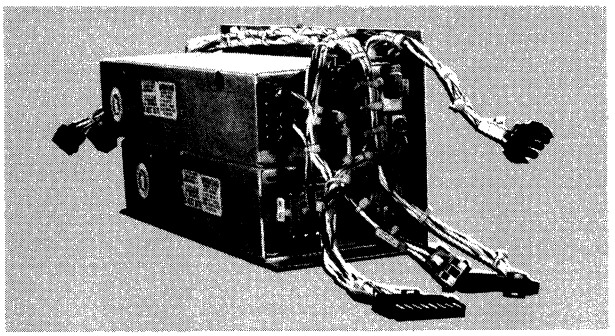
TOTAL UPS CAPABILITY

The B Series Battery Backup Switchers are available in standard 19" rack packaging. These configurations include sealed lead acid batteries, circuit breakers for AC input and battery input as well as indicator lights to signal battery ready and battery operation.



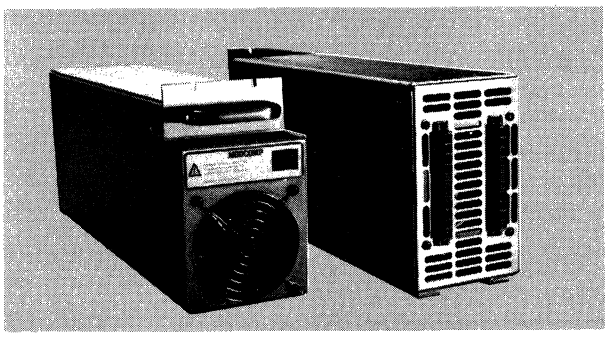
MULTI OUTPUT VME/VXI

This multi output configurable power supply can accommodate up to seven single or dual modules providing up to 14 outputs. With a maximum power of 800 watts it is ideally suited for standard bus applications including VME and VXI.



COMPLETE POWER SYSTEM

The customer for this special multi output power system needed a complete package including mounting bracket and cables with connectors. This customized solution "plugs" into the equipment and is securely mounted with built in "L" hooks and two fasteners.



HOT PLUG N + 1 PACKAGE

This hot N + 1 package was engineered for a high reliability industrial computer application. The clean simple mechanical design of the P Series facilitated repackaging to the unique dimensional requirements of the customers system.

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Call Your Local UNIPOWER Sales Rep or Contact Us Directly...

FOR THE SOLUTIONS YOU SEEK

- 250 To 2000 Watts
- Up To Eight Outputs
- Worldwide Safety Approvals
- Parallel Operation
- Low Profile Cases
- Power Factor Correction
- Wide Input Range
- Battery Backup
- N + 1 Redundancy
- 19" Rack Packaging

FOR THE APPLICATIONS YOU HAVE

- Computer Systems
- Computer Peripherals
- Telecommunications
- Office Automation
- Test And Measurement
- Industrial Control
- Medical Instrumentation
- Aerospace (Non Mil-Spec)

FOR THE EXCELLENCE YOU DESERVE

- Timely Response To Inquiries
- Standard And Custom Solutions
- Competitive Price And Delivery
- Two Year Warranty
- Worldwide Sales And Service
- Dedication To Continuous Improvement In Your Quality, Cost And Service
- Manufactured In The U.S.A.

UNISTREAK DELIVERY

UNIPOWER understands the value of time and your need to get product to market quickly. Our UNISTREAK delivery program guarantees you shipment within ten days on up to 3 pieces of any standard catalog product at a modest handling charge. We ship within 10 days or you don't pay the handling charge. So, if you need it now, ask for UNISTREAK delivery.

UNIVERSAL VOLTRONICS CORPORATION

For Information Call Or Write:
27 Radio Circle Drive, Mount Kisco, NY 10549
Phone: (914) 241-1300 ■ Fax: (914) 241-3129

Oil-Free Capacitor Charging Power Supplies

Universal Voltronics Corporation, a public subsidiary of Thermedics Inc. and ThermoElectron Corp., has been a leader in the High Voltage industry for over 30 years. Our products include: • High Voltage Switching Supplies to 30KW • High Voltage Linear Power Supplies to 400KV and 500KW • Precisely regulated high voltage power supplies to 500KV • High voltage line type and hard tube modulators • Solid state pulse generators to 100KV • Microwave component test sets • High voltage dividers • Isolation Transformers, standard line from 10kV to 250kV • High Voltage DC Power Packs, 2kV to 40kV • Multi-megajoule, megamp capacitor bank systems • Crowbar protection circits.

Universal Voltronics Corporation's new High Frequency Transformer Rectifier eliminates the need for oil/insulating fluid. The result is:*

- *compact, lightweight packaging*
- *30%-40% reduction in peak power drawn from source*
- *average power which is equal to peak power*
- *the highest safety—reduced risk of fire or accident*
- *highest efficiency.*

APPLICATIONS INCLUDE:

- Medical/Industrial Lasers
- X-ray Lithography
- E-Beam/Plasma Etching
- EMP/Flash X-Ray Simulators
- Industrial Welding/Heat Treating
- Magnetic Metal Forming

Available in 2.5kJ, 5kJ, and 10kJ Systems. Consult Factory

TYPICAL SPECIFICATIONS (BRI-5kJ):

Standard Max. Output Voltages	Average Current @ 100% Voltage	@ >75% Voltage
1 kV	10 A	13.3 A
2.5 kV	4 A	5.3 A
5 kV	2 A	2.7 A
10 kV	1 A	1.3 A
25 kV	400 mA	533 mA
35 kV	285 mA	380 mA
50 kV	200 mA	267 mA

At voltages between 75% and 100% of maximum, derate current such that kV x mA = 10,000. Other voltages and currents available, special order.

Charge Rate: 5 kJ/S PK
5 kJ/S AVG

Charge Voltage Regulation: ± .5% to 2kHz 100 ppm/°C TC
± .1% available as an option

Efficiency: >87% at full load

Input Voltages: 190–260V 50/60 Hz 3 phase 20A max. standard
190-260V 50-400 Hz 3 phase 20A max. standard
400 Hz available special order

Power Factor: >85%

Inrush Current: <20A

Protection: Overvoltage (internally adjustable) also protects against open circuit.
Prefire detection
Auto inhibit with adjustable recharge delay
Latched load detection
Overcurrent
Excess Rep rate
Over temperature
Internal & external interlocks

Cooling: Internal fans – 10 to +40°C ambient 0–7500 ft. altitude

Size: Standard 19″ rack mount 5¼″ panel height 17″ depth

Weight: Approximately 35 lbs.

Regulation Scheme: Quasi constant power:
Current decreases from max. at beginning of charge to lower values as voltage increases during charge. This greatly smooths variations in line current at lower rep rate.

*PATENT PENDING

UNIVERSAL VOLTRONICS CORPORATION

For Information Call Or Write:
27 Radio Circle Drive, Mount Kisco, NY 10549
Phone: (914) 241-1300 ■ Fax: (914) 241-3129

High Voltage Switching Power Supplies for OEM Applications for End User Applications

UVC's MOSFET-Based Switching Power Supplies offer the highest level of reliability and quality and are supported by UVC's thirty years of expertise as a High Voltage Industry Leader. Our Switching Power Supplies have Low Stored Energy and are Arc and Short Circuit Protected.

TABLE OF RATINGS

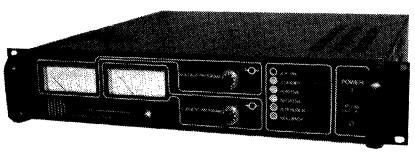
Output Voltage (KV)	Output Current (MA)	Input Volts	Input Ø	Model Number
0-5	400	200-250	3	BRC-5-400
	800	200-250	3	BRC-5-800
	1200	200-250	3	BRC-5-1200
	2000	200-250	3	BRC-5-2000
	4000	200-250	3	BRC-5-4000
	6000	200-250	3	BRC-5-6000
0-10	200	200-250	3	BRC-10-200
	400	200-250	3	BRC-10-400
	600	200-250	3	BRC-10-600
	1000	200-250	3	BRC-10-1000
	2000	200-250	3	BRC-10-2000
	3000	200-250	3	BRC-10-3000
0-20	100	200-250	3	BRC-20-100
	200	200-250	3	BRC-20-200
	300	200-250	3	BRC-20-300
	500	200-250	3	BRC-20-500
	1000	200-250	3	BRC-20-1000
	1500	200-250	3	BRC-20-1500
0-30	60	200-250	3	BRC-30-60
	120	200-250	3	BRC-30-120
	200	200-250	3	BRC-30-200
	320	200-250	3	BRC-30-320
	650	200-250	3	BRC-30-650
	1000	200-250	3	BRC-30-1000
0-50	40	200-250	3	BRC-50-40
	80	200-250	3	BRC-50-80
	120	200-250	3	BRC-50-120
	200	200-250	3	BRC-50-200
	400	200-250	3	BRC-50-400
	600	200-250	3	BRC-50-600
0-100	20	200-250	3	BRC-100-20
	40	200-250	3	BRC-100-40
	60	200-250	3	BRC-100-60
	100	200-250	3	BRC-100-100
	200	200-250	3	BRC-100-200
	300	200-250	3	BRC-100-300
0-150	12	200-250	3	BRC-150-12
	25	200-250	3	BRC-150-25
	40	200-250	3	BRC-150-40
	60	200-250	3	BRC-150-60
	130	200-250	3	BRC-150-130
	200	200-250	3	BRC-150-200
0-200	10	200-250	3	BRC-200-10
	20	200-250	3	BRC-200-20
	30	200-250	3	BRC-200-30
	50	200-250	3	BRC-200-50
	100	200-250	3	BRC-200-100
	150	200-250	3	BRC-200-150

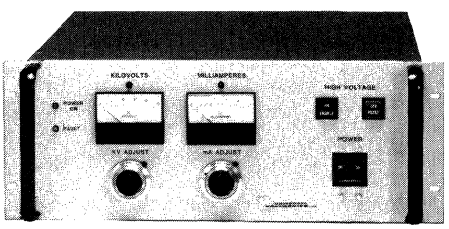
FEATURES:

- Compact and lightweight 500W in a 3½" rack mountable panel
- Low stored energy
- Low EMI
- Precision regulation
- Arc and short curcuit protection
- Low ripple
- High stability
- 110V or 220V input standard

APPLICATIONS:

- Medical/Industrial Lasers
- Ion Implantation
- Electrostatic Paint/Powder Depostion
- X-Ray Lithography
- E-Beam/Plasma Etching
- EMP/Flash X-Ray Stimulators
- Industrial Curing/Welding/Heat Testing
- Isotope Separation





Features, Laboratory Models:

Front Panel Controls:
On-Off circuit breaker and Power-On light
HV-On pushbutton and light
HV-Off pushbutton and light
Voltage and Current controlled by locking 10 turn potentiometer, 0.1% resolution
Meters are single range 2% FS analog

Packaging:
laboratory models are designed for standard 19 in. rack mounting. OEM and Airborne models are designed to the system requirements

Options:
Reversible output, DIgital meters, Custom voltage and current ranges, Remote controls—Consult Factory

Typical Specifications

Input: 115V 1ϕ or 208V 3ϕ (1000W and above)

Output: Adjustable, 0 to full rating. Rated current may be drawn at any voltage setting

Voltage Regulation: ±0.01% for line voltage of 105–125 volts. ±0.01% no load to full load

Current Regulation: Line, ±0.01% for line voltage between 100–125 volts Load, less than 100 µa over compliance range of 10% to 100%

Ripple: 0.01% of rated V at full load

Stability: .02%/hour, 0.05%/8 hours TYP after warm up

Polarity: Fixed, positive or negative Specify at time of order

AIR INSULATION

Output Voltage (KV)	Output Current (MA)	Air insulation	Model Number
0 - 5	100	90-125	BRC-5-100
		190-240	BRC-5-100
0 -10	50	90-125	BRC-10-50
		190-240	BRC-10-50
0 -15	32	90-125	BRC-15-32
		190-240	BRC-15-32
0 -20	25	90-125	BRC-20-25
		190-240	BRC-20-25
0 -30	15	90-125	BRC-30-15
		190-240	BRC-30-15
0 -40	12	90-125	BRC-40-12
		190-240	BRC-40-12
0 -50	10	90-125	BRC-50-10
		190-240	BRC-50-10

Size: 3½" High

Features, Laboratory Models:

Front Panel Controls:
On-Off switch and Power-On light
HV-On/Off pushbutton and light
Voltage and Current controlled by locking 10 turn potentiometer, 0.1% resolution
Meters are single range 2% FS analog

Packaging:
Laboratory models are designed for standard 19 in. rack mounting.

Options:
Reversible output, Digital meters, Custom voltage and current ranges, Remote controls—Consult Factory

Typical Specifications

Input: 115V or 220V

Output: Adjustable, 0 to full rating. Rated current may be drawn at any voltage setting

Voltage Regulation: ±0.01% for line voltage of 105–125 volts. ±0.01% no load to full load

Current Regulation: Line, ±0.01% for line voltage between 100–125 volts Load, less than 100 µa over compliance range of 10% to 100%

Ripple: 0.01% of rated V at full load

Stability: .02%/hour, 0.05%/8 hours TYP after warm up

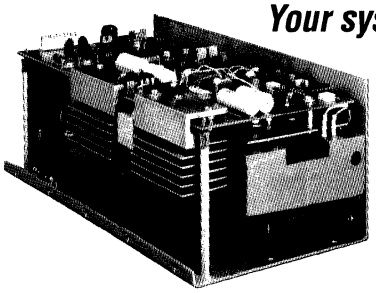
Polarity: Fixed, positive or negative Specify at time of order

UNIVERSAL VOLTRONICS CORPORATION

For Information Call Or Write:
27 Radio Circle Drive, Mount Kisco, NY 10549
Phone: (914) 241-1300 ■ Fax: (914) 241-3129

High Voltage Power Supplies Optimized for OEM Applications from Universal Voltronics Corporation

Your system is only as good as your power supply.



Ensure the highest level of reliability and quality in your system with high voltage power supplies from Universal Voltronics Corporation. UVC has delivered thousands of high voltage power supplies for laser and other applications which require precision regulation. Our high frequency systems are compact, easy to use, designed to operate without ballast resistors in either the CW or pulse modes in gas discharge applications and provide full power at 3/4 Voltages.

	MODELS		
	500W	**1000W**	**2000W**
Maximum Continuous Voltage	40kv	40kv	40kv
Maximum CW Power Output	500W	1000W	2000W
Voltage regulation from 20 to 40 kV		+ – 5% of FS*	
Current regulation		+ – .5% of FS	
Switching frequency		40kHz	
Input Voltage and Current	105–125VAC 50/60Hz 1 Ø, 7A	105–125VAC 50/60Hz 1 Ø, 15A	105–125VAC 50/60Hz 1 Ø, 28A
	200–250VAC 50/60Hz 1 Ø, 4A	200–250VAC 50/60Hz 1 Ø, 8A	200–250VAC 50/60Hz 1 Ø, 15A
	N.A.	190–240VAC 3 Ø, 4A	190–240VAC 3 Ø, 8A
Ripple	5% RMS*		
Metering Signals-Voltage	0–10V = 0–40kV		
Metering Signals-Current	0–10 = 0–full scale		
Internal Setpoint Controls	one turn potentiometers		
Remote Setpoint Signals	same as metering signals		
Remote HV on Signal	+5V @ 3.5mA into opto-isolator or contact closure		
MECHANICAL			
Size	13″ x 6.75″ x 5.25″		
Weight	12.25 pounds		
HV Insulation	HV assembly potted in repairable RTV		
Mounting Position	any		
HV Output	dry cable well		
Interface connector	10 PIN panduit		
Air Cooled by Internal Fan (Standard to all units)		Option water cooled	Option water cooled

*.5% available by special order

LAN AND GENERAL PURPOSE DC/DC CONVERTERS

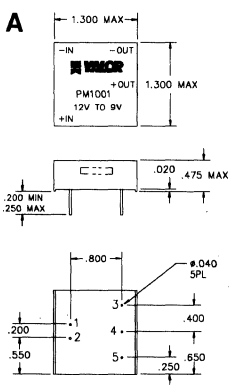
FEATURES

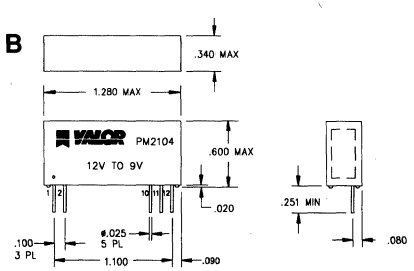
- Up to 2 Watts (nominal), Regulated and Unregulated.
- Up to 2500 VRMS Isolation Available.
- Same Price for 500V and 2000V VRMS Isolation.
- Industry Standard Packages
- Low Cost, Excellent Reliability
- Surface Mount Versions Available

SPECIFICATIONS

- Efficiencies to 72%
- Operating Temperature Range: 0° to 70°C
- Output Ripple: 50mVp-p, 100mVp-p MAX
- Regulation: ±5% (regulated)
- Enable: LO to Enable When Indicated (*)

PACKAGES





Selection Table

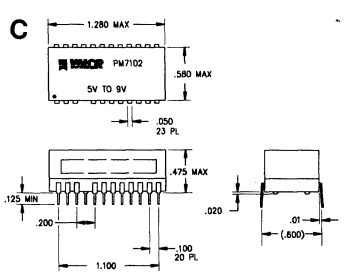
VOLTAGE OUT	VOLTAGE IN					
	5V			12V		
±5	PM 2100		PM 7120			
±9	PM 2102	PM 6501	PM 7002	PM 1001	PM 2104	PM 6502
	PM 7003	PM 7102	PM 7103	PM 7004	PM 7104	PM 7105
	PM 9002	PM 9921	PM 9929	PM 9004	PM 9923	PM 9925
	PM 9931			PM 9927	PM 9933	
±12	PM 7006		PM 7007			
	PM 9006		PM 9007			
±15	PM 9008					
DUAL ±12, ±12	PM 7110					
DUAL +12, −12	PM2110					

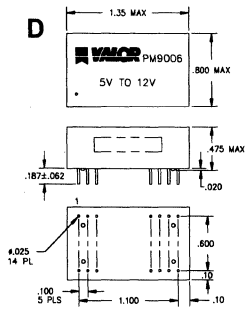
Valor DC/DC Converters

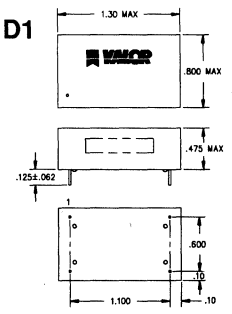
PART#	V IN	V OUT	I OUT	REG	ISO(V)	PKG
PM 1001	12	−9	200	YES	2500	A
PM 2100	5	5	200	NO	500	B
PM 2102	5	−9	200	NO	500	B
PM 2104	12	−9	200	NO	500	B
PM 6501	5	−9	225	YES	2000	E
PM 6502	12	−9	225	YES	2000	E
PM 7002	5	−9	200	YES	500	C
PM 7003	5	−9	200	YES	2000	C
PM 7004	12	−9	200	YES	500	C
PM 7006	5	12	165	YES	500	C
PM 7007	5	12	165	YES	2000	C
PM 7102	5	−9	200	NO	500	C
PM 7103	5	−9	200	NO	2000	C
PM 7104	12	−9	200	NO	500	C
PM 7105	12	−9	200	NO	2000	C
PM 9002*	5	−9	200	YES	500	D
PM 9004*	12	−9	250	YES	500	D
PM 9006*	5	12	165	YES	500	D
PM 9007*	5	12	165	YES	2000	D
PM 9008*	5	15	130	YES	500	D
PM 9921	5	−9	200	NO	2000	D-1
PM 9923	12	−9	200	NO	2000	D-1
PM 9925	12	−9	250	YES	2000	D
PM 9927*	12	−9	225	YES	2000	D
PM 9929*	5	−9	225	YES	2000	D
PM 9931	5	−9	225	YES	2000	D-1
PM 9933	12	−9	225	YES	2000	D-1

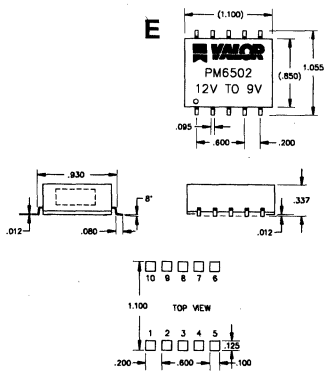
Dual Output Converters

PART#	V IN	V-1 OUT	I-1 OUT	V-2 OUT	I-2 OUT	REG	ISO	PKG
PM 2110	5	+12	75	−12	75	NO	500	B
PM 7110	5	12	80	12	100	NO	500	C









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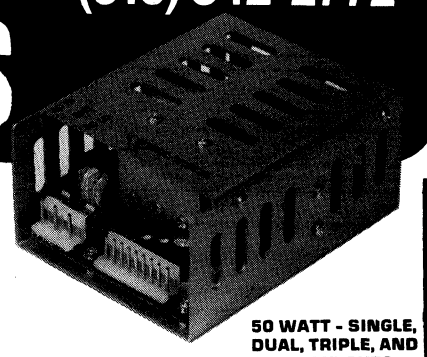
VOLTEX POWER SUPPLIES

(516) 842-2772



compact, competitive and powerful.

AC to DC switchmode power supplies

model number	power watts	output #1 V A	output #2 V A	output #3 V A	output #4 V A
VLX-82-714-1	50	5-10			
VLX-82-714-2		12-4			
VLX-82-714-3		15-3			
VLX-82-714-4		24-2			
VLX-82-713-1		5-5	12-2		
VLX-82-713-2		5-5	15-1.5		
VLX-82-713-3		12-2	12-2		
VLX-82-713-4		15-1.5	15-1.5		
VLX-82-712-1		5-5	12-1	12-1	
VLX-82-712-2		5-5	15-1	15-1	
VLX-82-712-3		5-5	12-1	24-0.5	
VLX-82-711-1		5-4	12-1	12-1	5-1
VLX-82-711-2		5-4	15-1	15-1	5-1
VLX-82-711-3		5-4	12-1	12-1	24-0.5

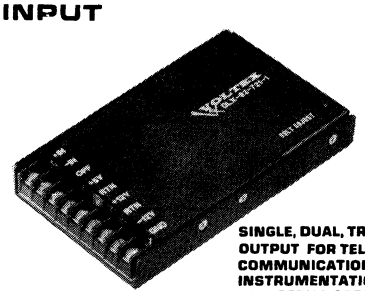
model number	power watts	output #1 V A	output #2 V A	output #3 V A	output #4 V A
MPX-82-706-1	150	5-30			
MPX-82-706-2		12-12			
MPX-82-706-3		15-10			
MPX-82-706-4		24-6			
MPX-82-705-1		5-15	12-6		
MPX-82-705-2		5-15	15-5		
MPX-82-705-3		12-6	12-6		
MPX-82-705-4		15-5	15-5		
MPX-82-704-1		5-15	12-3	12-3	
MPX-82-704-2		5-15	15-3	15-3	
MPX-82-704-3		5-15	12-3	24-1.5	
MPX-82-703-1		5-15	12-3	12-3	5-1
MPX-82-703-2		5-15	15-2.5	15-2.5	5-1
MPX-82-703-3		5-15	12-2.5	12-2.5	24-0.5

model number	power watts	output #1 V A	output #2 V A	output #3 V A	output #4 V A
LPX-82-710-1	100	5-20			
LPX-82-710-2		12-8			
LPX-82-710-3		15-7			
LPX-82-710-4		24-4			
LPX-82-709-1		5-10	12-4		
LPX-82-709-2		5-10	15-3		
LPX-82-709-3		5-10	24-2		
LPX-82-709-4		12-4	12-4		
LPX-82-709-5		15-3	15-3		
LPX-82-708-1		5-10	12-2	12-2	
LPX-82-708-2		5-10	15-1.5	15-1.5	
LPX-82-708-3		5-10	12-2	24-1	
LPX-82-707-1		5-10	12-2	12-2	5-1
LPX-82-707-2		5-10	15-1.5	15-1.5	5-1
LPX-82-707-3		5-10	12-1.5	12-1.5	24-0.5
LPX-82-707-4		5-10	15-1.5	15-1.5	24-0.5
LPX-82-707-5		5-10	12-1.5	12-1.5	12-1.5
LPX-82-707-6		5-10	15-1.5	15-1.5	15-1.5

model number	power watts	output #1 V A	output #2 V A	output #3 V A	output #4 V A
MLX-82-715-1	200	5-40			
MLX-82-715-2		12-16			
MLX-82-715-3		15-13			
MLX-82-715-4		24-8			
MLX-82-716-1		5-20	12-8		
MLX-82-716-2		5-20	15-6		
MLX-82-716-3		5-20	24-4		
MLX-82-716-4		12-8	12-8		
MLX-82-716-5		15-6	15-6		
MLX-82-717-1		5-20	12-4	12-4	
MLX-82-717-2		5-20	15-3	15-3	
MLX-82-717-3		5-20	12-4	24-2	
MLX-82-718-1		5-20	12-4	12-4	5-1
MLX-82-718-2		5-20	15-3	15-3	5-1
MLX-82-718-3		5-20	12-3	12-3	24-1
MLX-82-718-4		5-20	15-2.5	15-2.5	24-1
MLX-82-718-5		5-20	12-3	12-3	12-2
MLX-82-718-6		5-20	15-2	15-2	15-2

50 WATT - SINGLE, DUAL, TRIPLE, AND QUAD OUTPUTS

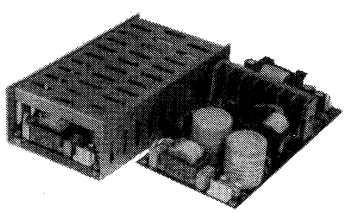
UNIVERSAL INPUT



SINGLE, DUAL, TRIPLE, OUTPUT FOR TELE-COMMUNICATIONS, INSTRUMENTATION AND INDUSTRIAL APPLICATION

25 & 50 WATT

DC-DC CONVERTERS



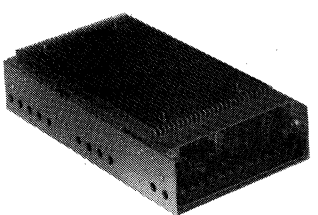
PC BOARD OR CASED

100 WATT-SINGLE, DUAL, TRIPLE, AND QUAD OUTPUTS-

DC to DC switchmode power converters

model number	power watts	output #1 V A	output #2 V A	output #3 V A	output #4 V A
DLX-82-719-1	25	5-5			
DLX-82-719-2		12-2			
DLX-82-719-3		15-2			
DLX-82-719-4		24-1			
DLX-82-720-1		5-3	12-1		
DLX-82-719-4		24-1			
DLX-82-720-1		5-3	12-1		
DLX-82-720-2		5-3	15-1		
DLX-82-720-3		12-1	12-1		
DLX-82-720-4		15-1	15-1		
DLX-82-721-1		5-3	12-0.5	12-0.5	
DLX-82-721-2		5-3	15-0.5	15-0.5	
DLX-82-722-1	50	5-10			
DLX-82-722-2		12-4			
DLX-82-722-3		15-4			
DLX-82-722-4		24-2			
DLX-82-723-1		5-5	12-2		
DLX-82-723-2		5-5	15-2		
DLX-82-723-3		12-2	12-2		
DLX-82-723-4		15-2	15-2		
DLX-82-724-1		5-5	12-1	12-1	
DLX-82-724-2		5-5	15-1	15-1	
DMX-82-725-1	100	5-20			
DMX-82-725-2		12-8			
DMX-82-725-3		15-7			
DMX-82-725-4		24-4			
DMX-82-726-1		5-10	12-4		
DMX-82-726-2		5-10	15-4		
DMX-82-726-3		12-4	12-4		
DMX-82-726-4		15-4	15-4		
DMX-82-727-1		5-10	12-2	12-2	
DMX-82-727-2		5-10	15-2	15-2	
DMX-82-728-1		5-10	12-1	12-1	24-1
DMX-82-728-2		5-10	15-1	15-1	24-1

model number	power watts	output #1 V A	output #2 V A	output #3 V A	output #4 V A
DMX-82-729-1	150	5-30			
DMX-82-729-2		12-12			
DMX-82-729-3		15-10			
DMX-82-729-4		24-6			
DMX-82-730-1		5-15	12-6		
DMX-82-730-2		5-15	15-5		
DMX-82-730-3		12-6	12-6		
DMX-82-730-4		15-5	15-5		
DMX-82-731-1		5-15	12-3	12-3	
DMX-82-731-2		5-15	15-3	15-3	
DMX-82-732-1		5-15	12-1.5	12-1.5	24-1.5
DMX-82-732-2		5-15	15-1.5	15-1.5	24-1.5
DPX-82-733-1	200	5-40			
DPX-82-733-2		12-16			
DPX-82-733-3		15-14			
DPX-82-733-4		24-8			
DPX-82-734-1		5-20	12-8		
DPX-82-734-2		5-20	15-7		
DPX-82-734-3		12-8	12-8		
DPX-82-734-4		15-7	15-7		
DPX-82-735-1		5-20	12-4	12-4	
DPX-82-735-2		5-20	15-4	15-4	
DPX-82-736-1		5-20	12-2	12-2	24-2
DPX-82-736-2		5-20	15-2	15-2	24-2



100 WATT

DC-DC CONVERTERS

SINGLE, DUAL, TRIPLE, AND QUAD OUTPUT FOR TELECOMMUNICATIONS, INSTRUMENTATION AND INDUSTRIAL APPLICATIONS.

Reliability

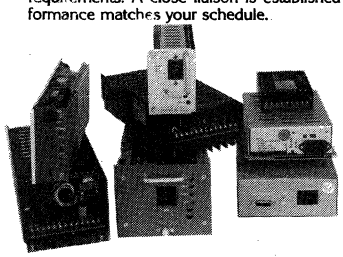
Reliability is designed into any power supply delivered by Voltex. Long, trouble free operation is assured by paying attention to all details.

Dependability

From prototype through production we endeavor to meet your requirements. A close liaison is established to make sure that our performance matches your schedule.

Capability

The entire power system is designed by Voltex. Magnetics, sheet metal, etc. are designed and fabricated in our plant. This assures you of consistent, high quality power systems. Instrumentation, such as power failed detect systems, sequencing systems, in fact all systems associated with power systems can be designed. Power related control systems, such as motor speed controls, have also been designed.



Custom Designed Power Supplies for OEM applications

VOLTEX CO., INC.

3460 Great Neck Road, North Amityville, New York 11701

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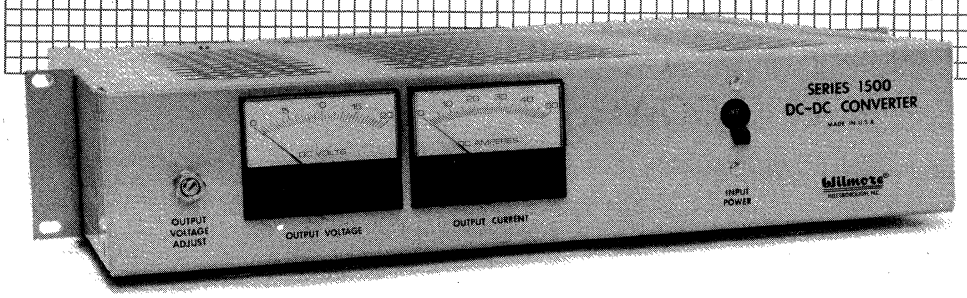
Wilmore DC-To-DC Power Converters



- **80% To 90% Efficient**
- **200, 400 Or 800 Watts**
- **Height 3.45″ (2 Rack Spaces)**
- **Input/Output Isolation**

The Series 1500 converters provide an isolated, regulated, adjustable dc output from station batteries or other widely fluctuating dc sources to reliably power telecommunications equipment, supervisory control systems, and other sensitive electronic equipment. Conservatively rated and very efficient, these converters will operate at any load within their rating over a wide ambient temperature range with simple convection cooling. Their minimal no-load input power (about 5 watts) and correspondingly high light-load efficiencies make them uniquely suited for applications in which extended periods of "standby" service are encountered.

Front-Panel Controls And Indicators

A combination circuit breaker and ON/OFF switch is provided for the input power. A voltmeter and ammeter display the dc output. A screwdriver-slotted potentiometer shaft with locking nut is provided to adjust the output voltage level.

Size And Weight

All converters measure 3.45″ high by 17.0″ wide. The 200-watt and 400-watt units are 13.2″ deep, and the 800-watt units measure 13.4″ deep. All units weigh less than 18 pounds.

Optional Features

Standard options for Series 1500 converters include paralleling diodes for multiple-unit redundancy applications and auxiliary Form C contacts for remote indication of improper converter output. In addition, many other input/output voltage combinations not listed in the adjacent table are available. Contact our sales department for details.

Other Rack Mounted DC-To-DC Converters

In addition to the Series 1500, Wilmore manufactures many other standard and custom, single and multiple-output rack-mounted DC-to-DC converters. Each series is isolated, regulated and highly efficient. Each is designed and manufactured in accordance with Wilmore's emphasis on conservative electrical ratings and long product life. Contact our sales department for more information.

Input Voltage Range (Vdc)	Adjustable Output Voltage Range (Vdc)	Output Current (Adc)	Model Number
20-29	12-14	0-15	**1502-24-13-15**
20-29	12-14	0-30	**1502-24-13-30**
20-29	22-26	0-8	**1502-24-24-8**
20-29	22-26	0-16	**1502-24-24-16**
20-29	44-52	0-4	**1502-24-48-4**
20-29	44-52	0-8	**1502-24-48-8**
21-29	45.5-50.5	0-16	**1560-24-48-16**
40-58	12-14	0-15	**1502-48-13-15**
40-58	12-14	0-30	**1502-48-13-30**
40-58	22-26	0-8	**1502-48-24-8**
40-58	22-26	0-16	**1502-48-24-16**
42-58	22-26	0-30	**1561-48-24-30**
40-58	44-52	0-4	**1502-48-48-4**
40-58	44-52	0-8	**1502-48-48-8**
40-58	123.5-136.5	0-1.5	**1502-48-130-1.5**
40-58	123.5-136.5	0-3	**1502-48-130-3**
42-58	123.5-136.5	0-6	**1562-48-130-6**
105-140	12-14	0-15	**1502-130-13-15**
105-140	12-14	0-30	**1502-130-13-30**
105-140	22-26	0-8	**1502-130-24-8**
105-140	22-26	0-16	**1502-130-24-16**
105-140	44-52	0-4	**1502-130-48-4**
105-140	44-52	0-8	**1502-130-48-8**
105-140	123.5-136.5	0-1.5	**1502-130-130-1.5**
105-140	123.5-136.5	0-3	**1502-130-130-3**

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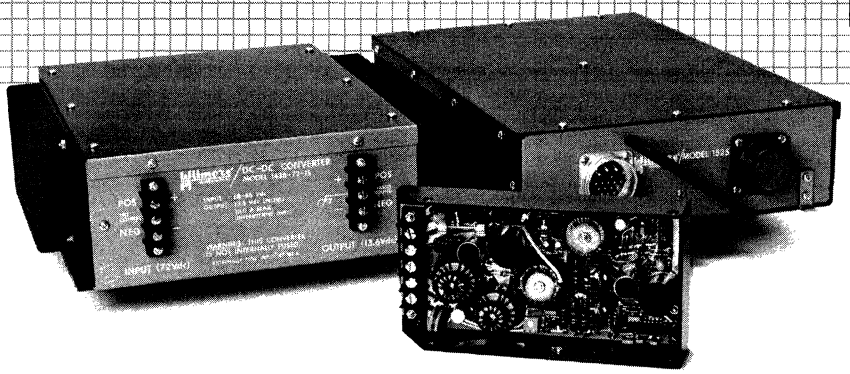
Wilmore

Railroad/Transit DC-To-DC Converters



- **24, 36, 72 And 110-VDC Inputs**
- **Input Transient Protection**
- **-30°C To 60°C Temperature Range**
- **Electrically And Mechanically Rugged**

Wilmore's RT (Railroad/Transit) Series dc-to-dc converters are especially designed to power radio transceivers, fuel management systems, ATCS equipment, and other sensitive electronic loads aboard locomotives and electric rail vehicles. Model 1525 converters can be mounted on AAR-type communications equipment racks for standard locomotive radio/converter installations. Model 1438 and Model 1554 converters have baseplate flanges for convenient mounting. Conservative electrical, mechanical, and thermal design and special construction techniques provide install-and-forget reliability in the harsh environment found on rail vehicles.

Transient Withstand Capability

High-voltage, high-energy transients on locomotive power busses will damage inadequately-protected electronic equipment. RT Series converters protect sensitive loads while operating through input transients up to 3000 volts in amplitude and 90 watt-seconds in energy content. Each converter is individually tested to meet this withstand capability. A 20-mfd capacitor is charged to 3000 Vdc (90 watt-seconds of stored energy) then abruptly connected across the input terminals. This test is repeated between the input terminals and chassis ground. RT Series converters do not rely on gas discharge tubes, varistors, power zeners, or other limited-life transient suppression devices to achieve this capability.

Mechanical Considerations

Equipment installed on locomotives and other rail vehicles is subject to potentially-destructive mechanical shock and vibration levels. RT Series converters are designed and manufactured for continuous use in railroad environments. Printed circuit boards are glass-epoxy with double-sided solder pads and plated-through holes to promote solder joint integrity. Larger electronic components are selected on the basis of mechanical ruggedness as well as circuit function. Special attention is given to internal weight distribution, avoidance of large masses on printed circuit boards, and appropriate use of locking fasteners and component-staking compounds.

Custom-Designed RT Series Converters

As the use of sensitive electronic equipment on rail vehicles continues to grow and diversify, user's needs for reliable power conversion are becoming highly individualized. The majority of Wilmore's work for the rail transportation industry is the design and manufacture of custom power products. Our field-proven circuitry can be readily scaled to provide different input/output voltage combinations, output power levels, and package sizes for use on diesel-electric locomotives and electrically-powered rail transit vehicles. Our engineering charges for custom units are modest, and our turnaround times are short. If you have some special requirements regarding any performance criteria, our New Products Group would like to hear from you. When the program gets to the production phase, Wilmore's two production facilities in North Carolina will deliver to meet your program goals. We are a competitive, quality-oriented, domestic manufacturer with the ability and experience to meet difficult design criteria and demanding production schedules.

Nominal Input Voltage (Vdc)	Output Voltage (Vdc)	Output Current (Adc)	Dimensions (h" x w" x d")	Weight (Pounds)	Mounting and Connections	Model Number
36	13.6	0-5	3.7 x 9.0 x 11.8	6	Mounting flange on base accepts four #8 bolts. Input and output connections are made via barrier-strip terminal blocks.	1438-36-5
36	13.6	0-10	3.7 x 11.4 x 11.8	7		1438-36-10
36	13.6	0-15	3.7 x 11.4 x 11.8	8		1438-36-15
72	13.6	0-5	3.7 x 9.0 x 11.8	6		1438-72-5
72	13.6	0-10	3.7 x 11.4 x 11.8	7		1438-72-10
72	13.6	0-15	3.7 x 11.4 x 11.8	8		1438-72-15
72	13.6	0-30	3.1 x 12.0 x 15	14		1554-72-13-30
24	13.6	0-12	3.3 x 10.3 x 16.2	16	AAR rack mountable.	1525-24-12
72	13.6	0-12	3.3 x 10.3 x 16.2	16		1525-72-12
110	13.6	0-12	3.3 x 10.3 x 16.2	16		1525-110-12

NEW

The first products in our new *miniaturized* Series 1620 RT converters are being introduced in 1991:

- **50%-75% Smaller**
- **Full Transient Protection**
- **Lightweight and Rugged**

For more information, request Bulletin 1062

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Mobile Communications DC-To-DC Converters

- **Reliable 12-Volt Power From Any Vehicle**
- **High Efficiency**
- **-30°C To 60°C Operating Range**
- **Ruggedized For Mobile Applications**

These dc-to-dc converters are designed to power standard mobile communications equipment from vehicular electrical systems with output voltages other than 12-Vdc negative ground. Typical applications include powering equipment on 24-V, 36-V and 48-V lift trucks, positive ground trucks, and 24-V heavy duty construction vehicles.

Heavy Duty 24-V To 12-V Converters - Series 1416

With output current ratings of 15, 25 and 35 amperes, the three models of this series provide a regulated 13.5 Vdc from 24-volt, negative ground vehicular battery systems. Designed to meet military shock and vibration specifications, the Series 1416 converters are lightweight, highly efficient, and extremely rugged.

Unregulated, Economy Converters - Series 1360

These rugged unregulated converters include 12-Vdc, polarity-reversing converters (Models 1360 and 1380), 24-volt to 12-volt converters (Models 1365 and 1395), and 12-volt to 24-volt converters (Models 1424 and 1442). All are light weight and quiet with conversion efficiencies exceeding 85%.

Converters - Series 1340 Regulated/Isolated

The Series 1340 can be used with 12-V, 24-V, 36-V and 48-V vehicular battery systems to provide voltage regulation, electrical isolation, and voltage conversion for 12-V and 24-V mobile communications equipment.

Wide Input Converter - Model 1475

The Model 1475 is designed to power mobile communications equipment in lift trucks. This converter features an extremely wide voltage range of 20 to 56 volts, electrical isolation and output voltage regulation. These features allow the user to specify one model for an entire fleet of lift trucks despite the presence of more than one battery voltage.

Input Voltage Range (Vdc)	Nominal Output Voltage[1] (Vdc)	Output Current[2] (Adc)	Isolated/ Polarity-Reversing	Dimensions (h" x w" x d")	Efficiency[3] (Typical)	Model Number
21-32	13.5	0-15	No	4 x 9.2 x 10.4	80%	**1416-15**
21-32	13.5	0-25	No	4 x 9.2 x 10.4	80%	**1416-25**
21-32	13.5	0-35	No	4 x 9.2 x 10.4	80%	**1416-35**
10-16	13.0	0-10	Polarity-Reversing	2.5 x 7.3 x 9.8	80%	**1380**
10-16	13.0	0-15	Polarity-Reversing	2.5 x 7.3 x 9.8	80%	**1360**
20-32	13.0	0-10	No	2.5 x 7.3 x 9.8	80%	**1395**
20-32	13.0	0-15	No	2.5 x 7.3 x 9.8	80%	**1365**
10-16	26.0	0-10	No	2.5 x 7.3 x 9.8	80%	**1442**
10-16	26.0	0-15	No	2.5 x 7.3 x 9.8	80%	**1424**
11-15	13.0	0-6	Isolated	3.9 x 4.8 x 7.8	72%	**1340-13-13-6**
11-15	26.0	0-3	Isolated	3.9 x 4.8 x 7.8	72%	**1340-13-26-3**
22-30	13.0	0-6	Isolated	3.9 x 4.8 x 7.8	72%	**1340-26-13-6**
22-30	26.0	0-3	Isolated	3.9 x 4.8 x 7.8	72%	**1340-26-26-3**
30-42	13.0	0-6	Isolated	3.9 x 4.8 x 7.8	72%	**1340-36-13-6**
40-56	13.0	0-6	Isolated	3.9 x 4.8 x 7.8	72%	**1340-48-13-6**
20-56	13.0	0-6	Isolated	2.5 x 7.5 x 10.4	75%	**1475**

[1] Models 1380, 1360, 1395, 1365, 1442, and 1424 provide voltages directly proportional to input voltage. All other models provide regulated output voltages.

[2] Maximum current ratings assume an intermittent demand on a 20% duty cycle except for the Series 1340 converters. The rating given for the Series 1340 is a continuous duty rating.

[3] These are typical minimum efficiencies for one-half to full load.

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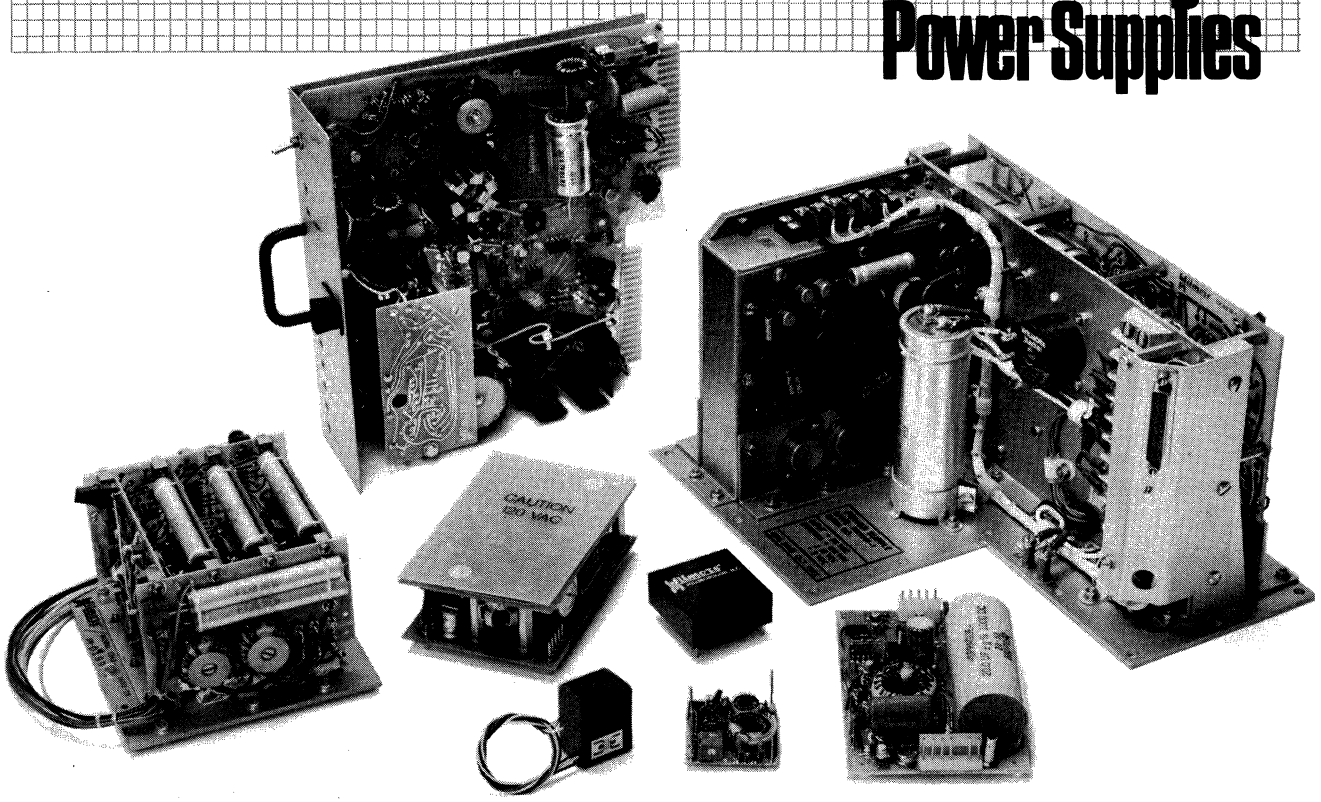
Wilmore

Custom-Designed Power Supplies



The majority of our work is the design and manufacture of custom switching power supplies and dc-to-dc converters.

More than twenty years ago our transistor-switching power supplies began flying on spacecraft. Today we ship thousands of custom-designed industrial power supplies each month to a wide base of original equipment manufacturers. We are familiar with environments as demanding as diesel locomotives and as favorable as air-conditioned equipment bays. Our products operate daily from telecom and utility station batteries, vehicular electrical systems, low-voltage industrial ac circuits, and commercial ac power. We probably have had experience with applications similar to yours.

We combine the ability to deliver prototypes quickly and the production resources to manufacture competitively.

Systems engineers and power supply designers face the difficult task of electrically, mechanically, and thermally integrating a power supply into the system. The task can be further complicated by time constraints. Wilmore excels at this phase of program support, delivering carefully-conceived prototypes often in just a few weeks. Our responsiveness continues through to the production phase. Wilmore's two assembly plants in North Carolina were built from the ground up to produce power supplies in volume. We are a competitive domestic manufacturer with the flexibility to meet difficult production schedules.

Our New Products Group would like to hear from you.

Your inquiry will be answered promptly by the people who will be responsible for the design and prototyping of your power supply. If you need a quotation on your completed specification, or if you just want to discuss your application please give our New Products Group a call. We would appreciate the opportunity to help solve your power conversion problems.

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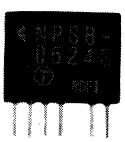
DC-DC CONVERTERS

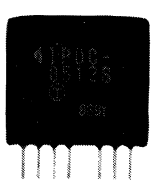
FEATURES

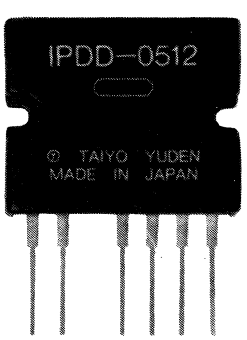
- Surface-Mount (SMT) and SIP Configurations
- Largest Selection in 2 to 5Vdc Input Range
- 1,000,000 Hr MTBF
- Industry's Smallest
- Isolated and Non-Isolated Models
- 9 Standard SMT Models
- 37 Standard SIP Models

APPLICATIONS

- Laptop Displays
- LAN Cards
- Automotive
- Cellular Phones
- Security/Alarms
- Pagers
- RS232C Ports
- Modems
- Medical Instruments
- Portable Phones
- Hand-held Instruments
- Multimeters







Model	Input Vdc	Output Vdc	Output mA	Regulation (%) Line	Regulation (%) Load	Stability %/°C	Eff %	Pkg Type	Dimensions LxWxH (in)
NON-ISOLATED BATTERY INPUT									
BPSA-0205S	2.0-3.5	+5	40	±1.5	±1.5	0.1	50	SIP	0.67x0.24x0.47
BNSA-0205S	2.0-3.5	-5	40	±1.5	±1.5	0.1	50	SIP	0.67x0.24x0.47
BPSA-0205G	2.0-3.5	+5	40	±1.5	±1.5	0.1	50	SMT	0.68x0.49x0.20
BNSA-0205G	2.0-3.5	-5	40	±3.0	±3.0	0.1	45	SMT	0.68x0.49x0.20
BPSA-0212S	2.0-3.5	+12	20	±1.5	±1.5	0.03	50	SIP	0.67x0.24x0.47
BNSA-0212S	2.0-3.5	-12	20	±1.5	±1.5	0.03	50	SIP	0.67x0.24x0.47
BPSA-0212G	2.0-3.5	+12	20	±1.5	±1.5	0.03	50	SMT	0.68x0.49x0.20
BNSA-0212G	2.0-3.5	-12	20	±1.5	±1.5	0.03	45	SMT	0.68x0.49x0.20
NON-ISOLATED INVERTING									
NNSA-0505S	4.5-5.5	-5	60	±1.0	±1.5	0.1	55	SIP	0.67x0.24x0.47
NNSA-0505G	4.5-5.5	-5	60	±1.0	±1.5	0.1	60	SMT	0.68x0.49x0.20
NNSB-0505S	4.5-5.5	-5	100	±1.0	±1.5	0.1	60	SIP	0.79x0.35x0.63
NNSC-0505S	4.5-5.5	-5	200	±1.0	±1.5	0.1	60	SIP	0.87x0.39x0.79
NNSA-0512S	4.5-5.5	-12	25	±1.0	±1.5	0.03	55	SIP	0.67x0.24x0.47
NNSA-0512G	4.5-5.5	-12	25	±1.0	±1.5	0.03	60	SMT	0.68x0.49x0.20
NNSB-0512S	4.5-5.5	-12	40	±1.0	±1.5	0.03	60	SIP	0.79x0.35x0.63
NNSC-0512S	4.5-5.5	-12	80	±1.0	±1.5	0.03	60	SIP	0.87x0.39x0.79
NNSA-0515S	4.5-5.5	-15	20	±1.0	±1.5	0.03	55	SIP	0.67x0.24x0.47
NNSA-0515G	4.5-5.5	-15	20	±1.0	±1.5	0.03	60	SMT	0.68x0.49x0.20
NNSB-0515S	4.5-5.5	-15	33	±1.0	±1.5	0.03	60	SIP	0.79x0.35x0.63
NNSC-0515S	4.5-5.5	-15	67	±1.0	±1.5	0.03	60	SIP	0.87x0.39x0.79
NNSA-0523S	4.5-5.5	-22.5	12	±1.0	±1.2	0.02	55	SIP	0.67x0.24x0.47
NON-ISOLATED VOLTAGE BOOSTING									
NPSA-0512S	4.5-5.5	+12	25	±1.0	±1.5	0.03	65	SIP	0.67x0.24x0.47
NPSA-0512G	4.5-5.5	+12	25	±1.0	±1.5	0.03	60	SMT	0.68x0.49x0.20
NPSB-0512S	4.5-5.5	+12	40	±1.0	±1.5	0.03	60	SIP	0.79x0.35x0.63
NPSC-0512S	4.5-5.5	+12	80	±1.0	±1.5	0.03	60	SIP	0.87x0.39x0.79
NPSA-0515S	4.5-5.5	+15	20	±1.0	±1.5	0.03	65	SIP	0.67x0.24x0.47
NPSA-0515G	4.5-5.5	+15	20	±1.0	±1.5	0.03	60	SMT	0.68x0.49x0.20
NPSB-0515S	4.5-5.5	+15	33	±1.0	±1.5	0.03	60	SIP	0.79x0.35x0.63
NPSC-0515S	4.5-5.5	+15	67	±1.0	±1.5	0.03	55	SIP	0.79x0.35x0.63
NPSB-0524S	4.5-5.5	+24	20	±1.5	±2.0	0.03	55	SIP	0.79x0.35x0.63
NPSC-0524S	4.5-5.5	+24	40	±1.5	±2.0	0.03	55	SIP	0.87x0.39x0.79
ISOLATED									
IPDA-0512S	4.5-5.5	±12	12.5	±1.5	±2.5	0.03	60	SIP	0.83x0.35x0.79
IPDB-0512S	4.5-5.5	±12	21	±1.5	±2.5	0.03	60	SIP	0.91x0.35x0.87
IPDC-0512S	4.5-5.5	±12	42	±1.5	±2.5	0.03	60	SIP	0.98x0.35x0.94
IPDD-0512	4.5-5.5	±12	125	±1.5	±2.5	0.03	60	SIP	1.57x0.39x0.67
IPDE-0512	4.5-5.5	±12	208	±1.5	±2.5	0.03	60	SIP	2.01x0.47x0.91
IPDA-0515S	4.5-5.5	±15	10	±1.5	±2.5	0.03	60	SIP	0.83x0.35x0.79
IPDB-0515S	4.5-5.5	±15	17	±1.5	±2.5	0.03	60	SIP	0.91x0.35x0.87
IPDC-0515S	4.5-5.5	±15	34	±1.5	±2.5	0.03	60	SIP	0.98x0.35x0.94
IPDD-0515	4.5-5.5	±15	100	±1.5	±2.5	0.03	60	SIP	1.57x0.39x0.67
IPDE-0515	4.5-5.5	±15	166	±1.5	±2.5	0.03	60	SIP	2.01x0.47x0.91
IPSA-0524S	4.5-5.5	24	12.5	±1.5	±2.5	0.03	60	SIP	0.83x0.35x0.79
IPSB-0524S	4.5-5.5	24	21	±2.0	±2.5	0.03	60	SIP	0.91x0.35x0.87
IPSC-0524S	4.5-5.5	24	42	±2.0	±2.5	0.03	60	SIP	0.98x0.35x0.94
IPSD-0524	4.5-5.5	24	125	±1.5	±2.5	0.03	60	SIP	1.57x0.39x0.67
IPSE-0524	4.5-5.5	24	208	±1.5	±2.5	0.03	60	SIP	2.01x0.47x0.91

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LINEAR POWER SUPPLIES

EXTENDED PERFORMANCE SERIES

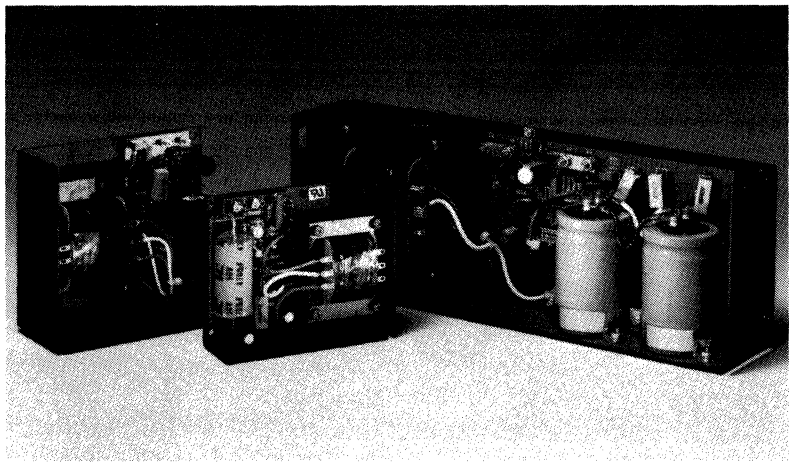
Dash No.	Output Range (Vdc)	XE 20	XE 30	XE 60	XE 90	XE 120	XE 180	XE 240
		Output Current (A)						
-5	5	4.0	6.0	12.0	18.0	25.0	36.0	50.0
-5	6	3.3	5.0	10.0	13.0	18.0	26.0	36.0
-12	11	2.5	4.2	8.4	11.1	12.9	18.7	25.8
-12	12	2.4	4.0	8.0	10.2	12.1	18.1	24.2
-12	13	2.2	3.7	7.4	9.6	11.5	16.6	23.0
-15	14	2.2	3.5	7.0	9.0	11.0	16.0	22.0
-15	15	2.1	3.3	6.6	8.4	10.3	14.7	20.6
-15	16	1.9	3.0	6.0	7.6	9.5	13.8	19.0
-24	20	1.6	2.4	4.8	6.2	7.6	10.4	15.2
-24	21	1.6	2.4	4.8	6.2	7.6	10.4	15.2
-24	22	1.5	2.2	4.4	5.7	7.0	10.1	14.0
-24	23	1.5	2.2	4.4	5.7	7.0	10.1	14.0
-24	24	1.2	2.0	4.0	5.0	6.5	9.3	13.0
-24	25	1.2	2.0	4.0	5.0	6.5	9.3	13.0
Mechanical Specifications								
L (in)		4.50	5.75	6.25	8.50	12.00	9.62	11.94
W (in)		4.00	4.38	5.25	5.50	5.62	8.50	9.25
H (in)		2.75	3.50	4.87	4.87	4.88	4.88	4.88
Wt (lbs)		2.8	4.8	9.1	12.3	18.3	24.5	32.5

OEM SERIES

Dash No.	Output Range (Vdc)	XPX 20	XPX 30	XPX 45	XPX 60	XPX 90
		Output Current (A)				
-5	5	4.0	6.0	9.0	12.0	18.0
-5	6	3.3	5.0	7.5	10.0	13.0
-12	11	2.5	3.0	5.0	6.8	10.5
-12	12	2.4	3.0	4.8	6.5	10.0
-12	13	2.2	2.7	4.4	6.1	9.6
-24	21	1.5	2.4	3.8	5.2	6.7
-24	22	1.5	2.4	3.8	5.2	6.7
-24	23	1.2	2.3	3.6	5.0	6.0
-24	24	1.2	2.3	3.6	5.0	6.0
-48	48	-	1.2	-	-	-
-100	75	-	0.8	-	-	-
-100	100	-	0.6	-	-	-
-150	110-150	-	0.4	-	-	-
-180	150-190	-	-0.3	-	-	-
-250	190-220	-	0.25	-	-	-
-250	220-250	-	0.2	-	-	-
Mechanical Specifications						
L (in)		4.87	5.62	7.00	9.00	14.00
W (in)		4.00	4.88	4.88	4.87	4.88
H (in)		1.97	2.95	3.38	3.39	3.39
Wt (lbs)		2.3	4.1	6.0	7.5	12.5

UNREGULATED SERIES

Dash No.	15XXU Vdc/A	30XXU Vdc/A	60XXU Vdc/A	100XXU Vdc/A	200XXU Vdc/A	500XXU Vdc/A	750XXU Vdc/A	1000XXU Vdc/A
-7	7.5/1.8	7.5/3.0	7.5/6.0	8.5/10.0	-	-	-	-
-12	11.0/1.2	12.0/2.4	12.0/4.8	12.5/7.0	-	-	-	-
-16	17.0/0.9	16.0/1.8	16.0/3.6	17.0/6.0	-	-	-	-
-24	25.0/0.6	26.5/1.2	26.5/2.4	25.5/3.5	27.5/7.5	24.6/20.0	24.0/30.0	24.0/40.0
-48	48.0/0.3	48.0/0.6	48.0/1.2	48.0/1.8	47.0/4.0	48.0/10.0	48.0/15.0	48.0/20.0
Mechanical Specifications								
L (in)	4.62	5.88	6.25	7.12	8.10	9.00	9.50	9.00
W (in)	2.62	3.19	3.69	4.00	5.00	5.62	8.00	9.00
H (in)	2.09	2.62	3.00	3.25	3.88	4.62	5.56	5.38
Wt (lbs)	1.5	2.6	4.0	6.3	12.3	20.5	31.0	33.0



FEATURES

Extended Performance Series (XE)

- 20W to 240W (at 5Vdc)
- Adjustable output voltage ranges from 5Vdc to 25Vdc
- 0 to 55°C without derating
- Electrostatically Shielded Xfmr
- Foldback Current Limiting
- Short Circuit and Reverse Voltage Protection
- 115/230VAC input

OEM Series (XP)

- 20W to 90W (at 5Vdc)
- Adjustable output voltage ranges from 5Vdc to 24Vdc (up to 250Vdc on XP30)
- 0 to 40°C without derating
- Foldback Current Limiting
- Short Circuit and Reverse Voltage Protection

Unregulated Series (XU)

- 15W to 1000W
- Excellent Source of Bulk dc Power for Distributed Power Systems
- Best Cost-per Watt Value

SPECIFICATIONS

XE & XP Series

Input: 115/230 (XE), 115 (XP) VAC±10%, 47-440Hz. (Derate output current 15% at 400Hz.)

Output: Floating, adjustable with multi-turn cermet pots over range per table.

Line Regulation: ±0.05% for 10% line change. (0.2% for 20% change.)

Load Regulation: ±0.05% for 50% load change. (0.2% for 100%.)

Transient Response: <50µs for 50% load change.

Noise and Ripple: 0.1% peak-to-peak.

Operating Temperature: 0-55°C (XE), 0-40°C (XP, XE20). Derate 2%/°C to 71°C.

Temperature Coefficient: ±0.01%/°C, max.

Stability: ±0.1% max for 24 hrs, after warmup.

XU Series

Input: 115/230VAC,50/60Hz.

Output: Floating fixed output at full load rating per model selection chart.

Load Regulation: 15%, 0-50% of rating, typical. 9%, 50-100% rating , typical.

Ripple: 3% rms, max at full load.

Operating Temperature: 0-50°C. (Derate 2%/°C to 71°C.)

Overcurrent Protection: Fuse.

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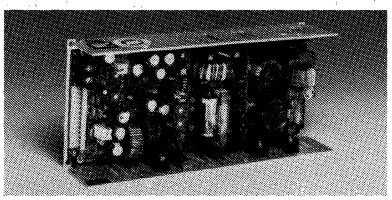
Xentek
SWITCHMODE POWER SUPPLIES

FEATURES

- NEW Auto-Ranging Models
- Up to 3.0 Watts/in³
- Four Regulated, Adjustable Outputs
- On-board EMI Filtering
- Low PARD (1% max)
- Overload, Overvoltage, Reverse Voltage & Thermal Protection
- Two-year Warranty

SPECIFICATIONS

AC Input: 90-132/180-264VAC, 47-63Hz, Auto-ranging (AR Models); Jumper selected (SX Models).
Input Protection: Fuse.
Inrush Current: 32A, max.
Input Transient Protection: Meets IEEE 587, Category A.
Efficiency: 75% typical.
Hold-up Time: 20ms.
AC Power Fail Signal: TTL low 5ms before loss of regulation.
MTBF: 100,000 Hrs, minimum.
EMI Filtering: VDE 0871/6.78 and FCC Level A (SX Models), FCC Level B (AR Models).
Adjustability: ±5%, all outputs.
Line & Load Regulation: 1%, max on all outputs.
Cross Regulation: Negligible.
Remote Sense: Compensates for 0.5 volt cable drop on main output.
Remote ON/OFF: TTL low signal, standard on all models rated >300W.
PARD: 1%, max, all outputs.
Output Overshoot: None on turn-on or turn-off.
Overload Protection: Input and output protection, standard.
Reverse Voltage Protection: Full current rating, all outputs.
Transient Response: 2% max for 25% load change; recovery to within 1% in <500µs.
Stability: ±0.1% for 24 Hrs.
Temperature Coefficient: 0.02%/°C.
Operating Temperature: 0-50°C, full rating. Derate to 50% at 70°C.
Storage Temperature: -55°C to +85°C.
Safety: Meets UL 478; UL 1012; CSA 22.2 No. 220, Electrical Bulletin 1402C; VDE 0804; VDE 0806; IEC380; IEC435.



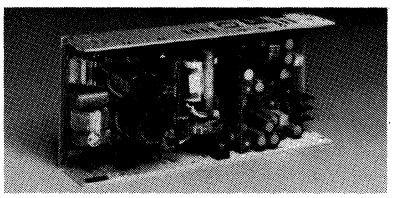
150/175[1] WATTS

Main Output:
+5Vdc/15A, max; 3A, min.

AUXILIARY OUTPUTS			
AR175[2]-	Aux 1	Aux 2	Aux 3
81000	+12V/6A (8A)	12V/2A (3A)	5V/1A (1.5A)
81010	+12V/6A (8A)	12V/2A (3A)	12V/1A (1.5A)
81030	+12V/6A (8A)	24V/1A (1.5A)	5V/1A (1.5A)
81040	+12V/6A (8A)	24V/1A (1.5A)	5V/1A (1.5A)
81050	+15V/6A (8A)	15V/2A (3A)	5V/1A (1.5A)
81060	+24V/4A (5A)	12V/2A (3A)	5V/1A (1.5A)
81070	+24V/4A (5A)	12V/2A (3A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 9.50" x 4.25" x 2.00"
AR Models: 11.50" x 4.25" x 2.00"



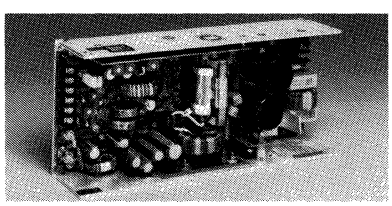
175/200[1] WATTS

Main Output:
+5Vdc/20A, max; 3A, min.

AUXILIARY OUTPUTS			
AR200[2]-	Aux 1	Aux 2	Aux 3
81500	+12V/6A (8A)	12V/2.5A (3A)	5V/1A (1.5A)
81510	+12V/6A (8A)	12V/2.5A (3A)	12V/1A (1.5A)
81530	+12V/6A (8A)	24V/1A (1.5A)	5V/1A (1.5A)
81540	+12V/6A (8A)	24V/1A (1.5A)	5V/1A (1.5A)
81550	+15V/6A (8A)	15V/2.5A (3A)	5V/1A (1.5A)
81560	+24V/4A (5A)	12V/2.5A (3A)	5V/1A (1.5A)
81570	+24V/4A (5A)	12V/2.5A (3A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 9.50" x 4.25" x 2.25"
AR Models: 11.50" x 4.25" x 2.25"



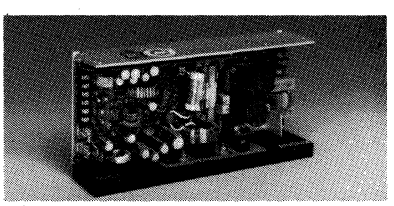
225/300[1] WATTS

Main Output:
+5Vdc/40A, max; 5A, min.

AUXILIARY OUTPUTS			
AR300[2]-	Aux 1	Aux 2	Aux 3
82000	12V/10A	12V/2A (3A)	5V/1A (1.5A)
82010	12V/10A	12V/2A (3A)	12V/1A (1.5A)
82030	12V/10A	24V/1A (1.5A)	5V/1A (1.5A)
82040	12V/10A	24V/1A (1.5A)	5V/1A (1.5A)
82050	15V/10A	15V/2A (3A)	5V/1A (1.5A)
82060	24V/5A (6A)	12V/2A (3A)	5V/1A (1.5A)
82070	24V/5A (6A)	12V/2A (3A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 10.00" x 5.00" x 2.50"
AR Models: 12.00" x 5.00" x 2.50"



245/325[1] WATTS

Main Output:
+5Vdc/45A, max; 5A, min.

AUXILIARY OUTPUTS			
AR325[2]-	Aux 1	Aux 2	Aux 3
82300	12V/10A	12V/2A (3A)	5V/1A (1.5A)
82310	12V/10A	12V/2A (3A)	12V/1A (1.5A)
82330	12V/10A	24V/1A (1.5A)	5V/1A (1.5A)
82340	12V/10A	24V/1A (1.5A)	12V/1A (1.5A)
82350	15V/10A	15V/2A (3A)	5V/1A (1.5A)
82360	24V/5A (6A)	12V/2A (3A)	5V/1A (1.5A)
82370	24V/5A (6A)	12V/2A (3A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 10.00" x 5.00" x 2.50"
AR Models: 12.00" x 5.00" x 2.50"

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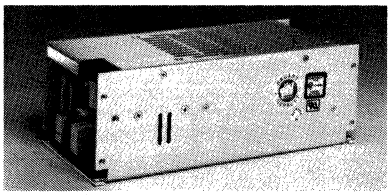


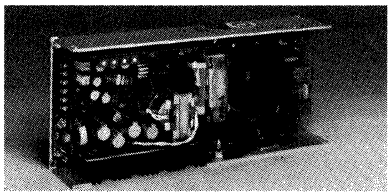
350[3] WATTS

Main Output:
+5Vdc/45A, max; 5A, min.

AUXILIARY OUTPUTS			
AR350[2]-	Aux 1	Aux 2	Aux 3
82500	12V/12A (14A)	12V/2.5A (3A)	5V/1A (1.5A)
82510	12V/12A (14A)	12V/2.5A (3A)	12V/1A (1.5A)
82530	12V/12A (14A)	24V/1A (1.5A)	5V/1A (1.5A)
82540	12V/12A (14A)	24V/1A (1.5A)	12V/1A (1.5A)
82550	15V/12A (14A)	15V/2.5A (3A)	5V/1A (1.5A)
82560	24V/6A (7A)	12V/2.5A (3A)	5V/1A (1.5A)
82570	24V/6A (7A)	12V/2.5A (3A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 10.00" x 5.00" x 3.50"
AR Models: 12.00" x 5.00" x 3.50"



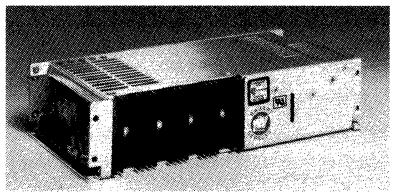
400[4] WATTS

Main Output:
+5Vdc/50A, max; 5A, min.

AUXILIARY OUTPUTS			
AR400[2]-	Aux 1	Aux 2	Aux 3
83000	12V/10A	12V/6A (8A)	5V/1A (1.5A)
83010	12V/10A	12V/6A (8A)	12V/1A (1.5A)
83030	12V/10A	24V/4A (5A)	5V/1A (1.5A)
83040	12V/10A	24V/4A (5A)	12V/1A (1.5A)
83050	15V/10A	15V/6A (8A)	5V/1A (1.5A)
83060	24V/5A (6A)	12V/6A (8A)	5V/1A (1.5A)
83070	24V/5A (6A)	12V/6A (8A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 10.50" x 5.00" x 2.50"
AR Models: 12.50" x 5.00" x 2.50"



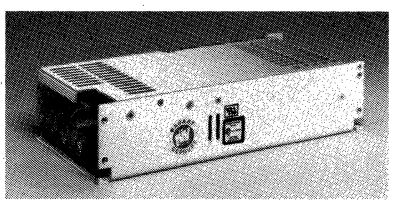
425[4] WATTS

Main Output:
+5Vdc/60A, max; 7A, min.

AUXILIARY OUTPUTS			
AR425[2]-	Aux 1	Aux 2	Aux 3
83500	12V/12A (14A)	12V/6A (8A)	5V/1A (1.5A)
83510	12V/12A (14A)	12V/6A (8A)	12V/1A (1.5A)
83530	12V/12A (14A)	24V/4A (5A)	5V/1A (1.5A)
83540	12V/12A (14A)	24V/4A (5A)	12V/1A (1.5A)
83550	15V/12A (14A)	15V/6A (8A)	5V/1A (1.5A)
83560	24V/6A (7A)	12V/6A (8A)	5V/1A (1.5A)
83570	24V/6A (7A)	12V/6A (8A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 10.50" x 5.00" x 3.50"
AR Models: 12.50" x 5.00" x 3.50"



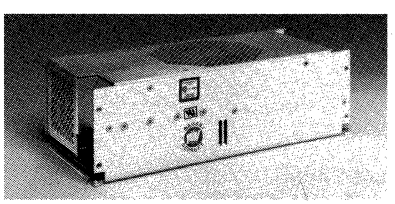
450[4] WATTS

Main Output:
+5Vdc/60A, max; 7A, min.

AUXILIARY OUTPUTS			
AR450[2]-	Aux 1	Aux 2	Aux 3
84000	12V/12A (14A)	12V/6A (8A)	5V/1A (1.5A)
84010	12V/12A (14A)	12V/6A (8A)	12V/1A (1.5A)
84030	12V/12A (14A)	24V/4A (5A)	5V/1A (1.5A)
84040	12V/12A (14A)	24V/4A (5A)	12V/1A (1.5A)
84050	15V/12A (14A)	15V/6A (8A)	5V/1A (1.5A)
84060	24V/6A (7A)	12V/6A (8A)	5V/1A (1.5A)
84070	24V/6A (7A)	12V/6A (8A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 11.50" x 5.00" x 2.50"
AR Models: 13.50" x 5.00" x 2.50"



500[3] WATTS

Main Output:
+5Vdc/70A, max; 7A, min.

AUXILIARY OUTPUTS			
AR500[2]-	Aux 1	Aux 2	Aux 3
84500	12V/12A (14A)	12V/6A (8A)	5V/1A (1.5A)
84510	12V/12A (14A)	12V/6A (8A)	12V/1A (1.5A)
84530	12V/12A (14A)	24V/4A (5A)	5V/1A (1.5A)
84540	12V/12A (14A)	24V/4A (5A)	12V/1A (1.5A)
84550	15V/12A (14A)	15V/6A (8A)	5V/1A (1.5A)
84560	24V/6A (7A)	12V/6A (8A)	5V/1A (1.5A)
84570	24V/6A (7A)	12V/6A (8A)	12V/1A (1.5A)

Note: Current shown in parentheses is peak rating.

Dimensions:
SX Models: 11.50" x 5.00" x 3.50"
AR Models: 13.50" x 5.00" x 3.50"

Notes

[1] Higher rating achieved when fan cooling (30 CFM airflow) is employed; the lower rating is with convection cooling.

[2] Auto-Ranging models are shown in table; for jumper-selected input, replace "AR" in the model number with "SX". For example:

Model AR300-82000 is auto-ranging version; Model SX300-82000 has jumper-selected input.

[3] Unit equipped with built-in fan.

[4] Fan cooling (30 CFM airflow) required.

Other voltage/current combinations are available in OEM quantities.

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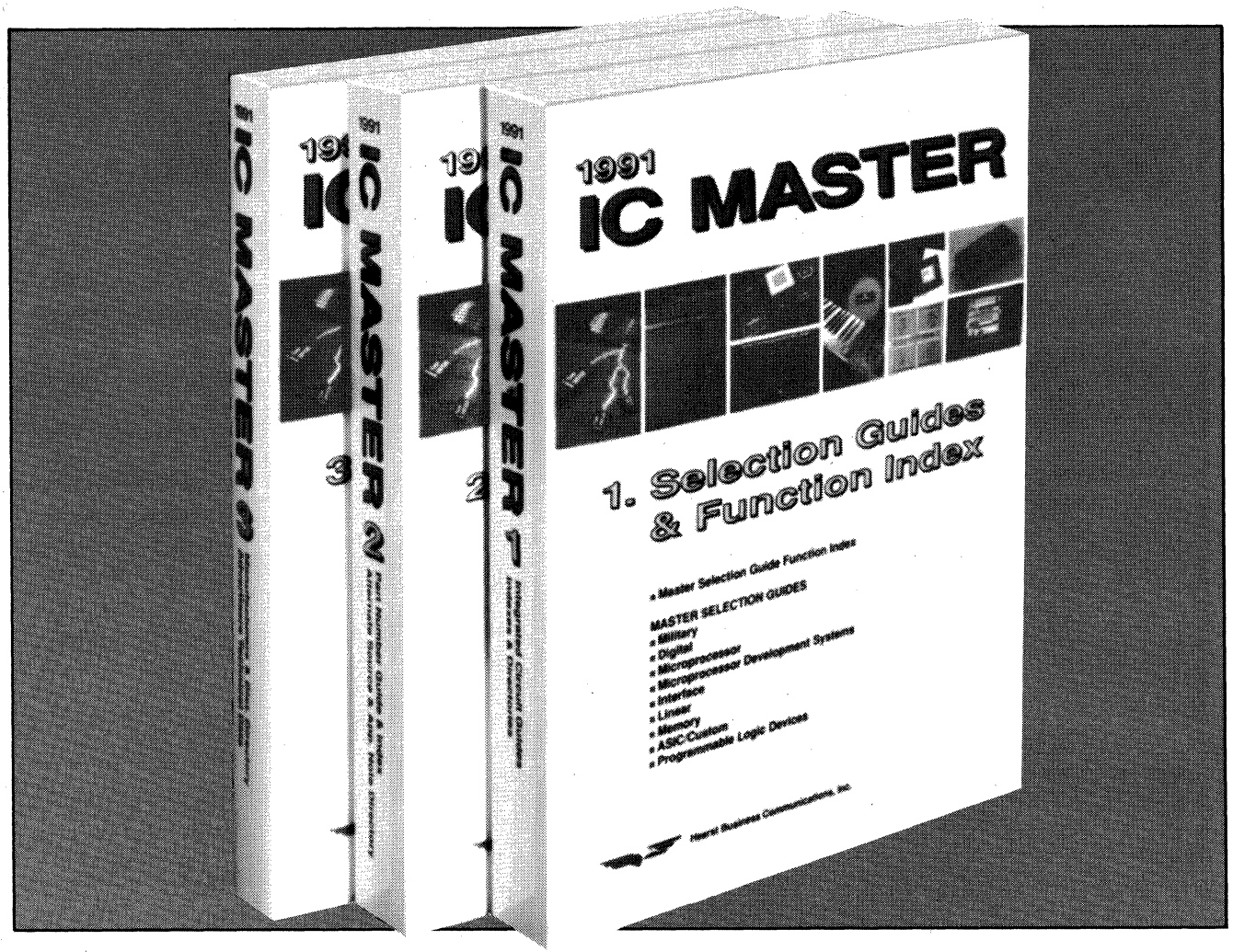

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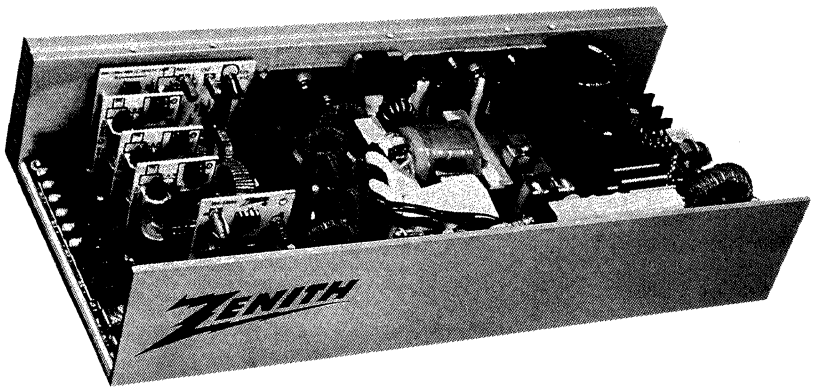

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- 2 Year Warranty.
- 100,000 - 150,000 MTBF.

Model	Max Output Power (Watts)	Main Output Volts DC Range (Min/Max)	Main Output Amps (Min/Max)	2nd Output Volts DC Range (Min/Max)	2nd Output Amps (Min/Max)	3rd Output Volts DC Range (Min/Max)	3rd Output Amps (Min/Max)	4th Output Volts DC Range (Min/Max)	4th Output Amps (Min/Max)
ZPS-150A	150	4.75/5.25	2.0/20.0	11.5-25.2	0.3/3.0 PK 4.5	9.5-15.8	0.3/4.0 PK 5.0	4.75-12.6	0.2/2.0
ZPS-175A	175	4.75/5.25	2.5/25.0	11.5-25.2	0.35/3.5 PK 5.25	9.5-15.8	0.35/4.5 PK 5.5	4.75-12.6	0.2/2.0
ZPS-200A	200	4.75/5.25	3.0/30.0	11.5-25.2	0.4/4.0 PK 6.0	9.5-15.8	0.4/5.0 PK 6.0	4.75-12.6	0.2/2.0
ZPS-250A	250	4.75/5.25	3.5/35.0	11.5-26.0	0.4/4.0 PK 6.0	4.75-16.0	0.4/4.0 PK 6.0	4.75-16.0	0.3/3.0 PK 4.5
ZPS-300A	300	4.75/5.25	4.5/45.0	11.5-26.0	0.6/6.0 PK 9.0	4.75-16.0	0.8/8.0 PK 12	4.75-16.0	0.4/4.0 PK 6.0
ZPS-400A	400	4.75/5.25	5.5/55.0	11.5-26.0	0.7/7.0 PK 10.5	4.75-16.0	1.0/10.0 PK 15.0	4.75-16.0	0.6/6.0 PK 9.0

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LINE REGULATORS/CONDITIONERS

Manufacturer	Starting EEM Page No.	Model/ Series	Power Rating(VA)	Frequency (Hz)	Phase			Voltage Protection	Surge Protection
					Single	Two	Three		
Acme Electric	D•2154	PS-87066	1400	60Hz				√	√
Compact Power Co.	D•2183	MAC	165VA - 6KVA	45Hz - 20KHz	√	√	√	√	
Elgar	D•2191	UPLC	1, 3, 5KVA	50, 60Hz	√				
Georator Corp.	D•2195	37	2.5 - 125KVA	50, 60Hz	√		√	√	√
Hipotronics	D•2200	PAVR Series	17KVA - 665KVA	50, 60Hz	√		√	√	√
Hitran	D•2202	SFR	20000	60Hz	√			√	√
Kikusui	D•2211	PCR Series	500VA - 60KVA	5 - 500Hz	√	√	√	√	√
Marway Products	D•2212	MPS, MPD Series	Power Distbn. Units	150A Capacity 18 Outlets	√	√	√	√	√
Pacific Power Source	D•2216	MS	62,500 - 625,000	50,60,400,415			√	√	√
		LN	50,000 - 500,000	50,60,400,415			√	√	√
		G	6,000 - 90,000	47 - 500	√		√	√	√
		MR	15,000 - 30,000	50,60,400,415			√	√	√
Pulizzi Engineering Inc.	D•2224	PC 874A-F	1440 - 2880	50 - 60Hz	√			√	√
		PC 300 C&D	8640	50 - 60Hz			√	√	√
		PC 300 MTD C&D	8640	50 - 60Hz			√	√	√
		PC 726 C&D	8640	50 - 60Hz			√	√	√
		TPC 115-8 A-F	1440 - 5760	50 - 60Hz	√			√	√
		PC 115 A&B	1440 - 2880	50 - 60Hz	√			√	√
		TPC 884	2400 - 4800	50 - 60Hz	√			√	√
		PC 585 C-F	2880 - 5760	50 - 60Hz	√			√	√
		PC 585/MTD C-F	2880 - 5760	50 - 60Hz	√			√	√
		PC 585-1/MTD C-F	2880 - 5760	50 - 60Hz	√			√	√
		PC 125 A-F	1440 - 5760	50 - 60Hz	√			√	√
		PC 861 A-G	1440 - 2880	50 - 60Hz	√			√	√
		PC 726 MTD C&D	8640	50 - 60Hz			√	√	√
		TPC 115-10/MTD A-F	1440 - 5760	50 - 60Hz	√			√	√
Xentek	D•2232	EIT, TRI, VDE, LGT	125 - 15,000	50 - 60Hz	√		√		√

UPS SYSTEMS

Manufacturer	Starting EEM Page No.	Model/ Series	Output (VA)	Output Frequency (Hz)	Phase		
					Single	Two	Three
Abacus Controls Inc.	D•2149	500 & 900 Series	330VA to 10KVA	50, 60Hz	√		
Acme Electric	D•2154	S-300 1000, 3000-1	300 - 1200 120	60Hz 60Hz			
Advance Conversion Devices	D•2156		1500, 2750 Watts		√	√	√
Behlman Electronics	D•2168	H Series H Series	1000 - 5000VA 1, 1.7, 2, 3 & 5KVA	50/60Hz 50, 60Hz	√ √		√ √
Best Power Technology	D•2177	Micro-Ferrups & Ferrups	500VA - 18KVA	50, 60Hz	√		
Chloride Electro Networks	D•2182	PWM	20 - 250KVA				
Controlled Power Co.	D•2185	Advantage /Series 1000A	4.5 - 25K	60Hz	√		
Elgar	D•2191	102-1B & 302-1B 502-1T	1 - 3KVA 5KVA	 60Hz	√ √		
Hitran	D•2202	HD	20000 MAX	60Hz	√		
Instrumentation & Control Systems Inc.	D•2208	2000 Series 4000 Series 1200 Series 1400 Series Lifeline E Series E	20KVA, 30KVA, 40KVA, 50KVA 10KVA, 15KVA, 20KVA 7.5KVA, 10KVA, 15KVA 500VA, 750VA, 1000VA 200VA, 600VA 1KVA - 20KVA 2KVA - 20KVA	120/208, 240/415, 208 or 240V 50, 60Hz 50, 60Hz 50, 60Hz 60Hz 50, 60Hz 50, 60Hz	√ √ √ √ √ √ √		√
Nova Electric Inc.	D•2214	Galaxy	1KVA - 5KVA	50, 60, 400Hz	√		
Pacific Power Source	D•2216	UG UMR ULN	6000 - 90000 15000 - 30000 50000 - 500000	47 - 500z 50, 60, 400, 415 50, 60, 400, 415	√		√ √ √
Wilmore	D•2230	1400	50 - 1000VA	50, 60Hz	√		

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FREQUENCY CONVERTERS

Manufacturer	Starting EEM Page No.	Model/ Series	Output (VA)	Output Frequency (Hz)	Phase		
					Single	Two	Three
Abacus Controls Inc.	D•2149	100, 200, 2000 Series	500VA to 50KVA		√		√
Avionic Instruments Inc.	D•2160	4A1000	1000 - 4000, 3000 - 12000	50, 60Hz, 400Hz	√		√
Behlman Electronics	D•2168	PA Series	20 - 100KVA	45 - 500Hz	√		√
California Instruments Corp.	D•2179	T, XP, L	100VA - 36KVA	20Hz - 20KHz	√	√	√
Compact Power Co.	D•2183	MAC	165VA - 6KVA	45Hz — 20KHz	√	√	√
Elgar	D•2191	SL & B Series SX Series VXP 3000 DMAC EL Series GPS 1000	120 - 3600VA 500 - 5250VA 750 - 2250VA 15KVA - 180KVA 1.2KVA - 15KVA 1KVA	45 - 5KHz 45Hz - 1KHz 350 - 1KHz 0.1 - 999.9Hz 47 - 500Hz 60Hz	√ √ √ √ √ √	√ √ √ √	√ √ √ √ √
Georator	D•2195	30 33 37 37 39	150 - 3000VA 2.5 - 20KVA 2.5 - 125KVA 25 - 90KVA 5 - 15KVA	400Hz 400Hz 50, 60Hz 400Hz 400Hz	√ √ √ √ √		√ √ √ √ √
Industrial Test Equipment	D•2204	C	80 to 3000	30Hz to 30KHz	√	√	√
KGS Electronics	D•2210	SPC Series SPC6 Series	750, 1000 Up to 1000	400Hz 400Hz	√ √		√ √
Kikusui	D•2211	PCR Series					
Nova Electric	D•2214		125VA - 60KVA	50, 60, 400Hz	√		√
Pacific Power Source	D•2216	G MS LN G Test MR AT HE E K	6000 - 90000 62500 - 625000 50000 - 500000 6000 - 90000 15000 - 30000 2.25 - 6.75 1000 1000 - 3000 250 - 4500	47 - 500Hz 50, 60, 400, 415Hz 50, 60, 400, 415Hz 47 - 5000Hz 50, 60, 400, 415Hz 47 - 5000Hz 20 - 2000Hz 45 - 2000 20 - 2000	√ √ √ √ √ √	 √ 	√ √ √ √ √ √ √ √
Panel Comps. Corp.	D•2222	85510300	1200VA	47 - 65Hz	√		

STATIC INVERTERS

Manufacturer	Starting EEM Page No.	Model/ Series	Output (VA)	Output Frequency (Hz)	Phase		
					Single	Two	Three
Abacus Controls Inc.	D•2149	400 & 4000 Series	500VA to 50KVA	50, 60, 400 Hz	√		√
Abbott Technologies	D•2152	KN, PN, LN, TN	30-320	60-400Hz	√		
Advance Conversion	D•2156		36VA - 5KVA	50, 60, 400 Hz	√		√
Avionic Instruments	D•2160	250, 1000	50-500, 800-1200	50, 60, 400Hz	√		√
Behlman Electronics	D•2168	ACP & ACM Series	100VA - 9000VA	45 - 10000Hz	√	√	√
Belmont Instrument Corp.	D•2176	Sine 125, Sine 1000	200 - 1000	50, 60, 400Hz	√		
Compact Power Co.	D•2183	MAC	165VA - 6KVA	45Hz - 20KHz	√	√	√
Energy Ltd.	D•2194	DA 50 - DAX 1000	50 - 1000	50, 60 Hz	√		
Instrumentation & Control Systems Inc.	D•2208	E Series I Lifeline	1KVA - 20KVA 1KVA - 20KVA 600VA	50, 60Hz 50, 60Hz 60Hz	√ √ √		
KGS Electronics	D•2210	SPC & SPS SPC Series SPS & SPC	50 - 2000 Up to 1000 To 1200	60, 400 Hz 400Hz 400, 60Hz	√ √ √		√
Kikusui	D•2211	PCR Series					
Nova Electric Inc.	D•2214		125VA - 50KVA	50, 60Hz	√		√
Wilmore	D•2230	1400 & 1600	50VA through 1000VA	50, 60Hz	√		

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UNINTERRUPTIBLE POWER SUPPLIES SINGLE PHASE 50Hz/60Hz 330VA-10KVA RACKMOUNT AND FREE STANDING SYSTEMS

NEW

- **Innovative Bi-Mode UPS**
- **Eliminates Half of Power Parts**
- **High MTBF**
- **Cost Effective Power Protection**
- **Free Standing & Rack Style**
- **Available on GSA Contract**

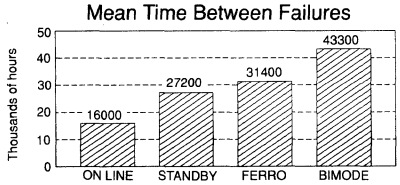
The Bi Mode family of UPS products introduced by Abacus Controls offers the reliability and simplicity of a standby UPS while fully protecting the critical load against all forms of power problems.

The Bi Mode UPS uses the same isolation transformer and power components for inverting when the utility is not present and for rectifier-battery charging when the utility is present.

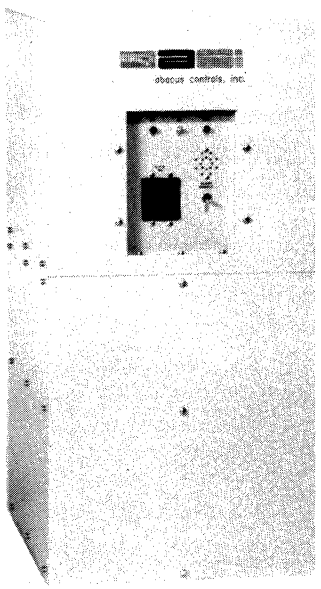
Unlike other on-line products there is no switch, either electromechanical or static device between the dual mode bridge circuit and the load. This permits synchronized transfers from the utility to the bridge instantaneously in either direction.

The advantages of this technology include cost, reliability, size, weight & audible noise.

RELIABILITY ANALYSIS FOR FOUR MODEL 933-4 UPS
Mean Time Between Failures



Look to the BIMODE UPS from Abacus Controls inc. Model 933-4, 3KW



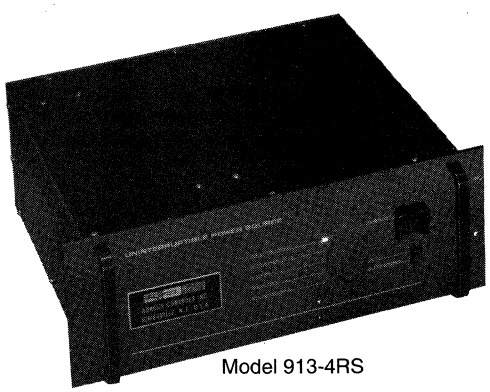
Model 933-4

BI-MODE SERIES

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)	Battery
533-3	3000	50	8.75	19	20	105	External
533-4	3000	60	8.75	19	20	105	External
933-3	3000	50	31.25	15.2	22.2	390	Internal
933-4	3000	60	31.25	15.2	22.2	390	Internal
553-3	5,000	50	12.25	19	20	170	External
553-4	5,000	60	12.25	19	20	170	External
953-3	5000	50	42	18.1	25.7	750	Internal
953-4	5000	60	42	18.1	25.7	750	Internal
514-3	10,000	50	51	22	30	410	External
514-4	10,000	60	51	22	30	410	External

BI-MODE SPECIFICATIONS

Input Voltage: 120/208/240 VAC ± 10%
Input Frequency: 50Hz or 60Hz
Output Voltage: 120/208/240 VAC
Voltage Regulation: ± 2%
Wave Form: Sinewave 2% THD
Efficiency: 90%
Temperature Range: 0–40°C
Humidity: 95% Non-condensing
Circuit Protection: CKT BKR: Fuse; By Pass Switch
Overload Capability: 150% PEAK



Model 913-4RS

SB SERIES

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
932-4	330	60	6.6	4.7	14.2	21
942-3	450	50	6.6	4.7	14.2	25
942-4	450	60	6.6	4.7	14.2	25
952-4	520	60	6.6	4.7	14.2	25
982-3	800	50	11.5	7.7	14.5	52
982-4	800	60	11.5	7.7	14.5	52
982-4RS	800	60	7	19	14	55
913-3	1200	50	11.5	7.7	14.5	71
913-4	1200	60	11.5	7.7	14.5	71
913-4RS	1200	60	7	19	14	77

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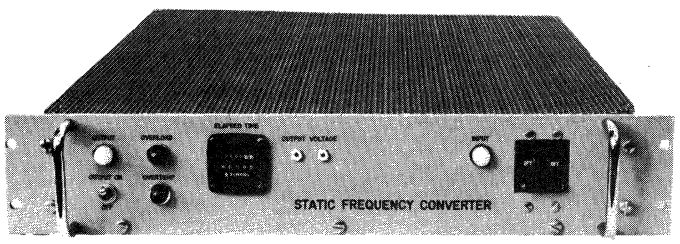
- **POWER FREQUENCY CONVERTERS**
- **SOLID-STATE INVERTERS**
- **UNINTERRUPTIBLE FREQUENCY CONVERTERS**



Model 152-1 (60Hz to 400Hz)

- **Digital Sinewave Generator**
- **77% Efficiency**
- **Low Cost**
- **Light Weight**
- **Proven Reliability**
- **Switching Power Transistors**
- **Useable as AC Power Supply**
  - **Motor Controller**
  - **Power Oscillator**
  - **Power Converter**
  - **Lab AC Source**

FREQUENCY CONVERTERS 50-60-400 Hz

Input Voltage: 115V AC, ±10%, single-phase for units 2000VA and below. 208V AC, ±10%, three-phase for units above 2000VA. 220V AC, ±10%, 50Hz is a no charge option. Other inputs available on a custom basis.

Input Frequency: 47 to 65Hz. 380 to 420Hz input is a no charge option.

Output Voltage: Adjustable 100 to 130 volts. Voltage adjust is internal for fixed frequency models, on the front panel for adjustable frequency models. (Other ranges available, consult factory.)

Voltage Regulation: Less than ±2% for combined no load to full load change and rated input voltage change.

Load Power Factor: 0.7 lead to 0.7 lag. Continuous zero lead to zero lag at full rated output without damage.

Output Waveshape: Sinewave less than 4% THD, 3% max any single frequency.

Protective Circuits: All models are equipped with automatic overload protection, including short circuit. Automatic reset upon overload removal. Circuit breaker on the input and fuse on the output. Automatic shutdown for input overvoltage, undervoltage.

Meters: Output voltmeter ammeter, and frequency meter offered as options.

Output Frequency: Rated output frequency for each model is shown on chart. For adjustable frequency models, adjustment is on the front panel. Internal frequency adjust is a no charge option.

Frequency Stability: Oscillator included in the unit base price. Fixed frequency oscillators are crystal controlled with a stability of ±0.05%. Adjustable oscillators are RC controlled and have a stability of ±0.25%.

Efficiency: Between 70 to 80 percent (typical 75%). At least 70% from 40% of full load to full load.

Peak Output Current: 150% of full rated current is available for three-cycles. Unit is set to current limit at 120% after three cycles.

SINGLE PHASE — 50/60 Hz

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
152-3	500	50	3½	19	20	50
152-4	500	60	3½	19	20	50
152-5	500	45-65	3½	19	20	50
113-3	1000	50	8¾	19	20	70
113-4	1000	60	8¾	19	20	70
113-5	1000	45-65	8¾	19	20	70
223-3	2000	50	12¼	19	20	130
223-4	2000	60	12¼	19	20	130
223-5	2000	45-65	12¼	19	20	130
233-3	3000	50	21	19	20	180
233-4	3000	60	21	19	20	180
233-5	3000	45-65	21	19	20	180
243-3	4000	50	21	19	20	240
243-4	4000	60	21	19	20	240
243-5	4000	45-65	21	19	20	240
263-3	6000	50	51	22	30	630
263-4	6000	60	51	22	30	630
263-5	6000	45-65	51	22	30	630
214-3	10000	50	63	22	30	775
214-4	10000	60	63	22	30	775
214-5	10000	45-65	63	22	30	775
2153-3	15000	50	63	22	30	1000
2153-4	15000	60	63	22	30	1000
2153-5	15000	45-65	63	22	30	1000

THREE PHASE — 50/60 Hz

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
117-3	1000	50	8¾	19	20	75
117-4	1000	60	8¾	19	20	75
117-5	1000	45-65	8¾	19	20	75
118-3	1600	50	12¼	19	20	110
118-4	1600	60	12¼	19	20	110
118-5	1600	45-65	12¼	19	20	110
238-3	3000	50	17½	19	20	170
238-4	3000	60	17½	19	20	170
238-5	3000	45-65	17½	19	20	170
268-3	6000	50	51	22	30	630
268-4	6000	60	51	22	30	630
268-5	6000	45-65	51	22	30	630
219-3	10000	50	63	22	30	730
219-4	10000	60	63	22	30	730
219-5	10000	45-65	63	22	30	730
2158-3	15000	50	63	22	30	1000
2158-4	15000	60	63	22	30	1000
2158-5	15000	45-65	63	22	30	1000
239-3	30000	50	63	60	30	2250
239-4	30000	60	63	60	30	2250
239-5	30000	45-65	63	60	30	2250
259-3	50000	50	80	60	42	3300
259-4	50000	60	80	60	42	3300
259-5	50000	45-65	80	60	42	3300

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FREQUENCY CONVERTERS

SINGLE PHASE — 400 Hz

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
152-1	500	400	3½	19	20	35
152-2	500	350-450	3½	19	20	35
162-1	600	400	3½	19	20	40
162-2	600	350-450	3½	19	20	40
113-1	1000	400	8¾	19	20	70
113-2	1000	350-450	8¾	19	20	70
223-1	2000	400	12¼	19	20	130
223-2	2000	350-450	12¼	19	20	130
233-1	3000	400	21	19	20	180
233-2	3000	350-450	21	19	20	180
243-1	4000	400	21	19	20	210
243-2	4000	350-450	21	19	20	210
263-1	6000	400	51	22	30	550
263-2	6000	350-450	51	22	30	550
283-1	8000	400	63	22	30	680
283-2	8000	350-450	63	22	30	680
214-1	10000	400	63	22	30	775
214-2	10000	350-450	63	22	30	775
2153-1	15000	400	63	22	30	1000
2153-2	15000	350-450	63	22	30	1000
224-1	20000	400	63	44	30	1400
224-2	20000	350-450	63	44	30	1400

THREE PHASE — 400 Hz

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
117-1	1000	400	8¾	19	20	70
117-2	1000	350-450	8¾	19	20	70
118-1	2000	400	8¾	19	20	90
118-2	2000	350-450	8¾	19	20	90
218-1	1600	400	12¼	19	20	95
218-2	1600	350-450	12¼	19	20	95
228-1	2500	400	12¼	19	20	140
228-2	2500	350-450	12¼	19	20	140
238-1	3500	400	17½	19	20	180
238-2	3500	350-450	17½	19	20	180
268-1	6000	400	51	22	30	590
268-2	6000	350-450	51	22	30	590
278-1	7500	400	51	22	30	680
278-2	7500	350-450	51	22	30	680
219-1	10000	400	63	22	30	750
219-2	10000	350-450	63	22	30	750
2158-1	15000	400	63	22	30	1000
2158-2	15000	350-450	63	22	30	1000
239-1	30000	400	63	44	30	2100
239-2	30000	350-450	63	44	30	2100
259-1	50000	400	80	60	42	3000
259-2	50000	350-450	80	60	42	3000

STATIC INVERTERS
DC TO 50-60-400 Hz

- **85% Efficiency**
- **Low Cost**
- **Light Weight**
- **Proven Reliability**

Input Voltage: 100 to 140V DC. Other input voltage ranges, 28V DC, 48V DC, 60V DC and 200V DC Sunverter.

Output Voltage: Set for 117V. Internal adjustment from 110V to 120V. 220V AC for 50Hz models.

Voltage Regulation: Less than 2% for single phase units, less than 5% for three phase units, for combined load and input voltage changes.

Output Waveshape: Sinewave less than 4% THD, 3% max any single frequency. (Less than 1% on custom basis.)

Protective Circuits: All models are equipped with automatic overload protection, including short circuit. Automatic reset upon overload removal. Circuit breaker on the input and fuse on the output. Automatic shutdown for input overvoltage, undervoltage.

STATIC INVERTERS

SINGLE PHASE

Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
452-1	500	400	* 3½	19	20	40
452-3	500	50	3½	19	20	45
452-4	500	60	3½	19	20	45
413-1	1000	400	8¾	19	20	60
413-3	1000	50	8¾	19	20	65
413-4	1000	60	8¾	19	20	65
423-1	2000	400	12¼	19	20	90
423-3	2000	50	12¼	19	20	110
423-4	2000	60	12¼	19	20	110
433-1	3000	400	12¼	19	20	140
433-3	3000	50	12¼	19	20	160
433-4	3000	60	12¼	19	20	155
443-1	4000	400	12¼	19	20	170
443-3	4000	50	12¼	19	20	220
443-4	4000	60	12¼	19	20	210
463-1	6000	400	63	24	30	350
463-3	6000	50	63	24	30	400
463-4	6000	60	63	24	30	390
483-1	8000	400	63	24	30	400
483-3	8000	50	63	24	30	440
483-4	8000	60	63	24	30	430
414-1	10000	400	63	24	30	470
414-3	10000	50	63	24	30	540
414-4	10000	60	63	24	30	510
424-1	20000	400	63	48	30	969
424-3	20000	50	63	48	30	1080
424-4	20000	60	63	48	30	1020

THREE PHASE

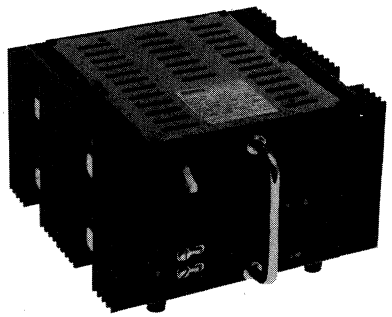
Model	Output Power (VA)	Output Frequency	Dimensions (Inches) H	W	D	Wt. (Lbs.)
417-1	1000	400	8¾	19	20	60
417-3	1000	50	8¾	19	20	70
417-4	1000	60	8¾	19	20	70
418-1	1600	400	12¼	19	20	90
418-3	1600	50	12¼	19	20	100
418-4	1600	60	12¼	19	20	100
428-1	2500	400	12¼	19	20	130
428-3	2500	50	12¼	19	20	150
428-4	2500	60	12¼	19	20	140
438-1	3500	400	17½	19	20	160
438-3	3500	50	17½	19	20	180
438-4	3500	60	17½	19	20	170
468-1	6000	400	63	24	30	350
468-3	6000	50	63	24	30	400
468-4	6000	60	63	24	30	390
488-1	8000	400	63	24	30	395
488-3	8000	50	63	24	30	475
488-4	8000	60	63	24	30	430
419-1	10000	400	63	24	30	470
419-3	10000	50	63	24	30	540
419-4	10000	60	63	24	30	520
429-1	20000	400	63	48	30	990
429-3	20000	50	63	48	30	1090
429-4	20000	60	63	48	30	1090
439-1	30000	400	63	48	30	1310
439-3	30000	50	63	48	30	1490
439-4	30000	60	63	48	30	1490

* Panel Height dependent on D.C. input requirement—CONSULT FACTORY

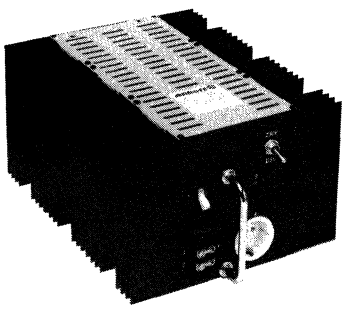
Abbott TECHNOLOGIES, INC.

Sine Wave Inverters

MODELS KN-PN LN-TN



Standard Models: KN, PN, LN, TN Cases K2, F2, J2



11 to 54 VDC Input 30 to 320 VA Output

- A wide range of standard models.
- 50 Hz or 60 Hz output.
- Surge current capabilities up to 3 times rated output power.
- Exceptional reliability. Typical MTBF: 90,586 hours for model LN8.
- High efficiency provided by sine wave. Conserves power.
- Saves motors by reducing overheating.
- Low distortion. 2% typical.
- Salt spray package.
- Compact. Lightweight.
- Switchable 115 VAC 60 Hz/230 VAC 50 Hz.
- Wide temperature range: −20°C to +55°C ambient operation.
- Special models available.
- 2-year warranty.

Abbott's sine wave inverters convert dc battery power to regulated clean ac. They are used to provide uninterrupted power to operate computers, motors, lamps, digital processors, TV broadcast equipment and telecommunication electronics.

Our inverters have become the industry standard by providing dependable performance in such rugged applications as marine radar, railway signal and communications, security electronics, and mobile test equipment.

11 to 15 VDC Input

Output Power (VA)	Case	Weight (Lbs.)	Single Output 115 VAC 60 Hz	Single Output 220 VAC 50 Hz	Switchable Output 115V 60 Hz/220V 50 Hz
30	K2	16	KN3T-115-60	KN3T-220-50	KN3T-50/60
30	G2	27	KS3R-115-60	KS3R-220-50	NA
60	F2	18	KN6T-115-60	KN6T-220-50	KN6T-50/60
60	G2	27	KS6R-115-60	KS6R-220-50	NA
120	J2	30	KN12T-115-60	KN12T-220-50	KN12T-50/60

29 to 38 VDC Input

Output Power (VA)	Case	Weight (Lbs.)	Single Output 115 VAC 60 Hz	Single Output 220 VAC 50 Hz	Switchable Output 115V 60 Hz/220V 50 Hz
80	K2	16	LN8T-115-60	LN8T-220-50	LN8T-50/60
80	G2	27	LS8R-115-60	LS8R-220-50	NA
160	F2	18	LN16T-115-60	LN16T-220-50	LN16T-50/60
160	G2	27	LS16R-115-60	LS16R-220-50	NA
320	J2	30	LN32T-115-60	LN32T-220-50	LN32T-50/60

22 to 30 VDC Input

Output Power (VA)	Case	Weight (Lbs.)	Single Output 115 VAC 60 Hz	Single Output 220 VAC 50 Hz	Switchable Output 115V 60 Hz/220V 50 Hz
60	K2	16	PN6T-115-60	PN6T-220-50	PN6T-50/60
60	G2	27	PS6R-115-60	PS6R-220-50	NA
120	F2	18	PN12T-115-60	PN12T-220-50	PN12T-50/60
120	G2	27	PS12R-115-60	PS12R-220-50	NA
240	J2	30	PN24T-115-60	PN24T-220-50	PN24T-50/60

42 to 54 VDC Input

Output Power (VA)	Case	Weight (Lbs.)	Single Output 115 VAC 60 Hz	Single Output 220 VAC 50 Hz	Switchable Output 115V 60 Hz/220V 50 Hz
80	K2	16	TN8T-115-60	TN8T-220-50	TN8T-50/60
80	G2	27	TS8R-115-60	TS8R-220-50	NA
160	F2	18	TN16T-115-60	TN16T-220-50	TN16T-50/60
160	G2	27	TS16R-115-60	TS16R-220-50	NA
320	J2	30	TN32T-115-60	TN32T-220-50	TN32T-50/60

ABBOTT TECHNOLOGIES, INC.
Head Office: 8203 Vineland Avenue, Sun Valley, CA 91352, (818) 504-0644, FAX (818) 768-0395
Eastern Sales Office: 321 Commercial Avenue, Suite 304, Palisades Park, NJ 07650, (201) 461-4005, FAX (201) 461-6323

Abbott TECHNOLOGIES, INC.

Sine Wave Inverters

MODELS KN-PN LN-TN

SPECIFICATIONS

INPUT VOLTAGE RANGE:
KN, KS: 11 to 15 VDC
PN, PS: 22 to 30 VDC
LN, LS: 29 to 38 VDC
TN. TS: 42 to 54 VDC

OUTPUT VOLTAGE: 115 or 220 VAC ±2% at full load and nominal input voltage.

OUTPUT FREQUENCY: 50 Hz or 60 Hz.

LINE REGULATION: 3% for specified input voltage range with load constant.

LOAD REGULATION: 3% for load change of half load to full load with line constant; 6% for change of no load to full load.

WAVE FORM: Sine wave with 2% typical, 5% maximum distortion.

POWER FACTOR: Fully rated output VA, from unity to 0.7 power factor lagging or leading.

EFFICIENCY: At full load with nominal input voltage
40% minimum on KN, KS
50% minimum on PN, PS
58% minimum on LN, LS
60% minimum on TN, TS

OPERATING TEMPERATURE RANGE: (KN, PN, LN and TN): −4°F to +131°F (−20°C to +55°C) ambient air temperature. Humidity 0 to 90% (non condensing) at 25°C.

OPERATING TEMPERATURE RANGE: (KS, PS, LS and TS): −4°F to +131°F (−20°C to +55°C) ambient air temperature. G2 case is submersible (10 feet, 2 minutes).

INPUT TRANSIENT PROTECTION: 45 VDC for 0.1 second transient deviation and recovery (for change of 50%) of rated (load).

ALTITUDE: 10,000 feet above sea level (KN, PN, LN, TN) 50,000 feet above sea level (KS, PS, LS, TS).

PROTECTIVE FEATURES

OVERLOAD PROTECTION: Magnetic type circuit breaker. Reverse polarity protection.

HIGH RELIABILITY

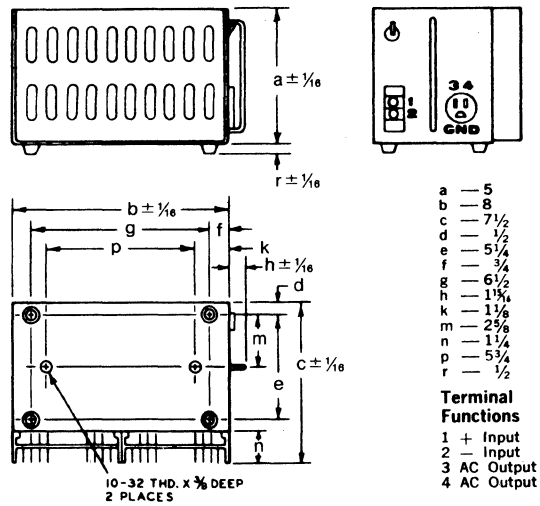
Model LN8T-115-60: MTBF 90,586 hours at 25°C ambient, ground benign environment per MIL-HDBK-217. Model TN8T-115-60: MTBF 74,733 hours at 50° ambient.

2-YEAR WARRANTY/ALL MODELS.

WIRE FUNCTIONS

RED	+ INPUT
BLACK	− INPUT
WHITE	AC OUTPUT
BROWN	AC OUTPUT

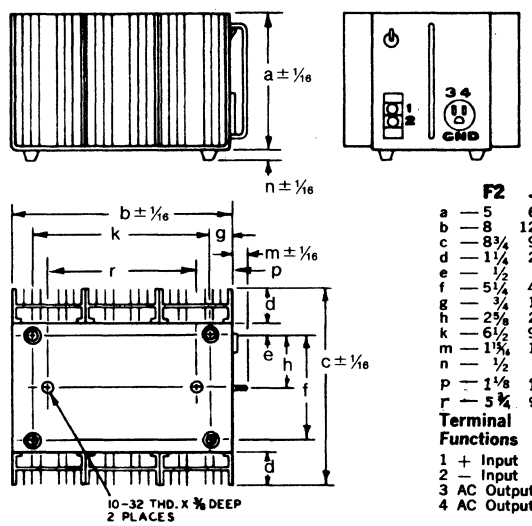
Case K2 Dimensions in inches.



a	5
b	8
c	7 1/2
d	1/2
e	5 1/4
f	3/4
g	6 1/2
h	1 13/16
k	1 1/8
m	2 5/8
n	1 1/4
p	5 3/4
r	1/2

Terminal Functions
1 + Input
2 − Input
3 AC Output
4 AC Output

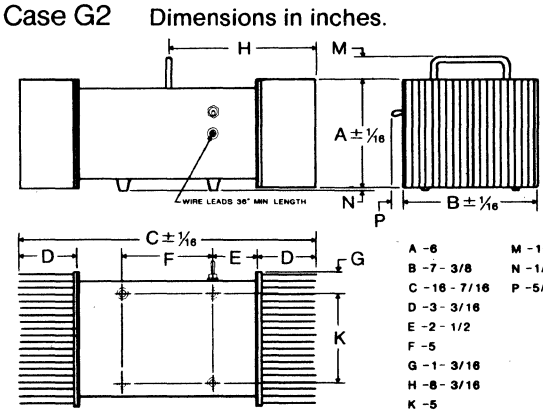
Cases F2, J2 Dimensions in inches.



	F2	J2
a	5	6 1/2
b	8	12
c	8 3/4	9 3/4
d	1 1/4	2 1/8
e	1/2	3/8
f	5 1/4	4 3/4
g	3/4	1 1/4
h	2 5/8	2 3/8
k	6 1/2	9 1/2
m	1 13/16	1 13/16
n	1/2	1/2
p	1 1/8	1 1/4
r	5 3/4	9 1/2

Terminal Functions
1 + Input
2 − Input
3 AC Output
4 AC Output

Case G2 Dimensions in inches.



A	6
B	7 - 3/8
C	16 - 7/16
D	3 - 3/16
E	2 - 1/2
F	5
G	1 - 3/16
H	8 - 3/16
K	5
M	1 - 1/4
N	1/8
P	5/8

Note: Dimensional tolerances are all ±1/16".

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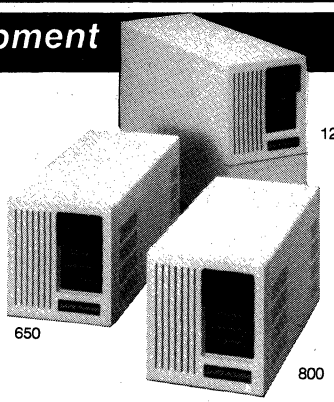
SAFE POWER™ Protection Equipment

SAFE POWER™ Off-Line UPSs



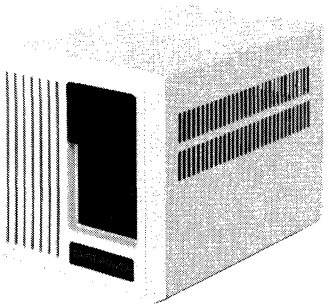
- *Supports IBM, XT, AT, PS/2, Compaq and all compatibles*
- *Network compatible, LANS, WANS, file servers*
- *Fast transfer time*
- *Simple on/off switch operation*
- *Surge/spike protection and EMI/RFI noise protection*
- *Pulsing signal alerts user of power failure on the 650, 800, 1200; burst tone sounds within 1 minute of depletion*
- *Multiple output receptacles to protect more than one piece of equipment*

Mfr.'s Type	Output Characteristics							Physical Specifications	
	Power (VA)	Nominal Voltage full load V	Current (Amp)	Frequency (Hz)	Waveform	Transfer Time (Typical, msec)	Output Receptacles	Weight (Lbs)	Dimensions H x W x D (Inches)
S-300	300	120±1%	3.0	60	Square-wave	2	3	18.0	6.25 x 3.75 x 13.75
S000-85024-01	425	115±3%	3.7	60	Quasi-square	2-4	4	36.0	5.5 x 15.25 x 9.25
S-650	650	120±1%	5.4	60	Sinewave	2	4	32.0	7.5 x 6.9 x 14.3
S-800	800	120±1%	6.7	60	Sinewave	2	4	41.0	7.5 x 6.9 x 16.3
S-1200	1200	120±1%	10.0	60	Sinewave	2	4	65.0	12.0 x 6.9 x 17.43

NOTE: 220/240V, 50Hz models available

True-Power® Powerline Conditioner

For Precise Voltage Regulation with Excellent Transient Suppression



Standard Features

- *Reliable, regulated output voltage when input voltage varies, even to brownout levels*
- *Noise rejection effectively suppresses transients, spikes and surges*
- *Sinusoidal output features less than 3% total harmonic distortion*
- *Rapid response to line and load change*

Mfr.'s Type	Output Characteristics			Physical Specifications	
	Rating (VA)	Maximum Output (Amps)	Duplex Receptacle at 15A Maximum	Weight (Lbs)	Dimensions H x W x D (Inches)
PS-87066	1400	12	4	13.0	7.5 x 6.9 x 10.3

NOTE: Available only in 120V, 60 Hz

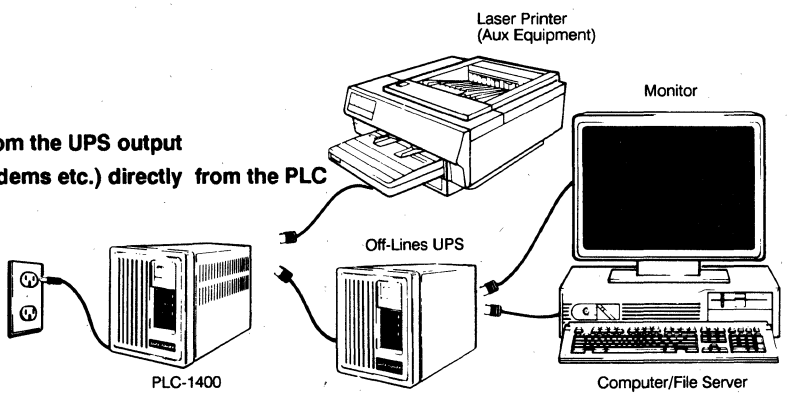
Save with Modular, Custom Power Protection from SAFE POWER™

Why pay for more protection than you need?

Design your own custom protection system by combining the PLC-1400 with a SAFE POWER Off-Line UPS of your choice.

Cost Saving Solution:

1. **Apply utility power to the PLC**
2. **Use the PLC output to drive the UPS**
3. **Power your computer/file server and monitor from the UPS output**
4. **Power peripheral equipment (laser printers, modems etc.) directly from the PLC**



Acme Electric Corporation†
5416 Amelia Earhart Drive
Salt Lake City, UT 84116
Telephone (801) 539-0227
Toll Free (800) 325-5848
FAX (801) 539-0237

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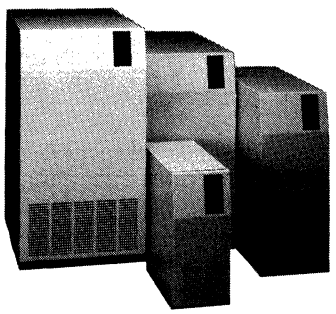
Protection Equipment

SAFE POWER™

Power-Ready® On-Line Uninterruptible Power Supplies



- *Smallest, quietest On-Line UPS available*
- *Self-contained system including maintenance-free batteries and status transfer switch*
- *Micro-processor controlled, PWM (pulse-width modulated) technology*
- *Compatible with any properly rated auxiliary engine generator*
- *Easy to install*
- *Designed to meet applicable standards of IEEE, NEMA, NEC, FCC, IEC, ANSI, UL and CSA. Units listed to UL specifications by ETL*
- *User friendly controls (Digital metering on 5 and 10kVA)*
- *Bypass provides redundancy in the event of unit failure*

Mfr.'s Type	Rating kVA/kW	Input Voltage	Input Bypass Voltage	System Output Voltage	Freq. Hz	Audible Noise dBA @ 3ft	Weight (lbs.)	Physical Dimensions (H x W x D)
1000	1/0.8	120	120	120	60	55	111	18.2 x 8.1 x 20.3
3000-1	3/2.4	120	120	120	60	55	285	28.7 x 10.5 x 25.6
3000-3	3/2.4	208, 220 230, 240	208, 220 230, 240	208, 220, 230, 240	60	55	285	28.7 x 10.5 x 25.6
5000-1	5/4	120, 208, 220 230, 240	120, 208, 220 230, 240	120, 208, 120, 208 220, 230, 240 120, 240	60	55	502	33 x 15 x 30
10000-3	10/8	208, 220, 230, 240	120, 208, 220 230, 240	120, 208, 120, 208 220, 230, 240 120, 240	60	56	877	38.5 x 18 x 30

SAFE WATCH UPS Monitoring and Data Protection Software

SAFE WATCH saves your files, exits your programs, shuts down the UPS to save battery power, and once power is restored, can even re-start your programs automatically.

SAFE WATCH is the only software that truly monitors the UPS battery and will interface with and serial or parallel port on your computer. SAFE WATCH is network and stand-alone compatible.

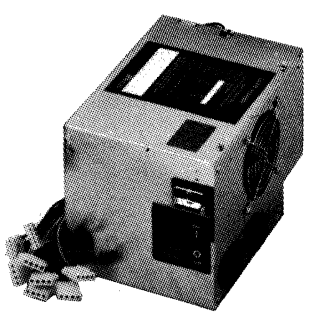
See how simply it can be installed, and how it remains "invisible" until you really need it. Contact Acme Electric Corporation, 5416 Amelia Earhart Drive, Salt Lake City, Utah 84116 or call 801-539-0227 or 800-325-5848; Fax 801-539-0237.

SAFE POWER™ Uninterruptible Switch-mode Power Supplies (USPSs)

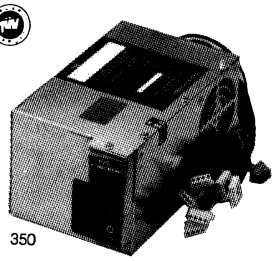
- *Fits inside XT, AT and tower designs*
- *3 to 10 minutes of on-line DC power backup*
- *Built in EMI filter*
- *Includes 100 watts of AC backup for AT and tower design (80 watts XTs).*

Mfr.'s Type	Power			Weight (Lbs.)
	Total (VA)	DC Watts		
		Cont.	Peak	
USPS 350	350	160	180	12.3
USPS 500/500T	500	230	270	14.5

Tower design includes remote switch and harness



500



350

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ACDCo Power WHERE you need it!

Inverters - Uninterruptible Power Systems - Battery Chargers - Frequency Changers - Power Supplies

ACDCo Power Equipment is designed to meet high reliability and performance standards providing maximum life with minimum maintenance to protect all system circuits that require dependable, high quality power.

PRODUCT

Inverters, Power — DC to AC Output: Fixed-base, portable, mobile and marine.

Uninterruptible AC Power Systems: 36 VA to 5 KVA.

Frequency Converters — AC to AC: 50/60 Hz, 60/50 Hz, 50/400 Hz and 60/400 Hz.

TYPICAL SPECIFICATIONS

Input: ±15% from nominal.

Output: Sine wave, 120 Volts RMS, 60 Hz.

Voltage Regulation: 2% over full input and load range.

Frequency Regulation: 1% over full input and load range.

Power Factor: .9 Lead to .8 Lag.

Efficiency: Over 80% at nominal input.

Distortion: Less than 5%.

Overload: Within specifications for ONE MINUTE at 140% load.

Overload Protection: No damage from short to open circuit, reversal of input, or input voltage to 140% nominal.

DESIGN FEATURES

Ruggedized construction, no moving parts, completely solid state, easy servicing — sides fold down, plug-in transistors and I/C's on Printed Circuit Boards, all P/C boards plug-in removable.

STATIC INVERTER MODELS

Rating	12VDC	24VDC	32VDC	48VDC	120VDC
36VA	A12-1	A13-1	A19-1	A14-1	A16-1
72VA	A22-1	A23-1	A29-1	A24-1	A26-1
125VA	A32-1	A33-1	A39-1	A34-1	A36-1
250VA	A42-1	A43-1	A49-1	A44-1	A46-1
500VA	A52-1	A53-1	A59-1	A54-1	A56-1
1000VA		A63-1	A69-1	A64-1	A66-1

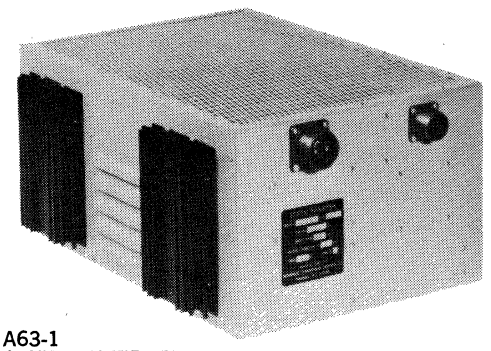
See the following pages for the New ACE Series Inverters

Three Phase Models Available up to 15KVA

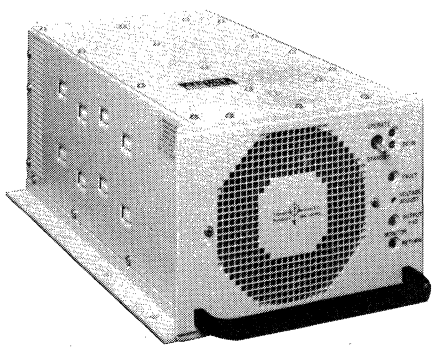
ACDCo. inverters are used in one of the roughest of Marine Environments on the U.S. Coast Guard's Rescue Life Boats to power their Navigation and Communication equipment.

ACDCo. has versions of power equipment available to meet military specifications.

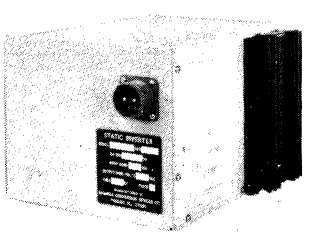
ACDCo. static inverters are used by major Public Utility companies throughout the United States.



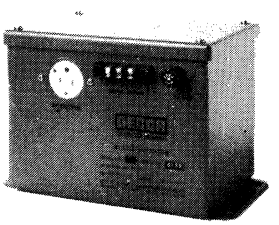
A63-1
1 KVA INVERTER



New ACE Inverter
2.75KVA



A43-1
250VA
INVERTER



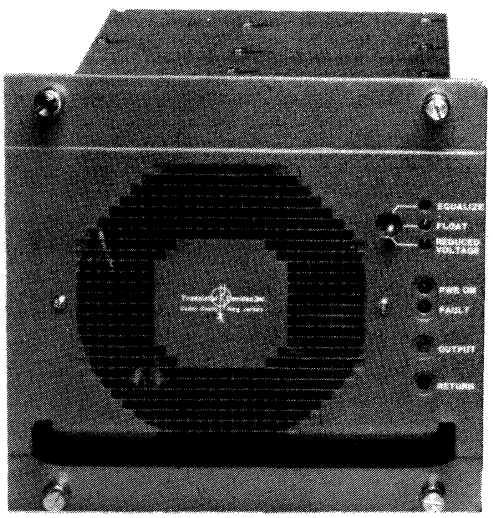
A12-1
36VA
INVERTER

ADVANCE CONVERSION DEVICES
A UNIT OF
Transistor Devices Inc.
85 HORSEHILL RD., CEDAR KNOLLS, NJ 07927 PHONE: (201) 267-1900 FAX: (201) 267-2047

ACDCo POWER WHERE YOU NEED IT

BCE SERIES

BATTERY CHARGER

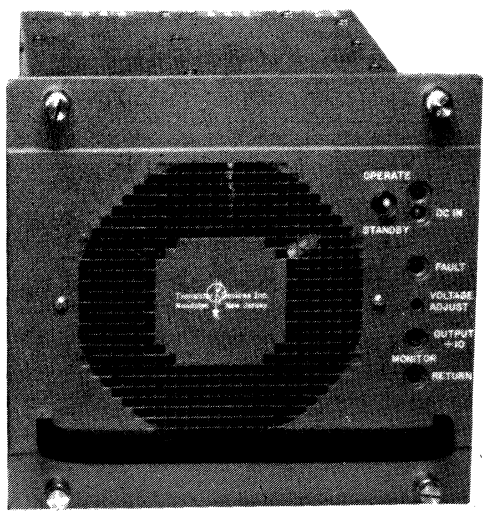


- 3,450 WATTS
- EQUALIZE PROGRAM
- AUTO REDUCED VOLTAGE MODE
- UNIVERSAL INPUT
- POWER FACTOR CORRECTED

Models (Partial Listing)			
Input Voltage @ 47-63 Hz	Output (Nominal)		
	28V @ 115A	56V @ 57.5A	140V @ 23A
103-132V	BCE-28-115-AFX	BCE-56-58-AFX	BCE-140-23-AFX
175-264V	BCE-28-115-BFX	BCE-56-58-BFX	BCE-140-23-BFX
103-264V	BCE-28-115-CFX	BCE-56-58-CFX	BCE-140-23-CFX

ACE SERIES

SINE WAVE INVERTER



- 2,750 WATTS
- 0-LEAD TO 0-LAG
- 1% THD SINEWAVE OUTPUT
- 50/60/400HZ MODELS
- RUGGEDIZED CONSTRUCTION

Models (Partial Listing)			
Output Voltage & Freq.	Input Voltage Range		
	22-32 VDC	43-64 VDC	105-160 VDC
117 @ 60 Hz	ACE-K024-060X	ACE-K048-060X	ACE-K120-060X
220 @ 50 Hz	ACE-E024-050X	ACE-E048-050X	ACE-E120-050X
115 @ 400 Hz	ACE-K024-400X	ACE-K048-400X	ACE-K120-400X

Each unit is 7" high by 8¼" wide by 17½" deep and will mount in a standard 19" rack.
"X" indicates mountings and other optional configurations.
Three phase units and frequency changers also available. Consult factory for complete model number.

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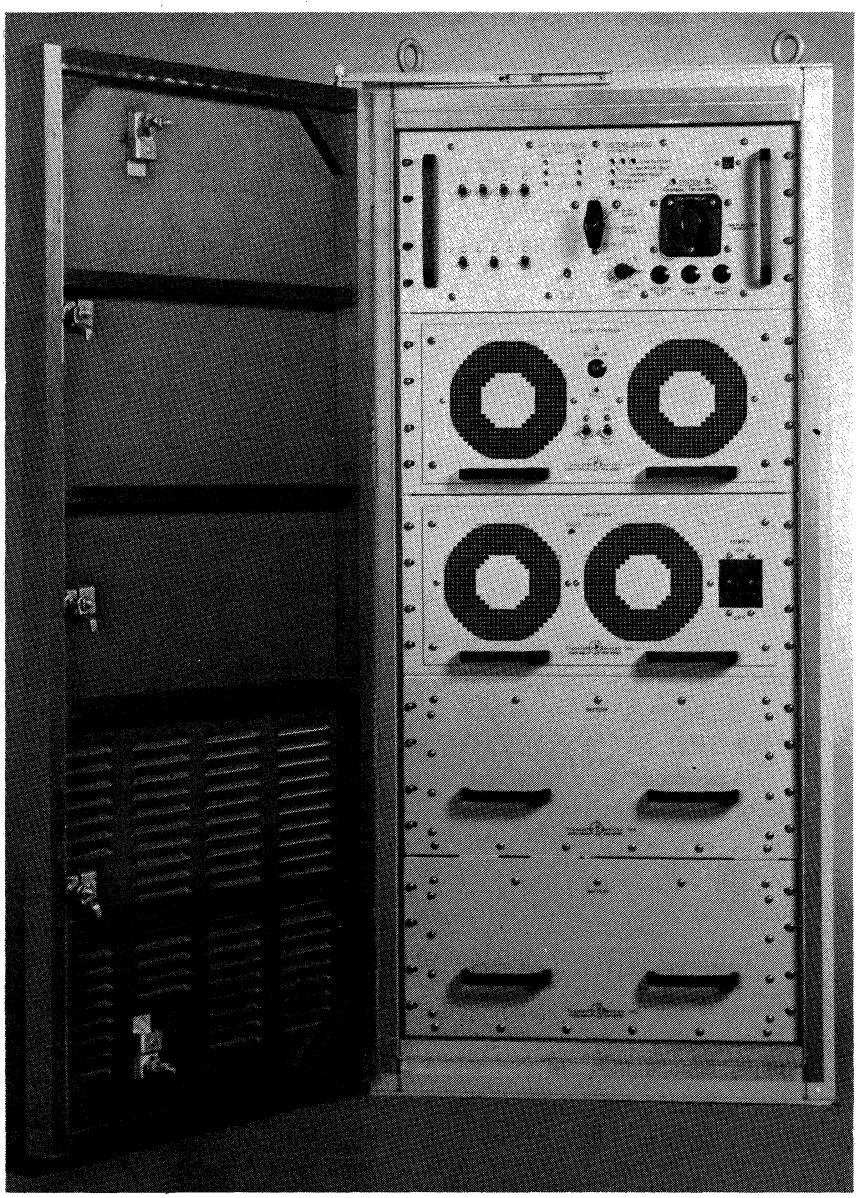
ACDC POWER WHEN YOU NEED IT

RUGGEDIZED MIL-UPS POWER SYSTEMS FOR MILITARY & HOSTILE ENVIRONMENTS

- On-Line System Provides Seamless Power Transfer
- "Sine Shaping" Inverter with 0 Lead 0 Lag Load Power Factor
- Wide Input Range Provides Immunity to AC Line Voltage and Frequency Fluctuations
- 85 Volt Brownout Ride-through Without Battery Assist
- Ruggedized Rack Mounted Construction
- Can Meet High Shock, Vibration, Humidity, Salt, and EMI Specifications
- Field Replaceable LRU's Enhance System Up-time
- US, Euro, and Mil Power Single and Three Phase, 50, 60 & 400 Hz Models
- Redundant 2 Channel Systems Available



MARINE • GROUND MOBILE • FLIGHT-LINE • FACTORY FLOOR

ADVANCE CONVERSION DEVICES

A UNIT OF

Transistor Devices Inc.

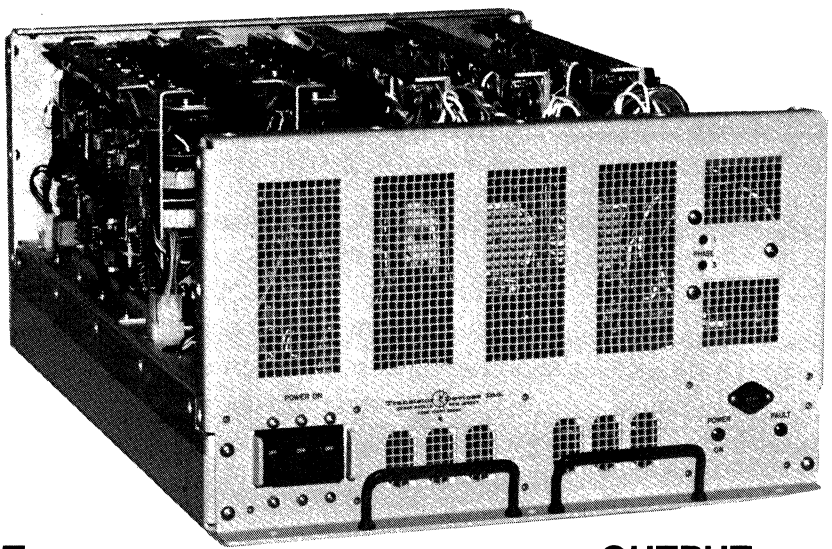
85 HORSEHILL RD., CEDAR KNOLLS, NJ 07927 PHONE: (201) 267-1900 FAX: (201) 267-2047

ACDC POWER WHERE YOU NEED IT

6 KW FREQUENCY CONVERTER

400 Hz to 60 Hz
1 or 3 Phase Output

Low Harmonic Distortion
Airborne/Military



INPUT

115/200 VAC
350 - 700Hz, 3 Phase
Per MIL-STD-704C, and
DOD-STD-1399/300

OUTPUT

120/208 VAC 60 Hz 3 Phase
or
120 VAC 60 Hz 1 Phase
(Internal switch selectable)

SPECIFICATIONS

Wave Form	Sinusoidal, less than 2% THD
Power Factor	Operates into loads 0 to 1
Load Crest Factor	Up to 3
DC Content	Less than 0.1 VDC
Rated Capacity	2 KW per phase (3 phase) 6 KW, single phase mode
Protection	Overload, short circuit, front panel circuit, breaker
Size	19 in. x 8-3/4 in. x 22 in.
Weight	95 lbs.
Environment	Military, Airborne
Components	ER/Hermetically Sealed

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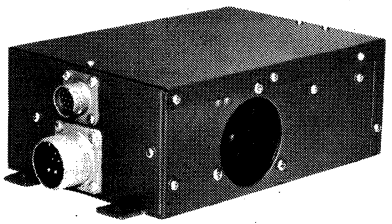
Avionic Instruments, Inc.



Lightweight 50, 60, 400 Hz Static Inverters/Frequency Converters for Aerospace, Military, Commercial

- *50 VA–12 KVA*
- *Less than 10 lbs/KVA*
- *Parallelable*
- *Single phase or three phase*
- *50-60-400 Hz configurations*
- *Custom design capability*
- *High efficiency 80% typical*
- *300 microsecond dynamic load response*
- *No spikes—no surges*
- *Sinewave distortion 0.75% typical*
- *Meets military standards for severe hostile environments*

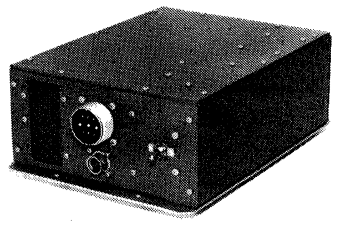
AVIONIC INSTRUMENTS INC. (AI²) Power Conversion products features an advanced power processing technique that virtually eliminates the limitations inherent in traditional power conversion designs.

These advanced designs include a 40KHz DC to DC converter/regulator and a two-state (bridge) inverter regulator. The sinusoidal output voltage is achieved from the bridge section through use of a spectrum controlled modulation system utilizing advanced field effect transistor switching circuitry. Heavy baseband magnetic components are eliminated resulting in an extremely lightweight, efficient, and highly reliable inverter design.

Each section of these advanced designs utilizes a patented, current controlled, closed loop system which is inherently stable, providing excellent steady state and dynamic response characteristics evidenced by no output voltage excursions outside the regulation band—under any conditions of load application and removal—including non-linear loads such as half wave rectifiers. Protection circuitry includes overtemperature protection, built-in overvoltage and out of frequency shutdown features, as well as 200 percent of rated current under short circuit conditions.

Avionic's modular design allows interconnection of units for increased power output and for multi-phase systems. Reliable custom designed units for non standard frequencies and voltages are made easy by the basic Avionic's two-stage conversion design.

Avionic Instruments Inc., 1414 Randolph Ave., Avenel, NJ 07001. FAX: (908) 382-4996
Telephone: (908) 388-3500, Cable Address: Reainta, Rahway, Telex: WU844-413 Reaintl Rway, RCA 247034 REA UR



General Performance Specifications

(Consult factory for exact data on specific models)

Input Voltage
Static Inverters:
28VDC ± 10V.
Frequency Converters:
115/200 VAC ± 10%, 400 Hz.

Output Power
50VA to 12kVA.

Output Voltage
115VAC RMS ± 1%, single phase units.
26VAC nominal
115/200VAC wye RMS ± 1%, three phase units.
200 microsecond response time.

Output Frequency
50/60/400Hz ± 1.0% for all conditions of line, load, and temperature.

Waveshape
Sinewave 0.75% THD, typical.
Less than 0.1VDC component per MIL STD 704C.

Efficiency
80% typical at full rated output.

Overload
110% rated output for 2 hours.
150% load current for 5 minutes, nominal conditions per TSO-C73.

Short Circuit Current
200% for five minutes.

Power Factor
0.7 lead to 0.7 lag.
Not damaged by any power factor.

Environmental
RTCA DO-160A for severe, hostile environments.

Altitude
55,000 feet, operating.

Qualifications
FAA TSO-C73.
RTCA DO-160A
Cat.F2B/RTY/EXXXFXXZAZZ.

EMI
MIL STD-461A(4). Some relaxation required.
RTCA DO-160A Cat. Z for conducted, radiated and susceptibility.

Temperature Range
−55°C to +71°C, operating.
−65°C to +85°C, storage and shipment.

Vibration
10g's; 5Hz–2000Hz.

Shock
15g's; each axis.

Humidity
95%, 10 days; 71°C.

Explosion
DO-160A Cat. E.

Salt Spray
DO-160A Cat. S.

Sand and Dust
DO-160A Cat. D.

Fungus
DO-160A Cat. F.

Quality Assurance
MIL-I-45208A
MILQ-9858A upgrade in process
FAA TSO-C73

Protection
Cannot be damaged by any short circuit.
Input under/over voltage.
Output overvoltage.
Output under/over frequency.
Thermal overheat.
Reverse polarity.
Fault light indicator.

APPLICATIONS

Radio/Communications
RPVs and Drones
Robots
Stability Augmentation
Space Shuttle Systems
Surveillance Equipment
SATCOM Terminals
Shelters
Shipboard Communication
Autopilots
Appliances
Business Equipment
CRT Displays
Computers/Tactical
Environmental Systems
Fire Control Systems
Flight Test Equipment
Aircraft
Vans and Jeeps
Security Systems
TV Systems
Trainers/Simulators
Telemetry
UPS
Underwater Systems
X-Ray Systems
Guidance & Gyros
Lasers
Laboratory Equipment
MEDEVAC/EMS
Microwave Relay
OMEGA/VLF
Radars
Night Vision Devices
Hospitals

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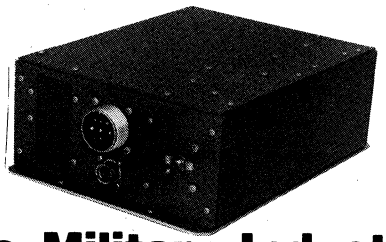
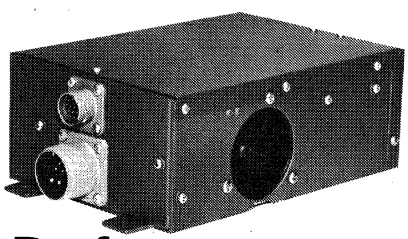
Avionic Instruments, Inc.



Frequency Converters for Aerospace, Military, Industry

	Model	Output		Dimensions	Weight
400 Hz 3Ø to 60 Hz	4A1000-1HP	1000VA	115 VAC	12.0″ × 8.5″ × 4.1″	15.5 lbs./7.1 kgs.
	4A1000-1HCP	1000VA	115 VAC	12.0″ × 8.5″ × 4.1″	15.5 lbs./7.1 kgs.
	4A2000-1B-1-HRP	2000VA	115 VAC	16.0″ × 10.0″ × 9.3″	44.0 lbs./19.6 kgs.
	4A3000-1BP	3000VA	115 VAC	16.0″ × 13.9″ × 9.3″	55.0 lbs./25.0 kgs.
	4A3000-1B-HRP	3000VA	115 VAC	16.0″ × 13.9″ × 9.3″	61.0 lbs./27.7 kgs.
	4A3000-1CP	3000VA	115/200 VAC	16.0″ × 13.9″ × 9.3″	55.0 lbs./25.0 kgs.
	4A3000-1C-HRP	3000VA	115/200 VAC	16.0″ × 13.9″ × 9.3″	61.0 lbs./27.7 kgs.
	4A4000-1BP	4000VA	115 VAC	14.8″ × 17.8″ × 9.3″	72.0 lbs./32.7 kgs.
400 Hz 3Ø to 50 Hz	4A1000-1GP	1000VA	115 VAC	12.0″ × 8.5″ × 4.1″	15.5 lbs./7.1 kgs.
	4A1000-1GCP	1000VA	115 VAC	12.5″ × 8.5″ × 4.1″	15.5 lbs./7.1 kgs.
	4A2000-1C-1-HRP	2000VA	115 VAC	16.0″ × 10.0″ × 9.3″	44.0 lbs./19.6 kgs.
	4A3000-1AP	3000VA	115 VAC	16.0″ × 13.9″ × 9.3″	55.0 lbs./25.0 kgs.
	4A3000-1A-HRP	3000VA	115 VAC	16.0″ × 13.9″ × 9.3″	61.0 lbs./27.7 kgs.
	4A1000-1C-1P	1000VA	230 VAC	16.0″ × 10.0″ × 9.3″	40.0 lbs./18.2 kgs.
	4A2000-1A-1-HRP	2000VA	230 VAC	16.0″ × 10.0″ × 9.3″	44.0 lbs./19.6 kgs.
	4A4000-1AP	4000VA	230 VAC	14.8″ × 17.8″ × 9.3″	72.0 lbs./32.7 kgs.



Static Inverters: Lightweight, High Performance, Rugged and Reliable

	Model	Output		Dimensions	Weight
28 VDC to 50 Hz Single-Phase	3A50-1B-1	50VA	115 VAC	7.0″ × 5.0″ × 2.8″	3.9 lbs./1.8 kgs.
	3A125-1B-1	125VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.3 lbs./1.9 kgs.
	3A250-1B-1	250VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.5 ibs./2.0 kgs.
	3A350-1B-1	350VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.75 lbs./2.2 kgs.
	3A800-1G	800VA	115 VAC	12.0″ × 8.5″ × 4.1″	12.5 lbs./5.7 kgs.
	3A1000-1G	1000VA	115 VAC	12.0″ × 8.5″ × 4.1″	12.5 lbs./5.7 kgs.
	SR100-3A	100VA	230 VAC	195 Cu. Inches.	8.0 lbs./3.6 kgs.
	3A250-1A-1	250VA	230 VAC	12.5″ × 5.9″ × 6.3″	12.1 lbs./5.5 kgs.
	SR250-3A	250VA	230 VAC	195 Cu. Inches	8.5 lbs./3.9 kgs.
	3A500-1A-1	500VA	230 VAC	12.5″ × 5.9″ × 6.3″	12.1 lbs./5.5 kgs.
	SR700-3A	700VA	230 VAC	195 Cu. Inches	9.0 lbs./4.1 kgs.
	3A800-1D-1	800VA	230 VAC	16.0″ × 10.0″ × 9.3″	35.5 lbs./16.1 kgs.
	3A1000-1D-1	1000VA	230 VAC	16.0″ × 10.0″ × 9.3″	35.5 lbs./16.1 kgs.
	3A1600-1A-1-HR	1600VA	230 VAC	16.0″ × 10.0″ × 9.3″	39.5 lbs./16.1 kgs.
	3A2000-1A-1-HR	2000VA	230 VAC	16.0″ × 10.0″ × 9.3″	39.5 lbs./16.1 kgs.
	SR2000-3A	2000VA	230 VAC	820 Cu. Inches	25.0 lbs./11.4 kgs.
	3A4000-1A	4000VA	230 VAC	14.8″ × 17.8″ × 9.3″	63.0 lbs./28.6 kgs.
	SP6000-3A	6000VA	230 VAC	2460 Cu. Inches	77.0 lbs./35.0 kgs.
	SP4000-3A	4000VA	230 VAC	1635 Cu. Inches	50.0 lbs./22.7 kgs.
	SP8000-3A	8000VA	230 VAC	3280 Cu. Inches	104.0 lbs./47.3 kgs.

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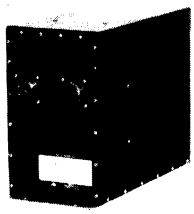

Static Inverters: Lightweight, High Performance, Rugged and Reliable

	Model	Output		Dimensions	Weight
28 VDC to 60 Hz Single-Phase	2A50-1B-1	50VA	115 VAC	7.0″ × 5.0″ × 2.8″	3.9 lbs./1.8 kgs.
	2A125-1B-1	125VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.3 lbs./1.9 kgs.
	2A250-1B-1	250VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.5 lbs./2.0 kgs.
	2A350-1B-1	350VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.8 lbs./2.2 kgs.
	2A500-1A-1	500VA	115 VAC	12.5″ × 5.9″ × 6.3″	12.0 lbs./5.5 kgs.
	*2A800-1G	800VA	115 VAC	12.0″ × 8.5″ × 4.1″	12.5 lbs./5.7 kgs.
	*2A1000-1G	1000VA	115 VAC	12.0″ × 8.5″ × 4.1″	12.5 lbs./5.7 kgs.
	2A1600-1A-1-HR	1600VA	115 VAC	16.0″ × 10.0″ × 9.3″	39.5 lbs./18.0 kgs.
	2A2000-1A-1-HR	2000VA	115 VAC	16.0″ × 10.0″ × 9.3″	40.0 lbs./16.4 kgs.
	2A2400-1B-HR	2400VA	115 VAC	16.0″ × 13.9″ × 9.3″	52.0 lbs./23.6 kgs.
	2A3000-1A-HR	3000VA	115 VAC	16.0″ × 13.9″ × 9.3″	52.0 lbs./23.6 kgs.
	2A4000-1A-HR	4000VA	115 VAC	14.8″ × 17.8″ × 9.3″	68.0 lbs./31.0 kgs.
28 VDC to 60 Hz Three-Phase	3PH150-2A	150VA	115/200 VAC	295 Cu. Inches	13.0 lbs./5.9 kgs.
	3PH375-2A	375VA	115/200 VAC	295 Cu. Inches	14.0 lbs./6.4 kgs.
	2A750-1A	750VA	115/200 VAC	12.2″ × 5.9″ × 9.0″	17.5 lbs./8.0 kgs.
	2A1050-1A	1050VA	115/200 VAC	12.5″ × 5.9″ × 9.0″	18.3 lbs./8.3 kgs.
	3PH1500-2A	1500VA	115/200 VAC	590 Cu. Inches	29.0 lbs./13.2 kgs.
	2A2400-1A-HR	2400VA	115/200 VAC	16.0″ × 13.9″ × 9.3″	55.5 lbs./25.2 kgs.
	2A3000-1B-HR	3000VA	115/200 VAC	16.0″ × 13.9″ × 9.3″	55.5 lbs./25.2 kgs.
	3PH4800-2A	4800VA	115/200 VAC	2502 Cu. Inches	78.5 lbs./35.7 kgs.
	3PH6000-2A	6000VA	115/200 VAC	2502 Cu. Inches	78.5 lbs./35.7 kgs.
	3PH7200-2A	7200VA	115/200 VAC	3680 Cu. Inches	116.5 lbs./53.0 kgs.
	3PH9000-2A	9000VA	115/200 VAC	3680 Cu. Inches	116.5 lbs./53.0 kgs.
	3PH12000-2A	12000VA	115/200 VAC	4905 Cu. Inches	152.5 lbs./70.0 kgs.

	Model	Output		Dimensions	Weight
28 VDC to 50 Hz Single-Phase	3A50-1B-1	50VA	115 VAC	7.0″ × 5.0″ × 2.8″	3.9 lbs./1.8 kgs.
	3A125-1B-1	125VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.3 lbs./1.9 kgs.
	3A250-1B-1	250VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.5 lbs./2.0 kgs.
	3A350-1B-1	350VA	115 VAC	7.0″ × 5.0″ × 2.8″	4.75 lbs./2.2 kgs.
	*3A800-1G	800VA	115 VAC	12.0″ × 8.5″ × 4.1″	12.5 lbs./5.7 kgs.
	*3A1000-1G	1000VA	115 VAC	12.0″ × 8.5″ × 4.1″	12.5 lbs./5.7 kgs.
	3A250-1A-1	250VA	230 VAC	12.5″ × 5.9″ × 6.3″	12.5 lbs./5.7 kgs.
	3A500-1A-1	500VA	230 VAC	12.5″ × 5.9″ × 6.3″	12.1 lbs./5.5 kgs.
	SR700-3A	700VA	230 VAC	195 Cu. Inches	9.0 lbs./4.1 kgs.
	3A800-1D-1-HR	800VA	230 VAC	16.0″ × 10.0″ × 9.3″	35.5 lbs./16.1 kgs.
	3A1000-1D-1-HR	1000VA	230 VAC	16.0″ × 10.0″ × 9.3″	35.5 lbs./16.1 kgs.
	3A1600-1A-1-HR	1600VA	230 VAC	16.0″ × 10.0″ × 9.3″	39.5 lbs./18.0 kgs.
	3A2000-1A-1-HR	2000VA	230 VAC	16.0″ × 10.0″ × 9.3″	39.5 lbs./18.0 kgs.
	3A4000-1A-HR	4000VA	230 VAC	14.8″ × 17.8″ × 9.3″	68.0 lbs./31.0 kgs.
	SP6000-3A	6000VA	230 VAC	2460 Cu. Inches	77.0 lbs./35.0 kgs.
	SP4000-3A	4000VA	230 VAC	1635 Cu. Inches	50.0 lbs./22.7 kgs.
	SP8000-3A	8000VA	230 VAC	3280 Cu. Inches	104.0 lbs./47.3 kgs.

* Also available in 48VDC input configurations.

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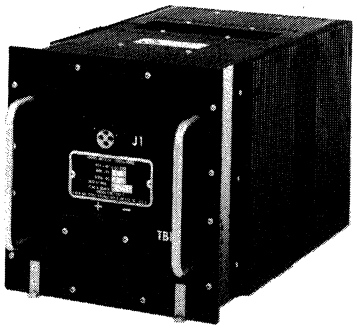
Avionic Instruments, Inc.

Static Inverter
1C 1000-( )
21 lbs.
12.60" L x 7.52" W x 7.65" H



Specifications

Input Voltage
28VDC ± 10VDC.

Output Voltage
115VAC ± 5VAC.

Output Frequency
400Hz ± 5Hz.
50,60 Hz available.

Output Power
1000VA.

Overload
1500VA linear load, 5 minutes.

Distortion
5% THD maximum.

Efficiency
82% minimum at full load.

Power Factor
0.8 lag to 0.9 lead.
Not damaged by any power factor.

Temperature Range
−55° C to +71° C.

Short Circuit Current
25 Amps minimum.

Qualified for use on the following Boeing Aircraft:

737	757
747-400	767

Consult AI2 for details on retrofit program

Qualification

Shock
Vibration
EMI
Temperature
Altitude
Fungus
Humidity
Explosion Atmosphere
Lightning Transients

Features

- Military Components
- High MTBF
- Remote on/off
- Short Circuit Protection
- Overvoltage Protection
- 300us response time
- Reverse polarity Protection
- ARINC 600 design

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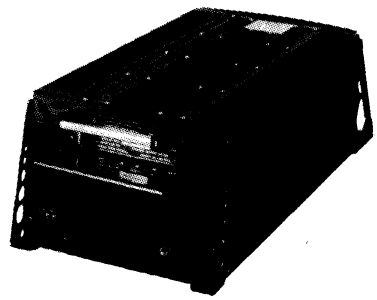
Avionic Instruments, Inc.

Static Inverter
1C 2400-( )
32 lbs.
22.6″ L × 9.0″ W × 6.0″ H



Qualified for use on Douglas MD-11

Consult AI2 for details on DC-10 retrofit program.

Features

- Military Components
- Overvoltage Protection
- Fault Bit
- 25ms Turn On
- Lightning Protection

Specifications

Input Voltage
28VDC ± 10VDC.

Output Voltage
115VAC ± 2.3VAC.
Single phase.

Output Power
2400VA continuous.

Overload
3000VA for 5 Minutes.

Output Frequency
400Hz ± 4Hz.
50,60 Hz available.

Distortion
3% THD. maximum at full load.

Efficiency
75% minimum at full load
and input voltage > 21VDC.

Power Factor
0.8 lag to 0.9 lead.
Not damaged by any power factor.

Temperature Range
– 55° C to + 71° C.

Short Circuit Current
44 Amps minimum.

Qualification

Altitude
FAA TSO-C73.
RTCA DO-160A, Para. 5.0.

Shock
FAA TSO-C73.
RTCA DO-160A, Para. 7.2.

Vibration
FAA TSO-C73.
RTCA DO-160A, Para. 8.3.1 and 8.4.

EMI
DAC WZZ7000.
IAW RTCA DO-160-B.

Lightning Transients
RTCA DO-160C, Para. 22.0.

Voltage Spike
RTCA DO-160A, Para. 17.3.

Voltage Transient
FAA TSO-C73.
RTCA DO-160A, Para. 17.4.

Temperature
FAA TSO-C73.
RTCA DO-160A, Para. 4.8 and 5.0.

Explosion Proof Atmosphere
RTCA DO-160A, Para. 9.0 Cat. E.

Fungus Resistance
RTCA DO-160A. Para. 13.0 Cat. F.

Sand and Dust
RTCA DO-160A, Para. 12.0 Cat. D.

Humidity
FAA TSO-C73.
RTCA DO-160A, Para. 6.3.2 Cat. B-1.

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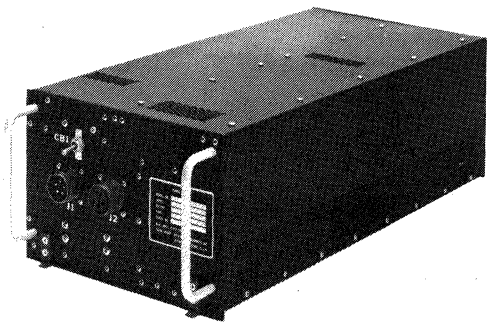
Telephone: (908) 388-3500, Cable Address: Reainta, Rahway, Telex: WU844-413 Reaintl Rway, RCA 247034 REA UR

Avionic Instruments, Inc.

NEW PRODUCT

Frequency Converter
4B3500-( )
45 lbs.
18.1" L x 9.0" W x 6.0" H



Specifications

Input Voltage
115/200VAC ± 10% three phase.

Input Frequency
400Hz ± 20Hz.

Output Voltage
115VAC ± 3Vrms, single phase.
(also available at 230VAC)

Output Power
3500VA.

Overload
4300VA for 5 Minutes.

Output Frequency
60Hz ± 0.7 Hz.
(also available at 50Hz)

Distortion
5% THD, maximum.

Efficiency
85% minimum at full load.

Power Factor
0.75 lag to 0.8 lead.
Not damaged by any power factor.

Temperature Range
– 55° C to + 71° C.

Short Circuit Current
50 A, minimum.

Direct replacement for NSN 6130-00-421-5314

Features

- Low Input Current Harmonics
- Output Overvoltage Protection
- Lightning Protection
- High MTBF
- ARINC mounting and PEM nut inserts

Qualification

Shock
MIL-STD-810, Method 516.

Vibration
MIL-STD-810, Method 514.

EMI
MIL-STD 461A, Notice 3.

Temperature
MIL-STD-810, Method 504.

Altitude
MIL-STD-810, Method 504.

Humidity
MIL-STD-810, Method 507.

Sand and Dust
MIL-STD-810, Method 510.

Fungus
MIL-STD-810, Method 508.

Explosive Atmosphere
MIL-STD-810C, Method 511.1.

Avionic Instruments Inc., 1414 Randolph Ave., Avenel, NJ 07001. FAX: (908) 382-4996
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Hearst Engineering Software

ICMASD...IC Alternate Source Directory

The all new 1991 version of the world famous Alternate Source Directory is now available in floppy disk form for your IBM XT & AT and 100% compatible personal computer with hard drive.

The **1991 ICMASD** contains the more than 180,000 listings that appear in the Alternate Source Directory Section contained in Volume Two of the printed version of the 1991 IC Master ...plus additional discontinued parts. The database includes complete vendor addresses and phone numbers.

You can personalize the **ICMASD** for your application. The program allows you to add comments, up to 20 digits long, to each listing. These comments can be part numbers, prices, or any information specific to your needs. You may also add, delete and/or discontinue devices!

For greater flexibility the base number search feature enables you to access parts by base number, i.e., the device number stripped of prefixes and suffixes. You don't need to know the manufactures codes to call up any of the alternates to these devices.

The **1991 ICMASD** is fast, convenient and very user friendly!

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Published Annually in March

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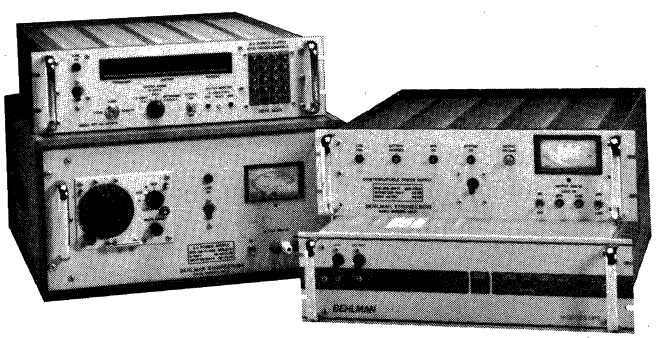
AC POWER

...For Every Application and More

From computer-controlled AC power sources for test labs through back-up power at remote sites, to efficient frequency converters, Behlman covers the entire spectrum of AC power requirements. For nearly four decades the Behlman name and AC power were inseparable. And today that tradition continues. Behlman solves the most exacting AC power applications with quality products and personal service.

INSTRUMENT-QUALITY AC POWER SOURCES

Behlman Instrument-Quality AC Power Sources greatly enhance your testing capabilities and effectiveness for complex computer-controlled or simple manual tests. These efficient linear sources are widely used in ATE systems, laboratories, production lines, test facilities, quality control and many other applications. For computer controlled applications the ACP Series reports actual measurements over the IEEE-488 interface. And the ACM Series offers precision, manually controlled power.



SOURCES FOR DC POWER SUPPLY TESTING

The DCT-Series AC Power Source provides the specific technical features required for the testing of DC power supplies at a lower cost than conventional AC power sources.

The DCT-Series is an enhanced programmable AC source which speeds up the testing of DC power supplies for manufacturers, OEMs and quality control departments. All output variables for DC power supply evaluation, inspection and checkout are remotely controlled by a computer via an EEE-488 Bus. This computer control broadens testing variables on the work bench and in larger test systems with absolute control of the output waveform for all aspects of DC power supply testing. Types of tests include numerous power line faults such as dropouts and surges, long-duration transients, frequency variations, low/high line power and more.

FREQUENCY CHANGERS

Behlman's Frequency changers provide economical, high quality power for a wide range of technical military, industrial and marine requirements. The cost effective PA Series offers solid-state 45 to 500 Hertz power in fixed, variable and IEEE-488 computer controlled models. These efficient units are designed for high reliability, lowering the cost of ownership in relation to rotary equipment.

UNINTERRUPTABLE POWER SYSTEMS

The H Series UPS by Behlman continuously guards against power line failures while protecting sensitive electronic equipment from line anomalities. The range of applications spans from mobil communications/transportable shelters to factory automation and process control. Small size and rugged design make the H Series the right choice for any rack-mount UPS application.

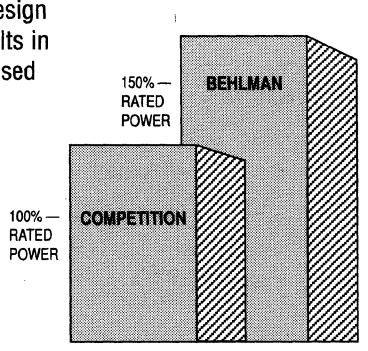
A WORD ABOUT BEHLMAN'S RATING METHOD

Full-rated VA is delivered to the load under the worst-case combination conditions of zero power factor loads, 10% low line and output voltage at 74% of maximum.

Continuous operation at 150% is possible for extended time periods under more optimum conditions, such as unity power factor loads, maximum output voltage, nominal input voltage, middle 60% frequency range and 25°C ambient.

Simply stated, Behlman's ACM and ACP Series AC Power Sources are designed to deliver 150% of rated power. This means that 50% more power is available to the load making these models more cost effective, versatile and reliable.

It is this unique design philosophy that results in Behlman's unsurpassed reliability and cost effectiveness.



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H-SERIES

1kVA to 5kVA
UNINTERRUPTABLE POWER SUPPLY

FEATURES

- Instrument quality design.
- True on-line UPS.
- Smallest, lightest package avaliable . . . 1000 VA only 5.25" high with batteries.
- Rugged standard rack mounting.
- 50Hz and/or 60Hz input or output frequencies.
- Uninterrupted operation under transient overloads.
- Low-distortion sine wave output.
- Outstanding line/load regulation.
- Low EMI/RFI.
- High effiency.
- RS-232 Interface options available.

APPLICATIONS

- Mobile communications
- Transportable shelters
- Process control
- ATE consoles
- Laboratory instrumentation
- Factory automation
- Remote facility/site
- Telecommunications
- Militarized versions available.

INSTRUMENT QUALITY, RACK MOUNTABLE UNINTERRUPTABLE POWER SYSTEMS

Behlman recognized the need for a unique power protection companion for electronic systems outside the conventional computer room UPS. The H-Series UPS now provides the array of benefits these applications demand, namely: small size, performance, ruggedness, reliability and value.

In features, operation and power rating requirements, the Behlman H-Series family meets and exceeds your most demanding applications. We've taken the hassle out of systems integration by offering an array of features that satisfy the most stringent applications.

Unique linear/switching power technologies are incorporated to reduce rack space requirements (H-1000 is only 5.25" high) and weight of each model to an absolute minimum. These same technologies provide unbeatable regulation and efficiency.

The family of H-Series units handle load crest factors well over two times their normal operating capacity without need for bypass to the utility line. Conservatively rated components allow them to drive the most unusual loads, even down to power factors of 0.5 leading or lagging. H-Series units are highly tolerant of input power variations yet produce a low distortion output. Emitted and radiated interference is extremely low making the H-Series family suitable for the most sensitive electronic equipment. Highly effecient electronics minimize fan noise and heat build-up.

Both contact closure and RS-232 are available on all models for communications and control. Input and output frequencies of 50Hz and/or 60Hz are also available. Continuous monitoring of voltage parameters are clear and accurate. Battery run-time can be extended by adding auxiliary battery packs.

TECHNICAL SPECFICATIONS, DIMENSIONS/WEIGHT

Model Number		Weight Lbs.(kg)	Height Ins (cm)	Depth Ins (cm)	Width Ins(cm)
H-1000	Inverter Battery (self-contained)	88 (40)	5.25 (13.4)	24 (61)	19 (48.3)
H-1700	Inverter Battery (self-contained)	135 (61)	8.75 (22.2)	22 (55.9)	19 (48.3)
H-2000	Inverter	56 (25.5)	5.25 (13.4)	22 (55.9)	19 (48.3)
	Battery	132 (60)	7 (17.8)	22 (55.9)	19 (48.3)
H-3000	Inverter	125 (56.8)	12.25 (31.1)	25.75 (65.4)	19 (48.3)
	Battery	132 (60)	7 (17.8)	22 (55.9)	19 (48.3)
H-5000	Inverter	139 (63.2)	12.25 (31.1)	25.75 (65.4)	19 (48.3)
	Battery (Two required)	132 (60)	7 (17.8)	22 (55.9)	19 (48.3)

Specifications subject to change without notice.

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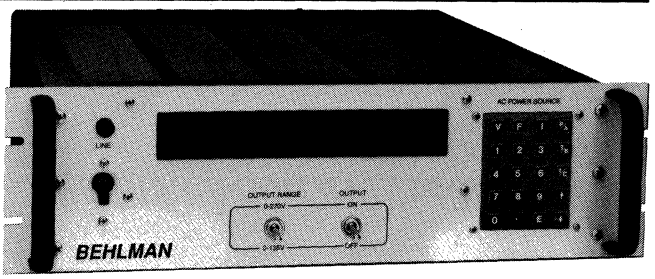
ACP SERIES

100VA to 9kVA AC POWER SOURCE



FEATURES

- 200% peak short-term current capability
- Computer interface reduces ATE system complexity
- Microcomputer-based crystal referenced, synthesized sinewave
- Built-in measurement system reduces support equipment
- Very low EMI/RFI
- Smaller, lighter – saves rack space
- Complete input and output transformer isolation
- Vacuum fluorescent display

APPLICATIONS

- MIL-STD-704 testing
- Military systems
- EMI/RFI test systems
- Areospace systems testing
- Power supply testing
- Acceptance testing
- Motor testing

PROGRAMMABILITY

- IEEE-488
- Output voltage
- Output frequency
- Output phase angle on three-phase models
- Current limit

OUTPUT MEASUREMENTS

- Voltage, Average responding (TRMS optional)
- Current, Average responding (TRMS optional)
- True power, Watts (optional)
- Power factor (optional)
- Frequency

GPIB PROGRAMMABLE SINGLE AND THREE PHASE

Behlman's ACP Series precision AC Power source is designed for wide usage in ATE systems, laboratories, production lines, test facilities, and many other applications. They are small in size and weight, increasing ease of handling and minimizing valuable rack space required.

Used in various computer controlled applications, Behlman's ACP Series AC power source provides truly independent and simultaneous output measurements while tests are in progress. This makes testing easier and faster because expensive voltmeters, ammeters, frequency counters or power meters are eliminated.

Programming is accomplished by the front panel keyboard or the IEEE-488 host interface computer, allowing for incrementing and decrementing of the output values with user definable resolution. On command, measurements are reported over the computer interface and the front panel, easy-to-read, display.

Fault Monitoring and diagnostic Self Tests are carried out by Built-In Test (BIT) circuits that report conditions through the interface and front panel display. The internal Fault Monitoring examines operating conditions and parameters on a continuous basis. The Self Test compares published specifications with actual output values.

The ACP Series delivers more power and features in the smallest, lightest package available. Valuable rack space is saved and testing capabilities and effectiveness are improved.

ACP SERIES TECHINICAL SPECIFICATIONS

THIS SUMMARIZES THE SPECIFIC PERFORMANCE CHARACTERISTICS FOR AN ACP SERIES PRECISION, PROGRAMMABLE AC POWER SOURCE. ALL RATED SPECIFICATIONS ARE BASED ON 25°C AMBIENT TEMPERATURE, NOMINAL INPUT LINE, UTILITY POWER FACTOR LOAD AND OPERATION AT 74-100% OF VOLTAGE OUTPUT RANGE, UNLESS OTHERWISE SPECIFIED. ALL MODELS ARE IN 19" RACK MOUNTING ENCLOSURE EXCEPT AS NOTED WITH (1) BELOW. THESE MODELS ARE MOUNTED IN A CABINET WITH A DIMENSION OF 52" H X 24" D X 31" W. SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

MODEL NO.	TOTAL POWER OUTPUT	CURRENT OUTPUT (AMPS)		WEIGHT (lbs.)	RACK DIMENSIONS	NO. OF RACK MOUNT CHASSIS
	RATED	135 V RANGE RATED	270 V RANGE RATED			
Single Phase		PER PHASE	PER PHASE			
ACP-100	100 VA	1.0	0.5	28	5.25"H x 22"D x 19"W	1
ACP-250	250 VA	2.5	1.3	40	5.25"H x 22"D x 19"W	1
ACP-350	350 VA	3.5	1.8	53	5.25"H x 22"D x 19"W	1
ACP-500	500 VA	5.0	2.5	63	7.00"H x 22"D x 19"W	1
ACP-750	750 VA	7.5	3.8	69	7.00"H x 22"D x 19"W	1
ACP-1000	1,000 VA	10.0	5.0	90	8.75"H x 24"D x 19"W	1
ACP-1500	1,500 VA	15.0	7.5	126	14.00"H x 22"D x 19"W	2
ACP-2000	2,000 VA	20.0	10.0	153	14.00"H x 22"D x 19"W	2
ACP-3000	3,000 VA	30.0	15.0	189	21.00"H x 22"D x 19"W	3
Three Phase						
ACP-3X100	300 VA	1.0	0.5	45	5.25"H x 24"D x 19"W	1
ACP-3X250	750 VA	2.5	1.3	76	8.75"H x 24"D x 19"W	1
ACP-3X350	1,050 VA	3.5	1.8	116	14.00"H x 22"D x 19"W	2
ACP-3X500	1,500 VA	5.0	2.5	153	14.00"H x 22"D x 19"W	2
ACP-3X750	2,250 VA	7.5	3.8	174	14.00"H x 22"D x 19"W	2
ACP-3X1000	3,000 VA	10.0	5.0	210	28.00"H x 22"D x 19"W	4
ACP-3X1500	4,500 VA	15.0	7.5	294	33.25"H x 19"D x 19"W	5
ACP-3X2000	6,000 VA	20.0	10.0	342	35.00"H x 19"D x 19"W	5
ACP-3X3000(1)	9,000 VA	30.0	15.0	410	42.00"H x 22"D x 19"W	5

INPUT CHARACTERISTICS

Frequency:	48-72 Hz	
Voltage:		
Single-Phase Models:	ACP-100 through ACP-1500:	115/230 Vac ± 10%, 1Ø.
	ACP-2000 and ACP-3000:	120/208 or 230 Vac ± 10%, 3Ø.
Three-Phase Models:	ACP-3X100 through ACP-3X500:	115/230 Vac ± 10%, 1Ø.
	ACP-3X750 through ACP-3x3000:	120/208 or 230 Vac ± 10%, 3Ø.

OUTPUT CHARACTERISTICS

Frequency:	45-2000 Hz
Voltage:	
Single-Phase Models:	0-135, 0-270, or 0-270 Vac, 1Ø, with automatic range change at 135 Vac. Switch selectable or IEEE-488 programmable.
Three-Phase Models:	0-135, 0-270, or 0-270 Vac, 3Ø with autorange at 135 Vac. Switch selectable or IEEE-488 programmable.
Load Regulation:	± 0.5% No load to full load.
Line Regulation:	± 0.1% for ± 10% line change.
Distortion:	1.0% maximum total harmonic distortion at rated power output.
Rated Power Output:	Obtainable from 74% to 100% of either voltage output range.
Maximum Power Output:	Up to 150% of rated power output available depending on operating conditions (54 Hz-1600Hz, nominal line, unity power factor).
Rated Current Output:	Obtainable from 50% to 100% of either voltage output range.
Maximum Current Output:	Up to 120% of rated current output for a maximum of one-half hour.
Peak Short-Term Current Output:	200% of rated current output.
Power Factor:	100% of rated power output available into any power factor load (unity to zero, leading or lagging).
Fault Protection:	Fast acting, main circuit breaker.
Overload Protection:	Electronic overload and short circuit protection with instantaneous automatic recovery when overload is removed.

WAVEFORM GENERATION

Oscillator Type:	Microcomputer-based, crystal referenced, synthesized sinewave.
Frequency Accuracy:	±0.005%

FRONT PANEL CONTROLS AND DISPLAY

Display Type:	40 Character, alphanumeric, blue vacuum fluorescent display to monitor operation.
Displayed Information:	Any combination of 3 (4 on 3Ø models) of the following measurements is available: -Frequency -Voltage (by phase on 3Ø) -Current (by phase on 3Ø) -Phase angle on 3Ø models Programming Information Internal Self Test/Fault Monitor error status
Programming Medium:	Alphanumeric Keypad
Output Control:	ON/OFF Toggle Switch.
Master Power:	ON/OFF circuit breaker for line power input control with indicator light.
Output Voltage: Range Select	Switch Selectable, 0-135 Vac, or 0-270 Vac with automatic range change at 135 Vac. There is a 200-300ms output dead-time when unit switches ranges.

STANDARD MEASUREMENTS AVERAGE RESPONDING

Voltage:	Measured at output sense terminals	
	Resolution:	0.1 Vac
	Accuracy:	± 0.7 Vac, ± 1 LSD
Current:	Resolution:	0.1 Amp AC
	Accuracy:	(both output ranges) ± 0.5% of maximum current output of 0-135 range, + 1 LSD
Frequency:	Resolution:	45-1000 Hz: 0.1 Hz 1000-2000 Hz: 1.0 Hz
	Accuracy:	0.005% of reading ± 1 LSD of resolution

STANDARD PROGRAMMING

Voltage:	Resolution:	± 0.1 Vac
	Accuracy:	± 0.6 Vac
Adjustable Current : Threshold Monitor	Resolution:	0.1 Amps AC
	Accuracy	(Both Output Ranges) ± 2.0% of maximum current output of 0-135V range.
	Minimum Programming Value:	Under 500 VA per phase 0.3 amps AC. Above 500 VA per phase 0.5 amps AC.
	Maximum Programming Value:	120% of rated current output of the 0-135V output range.
Frequency	Resolution:	0.1 Hz
	Accuracy:	0.005% of setting
Phase Angle (Three Phase Models Only):	Range:	0-360 degrees referenced to A phase
	Resolution:	1.0 degree
	Accuracy:	± 1.0 degree
		Also allows for independent or simultaneous programming of: –Voltage Output –Adjustable current, Threshold Monitor

STANDARD FEATURES

Remote Interface:	IEEE-488 (GPIB) Listener/Talker controls all operating parameters and reports measured values in addition to operating status.
Self Test:	A user requested test which compares published specifications with actual output values. Out of tolerance conditions are indicated via the front panel display and remote interface.
Internal Fault Monitor:	Examines operating conditions and parameters on a continuous basis. Parameters Include: Input line voltage, Internal cabinet temperature, Output characteristics in relation to specifications, Accidental overvoltage of output Faults are reported via the front panel display and remote interface.
High Rate Programming Mode:	Allows host computer to program rapid voltage and frequency deviations.
	Voltage: Programming range 0-100% of range
	Accuracy: + 0.6 Vac
	Response Time: 50 Microseconds to ± 90% of programmed value. 500 milliseconds to rated specifications of standard programming.
	Up-date Rate: Once every 175 microseconds
Frequency Programming:	45-2000 Hz in one Hz increments
	Accuracy: 0.005% of setting
	Response Time: 50 microseconds
	Up-date Rate: Once every 100 microseconds
Remote sense:	External sensing and correcting of load voltage via a barrier terminal block on back panel.

PHYSICAL

Mounting:	19" rack mount chassis with provision for slide mounting.
Paint:	Light grey and dark lettering.
Physical Size:	Dependent on VA rating.
Cooling:	Forced air, internal fan.
Output Connections:	Rear mounted barrier terminal block.
Operating Temperature:	0 to +55 degrees Celsius. (+32 to 130 degrees Fahrenheit).

OPTION #01:

Option #01 features include all of the standard features listed above and the following.

Event Programming:	A feature designed to simulate events such as line dropouts, voltage transients surges, etc.
	No. of events: 4
	Voltage
	Changes per Event: 1,2,or 3
	Programming: 0-100% of selected voltage range
	Resolution: 0.1% of selected voltage range
	Accuracy: ± 0.6 Vac
	Timing
	Duration: 0 to 6553.5 milliseconds
	Resolution: 0.1 millisecond
	Accuracy: ± 0.1 millisecond except at 0 duration which is ± 0.2 milliseconds.
	Output Response Time: 50 microseconds to 90% of programmed value. 500 milliseconds to rated specifications of standard programming.
Programmable Transition Time:	Allows the user to specify a point in time when programmed voltage changes occur after zero crossing.
	Delay
	Range: 0-25.5 milliseconds
	Resolution: 0.1 milliseconds
	Accuracy: ± 0.1 milliseconds
	Repeatability: ± 0.05 millisecond
	Accuracy of zero crossing Trigger: ± 0.1 millisecond
External Frequency Sync Input :	Allows output to be frequency sycronized to an external source.
	Input: 2-10 V peak square wave (50% duty cycle)
	Phase Lock: ± 5° referenced to zero crossing of output
Frequency Sync Output:	5.1 volt square wave syncronized to "A" phase.
Voltage/Frequency Transition Time:	5 volt pulse of approximately 20 microseconds duration generated at the time a programmed voltage or frequency change takes place.
Output Inhibit By TTL Input:	Allows output to be disabled remotely by a high TTL level input.

OPTION #02:

Package #02 options include all standard features and #01 features.

Measurements:	RMS Responding /True Power/Power Factor. Replaces Standard Measurement Specifications.
	Voltage Measured at output sense terminals
	Resolution: 0.1 Vac
	Accuracy: ±0.9 Vac ±1 LSD Crest Factor <3:1
	Current
	Resolution: 0.1 Amp AC
	Accuracy: (Both output ranges) Crest Factor <3:1: ±0.7% of maximum current output of 0-135 V range ± 1 LSD Crest Factor < 10:1: ±1.5% of maximum current output of 0-135 V range ±1 LSD
	Frequency
	Resolution: 0.1 Hz.
	Accuracy: 0.005% of reading ± 1LSD of resolution
	True Power
	Resolution: 1 Watt
	Accuracy: ± 2.0% of maximum power output
	Power Factor
	Resolution: 0.001
	Accuracy: (Both Output Ranges): ±0.03 over ranges of 27-270 Vac and 10 - 120% of rated current output of 0-135 Vac range.
	Programming
	Voltage Accuracy: ± 1.1 Vac
	All other programming specifications per standard programmin and option #01.

OPTION #03

Option #03 provides the input power of 220/380 Vac, 3Ø, 48 tc 72Hz for units 2000 VA and above.

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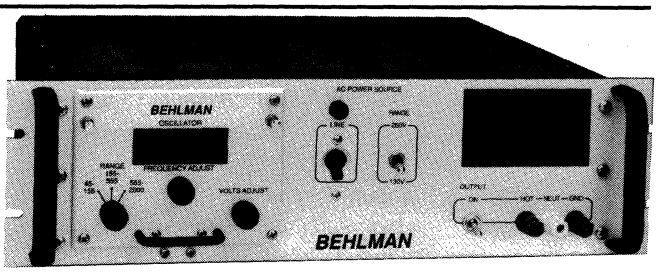
ACM SERIES

100VA to 9kVA AC POWER SOURCE



FEATURES

- Negligible EMI/RFI
- Smaller,lighter– saves rack space
- Tight regulation, low distortion
- Overload protection with instantaneous recovery
- Complete input/output transformer isolation
- 0.1% to 0.001% frequency accuracies
- 200% peak short-term current capability

APPLICATIONS

- Motor generator replacements
- Power supply testing
- Relay testing
- Avionics and missile test systems
- General laboratory support
- Motor testing
- Transformer testing
- Military test systems
- Automatic test equipment
- Acceptance testing
- Airborne, marine, ground support

MANUAL CONTROL
SINGLE AND THREE PHASE

Behlman's ACM Series AC Power source is a uniquely efficient linear power amplifier driven by plug-in oscillators, or an external synchronization source. These units are used in a wide variety of applications such as calibration facilities, laboratories, production lines and other test requirements where manually controlled AC power is required.

Incorporating an entirely unique design concept in linear power amplifiers, Behlman's units greatly increase stability into low power factor loads while reducing circuit complexity. This design is combined with advanced magnetics reducing size and weight, saving in valuable rack space and easing equipment handling.

The ACM Series is unparalleled, generating virtually no EMI/RFI emission, either conducted or radiated. To further decrease electronic noise and increase flexibility, both the input and output are coupled by isolation transformers. The output can be left floating or one side grounded. Complete overload, short circuit protection is provided by a combination of instantaneous automatic recovery circuitry and fast acting circuit breaker.

The ACM Series front panel is well organized with easily accessible control and digital readout on variable frequency models.

ACM SERIES TECHNICAL SPECIFICATIONS

THIS SUMMARIZES THE SPECIFIC PERFORMANCE CHARACTERISTICS FOR THE ACM SERIES PRECISION, MANUALLY CONTROLLED AC POWER SOURCE. ALL RATED SPECIFICATION ARE BASED ON 25° C AMBIENT TEMPERATURE, NOMINAL INPUT LINE, UNITY POWER FACTOR LOAD AND OPERATION AT 74-100% OF VOLTAGE OUTPUT RANGE, UNLESS OTHERWISE SPECIFIED. ALL MODELS ARE IN 19" RACK MOUNTING ENCLOSURE EXCEPT AS NOTED WITH (1) BELOW. THESE MODELS ARE MOUNTED IN A CABINET WITH A DIMENSION OF 52" H X 24" D X 31" W. SPECIFICATIONS SUBJECT SUBJECT TO CHANGE WITHOUT NOTICE.

MAINFRAME AMPLIFIER

MODEL NO.	TOTAL POWER OUTPUT	CURRENT OUTPUT (AMPS)		WEIGHT (lbs.)	RACK DIMENSIONS	NO. OF RACK MOUNT CHASSIS
		135 V RANGE	270 V RANGE			
	RATED	RATED	RATED			
Single Phase		Per Phase	Per Phase			
ACM-100	100 VA	1.0	0.5	28	5.25"H x 15"D x 19"W	1
ACM-250	250 VA	2.5	1.3	40	5.25"H x 15"D x 19"W	1
ACM-350	350 VA	3.5	1.8	53	5.25"H x 15"D x 19"W	1
ACM-500	500 VA	5.0	2.5	63	5.25"H x 19"D x 19"W	1
ACM-750	750 VA	7.5	3.8	69	7.00"H x 19"D x 19"W	1
ACM-1000	1,000 VA	10.0	5.0	90	8.75"H x 19"D x 19"W	1
ACM-1500	1,500 VA	15.0	7.5	126	14.00"H x 19"D x 19"W	2
ACM-2000	2,000 VA	20.0	10.0	153	14.00"H x 19"D x 19"W	2
ACM-3000	3,000 VA	30.0	15.0	189	21.00"H x 19"D x 19"W	3
Three Phase						
ACM-3X100	300 VA	1.0	0.5	45	5.25"H x 19"D x 19"W	1
ACM-3X250	750 VA	2.5	1.3	76	7.00"H x 19"D x 19"W	1
ACM-3X350	1,050 VA	3.5	1.8	116	8.75"H x 22"D x 19"W	1
ACM-3X500	1,500 VA	5.0	2.5	153	14.00"H x 19"D x 19"W	2
ACM-3X750	2,250 VA	7.5	3.8	174	14.00"H x 19"D x 19"W	2
ACM-3X1000	3,000 VA	10.0	5.0	210	28.00"H x 19"D x 19"W	4
ACM-3X1500	4,500 VA	15.0	7.5	294	28.00"H x 19"D x 19"W	4
ACM-3X2000	6,000 VA	20.0	10.0	342	35.00"H x 19"D x 19"W	5
ACM-3X3000(1)	9,000 VA	30.0	15.0	410	42.00"H x 22"D x 19"W	5

OSCILLATOR SPECIFICATIONS

The below oscillators are designed to plug into the front panel of Behlman's Precision ACM Power Sources. They are available in a variety of fixed and variable frequency outputs. Variable oscillators provide digital readout of frequency.

MODEL NO. SINGLE PHASE	MODEL NO. THREE PHASE	FREQUENCY RANGE	FREQUENCY ACCURACY	NOTES
Fixed Frequency	**Fixed Frequency**			
OSC-1-XXX-H	OSC-3-XXX-H	50, 60, or 400Hz	0.1%	Replaces XXX with the selected fixed frequencies of 50, 60 or 400Hz. Example: OSC-1-50-H or OSC-1-400-K
OSC-1-XXX-K	OSC-3-XXX-K	50, 60, or 400Hz	0.001%	
Variable Frequency Digital Readout	**Variable Frequency Digital Readout**	**FREQUENCY RANGE**	**FREQUENCY ACCURACY**	**Digital Readout Number of Bands**
OSCD-1-300/500-G	OSCD-3-300/500-G	300 to 500Hz	0.25%	One
OSCD-1-45/66-G	OSCD-3-45/66-G	45 to 66Hz	0.25%	One
OSCD-1-45/2000-E	OSCD-3-45/2000-E	45 to 2000Hz	1.0%	Three

GENERAL SPECIFICATIONS

INPUT CHARACTERISTICS

Frequency: 48-72 Hz

Voltage:

Single-Phase Models

ACM-100 through ACM-1500:
115/230 Vac ± 10%, 1Ø.

ACM-2000 and ACM-3000:
120/208 or 230 Vac ± 10%, 3Ø.

Three-Phase Models

ACM-3x100 through 3x500:
115/230 Vac ± 10%, 1Ø.

ACM-3x750 through 3x3000:
120/208 or 230 Vac ± 10%, 3Ø.

PHYSICAL

Mounting: High strength metal 19" rack mount chassis with provision for slide mounting.

Metering: Digital readout of output voltage.

Paint: Light grey and dark lettering.

Output Connections: Front panel binding posts and rear mounted barrier terminal block.

Cooling: Forced air, internal fan.

Operating Temperature: 0 to 55 degrees Celsius (+32 to +130 degrees Farenheit)

Physical Size: Dependent on VA rating.

FRONT PANEL CONTROLS AND INDICATORS

Output Control: ON/OFF toggle switch Range Select

Oscillator: Opening for selected plug-in oscillator. Provides applicable voltage and frequency control.

External Input: The Optional External Input Module replaces the plug-in oscillator for external control of the amplifier. Amplifier Drive: 0-9.2 Volts RMS. 15K ohms impedance.

OUTPUT CHARACTERISTICS

Frequency: 45-2000 Hz

Voltage:

Single-Phase Models: 0-135 or 0-270 Vac, 1Ø, switch selectable.

Three Phase Models: 0-135 or 0-270 Vac, 3Ø, switch selectable.

Load Regulation: ± 0.5%. No load to full load. Adjustable through zero for specific loads.

Line Regulation: ± 0.1% for ± 10% line change.

Distortion: 0.5% maximum total harmonic distortion at rated power output.

Rated Power Output: Obtainable from 74% to 100% of either voltage output range.

Maximum Power Output: Up to 150% of rated output available depending on operating conditions (54 Hz-1600 Hz, nominal line, unity power factor).

Rated Current Output: Obtainable from 50% to 100% of either voltage output range.

Maximum Current Output: Up to 120% of rated current output for a maximum of one half hour.

Peak Short-Term Current Output: 200% of rated current output.

Power Factor: 100% of rated power output available into any power factor load (unity to zero, leading or lagging).

Fault Protection: Fast acting, main circuit breaker.

Overload Protection: Electronic overload and short circuit protection with instantaneous recovery when overload is removed.

OPTION #03

Option #03 provides the input power of 220/380 Vac, 3Ø, 48 to 72Hz for units 2000 VA and above.

BEHLMAN
An Astrosystems Company

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(800) 456-2006

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Ventura, California 93003
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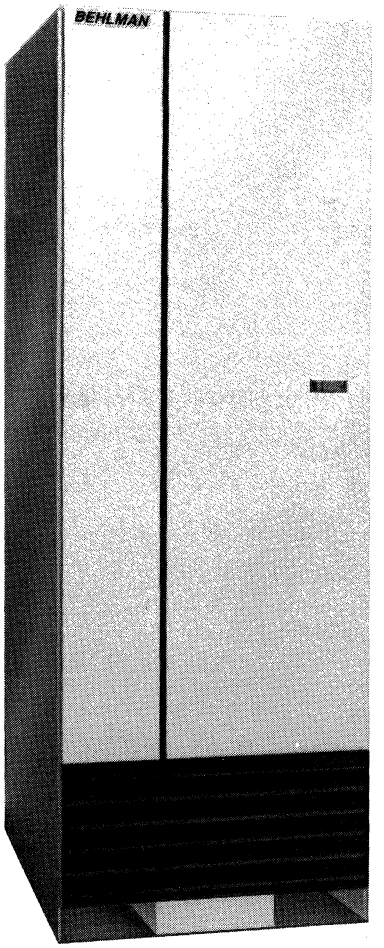
FAX: (805) 642-0790

PA SERIES

Up to 100 KVA FREQUENCY CONVERTER



APPLICATIONS

- Automatic test equipment.
- Computer programmable power.
- Facilities power.
- Avionics support testing.
- Motor generator replacements.
- 50Hz power requirements.
- 400Hz military power.
- Variable frequency testing, 45 to 500 Hz.
- Flightline power.
- Electronic product burn-in and testing.
- Dock-side marine power.
- International power requirements.

FIXED, VARIABLE GPIB PROGRAMMABLE

The PA Series Frequency Converter is typically used in laboratories, testing applications and facilities that require efficient, cost effective power conversion. Applications range from avionics and international product testing to frequency conversion for airborne and shipboard equipment.

The Solid-State PA Series is specifically designed to reduce downtime. Self-clearing power transistors help eliminate needless, expensive power shutdowns, maximizing maintenance-free operation. In the unlikely event a transistor device failure should occur, the device will automatically clear itself from the circuit without disturbing or derating the system's output specification. Self-diagnostics and monitoring give the user the benefit of servicing at his convenience. Modular construction further reduces down time. Each unit is assembled from the same basic plug-in modules, making it easy to configure, expand and service.

By incorporating a unique input circuit design, the PA Series minimizes input current distortion reflected on the utility service, as required by DoD 1399, Section 300. Input start-up surges are also reduced through the use of special soft-start circuitry, eliminating the need for oversized utility requirements.

The highly efficient PA Series outputs are configured for either fixed, variable or IEEE-488 computer control. Input voltage combinations range from 120/208 VAC to 277/480VAC. All standard models are available in either Wye or Delta connection. Output frequency is fixed or variable from 45 Hz to 500 Hz.

Unlike noisy motor generators, the PA series incorporates quiet solid-state technology. These are compact and do not require special site preparation. By offering solid-state efficiency and reliability the cost of ownership is lower than for rotary equipment.

FEATURES

- Self-diagnostics and module level replacement of electronics allow rapid and easy servicing.
- Redundant power circuits allow system operation in case of individual power device failure.
- Lowers operational cost. High efficiency of 88-90%.
- Small footprint saves up to 50% over the space of competitive units.
- Soft-start ramp-up eliminates input power line surges and the need for oversized utility service.
- Low input distortion using 36-phase rectification per DoD 1399, Section 300.
- Easy installation, no special connections.
- Workplace compatible with low audible noise.
- Expandable models using plug-in modules eliminate obsolescence.
- Precision output provides precisely controlled power into extremely complex loads.
- Very cost effective at all VA levels.
- Input isolation provided by power transistors.
- Versatile voltage ratings offer wide range of input and output combinations in Wye or Delta configurations.
- Optional IEEE-488 interface allows user control and monitoring for remote applications.

TECHNICAL SPECIFICATIONS

INPUT

Voltage:	All models are provided with a multi-tapped input transformer which accommodates most forms of 3-phase power (Specify when ordering).
Frequency:	57Hz to 63Hz indefinitely. 47Hz to 63Hz option is available.
Current:	Unique 36-phase input rectification available.
Distortion:	IAW DoD-STD-1399, Section 300.
Power Factor:	Greater than 0.95.
Soft-Start:	Limits input surge currents on start-up.
Efficiency:	Typically 88-90%.

OUTPUT

Power:	Single and Three-Phase through 100kVA.
Voltage:	Adjustable from 0 to 140VAC L-N. Configurable in Wye or Delta outputs. Higher voltages are also standard.
Load Regulation Adjustment:	-5% to +10%.
Frequency:	Fixed at 50, 60 or 400Hz, or variable from 45 to 500Hz.
Repetitive Peak Rating:	250% of nominal at 60Hz. 200% of nominal at 400Hz.
Current Distortion:	2% THD at 60Hz. 4% THD at 400Hz.
Phase Separation:	120 degrees ± 1 degree.
Load Imbalance:	100% load imbalance acceptable.

MECHANICAL

Dimensions:	77"H x 26.5"W x 33.5"D. Incorporates fork lift base.
Weight:	1000 to 1800 lbs., depending on model.

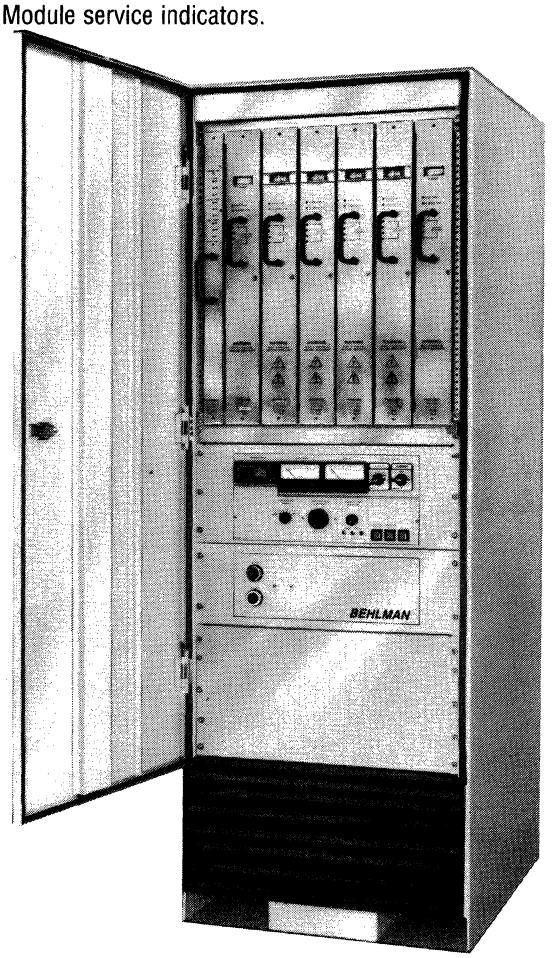
Specifications subject to change without notice.

ENVIRONMENTAL

Temperature:	Operating: 0°C to +55°C(+32°F to +131°F). Storage: -20°C to +70°C(-4°F to +158°F).
Humidity:	0 to 95% Rh, noncondensing.
Audible Noise:	≤60 dBA at five feet.
Cooling:	Forced air with reusable air filter.

MONITORS & CONTROLS

- Input power Start/Stop.
- Overload reset.
- Output current meter.
- Frequency meter.
- Overtemp indicator.
- Output On/Off.
- Output voltmeter.
- Amplitude control.
- Module current meter.
- Module service indicators.



MODELS

PA 3331:	50 kVA output.
PA 6331:	50 kVA expandable output.
PA6631:	100 kVA output.

Standard models available. All PA-Series models are available with variable or fixed output frequencies and a wide selection of input voltage configurations.

SERVICE AND SUPPORT

Behlman's proven solid-state technology offers outstanding performance and reliability. Self-clearing transistors repackaged within individual power modules help to ensure product uptime and low MTTR of less than thirty minutes. If your system shoul require servicing, Behlman Customer Services group is dedicated to providing unparalleled assistance. Product repair or technical documentation questions are handled quickly and competently. Extended and On-site warranties are available as well as spares provisioning kits.

BEHLMAN
An Astrosystems Company

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Phone: (805) 642-066
U.S.A. (800) 456-200
FAX: (805) 642-079

SINE WAVE DC/AC INVERTERS

- **SMALL, LIGHT WEIGHT**
  At 2lb. 5 oz. Belmont Inverters are ideal for use in portable battery powered equipment.
- **SINE WAVE OUTPUT**
  Frequency stable to less than 1% over full temperature range.
- **CSA CERTIFIED, PATENTED**
  Model SINE-125, illustrated, CSA certified at 50, 60 Hz. Exclusive technology protected under U.S. Patent #4,907,145.

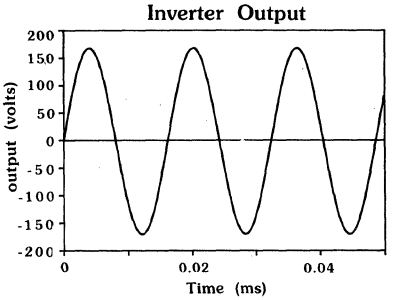
Model Sine-125,200VA/125 Watt Output, Specifications:

OUTPUT POWER: 125 W resistive load or 200 VA max with pf = 0.6 lag load
SIZE: 8.18 in. x 5.03 in. x 1.66 in. (20.8 cm x 12.8cm x 4.21 cm)
WEIGHT: 37 oz. (1.05 Kg)
EFFICIENCY: Typical 80% for resistive loads, greater than 70% for all loads @ 100W
FREQUENCY: 50 Hz, 60 Hz, or 400 Hz available, standard
OUTPUT VOLTAGE: 110 VAC Sine Wave **POWER FACTOR (LOAD):** 1 to 0.6 lag
INPUT VOLTAGE RANGE: 22 to 28 VDC normal operation, maximum range: 20 to 30 VDC
MAXIMUM OUTPUT CURRENT: 1.8 A rms (@ pf = 0.6)
OPERATING TEMPERATURE (CASE): 0° C to 70° C **STORAGE TEMPERATURE:** -40° C to 85° C
PROTECTION: Short circuit, Thermal overload
ISOLATION: 1250 VAC input to output, 1250 VAC input to case, 1250 VAC output to case
FREQUENCY STABILITY: ± 0.5 Hz or 1% over operating temperature range
RELATIVE ACCURACY (25° C): ± 0.5 Hz or 1% whichever is greater
OUTPUT VOLTAGE DRIFT: ± 3% over temperature range
OUTPUT LOAD IMBALANCE: 0 to 50% **MINIMUM LOAD:** None
SHORT CIRCUIT INPUT CURRENT: Less than 8A **OUTPUT CURRENT:** 2.2A
INPUT CURRENT (NO LOAD): 400 mA typical @ 24 VDC, 500 mA maximum
REMOTE TURN ON/OFF: Yes

Other Available Models

Input Voltage	Output Frequency	Output Power
12, 24 V DC	50, 60, 400 Hz	125, 500, 1000 Watts

Digital Oscilloscope Recording of Output Voltage @ 100 W. Inverter Output



BELMONT
INSTRUMENT CORPORATION

Pinehurst Park, 8 Cook Street, Billerica, MA 01821 • 508/663-0212

Announcing a breakthrough in Computer Power Protection...

New advanced, on-line uninterruptible power systems protect your micros, minis, workstations and LANs from power problems

Your computer is bombarded daily by spikes, sags, surges, noise, brownouts and blackouts. Bad power eats away at fragile electronic circuits, increases service costs, damages disks and causes downtime.

You can eliminate these problems by investing in an Uninterruptible Power System (UPS). Your investment in a UPS will mean reduced downtime, increased equipment life and lower service costs. Typically, a UPS will pay for itself in less than one year. But not all UPS are created equal. Many are off-line, standby systems. Most won't even provide isolation from the power line or a separately-derived neutral. Only BEST's UPS meet all six requirements of quality computer power protection.

Best Power Technology's UPS range in capacity from 500 VA to 18 KVA. They will protect your micros, minis, workstations, LANs and anything else that needs clean, continuous power.

FERRUPS Meets Six Requirements of Quality Power Protection

Best Power Technology, Inc.'s new, advanced, on-line uninterruptible power systems called FERRUPS are truly a breakthrough in computer power protection. FERRUPS meets all six requirements of quality computer power protection:

☑ **Lightning and surge protection.** Outstanding 2000 to 1 spike attenuation. Passes both Class A and the higher Class B ANSI/IEEE C62.42-45 tests.

☑ **Isolation, including output neutral to ground bonding.** Provides isolation required by Federal Information Processing Standard #94. Qualifies as a true, separately-derived power source as defined by National Electric Code Article 250-5D.

☑ **Regulation.** Output voltage regulated to within standards set by Computer Business Equipment Manufacturer's Association (CBEMA) and ANSI C84.1.

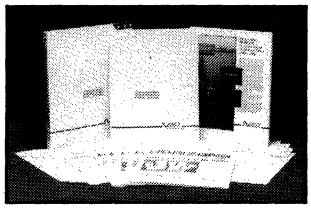
☑ **Continuous, no-break power.** On-line system provides continuous, no-break power during complete blackouts or momentary interruptions (not like a standby system).

☑ **Sine-wave power.** Computer-grade, sine-wave power.

☑ **Switch-mode power supply rated.** All VA ratings based on computer-type loads with switch-mode power supplies. No derating required when used with computers.

FERRUPS Is Intelligent and Interactive

FERRUPS not only meets all six requirements of quality power protection, it is also intelligent and interactive. FERRUPS is equipped with full duplex communication features for screen display of meter functions such as voltage, current, watts, battery status, etc. FERRUPS is the smartest, most interactive, communicative UPS in the business today!



*Interested? Call or send for our new, **FREE** literature today!*

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SAMPLE

Name _____ Company _____
Address _____
City _____ State _____ Zip _____
Equipment to be Protected _____
Phone _____ Check One: User☐ Dealer☐ Specifier☐ OEM☐

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms **A**•1114, **B**•1037, **C**•1116, **D**•1068
AC Power Supplies, Product Selection Guide **D**•2146
ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **A**•1300
DC Power Supplies, Product Selection Guide **D**•1501
Delay Lines, Product Selection Guide **A**•1493
Dielectrics, Thermal Conductivity **C**•1709
Discrete Semiconductors, Product Selection Guide **A**•2082
Displays, Readouts, & CRTs, Product Selection Guide **B**•1032
EBCDIC Code **D**•1110
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Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **C**•1601
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Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **A**•2013
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Thermal Conductivity of Dielectrics at Room Temperature **C**•1709
Thyristors/High Power Diodes, Miniglossary **A**•1728, **A**•2084
Timers, Miniglossary **B**•1409, **D**•1149
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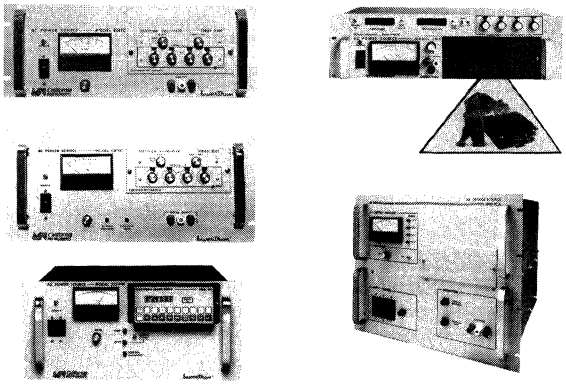
Transducers & Encoders, Product Selection Guide **B**•1872
Transformers, Product Selection Guide **A**•2131
Wire & Cable, Product Selection Guide **C**•1705
Wire Gauges—Diameter, Area, Copper Weight **C**•1864

California Instruments

AC POWER SYSTEMS

T SERIES POWER AMPLIFIERS



- Full VA output with Wide Voltage Range
- 1ϕ, 2ϕ, 3ϕY
- 50 Model Selection
- Modular Design
- 100 to 36000VA
- Voltages 0-270V
- 20-20kHz Optional

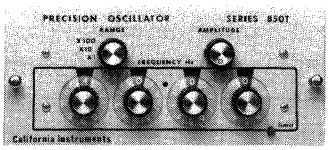
Model	Std. Voltage	R.P.F.R.①	Std Input Voltage	Panel Ht.
101T	1 Range	45-10kHz	115V, 1ϕ	3.5"
251T	3 Ranges	45-20kHz	115V, 1ϕ	5.25"
351TC	0-120, 0-240	45-5kHz	115V, 1ϕ	5.25"
501TC	0-135, 0-270	45-5kHz	115V, 1ϕ	7.0"
1001TC	0-130, 0-260	45-5kHz	230V, 1ϕ	8.75"
1501TC	4 Ranges	45-5kHz	230V, 1ϕ	14.0"
3001TCA	4 Ranges	45-2kHz	208V L-L, 3ϕ	15.75"

① Full Power Frequency Range

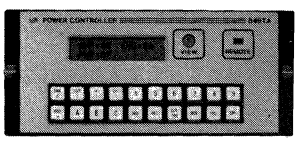
T SERIES PLUG-IN OSCILLATORS AND CONTROLLERS

Manual Oscillators

Model 850T
- 45Hz - 9999Hz
- 0.001% Accuracy
- Crystal Control
- Amplitude/Current Servo



Programmable Controllers



Model 849TA
- Control-Remote/Local
- IEEE-488 GPIB (Listen/Talk)
- Independent Phase Control
- Store Variable Sweeps & Ramps

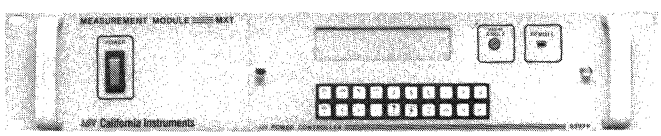
NOTE: Consult Factory for full line of Manual and Programmable Oscillators/Controllers

LDS SERIES LINE DISTURBANCE SIMULATOR

Programmable AC Power to simulate power line dropouts, spikes, sags and distortion.

LDS Series will consist of:
- Model 959XPT Controller
- Model MXT10 Interface Module
- Any California Instruments model AC Power Amplifier

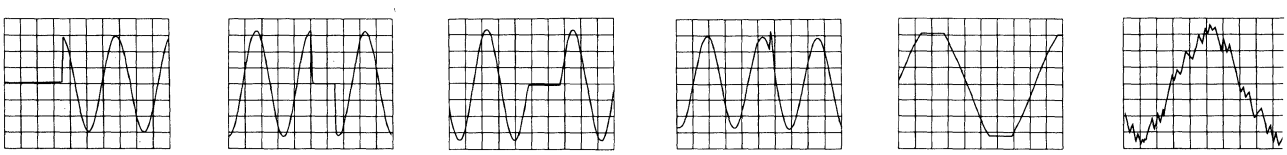
Features:
- Full IEEE-488 Listener/Talker
- 16 Linking Memory Registers
- Variable Speed Up/Dn Keys
- Bus or Keypad calibration



Provides California Instruments T & XP Series AC Power Amplifiers and many competitive model AC power amplifiers with the capability to program and measure output parameters, including current limit.

Program to control, display and report RMS Volts and Amps, Watts, VA, Pf, Phase Angles and Frequency. Can be used from 100VA to 36kVA in single and multiple phase configurations.

IEEE-488 or Front Panel Keyboard control to program Line Distortion Simulations like those shown below...or specify your particular line distortion.



Programmable start | ½ cycle dropouts | 10 ms dropout at 0° (or any angle) | 2 ms surge (at any angle) | Programmed distortion (0-20%) | Custom waveshape to custome requirement

TOLL FREE • 1-800-4AC-POWER

California Instruments Corp.
9025 Balboa Avenue
San Diego, CA 92123
(619) 279-8620
Fax: 619-279-8139
Telex: 695047
Toll Free: 800-4AC-POWER

California Instruments

1200 DCS SERIES – MODULAR DC POWER

Exclusive Features:

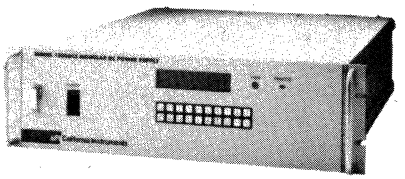
- Eight separate and isolated Outputs/ Chassis
- 5-1/4" Rack Height
- Front Chassis Module Loading
- Full Current Output, 10-100% Full Scale Voltage
- 38 Lbs (17.3 Kg) with Eight Power Modules/Chassis
- Over 80% Efficient
- Complete Automatic Self-Test of Each Output on Start-up
- Protection:
- Output Overload • Temperature
- Short Circuit • Open Sense Lead
- Over Voltage

This new modular design provides up to 1200 Watts of power, each chassis, with only 5-1/4" of panel height.

Designed to provide a selectable DC voltage and current from a single plug-in module, it maximizes flexibility for systems applications. DC power modules are front panel loaded, isolated by 50 Mohms with opto-isolation on the digital interface lines.

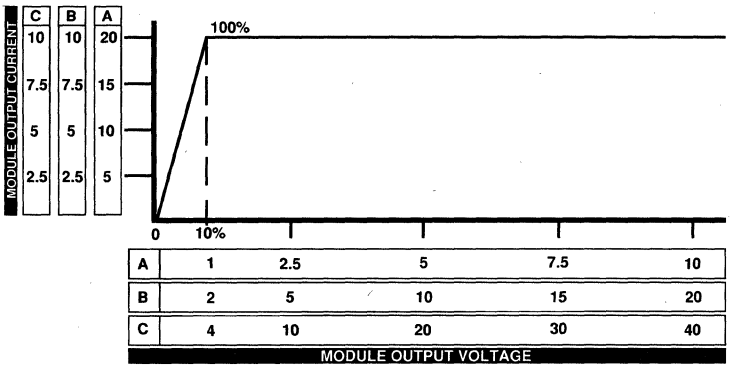
Module output voltages are 0 to 10, 20 or 40 volts with current capability of 0-10 or 20 Amperes. Over voltage – current – temperature protection is provided with automatic shut down.

The DCS Series DC Modular Power Supply overcomes the size, power, temperature and technology limitation of presently available supplies.



For full specifications, features and availability contact California Instruments.

OUTPUT CURRENT VS VOLTAGE RATINGS



L SERIES — SWITCHING AC POWER AMPLIFIERS

Exclusive Features:

Drive Linear Loads Without Derating
- Full output power—zero to unity power factor

High Frequency Power Available
- Output frequency range—45Hz to 5000Hz

Save up to 50% Rack Space
- Smallest front panel height per power level—Saves Rack Space

Much Less Heat Dissipated
- Efficiency—Greater than 80% typical

Versatility For Your Applications
- 4500 VA three-phase models can be programmed for single-phase output with Model 4503L-4154

Drive Off Line Switchers
- Crest factor of 2.5

Test for Ride-Through
- Programmable dropout feature

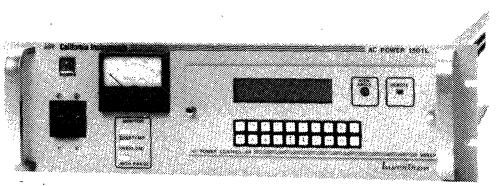
The L Series is the most compact and versatile series of AC Power Sources in the testing industry.

California Instruments offers:
- Model 1501L;1500VA, 1Ø, 5 1/4 Inch Ht.
- Model 1503L;500VA/Ø, 3Ø, 5 1/4 Inch Ht.
- Model 4503L;1500VA/Ø, 3Ø or 4500VA 1Ø, 10 1/2 Inch Ht.

NOTE: Manual or Programmable Controller built into module

All L Series Amplifiers have overload, short circuit and thermal protection with automatic reset after fault is removed and front panel fault indication. The built-in oscillator/controller has programming and measurement capability of volts, amps, power, phase angle, frequency and current limit and has the added feature of being able to ramp the programmable functions.

For full specifications, features and availability, contact California Instruments



Additional Features:
- Automatic remote calibration
- Complete self test with module status on faults with programmable controller
- Display/Bus reporting of load parameters:
  - Volts RMS
  - Amps RMS
  - Watts
  - Frequency
  - Phase Angles
  - VA
  - Power factor
- 26V/5V regulated outputs optional
- MATE conformance optional
- Output Relay standard all units
- 135V/270V Standard, 67.5V/135V or 156V/312V optional outputs
- To 13,500VA 1Ø or 4500VA 1Ø or 4500VA/Ø 3Ø

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AC POWER SYSTEMS

XP SERIES AMPLIFIERS, PLUG-IN CONTROLLERS AND MONITORS

Single Phase Amplifiers

FEATURES:

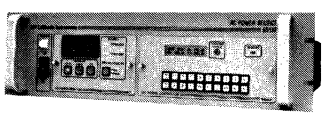
- Modular Design
- System Control
- Low Profile
- High Power-Low Cost
- Multi-Bus Control
- Combine into Poly-Phase Systems

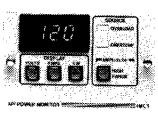
Model 321XP
420 VA Total Power

Model 971XP
1260 VA Total Power

Model 651XP
835 VA Total Power

Model 1301XP
1680 VA Total Power





Monitors

Model IMA1

- Overload & Overtemp Indicators
- Hi/Lo Range Switch

Model IMCI

- Voltage, Current & Power Display
- Hi/Lo Range Switch
- Overload & Overtemp Indicators

Three Phase Amplifiers

FEATURES

- 3 Independent Outputs in one enclosure
- Low Profile, High Power/cu.in.
- Automatic Rerating on Variable Load Conditions
- MATE/CIIL Option

SPECIFICATIONS:

- Multiple Voltage Ranges up to 270V, L-N
- Low Distortion; .05 to .5%
- Wide Band Frequency; up to 50kHz
- Complete Fault Protection and Thermal Derating
- Configurable in 10, 20 or 30 Outputs

Model 153XP
217 VA Total Power

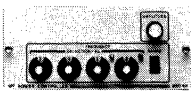
Model 653XP
810 VA Total Power

Model 1953XP
2500 VA Total Power

Controllers

Model 920XP

- Decade Dialing
- 45.0 to 10 kHz



Model 948XP

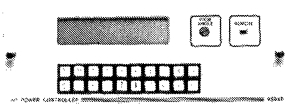
- Full IEEE-488 Talk/Listen
- Local or Remote Control
- Programmable Outputs

Model 949XP

- Full IEEE-488 Talk/Listen
- Independent Programming - Phase Angles & Amplitude
- Programmable Current Limits
- Simultaneous Sine/Square Wave Outputs on Different Phases
- Programmable Ramps, Sweeps & Drop-outs
- Measures and reports all load values
- MATE/CIIL option

Model 959XP Controller
(use with 653XP and 1953XP Amplifiers)

- Front panel keyboard or full IEEE-488 Talk/Listen
- Independent programming of phase amplitude
- 16 Linking Memory registers
- Variable speed Up/Dn keys
- Bus or Keypad calibration
- Program to control, display and report RMS volts and amps, watts, PF, phase angles and frequency.
- 10, 20 or 30

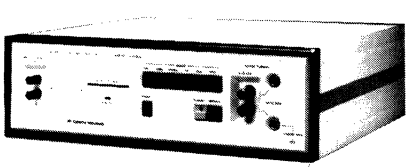


TRANSCONDUCTANCE AMPLIFIERS (PRECISION CURRENT SOURCES)

MODEL 3213K AC/DC Precision 100 Amp Current Source

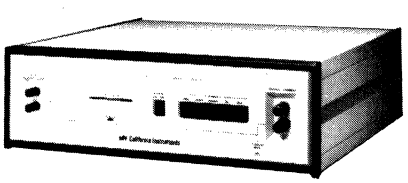
- 2-20 VAC/DC Input for Stability
- DC and 10 Hz to 10 kHz
- 200 nA to 100A (six ranges)
- 10 Volt Compliance

Note: Multiple units of Model 3213K Precision Current Source can be wired together in parallel for higher current applications, such as a full 1000 ampere controlled source in less than 84" of rack space.



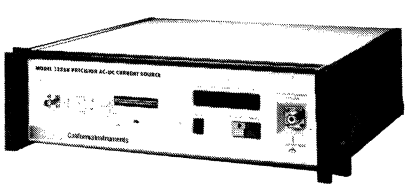
MODEL 3220K AC/DC Precision 20 Amp Current Source

- 2-20V AC/DC Input
- DC to 1 kHz
- 200nA to 20 Amp (5 ranges)
- .005% Basic Accuracy



MODEL 3225K AC/DC Precision 20 Amp Current Source

- DC and 10 Hz to 100 kHz Output
- Full Output Current to 100 kHz
- 200nA to 20 Amp (5 ranges)
- 10 Volt Compliance



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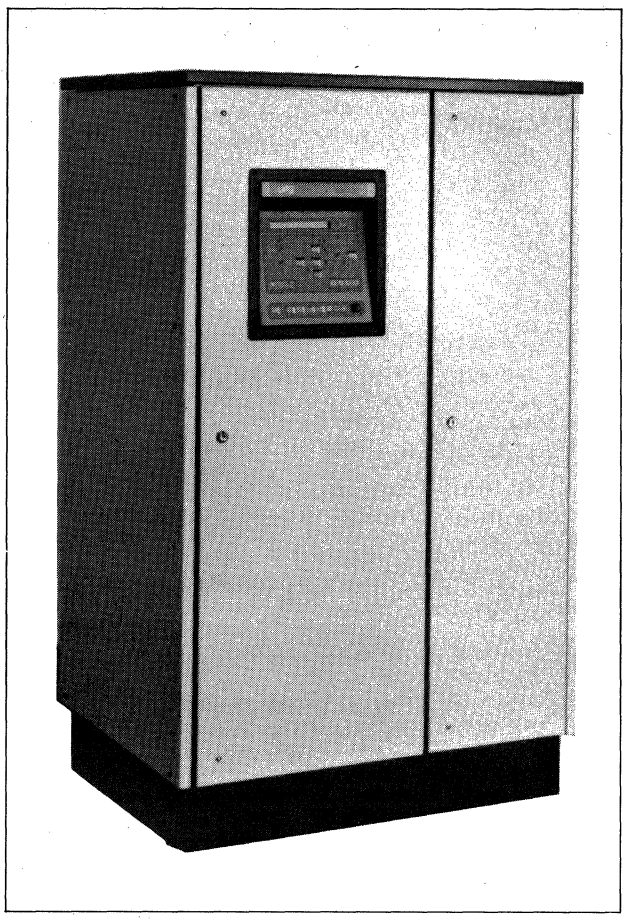

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Parallelability up to 1500 KVA
Field Upgradable

Our Markets

Chloride/UPSystems product is designed to provide continuous high quality filtered power to critical load applications during power outages or input power abnormalities. Our systems are found in the following applications:

- Mainframe Data Processing
- Telecommunications Systems
- Military/Aerospace
- Medical Equipment
- Industrial
- Communications
- Security

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Manufacturing Capabilities

Chloride/UPSystems has the resources to support your critical UPS needs. Our manufacturing operation performs to the "Baldrige" level quality standards.
Our Capabilities include:

- Facility: 140,000 square feet of efficient manufacturing space located just south of Rochester, NY.
- Quality: Statistical Process Control has been implemented on a plant wide basis. Chloride/UPSystems is producing manufacturing in a 6 sigma environment. Our facility is benchmarked against ISO-9001 standards. Quality systems are controlled by Mil-Std-9858A and Mil-I-45208A.
- Reliability testing: Each unit receives a complete functional testing before shipment as well as extended loaded Burn-In testing.
- Planning Systems to Assure On Time Delivery: Chloride utilizes sophisticated materials and manufacturing planning systems to assure your product is shipped on time, meeting your delivery needs.

Product Features

The Chloride/UPSystems product offers a wide variety of features including:

- Power History Recorder
- Alarm Log
- High Efficiency
- Low Noise Operation
- Low 2% Output Harmonic Distortion

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POWER ELECTRONICS
UPSYSTEMS

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TWICE
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HIGH PEAK CURRENT UNITS AVAILABLE NOW!

NEW TECHNOLOGY — HERE TODAY!

GENERAL:

- Ideal for operating or testing avionics, synchros, gyros, triac and SCR phase controllers, motors, fans, transducers, shaker tables, transformers, power supplies, relays, AC line-operated equipment for either foreign or domestic use; or any other system requiring a precision AC power source.
- Conveniently designed and small enough for easy use on either bench-top or fixed rack-mount installations.
- 70%-82% efficiency *across the full output voltage range* means low power consumption and cool operation at *any* output level.
- Comprehensive "soft-start" circuitry removes all supply-line and power supply output current and voltage surges.
- Whisper quiet operation.
- High power to weight ratio, results in excellent portability and decreased freight costs.
- Lightest and most efficient AC power source on the market today.
- Latest amplifier technology using "Pulse Width Modulation" (PWM) and patented, thick-film, power hybrid circuitry.

INTERFACE:

- Full digital metering of frequency, voltage, and current.
- Use internal sinewave oscillator or external input source.
- Convenient, front panel mounted 130V/260V voltage range switch, three-way binding posts and standard NEMA AC receptacles.
- Inputs and outputs both completely isolated and floating with respect to ground.

OUTPUT CAPABILITY:

- 165 VA, 500 VA, 1 KVA, 2 KVA, 3 KVA, 4 KVA, 5 KVA, and 6 KVA systems available.
- Use multiple 1 KVA mainframes with single master oscillator for power up to 6 KVA.
- Bandwidth: usable 45 Hz-20 KHz, full output 45 Hz-15 KHz.
- Stable, full output voltage and current without derating into *any* reactive load with power factor from unity to zero, leading or lagging.
- Full-current output at *any* output voltage with *no* confusing derating curves.
- Low sinewave distortion, excellent load and line regulation.
- High peak current rated units available.

PROTECTION:

- Output is completely overload and short-circuit-proof, with automatic and smooth recovery.
- Unit can operate safely and continuously into *any* type of symetrical AC load without derating, overheating, or shutdown.
- In the event of an internal fault, a self-diagnostic fault-isolation system will completely shut the unit down and prevent any catastrophic failures.
- Thermal protection will shut down unit if ventillation is choked off.

SERVICE:

- Totally modular design allows for easy service, if required.
- Immediate Availability.
- One year warranty.

COMPARE OUR SPECS *

MODEL	DESCRIPTION	MINIMUM OUTPUT		SIZE•INCHES			WT. LBS.	*PRICE*
		VOLTS•RMS	AMPS•RMS	H	W	D		
MAC-01	1 KVA MAINFRAME	0→130/260	8.0/4.0	5.25	19	13.5	56	$2,250
MAC-02	500 VA MAINFRAME	0→130/260	4.0/2.0	5.25	19	13.5	38	$1,450
MAC-03	165 VA MAINFRAME	0→130/260	1.4/0.7	5.25	19	13.5	31	$1,050
MOS-01	Precision 20 Hz-20 KHz sinewave oscillator with digital readout of frequency, voltage, and current. Also accepts external inputs and drives additional mainframes through EIM-01.			6.7″ x 5.0″ FRONT PANEL PLUG-IN			1.0	$ 400
EIM-01	External input module with level control and BNC input. Can slave additional mainframes from MOS-01 or IEE-01 oscillators.						.5	$ 70
IPDS-3000	IEEE-488/RS-232 Buss controlled oscillator with 1, 2, & 3 phase outputs, local or remote control.			1.75	19	12.0	8.0	$2,350

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eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

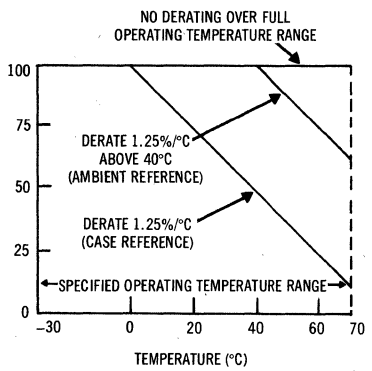

Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

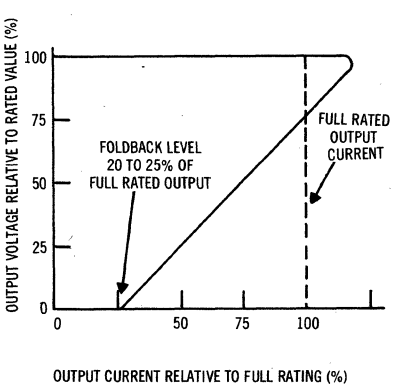

Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

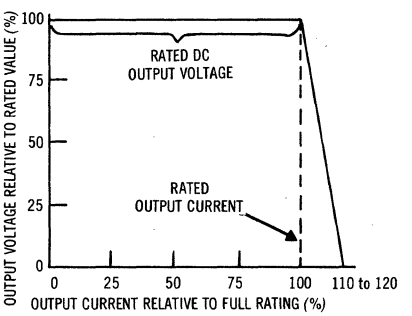

Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

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INSTALLATION FLEXIBILITY AND EFFECTIVE POWER CONDITIONING WITH POWER DISTRIBUTION

The Model D Distribution Model is designed for maximum application flexibility. The back panel of the Model D will interface with computer peripherals in any one or combination of three configurations. Systems can be ordered with known output receptacles, extension receptacles or field wired extensions. Changes can be made later by installing the proper output distribution panel. The three optional output configurations are:

1. Receptacle Interface:

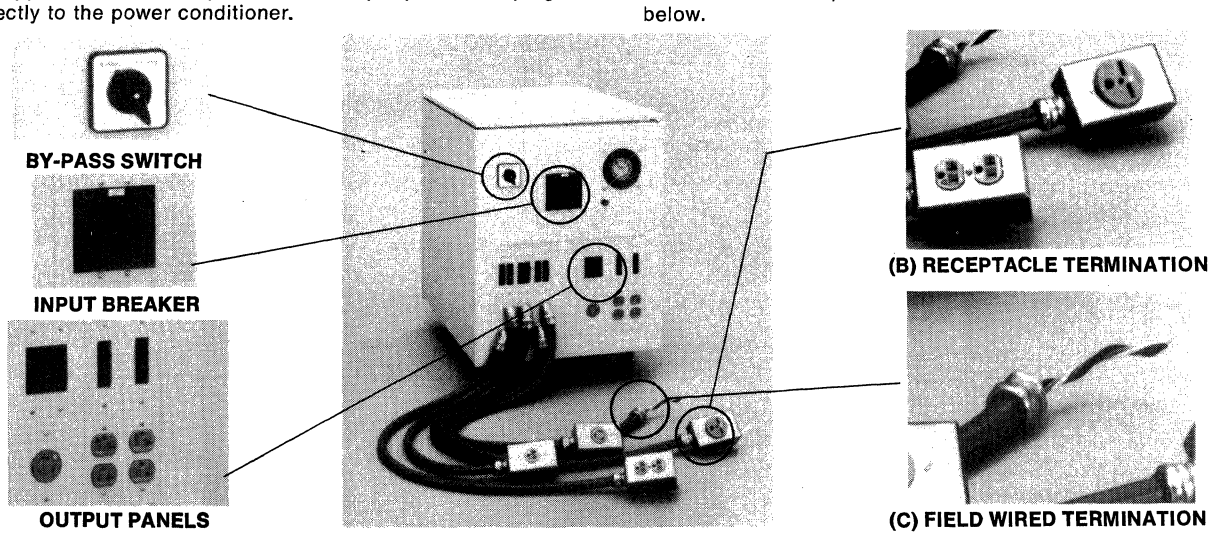
The back panel can be customized to mount a large variety of receptacles. The number of receptacles that can be mounted will depend on the number of spaces a given receptacle will occupy. This interface option will allow peripherals to plug in directly to the power conditioner.

2. Flexible Extension with Receptacle Termination:

The back panel is designed to accommodate a Flexible Extension with a large variety of receptacle termination available. The desired length of the Flexible Extension can be specified in 5 foot increments. The desired receptacle termination and number of receptacles can be selected. See Figure B below.

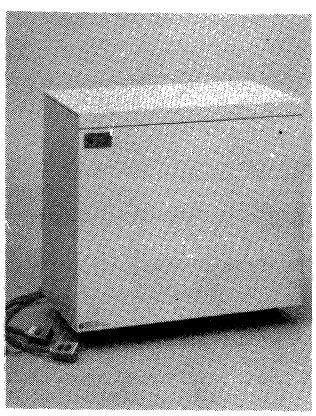
3. Flexible Extension with Field Wired Termination:

The third configuration is very similar to the configuration noted above (2) expect that the terminaiton is field installed wiring instead of receptacles. The desired length of the Flexible Extension can be specified in 5 foot increments. See Figure C below.



SERIES 500 MODEL D LINE VOLTAGE REGULATOR

The Series 500 Model D is a light weight efficient, distortion free method of regulating the voltage. It utilizes a tapped auto-transformer to automatically regulate output voltage quickly, efficiently and inexpensively. This unit should be applied where brownouts or surges are the main power line problem.



KVA	PHASE	OUTPUT DISTRIBUTION PANELS AVAILABLE	CABINET NO. AND DIMENSIONS
3, 5, 8 10, 15, 20, 25	Single	8	C-47588 21½″ x 29″ x 30″
9, 15	Three	8	C-47588 21½″ x 29″ x 30″
25, 30, 45, 50	Three	12	C-47589 45″ x 29″ x 44″

SPECIFICATIONS

Response Time: ¼ Cycle

Correction Time: 1 Cycle for 100% Correction

Efficiency: 98%

Output Distortion: Less than 1% added

Load Regulation: Less than ±2% from no load to full load

KVA Ratings: Single Phase 3, 5, 8, 10, 15, 20, 25
Three Phase 9, 15, 25, 30, 45 50

Logic Circuit: Micro-processor based

Input Frequency: 60 Hertz, ±3 Hertz (50 Hertz Models available)

Audible Noise: 40 db to 50 db depending on size

Operating Temperature: 0 Degrees C to 40 Degrees C

Voltage Monitor: Output Voltage Monitor indicates when input voltage is in or out of range.

Bypass Switch: Optional Bypass Switch is available.

LINE VOLTAGE REGULATION			
STANDARD UNIT		OPTIONAL 7-TAP UNIT	
INPUT LINE	OUTPUT LINE	INPUT LINE	OUTPUT LINE
+10%, −20%	± 3%	+10%, −20%	± 3%
+15%, −25%	± 8%	+15%, −25%	± 8%

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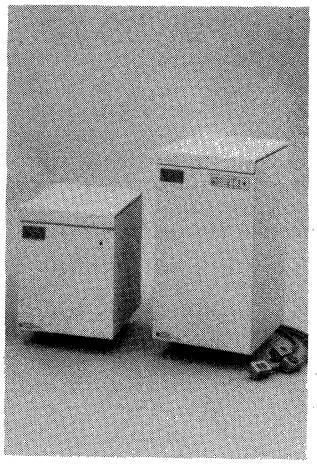
SERIES 600 MODEL D MAX-E-ISOLATION TRANSFORMER

The triple shielded, all copper isolation transformer is ideal where electrical noise and transients are a major problem. The unit provides common mode noise attenuation of 140 db. These common power line disturbances are caused by such things as lightning, electric motors starting and stopping, heavy duty relays tripping and network switching by utilities.



CABINET OUTPUT DISTRIBUTION PANELS			
KVA	PHASE	OUTPUT DISTRIBUTION PANELS AVAILABLE	CABINET NO. AND DIMENSIONS
3, 5, 8 10, 15 ,20, 25	Single	8	C-47588 21½″ x 29″ x 30″
3, 6, 9 15, 24, 30	Three	8	C-47588 21½″ x 29″ x 30″
45	Three	12	C-47589 45″ x 29″ x 44″

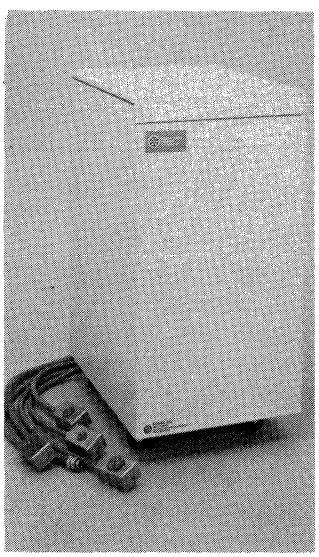
SPECIFICATIONS

Common Mode Noise Attenuation: 140 db
Transverse Mode Noise Attenuation: 3 db down at 600 Hertz, 40 db per decade to well below 50 db with resistive load.
Efficiency: 97%
Output Distortion: 0.1% Total Harmonic Distortion Added
Load Regulation: ±2% No Load to Full Load
Input Frequency Range: 60 Hertz, ±3 Hertz (50 Hertz units available)
KVA Ratings: Single Phase 3, 5, 8, 10, 15, 20, 25
Three Phase 3, 6, 9, 15, 24, 30, 45
Audible Noise: 40 db to 50 db depending on size.
Operating Temperature: 0 degrees C to 40 degrees C.
Input/Output Voltages: The following input/output voltages are available:

SINGLE PHASE		THREE PHASE	
INPUT VOLTAGE	OUTPUT VOLTAGE	INPUT VOLTAGE	OUTPUT VOLTAGE
208/240	120/240	208	208Y/120
		240	208Y/120
		480	208Y/120
		600	208Y/120

SERIES 700 MODEL D POWER LINE REGULATOR & CONDITIONER

The Series 700 Model D combines the characteristics of the Series 500 Line Voltage Regulator and the Series 600 Max-E-Isolation Transformer to solve all power line disturbances except blackouts. The Series 700 Power Line Regulator and Conditioner operates at an overall efficiency in the order of 97% while holding output voltage to ±5% over an input voltage variation of +10%, −20%. Other regulation ranges are available as noted below.



CABINET OUTPUT DISTRIBUTION PANELS			
KVA	PHASE	OUTPUT DISTRIBUTION PANELS AVAILABLE	CABINET NO. AND DIMENSIONS
3, 5, 8 10, 15, 20, 25	Single	8	C-47588 21½″ x 29″ x 30″
3, 6, 9, 15	Three	8	C-47588 21½″ x 29″ x 30″
24, 30, 45	Three	12	C-47589 45″ x 29″ x 44″

SPECIFICATIONS

Line Regulation: Less than ±2% from no load to full load.
Response Time: ¼ Cycle
Correction Time: 1 Cycle for 100% Correction
Efficiency: 97% typical
Output Distortion: No spikes, adds less than 1.0% total harmonic distortion.
Operating Frequency: 60 Hertz, ±3 Hertz
KVA Rating: Single Phase 3, 5, 8, 10, 15, 20, 25
Three Phase 3, 6, 9, 15, 24, 30, 45
Voltage Monitor: Output Voltage Monitor indicates when input voltage is in or out of range.
Bypass Switch: Optional Bypass Switch available to bypass regulator portion of system.
Operating Temperautre: 0 degrees C to 40 degrees C
Transverse Mode Noise Attenuation: 3 db down to 600 Hertz. 40 db per decade to well below 50 db with resistive load.
Common Mode Noise Attenuation: 140 db
Audible Noise: 40 db to 50 db depending on size.
Logic Circuit: Microprocessor Based.

LINE VOLTAGE REGULATION			
STANDARD UNIT		OPTIONAL 7-TAP	
INPUT LINE	OUTPUT LINE	INPUT LINE	OUTPUT LINE
+10%, −20%	± 5%	+10%, −20%	± 3%
+15%, −25%	±10%	+15%, −25%	± 8%

OPTIONAL EXTENDED RANGE	
INPUT LINE	OUTPUT LINE
+10%, −40%	+3%, −6%

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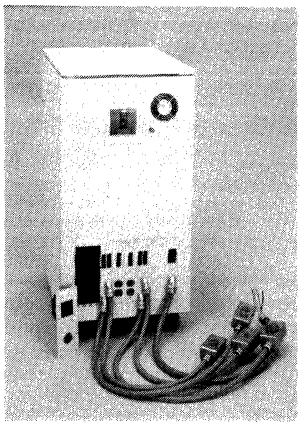
SERIES 800 MODEL D POWER PURIFICATION SYSTEM

This ferroresonant transformer protects sensitive electronic equipment against nearly all power line disturbances and problems including sags, surges, spikes, line noise and transients. The Series 800 provides a unique "ride-through" capability over a loss of input for one complete cycle.



CABINET OUTPUT DISTRIBUTION PANELS			
KVA	PHASE	OUTPUT DISTRIBUTION PANELS AVAILABLE	CABINET NO. AND DIMENSIONS
3, 5, 8, 10	Single	8	C-47588 21½″ x 29″ x 30″
15, 20	Single	12	C-47589 45″ x 29″ x 44″
25	Single	17	C-47590 56″ x 29″ x 44″

SPECIFICATIONS

Line Regulation: Output voltage will maintain constant to within ±3% with input voltage variations of +10% to −25%. In addition, usable voltages are available with an input range of +20% to −40%.

Load Regulation: The output voltage will maintain itself to within ±2% with output load variations of 0 to 100%.

Frequency Variations: A 1% change in line frequency from the nominal design frequency changes ouptut voltage approximately 1.5% in the same direciton as the frequency change.

Efficiency: Full load efficiency is in the order of 90% for standard input and output voltage levels.

Operating Temperature: −20 degrees C to +50 degrees C

Distortion: On harmonically neutralized systems harmonic content is 3% or less.

KVA Rating: Single Phase 3, 5, 8, 10, 15, 20, 25

Input/Output Voltages: The following input/output voltages are available:

Transverse Mode Noise Attenuation: 120 db

Common Mode Noise Attenuation: 140 db

Audible Noise: 45 to 50 db depending on size.

SINGLE PHASE	
INPUT VOLTAGE	OUTPUT VOLTAGE
208/240	120/240

SERIES 7000/ POWER DISTRIBUTION AND CONDITIONING SYSTEM

Controlled Power Company Series 7000 Power Distribution and Conditioning Systems provide conditioned, purified and reliable electrical power for: • Large and small computer installatoins • Data processing systems • Point of sale terminals • Multiple process and production programmable controllers • Sensitive medical test and diagnostic systems • Electronic laboratory test and control equipment • Any multiple, power sensitive, electronic installtaion.

Why Use A Series 7000 Power Distribution and Conditioning System?

The computer and electronic equipment industries have two special requirements that make the use of a Series 7000 Power Distribution and Conditioning System essential.

Computers and other electronic equipment operate by using a complex series of electrical impulses at speeds measured in nanoseconds. Power line transients, noise, brownouts, sags and surges in power can seriously affect these impulses resulting in scrambled results or equipment malfunction. Today, electrical power received directly from the power company is frequently subject to all of these problems.

Computers and other electronic installations are also subject to frequent change, expansion or rearrangement. An efficient, flexible method of distributing power to this equipment, without going through expensive, time consuming permanent wiring changes, greatly increases system flexibility while rdeucing total system cost.

The Advantages of Using Series 7000 Power Distribution Systems

INSTALLATION ADVANTAGES:

A centralized, pre-wired power distribution system provides:

- shorter installation time
- assured proper grounding
- reduced installation problems such as incorrect plugs, improper layout, improper phasing and many more
- easy accommodation of last minute planning changes
- easy device relocation resulting from layout errors
- growth with ease by simply adding flexible cables with the correct plugs

Most computer installations change every year with a major change or location move every three years. Series 7000 Power Distribution Systems greatly simplify such changes and moves.

Reliability Advantages

Series 7000 pre-engineered, pre-tested quality manufactured distribution systems provide:

- facotry assembly and pre-testing
- carefully selected and coordinated system components
- elimination of workmanship errors and variations in interpretation of requirements
- correct grounding techniques

Operating Adantages

A Series 7000 Power Distribution System offers:

- dramatic reduction in power related equipment problems through isolation regulation and noise attenuation of power disturbances
- flexible, adaptable power distribution for temporary or permanent changes without total system shutdown
- complete power system monitoring with fault readouts for rapid repairs, reducing lost time
- complete, full time electronic device protection with unit or system shutdown if necessary to prevent equipment damage

Economic Advantages

A Series 7000 Power Distribution System also offers a number of economic advantages.

- the system is portable and can be moved to a new location with the equipment
- a power distribution system is capital equipment, and receives capital equipment and invesmtent tax treatment
- protection of electronic system operation and equipment results in substantial cost savings in reliable system results and reduced maintenance and repair costs.

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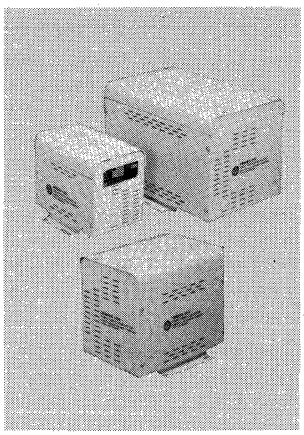
SERIES 800 MODEL P

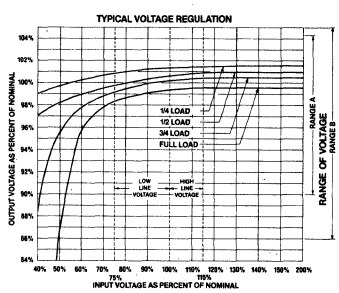
The Series 800 Model P is the solution to 99.5% of the problems defined at right: all but long duration power outages are solved. The regulating, saturating, isolation transformer will protect your sensitive electronic equipment against fluctuating voltages, short duration blackouts (1 cycle), brownouts, spikes and transients, all of the unexpected power problems that cost a company time and money.



SPECIFICATIONS

• Exceptional Regulation Bandwidth

The Model P regulation performance exceeds the performance of any product on the market today. The graph below illustrates the superiority of the product.



• **Protection Against Extreme Voltage Fluctuations and Irregularities:**

The Series 800 Model P will protect equipment when voltage drops to 50% of nominal or rises to 200% of nominal. Over this range, the output voltage will vary to some degree depending on the percent of load, but within usable limits.

• **Immunity to Distortion of Input Wave Form Irregularities:**

The input wave form can be distorted, and laden with transients. However, the output wave form is transient free and independent of the irregularities of the input. The input wave form can even be a square wave and still generate a good sine wave output. The oscillograph representations below are actual photographs of the input and output of a typical unit.

• **Unique "Ride Through" Capability:**

The output of the Model P does not go to zero with the loss of input power for a ¼ cycle (4 msec), a ½ cycle (8 msec) or even for a complete cycle (16.6 msec, depending on the load). The voltage from the Model P is generated essentially by a circuit operating as a powerful oscillator with energy stored in the unit. For this reason, the output is much more immune to the input than other regulating systems.

• **Isolation and Regulation in One Device:**

The Model P combines the common mode noise rejection and isolation capabilities of a multi-shielded transformer with regulating capability. In addition to rejecting common mode noise it virtually eliminates transverse noise and distortion on the power line. The Model P also has a step-up or step-down voltage capability which eliminates a step up/down transformer in many applications.

• **Voltage Recovery:**

The output voltage returns to 95% of nominal level within 2 cycles and to 100% within 3 cycles when going from no load to full load or vice-versa. Recovery from partial load changes is corrected in a shorter period of time.

• **Transverse-Mode Noise Attenuation:**

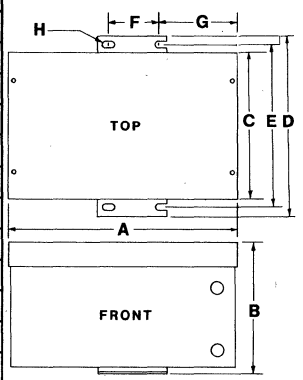
120 db

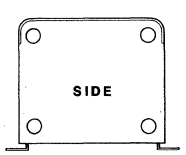
• **Common-Mode Noise Attenuation:**

140 db

PANEL MOUNT

Power Rating VA	*Input	*Output	Weight Pounds	Dimensions A	B	C	D	E	F	G	H	Model #
250	120/240	120	36	10.5	8.00	5.75	7.5	6.75	4.13	2.19	.31	5GAX-250-P
250	240/480	120	36	10.5	8.00	5.75	7.5	6.75	4.13	2.19	.31	5HAX-250-P
500	120/208/240	120	57	12	10	7.38	9	8.13	5.63	3.06	.38	5BGAX-500-P
500	240/480	120	57	12	10	7.38	9	8.13	5.63	3.06	.38	5HAX-500-P
750	120/208/240	120	70	12	10	7.38	9	8.13	5.63	3.06	.38	5BGAX-750-P
1000	120/208/240	120	83	12	10	7.38	9	8.13	5.63	3.06	.38	5BGAX-1K-P
1000	240/480	120	83	12	10	7.38	9	8.13	5.63	3.06	.38	5HAX-1K-P
1500	120/208/240	120	110	16.5	11.00	10.5	12.75	11.75	3	5.19	.44	5BGAX-1.5K-P
1500	240/480	120	110	16.5	11.00	10.5	12.75	11.75	3	5.19	.44	5HAX-1.5K-P
2000	120/208/240	120	116	16.5	11.00	10.5	12.75	11.75	3.88	5.19	.44	5BGAX-2K-P
2000	240/480	120	116	16.5	11.00	10.5	12.75	11.75	3.88	5.19	.44	5HAX-2K-P
2500	120/208/240	120	125	16.5	11.00	10.5	12.75	11.75	5.25	5.19	.44	5BGAX-2.5K-P
2500	240/480	120	125	16.5	11.00	10.5	12.75	11.75	5.25	5.19	.44	5HAX-2.5K-P
3000	120/208/240	120/240	137	16.5	11.00	10.5	12.75	11.75	5.25	5.19	.44	5BGGX-3K-P
3000	240/480	120/240	137	16.5	11.00	10.5	12.75	11.75	5.25	5.19	.44	5HGX-3K-P
5000	208/240	120/240	336	35	25	33.5						5BGGX-5K-I
5000	240/480	120/240	336	35	25	33.5						5HGX-5K-I
8000	240/480	120/240	460	35	25	33.5						5HGX-8K-I
10,000	240/480	120/240	536	35	25	33.5						5HGX-10K-I
15,000	240/480	120/240	920	41.5	27.5	39						5HGX-15K-I
20,000	240/480	120/240	1100	41.5	27.5	39						5HGX-20K-I
25,000	240/480	120/240	1425	56.5	32.5	48						5HGX-25K-I





* The Input and Output configurations are Hardwired In and Hardwired Out.

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ADVANTAGE SERIES 1000A
UNINTERRUPTIBLE POWER SYSTEM WITH POWER DISTRIBUTION & EXPANDABILITY

The Series1000A is a continuous duty, highly efficient, solid-state uninterruptible power system designed to provide 100% power protection during all phases of operation. Available in single phase, 4.5 KVA to 25 KVA.

Reliable Power Protection and Reliable Expandable Prescription Power

In the Normal Mode of operation (utility power is present) the Advantage provides completely conditioned and regulated power to the critical load. The upgrade ability permits KVA expansion in the field in less than a few hours.

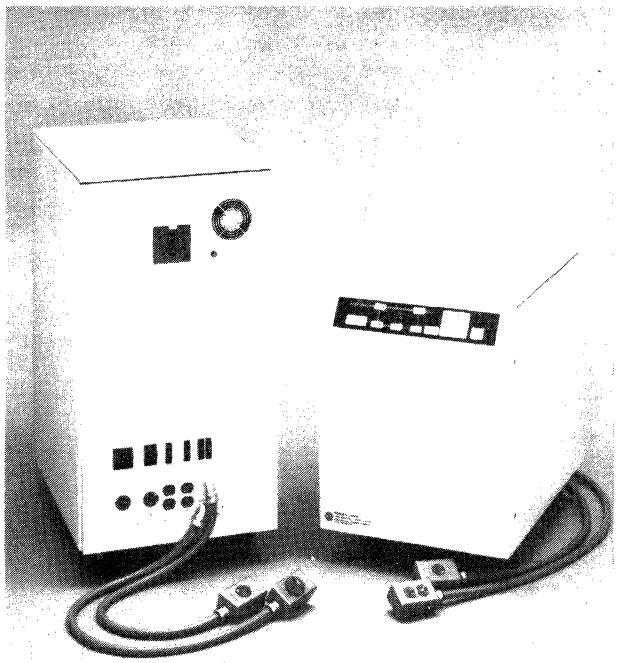
100% Uninterrupted Power

In the Emergency Mode of operation (power outage) battery power is fed through the Power Purification System so conditioned, regulated power is supplied to the critical load. The transition from Normal Mode to Emergency Mode takes place with no power interruption to the critical field.

Installation at a Fraction of the Cost

Because of the total distribution capability, installation costs are a fraction of the cost of installing a conventional UPS.

An efficient flexible method of distributing power is provided by the Advantage via exchangeable output distribution panels. The Advantage method of power distribution eliminates the high cost, time consuming method of permanent wiring changes incurred with a conventional installation. Flush mounted receptacles, flexible cable for hard wiring are available to distribute power to the equipment.



SPECIFICATIONS:

- Line Regulation: Output voltage is regulated to within ±3% of nominal with input voltage range of +20% to –25%. In addition, usable voltages are available with an input range of +20% to –40% (Applicable when in manual bypass or low battery condition for a limited time).
- Load Regulation: The output voltage will maintain itself to within 3% with output load variations of 0 to 100%.
- Overload: Will withstand an overlaod of 125% for ten minutes.
- Audible Noise: 45 to 55 db depending on size.
- Handles non-linear loads.

ADVANTAGE SERIES 1000C
UNINTERRUPTIBLE POWER SYSTEM

The Advantage Series 1000C Uninterruptible Power System performs the overall function of providing transient free, regulated AC power to the critical load during normal line power operation and during blackouts and brownouts. The Advantage offers a solid state inverter and long lasting battery pack, providing immunity to all line disturbances and power interruptions with no break in AC output power.

This product is designed for *Mini Computers, LAN's, Process Controllers, Telephone Systems, Electronic Cash Registers* and other sensitive electronic equipment. The Advantage is *compact in size, efficient, & has a low cost.*

SPECIFICATIONS:

OUTPUT POWER RATING	MODEL #	INPUT VOLTAGE/ OUTPUT VOLTAGE	BACK-UP TIME AT FULL LOAD	DIMENSIONS Hx W x D (inches)
1000 VA	5AAX-1K-10-C	120V/120V	10 minutes	5 x 17 x 21
1600 VA	5AAX-1.6K-10-C	120V/120V	10 minutes	5 x 17 x 21

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A
A/D acrylonitrile butadiene-styrene
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AFC audio frequency control
AFT automatic filter test
ALGOL algorithmic language
AM a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
ASIC application specific IC
ATE automatic test equipment
ATG automatic test generation
AWG American wire gauge

B
BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility syste

C
CAD computer-aided design
CAE computer-aided engineering
CAM computer-aided manufacture
CAMAC computer-automated measurement and control
CAPP computer-aided process planning
CAT computer-aided test
CATV cable television or community antenna television
CCC (leaded) ceramic chip carriers
CCD computer-controlled display
CERMET ceramic metal element
CIE computer-integrated engineering
CIM computer-integrated manufacturing
CLCC ceramic leadless chip carriers
CMOS complementary metal-oxide semiconductor
Comm. communications
CPS characters per second
CPU central processing unit

D
D/A digital to analog
DAC digital to analog converter
DBMS data base management system
DC direct current
DFT design for testability
DIAC bidirectional trigger diode
DIL dual in-line
DIN Deutsche Industrie Normenausschuss
DIP dual in-line package
DPM digital panel meter
DRAM dynamic RAM
DTL diode transistor logic

E
EDA electronic design automation
EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EIA Electronic Industries Association
EMC electromagnetic compatibility
EMI electromagnetic interference
EMP electromagnetic pulse
EPROM erasable programmable ROM
ESR equivalent series resistance

F
FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G
GaAsFET gallium arsenide FET
CMIP commn management information protocol
GPIB general purpose interface bus
GPS global positioning system

H
HF high frequency (3 to 30 MHz)
HIPOT test, measurement, and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I
IAB Internet Activities Board
IC integrated circuit
IDC insulation displacement contact
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared
ISDN integrated services digital network
ISO International Standards Organization

J
JEDEC Joint Electronic Device Engineering Council
JFET junction FET
JMOS junction MOS

K
kHz kilohertz (10^3 hertz)
KSR keyboard send /receive

L
LAN local area network
LC (filters) inductance/capacitance
LCC leaded chip carrier
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LIF low insertion force
LNA low noise amplifier
LNB low noise band
LSI large scale integration
LVDT linear velocity displacement transformer

M
MASER microwave amplification by stimulated emission of radiation
MATV master antenna television
µF microfarad
MHz megahertz
MIC microwave IC
MIPS million instructions per second
MIB microcomputer interface board
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor FET
MOSIGT metal oxide semiconductor insulated-gate transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N
NBS National Bureau of Standards
NEMP nuclear electromagnetic pulse
NIM national instrumentation module
NOR not OR
NTC negative temperature coefficient

O
OCR optical character reader
OEM original equipment manufacturer
OR a logical operator
OSI open systems interconnection

P
PAL programmable array logic
PC printed circuit
PCB printed circuit board
PCM pulse code modulation
PCS plastic clad silica
pF picofarad
PGA pin grid array
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PLCC plastic leaded chip carrier
PLL phased lock loop
PPI plan position indicator
PROM programmable ROM
PTC positive temperature coefficient
PUT programmable unijunction transistor

Q
QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R
RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S
SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SCS silicon-controlled switch
SDA source & detector assemblies
SGMP simple gateway monitoring protocol
SIDAC bidirectional voltage-triggered switch
SIMM single in-line memory module
SIP single in-line package
SMD surface mount device
SMT surface mount technology
SNMP simpole network management protocol
SO small outline
SOIC small outline IC
SOT small outline transistor
SSI small scale integration
SSR solid-state relay
STL Schottky transistor logic
SUS silicon unilateral switch

T
TC temperature coefficient
TCE thermal coefficient of expansion
TXCO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TRIAC bidirectional AC switch
TTL transistor-transistor logic
TTY teletypewriter

U
UHF ultra high frequency (300 MHz to 3 GHz)
UJT silicon unijunction transistor
UL Underwriters Laboratory
UPS uninterruptible power supply

V
VAC volts (of) alternating current
VAN value-added network
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency (30 kHz to 300 MHz)
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VME virtual machine environment
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W
WPS word processing software

Y
YIG yttrium iron garnet

Z
ZIF zero insertion force

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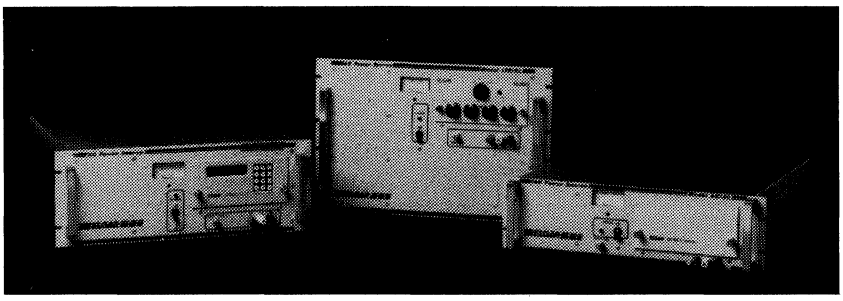
SL/SX Series AC Power Sources



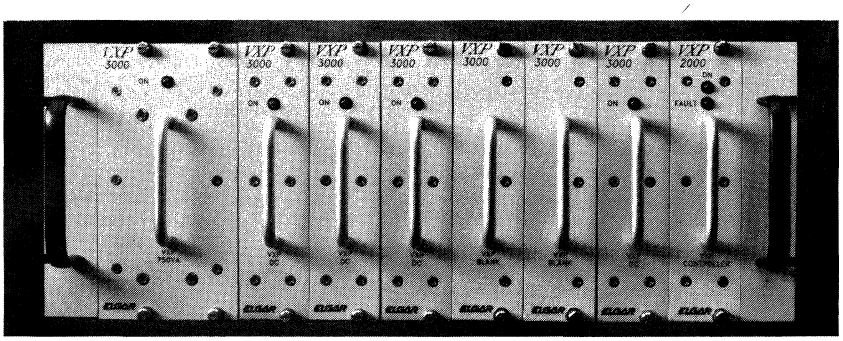
Elgar's SL Series solid-state frequency changers are small and lightweight in design. These linear power sources save critical panel space and money because they can provide up to 50% more power density and weigh nearly one-third less than most competitive models.

The SL Series is ideal for general purpose test applications, as well as ATE systems and avionics testing.

Elgar's SX Series AC linear power sources are designed to drive non-linear, rectifier loads. They meet all the electrical power requirements for the testing of modern switch-mode DC power supplies.

The 4:1 (or greater) crest factor capability which provides repetitive peak current up to 70A, makes the SX Series ideal for testing any equipment that causes a peak load on the AC power line.

VXP3000 Programmable Power System



Elgar's VXP3000 Programmable Power System is the state-of-the-art solution for test systems where high power density, small size and flexibility are the key priorities.

The unique chassis design employs 1.8 inch wide slots which accept one controller module and up to eight power modules or three 750VA AC modules. The ability to provide both AC and DC power in one chassis and at one GPIB address is further enhanced by an Auxiliary Drive Module (ADM). This module allows the VXP controller to program external bulk or high power DC power supplies as if they were standard VXP power modules.

CONTROLLERS
IEEE-488 controller With ABLE or CIIL (MATE) syntax
Slave controller For use with expansion chassis or as an interface to a VXP1000 power programmer located in a VXI chassis

DC POWER MODULES
Output voltage range 0-7, 10, 14, 20, 32, 40, 60, 100 and 200 VDC 1.8" standard width (up to 8 modules per chassis)
Full rated output power 200 W for 10, 14, 20, 32, 40, 60, 100 and 200 VDC modules; 140 W for 7 VDC module. 1.5 KW, 4-side module available at 100 VDC
Parallelable For load sharing (available for 140W and 200W modules)
Series connectable Up to 400 VDC

AC POWER MODULES
Full rated output power 750 VA
Output voltage range 0-135 VAC, 3.6" double-wide size
Frequency range 350-999.9 Hz (45-350Hz with reduced specifications)
Configurable For up to 2250 VAC single-phase or up to 6750 VA three-phase
Parallelable For higher power requirements by using the special plug-in VXP-LSM module
Auxiliary output A 0-26 VAC/2 A output proportional to the main output voltages provided. An optional 5 VAC/5A auxiliary output is available.
Fast current limit protection Against short circuits
Efficiency Over 80%

NEW Digitally Modulated AC Power Systems

Elgar/Ling Digitally Modulated AC (DMAC) power systems with"linear" specifications offer unmatched efficiency and flexibility in a wide range of switching AC applications. They can be used for upgrading or replacing motor generators and their quiet operation means they can be located next to test stands or in control rooms without disturbing operators.

With optional Elgar Plug-In Programmers (PIP), DMAC's can serve as powerful Automatic Test Equipment (ATE) tools. A PIP can be installed in a DMAC to furnish full IEEE listener/talker capabilities and allow complete control of voltage on any phase, frequency or phase angle.

Modular construction produces a low MTTR and an extremely wide range of single and three-phase systems in 6 KVA steps from 18 to 260 KVA. DMAC's have the output purity standard normally found in a linear supply of 0.5% Total Harmonic Distortion (THD).

DMAC Series AC power sources drive any load from zero to unity power factor and can provide uninterruptible power for UPS applications when ordered with optional battery backup. With higher efficiency at all load levels, DMAC's use less commercial power and generate less heat, resulting in significant operating cost savings.

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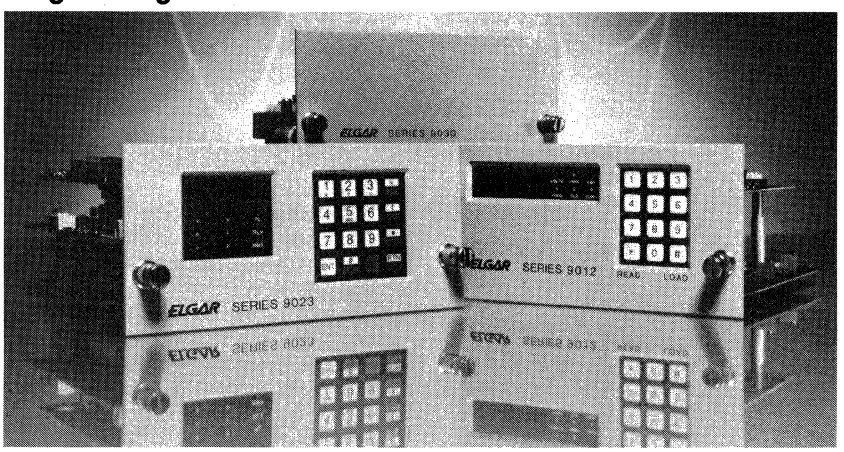
VXP1000

Elgar's VXP1000 Power Programmer allows the user full integration of Elgar AC & DC Power Systems and loads into the VXIbus environment. The VXP1000 is an interface card which co-resides in any VXI instrument chassis, slot 1-11. The PowerProgrammer operates with slightly modified versions of Elgar's standard AC Programmable SL/SX, DC Programmable AT8000 and VXP3000 PowerSystems.

Size: C Module
Interface Capability of three AC or DC power systems from one card

In addition to the standard AC & DC Programmable features, the VXP1000 provides the user exceptional capability for automatic calibration, timed-based event programming and continuous power source monitoring.

Plug in Programmers



Programmable Oscillators

Plug-in Programmable oscillators (PIP's) which provide the interface between a computer and any Elgar AC Power Source System, are available for programming frequency, voltage amplitude, and phase angle in multi-phase systems. Elgar's PIP's are microprocessor controlled and offer more power options than ever before. Our latest PIP provides programmable current limiting and is CIIL compatible to meet Air Force MATE/TMA specifications.

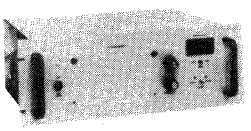
Elgar's Atlas Based Language Extension (ABLE) makes programming simple via IEEE-488 (GPIB). Most PIP models provide keypad and LED read-out for convenient local control. And with Elgar's PIP, rack space is cut to a bare minimum since it is designed as a plug-in component for AC Power Sources.

PIP704 Transient Generator

The PIP704 Plug-In Programmable Transient Generator is designed to meet the MIL-STD-704 (revisions A through D) "Aircraft Electrical Power Characteristics" test requirements for 400Hz power. It's also an effective tool for Bu-Ships 1399 testing and for general purpose testing that requires AC transient generation.

The PIP704 can be programmed and monitored locally or remotely for simultaneous or independent transients including 704D ramps, voltage surges/sags, frequency deviation, voltage phase differentiation and waveform distortion in any single-phase or in all three phases. Standard frequency range is 45Hz to 1 KHz with voltage drop-outs from 1 millisecond to 222.2 seconds.

The New EL Series AC Frequency Changers



Now You Can Meet Smaller Power Conversion Applications That Do Not Require Critical Test and Measurement Standards

The Elgar El Series utilizes switching technology. These frequency changers are specially designed to power electronic equipment, motors and other high current-consuming loads.

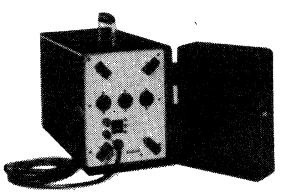
We offer a wide selection of fixed and variable frequencies with a full or narrow range voltage control.

The output of all models is transformer isolated. The frequency is either fixed or continuously variable. On fixed frequency models, the output voltage is fixed at 115VAC or 230VAC. On variable frequency models, the output is adjustable from 0-130VAC or 0-260VAC.

Features:

- 1.2-15KVA
- Peak current to 3.0 X RMS
- Zero to unity power factor
- 200 microseconds response time for 100% load changes
- Soft start circuit prevents power line disruptions
- Available in 6 models - single and three phase

Convert Any Voltage/Frequency to 117VAC/60Hz



Elgar's 1.0 KVA portable AC power source converts unstable, "dirty" AC power anywhere, worldwide into regulated 117VAC, 60 Hz sine-wave power without range switching or other adjustments.

The GPS 1000 can accept 45-450Hz with voltage ranging from 85VAC to 140VAC and 170VAC to 280VAC.

Three convenient outlets are included. Optional input adapter cables are available for plug-in power anywhere in the world. The GPS1000 weighs only 44 pounds. Efficiency is 80%; operation is quiet and cool.

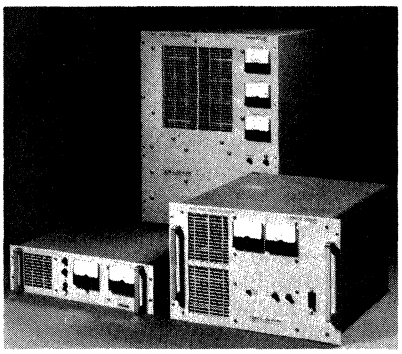
Applications include powering of:

- Data processing, communications or other sensitive electronic equipment.
- Unstable generator outputs at construction sites.
- Other remote sites anywhere in the world.

ELGAR

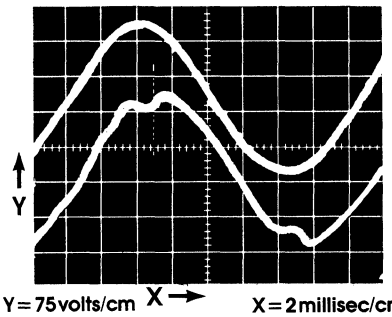
9250 Brown Deer Road, San Diego, CA 92121
Call for our Free Catalog or for more information
800-733-5427 • FAX: 619-458-0267

Ultra Precision Line Contitioners



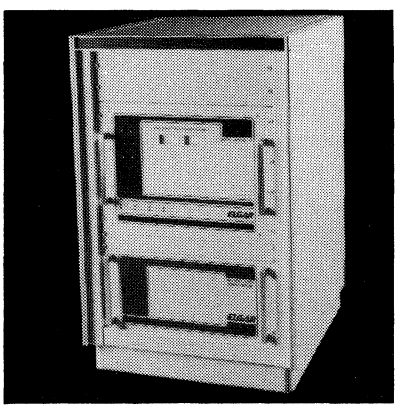
Elgar's Ultra Precision AC Line Conditioners provide precise, clean AC power to critical loads by eliminating high-speed AC line and load transients and distortion as well as providing precise regulation. These versatile instruments have response times 5,000 times faster than the fastest conventional AC line regulators and line isolation of 70 to 100dB, far superior to mere isolation transformers. All Elgar AC line conditioners are designed for continuous operation and are contained in rack-mount enclosures. Front panel controls include meters to monitor input and output voltages and output load current, an overload indicator and an input circuit breaker.

WAVEFORM COMPARISION CHART



The lower trace shows a very distorted input AC line waveform with a 75 volt peak spike riding on it. The upper trace shows the output of the Elgar AC Line Conditioner which shows no trace of the AC input anomalies.

Uninterruptible Power Systems



1 and 3 KVA Cabinet System

Elgar solid-state, non-ferroresonant Uniterruptible Power Systems (UPS) combine a battery charger, battery bank, solid-state inverter and bypass switch to provide clean, continuous power to critical loads.

Elgar UPS's are on-line systems so that power is continuously supplied through an inverter. Upon power failure, the battery automatically supplies the load with no switching.

In case of overload, or in the unlikely event of a component failure within the Uninterruptible Power System, the bypass switch is activated. The critical load automatically transfers to the input AC line or bypass input AC. All Elgar solidstate UPS's are available with a static bypass switch (SBS) that can make the transfer with less than 1ms interruption.

102-1B and 302-1B Uninterruptible Power System

Elgar's 102-1B and 302-1B UPS's are rugged, reliable rack-mount units with excellent dynamic characteristics and an extremely wide (+10% /-20%) AC input voltage range.

The UPS 102-1B is a 1 KW, 1 KVA, 60Hz system, while the UPS 302-1B is a 3 KW, 3 KVA, 60 Hz system. All other specifications are the same.

502-1T Uninterruptible Power System

Elgar's free-standing 5 KW/5 KVA UPS 502-1T provides excellent dynamic characteristics and quiet (56 dBa at 1 meter) operation. It's specifically designed for compatibility with micro and minicomputers in industrial and scientific installations — eliminating power line problems without major modifications to facilities or air conditioning systems. Its small size (40" high with a 24" by 30" footprint) saves space in confined environments. The 502-1T employs a high-efficiency PWM static inverter to minimize cooling requirements.

Global Uninterruptible Power System

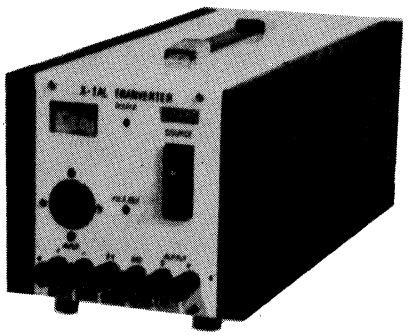
Elgar has developed the world's most versatile Global Uninterruptible Power System (GUPS). It can operate from:

- Any available AC input power,
- a 28 VDC input or
- From its own internal battery for a minimum of 5 minutes in the event of an extended power failure.

Ruggedized military-grade construction for portable transit case or rack mounting make it the ideal international power conversion system for computers, communications equipment, instrumentation, oil logging equipment, field-environment laboratory instrumentation, remote chart-recorder operation, data acquisition equipment and motor generator output conditioning.

Maximum output rating 1.2KVA
Output voltage 120 VAC ±2%
Output frequency 60Hz ±1% crystal controlled
Line & Load regulation ±2%
Load power factor 0 lead 0 lag
RMS current 10 amps
Efficiency 80% from AC line, 70% from DC input
Input frequency 45-450 Hz
Input voltage 95-140 VAC, 190-280 VAC, 24-37 VDC
Weight 97 lbs including internal batteries
Dimensions H-W-D Rack configuration 7"-19"-21"

ENERGY LTD
4714 UPSHUR STREET, BLADENSBURG, MARYLAND 20710
301/699-1144 • FAX: 301/699-8107



INVERTERS—SILENT AC POWER ANYWHERE

Provide INVERSION of DC Power to Pure Sine Wave AC Power.

Energy, Ltd. presents a superior line of solid state inverters from 50VA to 1KVA. Our state-of-the-art inverters supply precise frequency control, and are used wherever it is necessary to obtain completely noise-free, pure sine wave, alternating current power, from a DC source.

With stable, low-distortion output, quiet operation, and light-weight portability, Energy's inverters are designed for applicatoins requiring the highest reliability standards, such as video and telecommunications, (mobile, marine, and fixed) medical and computer equipment, microwave systems, motors, and instrumentation.

PORTABLE SINE WAVE INVERTERS

Model	DA50-1H	DA50-2H	DA100-1H	DA100-2H	DA200-1H	DA200-2H
Output power	50VA	50VA	100VA	100VA	200VA	200VA
Rating	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Ventilation Method	Self cooling	Self cooling	Self cooling	Self cooling	Self cooling	Self cooling
Input rated voltage	DC12V	DC24V	DC12V	DC24V	DC12V	DC24V
Input fluctuation	11–15V	22–30V	11–15V	22–30V	11–15V	22–30V
Output voltage	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V
Output frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Frequency stability	Less than ± 1Hz	Less than ± 1Hz	Less than ± 1Hz	Less than ± 1Hz	Less than ± 1Hz	Less than ± 1Hz
Dimensions H x W x D (")	6.9 x 4.5 x 8.4	6.9 x 4.5 x 8.4	6.9 x 6 x 8.4	6.9 x 6 x 8.4	6.9 x 6 x 8.4	6.9 x 6 x 8.4
Weight (lbs)	11	11	12.4	12.4	14.3	14.3

PORTABLE CRYSTAL CONTROLLED SINE WAVE INVERTERS

Model	DAX200-1H	DAX200-2H	DAX300-1H	DAX300-2H	DAX500-1H	DAX500-2H	DAX1000-2H
Output power	200VA	200VA	300VA	300VA	500VA	500VA	1000VA
Rating	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Ventilation Method	Self cooling	Self cooling	Self cooling	Self cooling	Fan cooling	Fan cooling	Fan cooling
Input rated voltage	DC12V	DC24V	DC12V	DC24V	DC12V	DC24V	DC24V
Input fluctuation	11–15V	22–30V	11–15V	22–30V	11–15V	22–30V	22–30V
Output voltage	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V	AC115V/230V
Output frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Frequency stability	Less than ± fx10^{-5}	Less than ± fx10^{-5}	Less than ± fx10^{-5}	Less than ± fx10^{-5}	Less than ± fx10^{-5}	Less than ± fx10^{-5}	Less than ± fx10^{-5}
Dimensions H x W x D (")	6.9 x 7.2 x 10.3	6.9 x 7.2 x 10.3	6.9 x 7.2 x 15.5	6.9 x 7.2 x 15.5	8.7 x 13.8 x 13.8	8.7 x 13.8 x 68.4	10 x 16.9 x 18.5
Weight (lbs)	16.5	16.5	26.5	26.5	68.4	68.4	79.4

TECHNICAL INFORMATION—ALL MODELS:

Overload	To 125% for 5 minutes
Operating Temperature	– 5° to +45°C
Max. Operating Humidity	90%
Max. dB Noise Level	-0-
Output Surge Capacity	150% for 15 seconds
Rating	Continuous
Input Protection Method	Fuse or Circuit Breaker
Output Waveform	Sinusoidal

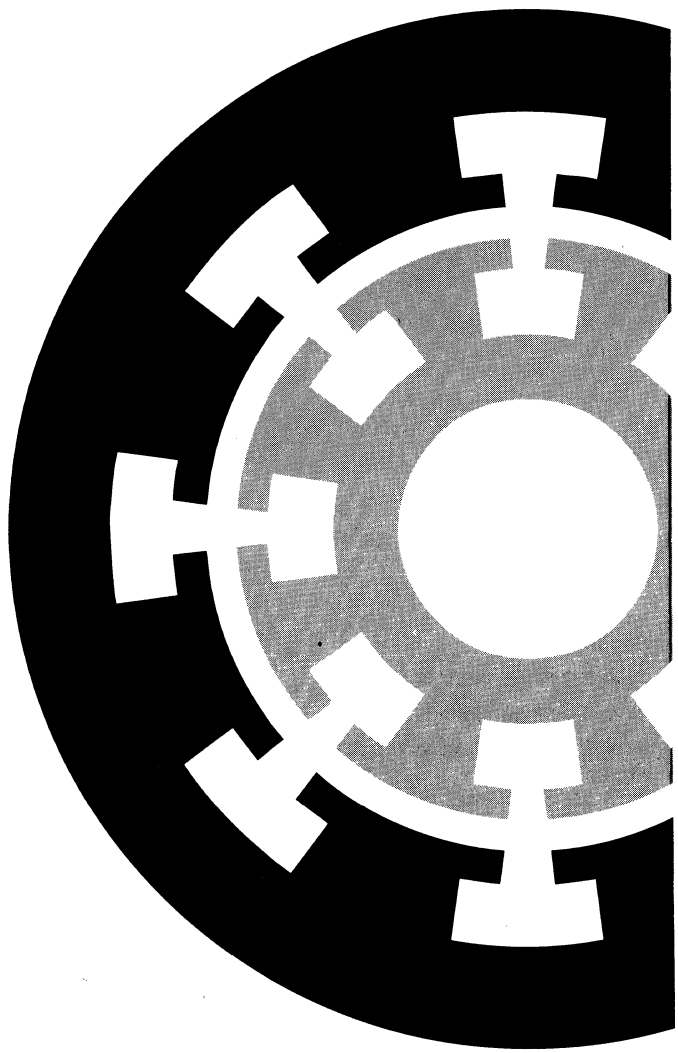
Sizes from 50VA to 1KVA
Specify output voltage
Rack-mount models available
Specify output frequency

Portable models convert to fixed-base inverters by use of mounting rails

GEORATOR CORPORATION

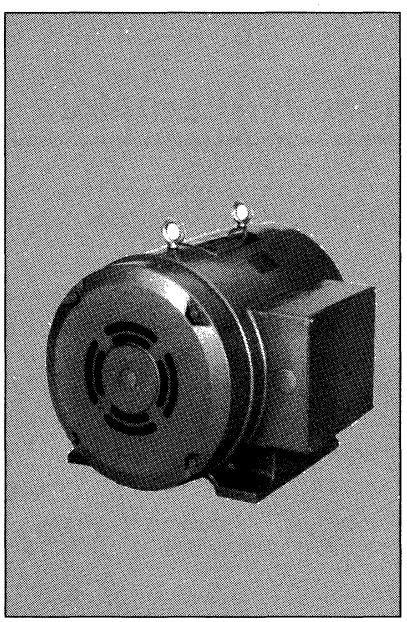
Since 1950

Frequency Converters
Line Isolators
Permanent Magnet Alternators



9617 Center Street, P.O. Box 70, Manassas, VA 22110
TEL: 800-523-9938, 703-368-2101 FAX: 703-368-1078

FREQUENCY CONVERTERS SERIES 30 60 TO 400 / 50 TO 400 HZ



Designed for use in any application requiring a clean, reliable source of 400 Hz power. Inherent regulation provides excellent voltage and frequency stability. Exceptional MTBF with minimal maintenance. Compact and quiet, motor and generator are assembled horizontally in a common housing.

Specifications

Power Ratings: 150 VA to 3 KVA

Motor Type: Induction

Alternator Type: Permanent magnet excitation

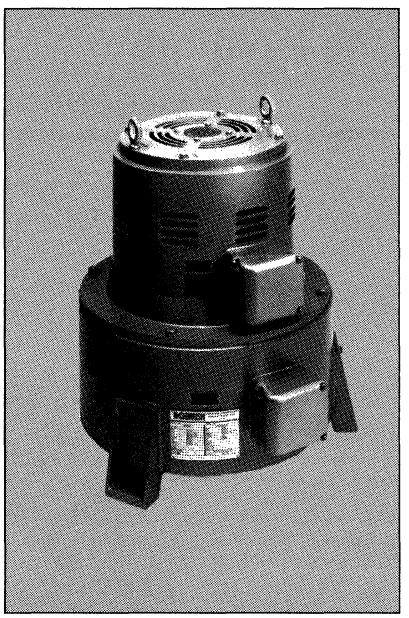
Waveform: THD less than 4% (usually)

Ambient Temp.: -20°C to +50°C

Approx. Dimensions: 15"L x 14"W x 12" H

Standard and non-standard input/output voltages available.

FREQUENCY CONVERTERS SERIES 33 60 TO 400 / 50 TO 400 HZ



Designed for use in any application requiring a clean, reliable source of 400 Hz power. Inherent regulation provides excellent voltage and frequency stability. Exceptional MTBF with minimal maintenance. Motor and generator are assembled vertically.

Specifications

Power Ratings: 2.5 to 20 KVA

Motor Type: Induction

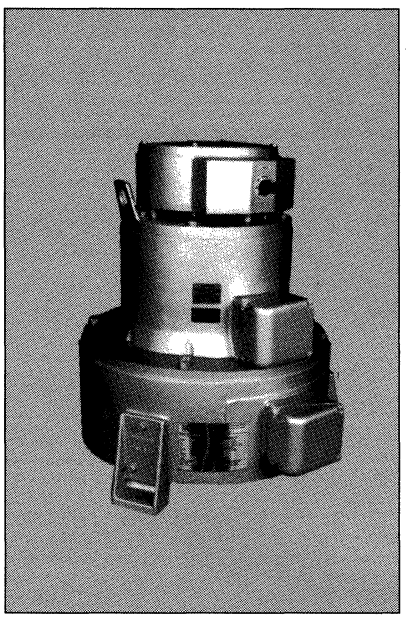
Alternator Type: Permanent magnet excitation

Waveform: THD less than 4%

Ambient Temp.: -20°C to +50°C

Standard and non-standard input/output voltages available.

FREQUENCY CONVERTERS SERIES 39 400 HZ, VOLTAGE REGULATED



Ideal for any application requiring a clean, regulated source of 400 Hz power. All units include a voltage regulator which maintains output at ±1.5%, from NL to FL. Consists of a motor and generator set assembled vertically.

Specifications

Power Ratings: 5 to 15 KVA

Motor Type: Induction

Alternator Type: Permanent magnet excitation

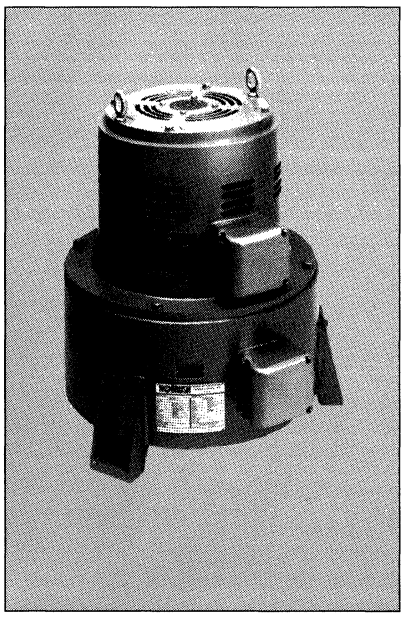
Waveform: THD less than 4%

Ambient Temp.: -20°C to +50°C

Standard and non-standard input/output voltages available.

9617 Center Street, P.O. Box 70, Manassas, VA 22110, Fax 703-368-1078
Call 1-800-523-9938 for complete specifications.

FREQUENCY CONVERTERS 400 HZ, EXACT



Ideal for applications requiring a clean, reliable source of exact 400 Hz power, NL to FL. Both voltage regulated and standard models available. Consists of a motor and generator set, assembled horizontally for 2.5 and 3 KVA units; larger units assembled vertically.

Specifications

Power Ratings: 2.5 to 12.5 KVA

Motor Type: Synduction

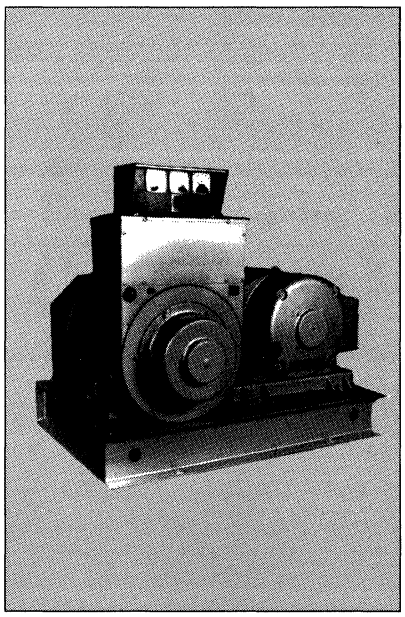
Alternator Type: Permanent magnet excitation

Waveform: THD less than 4%

Ambient Temp.: -20°C to +50°C

Standard and non-standard input/output voltages available.

FREQUENCY CONVERTERS SERIES 37 50 TO 60 / 60 TO 50 HZ



Provides accurate and stable output power, as well as complete isolation from switching transients, voltage fluctuations, and line noise. Units allow for compatibility between U.S. and International power standards. Consists of a separate motor and brushless alternator, mounted on a common base.

Specifications

Power Ratings: 2.5 to 125 KVA

Motor Type:
High efficiency induction
(Synduction optional on 2.5 to 25 KVA)

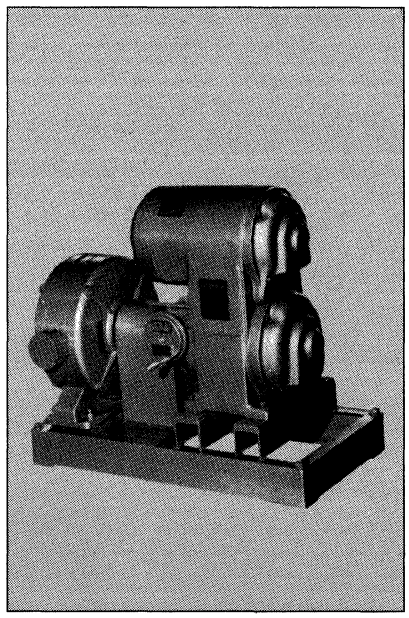
Alternator Type: Synchronous rotating rectifier with voltage regulator mounted.

Waveform: THD less than 5%

Ambient Temp.: Maximum 40°C

Standard and non-standard input/output voltages available.

VARIABLE FREQUENCY CONVERTERS SERIES 32



Allows conversion of 60 or 50 Hz power to a wide range of output frequencies. Consists of an induction motor variable speed drive coupled to a brushless generator, mounted on a common base. Ideal for test applications where power with continuously variable output frequency is needed.

Specifications

Power Ratings: .5 to 62.5 KVA

Frequency: 47 to 63 Hz or 380 to 420 Hz

Motor Type: Induction

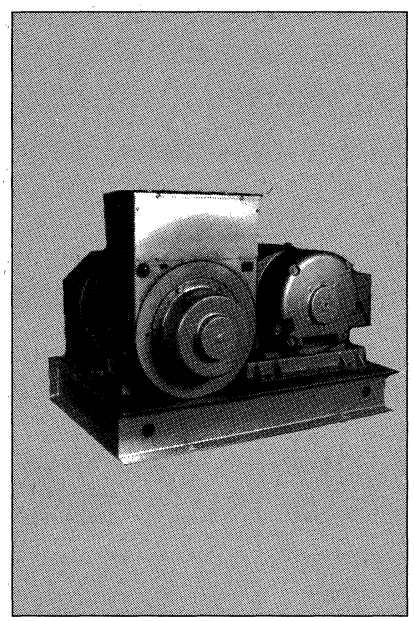
Waveform: THD less than 5%

Ambient Temp.: -20°C to +40°C

Standard and non-standard input/output voltages available.

9617 Center Street, P.O. Box 70, Manassas, VA 22110, Fax 703-368-1078
Call 1-800-523-9938 for complete specifications.

FREQUENCY CONVERTERS SERIES 37 400 HZ, HIGH-POWER



Designed for applications requiring higher output ratings of 400 Hz power. Provides accurate, reliable power and complete isolation from voltage fluctuations, switching transients, and line noise. Consists of a separate motor and brushless alternator, mounted on a common base.

Specifications

Power Ratings: 25 to 75 KVA

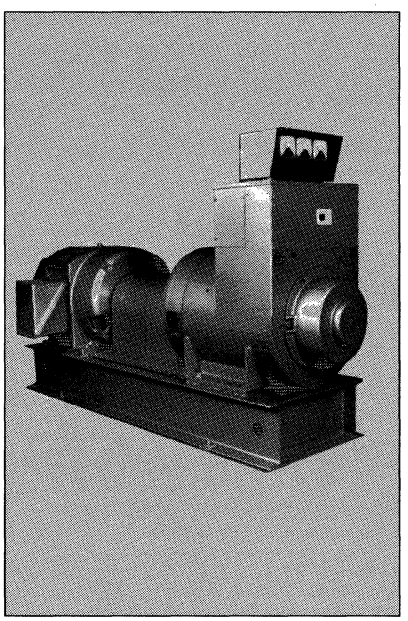
Motor Type: High efficiency induction

Waveform: THD less than 5%

Ambient Temp.: Maximum 40°C

Standard and non-standard input/output voltages available.

POWER CONDITIONERS SERIES 37 60 TO 60 HZ



Provides complete isolation between the load and input power, eliminating voltage fluctuations, switching transients and line noise. Maintains approx. 100 milliseconds of ridethrough during power outages. Consists of a coupled in-line motor and brushless alternator, mounted on a common base.

Specifications

Power Ratings: 2.5 to 125 KVA

Motor Type:
High efficiency induction
(Synduction optional on 2.5 to 25 KVA)

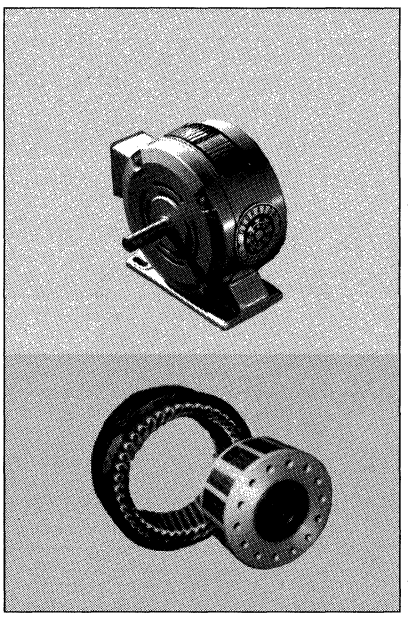
Alternator Type: Synchronous rotating rectifier with voltage regulator mounted.

Waveform: THD less than 5%

Ambient Temp.: Maximum 40°C

Standard and non-standard input/output voltages available.

PM ALTERNATORS ROTORS AND STATORS SERIES 36 AND 38



NoBrush® alternators may be used wherever rotational mechanical energy is available for conversion into DC or high-frequency AC power. Standard models as well as units built to customer specs available with or without aluminum alloy housings or bearings.

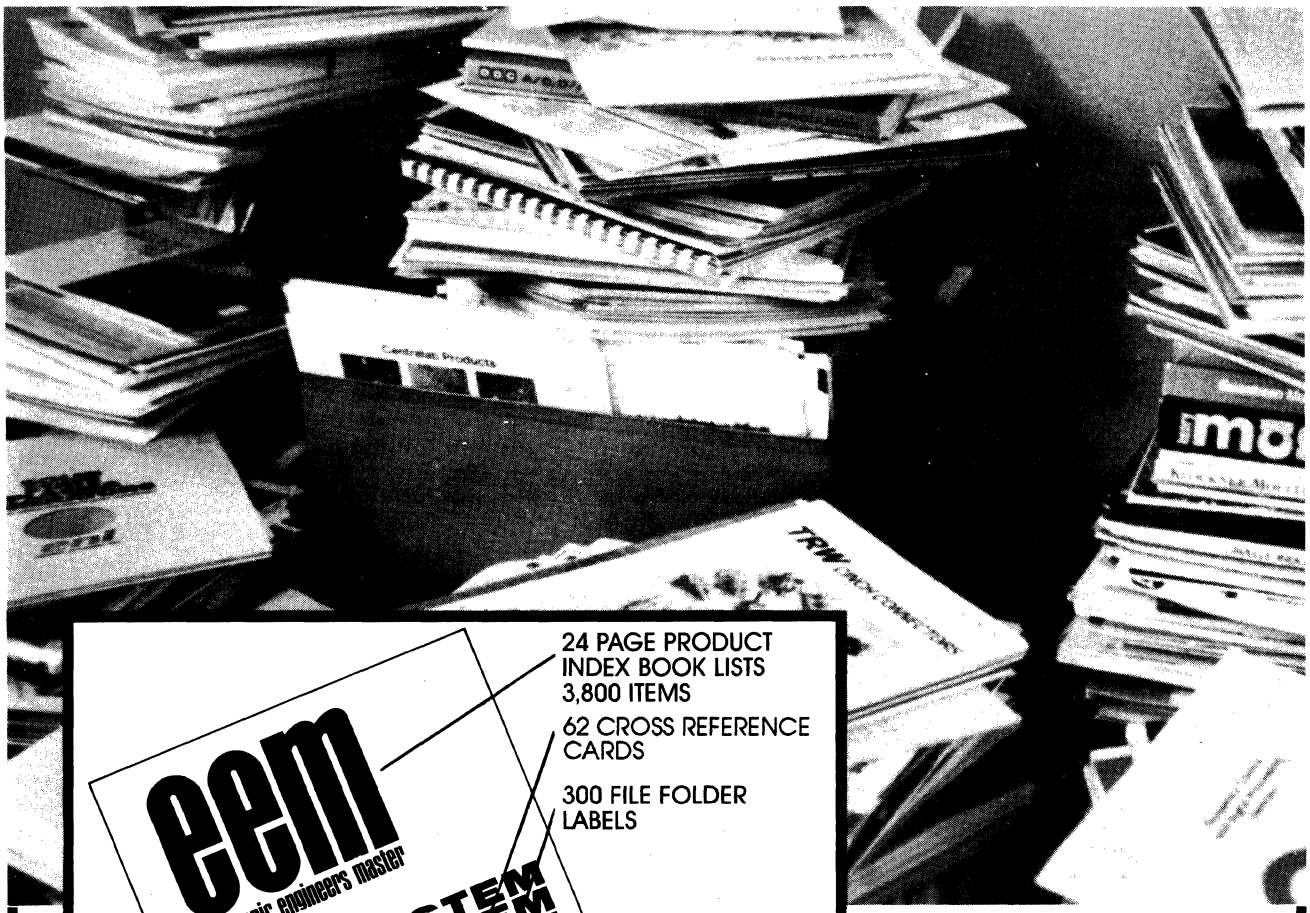
The high efficiency, compact size and rugged design of these alternators make them ideal for use in special industrial applications, main generator pilot excitation or tachometer feedback, and high voltage isolation.

Specifications

Power Ratings: .25 to 20 KVA

Frequency: 50 to 1000 Hz

9617 Center Street, P.O. Box 70, Manassas, VA 22110, Fax 703-368-1078
Call 1-800-523-9938 for complete specifications.



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30 YEARS OF SERVICE

Hipotronics®

Peschel™ AUTOMATIC VOLTAGE REGULATORS

Three Phase Input Voltage Range: +9%/−14% of Nominal

INPUT: 240 Volts, 220 Volts, 208 Volts

Correction rate approx. 10 volts/sec.

Amps	KVA At 240V	Model	Cabinet Y	Cabinet YZ	Weight Y lb. (kg)	Weight YZ lb. (kg)
40	17	A240-40Y(Z)	A	B	320 (145)	470 (213)
60	25	A240-60Y(Z)	A	B	510 (231)	550 (250)
100	42	A240-100Y(Z)	B	B	550 (250)	600 (272)
150	62	A240-150Y(Z)	B	C	720 (327)	875 (397)
200	83	A240-200Y(Z)	C	C	800 (363)	1050 (476)
300	125	A240-300Y(Z)	C	C	950 (431)	1100 (499)
400	166	A240-400Y(Z)	C	D	1150 (522)	1550 (703)
500	208	A240-500Y(Z)	D	D	1400 (635)	1725 (783)
600	249	A240-600Y(Z)	D	D	1650 (748)	1900 (862)
700	291	A240-700Y(Z)	D	D	1850 (839)	2200 (998)
800	333	A240-800Y(Z)	D	D	2100 (953)	2400 (1089)

INPUT: 415 Volts, 380 Volts

Correction rate approx. 15 volts/sec.

Amps	KVA At 415V	Model	Cabinet Y	Cabinet YZ	Weight Y lb. (kg)	Weight YZ lb. (kg)
40	29	A415-40Y(Z)	A	B	400 (181)	550 (250)
60	43	A415-60Y(Z)	A	B	480 (218)	600 (272)
100	72	A415-100Y(Z)	B	B	650 (295)	700 (318)
150	108	A415-150Y(Z)	B	B	950 (431)	1100 (499)
200	144	A415-200Y(Z)	C	C	1200 (544)	1375 (624)
300	216	A415-300Y(Z)	C	D	1350 (612)	1550 (703)
400	288	A415-400Y(Z)	C	D	1500 (680)	1700 (771)
500	359	A415-500Y(Z)	D	D	1775 (805)	1950 (885)
600	431	A415-600Y(Z)	D	D	1875 (851)	2175 (967)
700	503	A415-700Y(Z)	D	E	2000 (907)	2500 (1134)
800	575	A415-800Y(Z)	E	E	2300 (1043)	2700 (1305)

INPUT: 480 Volts

Correction rate approx. 20 volts/sec.

Amps	KVA	Model	Cabinet Y	Cabinet YZ	Weight Y lb. (kg)	Weight YZ lb. (kg)
40	33	A480-40Y(Z)	A	B	450 (204)	600 (272)
60	50	A480-60Y(Z)	A	B	500 (227)	700 (318)
100	83	A480-100Y(Z)	B	B	650 (295)	850 (386)
150	125	A480-150Y(Z)	C	C	1000 (454)	1200 (544)
200	166	A480-200Y(Z)	C	D	1275 (578)	1350 (612)
300	249	A480-300Y(Z)	C	D	1350 (612)	1500 (680)
400	333	A480-400Y(Z)	D	D	1450 (658)	1700 (771)
500	416	A480-500Y(Z)	D	D	1600 (726)	2100 (953)
600	499	A480-600Y(Z)	D	E	1800 (817)	2800 (1270)
700	582	A480-700Y(Z)	E	E	2300 (1043)	3000 (1361)
800	665	A480-800Y(Z)	E	E	2700 (1305)	3300 (1497)

Three Phase Input Voltage Range: ±20% of Nominal

INPUT: 240 Volts, 220 Volts, 208 Volts

Correction rate approx. 10 volts/sec.

Amps	KVA At 240V	Model	Cabinet Y	Cabinet YZ	Weight Y lb. (kg)	Weight YZ lb. (kg)
40	17	D240-40Y(Z)	A	B	390 (177)	500 (227)
60	25	D240-60Y(Z)	A	B	500 (250)	575 (261)
100	42	D240-100Y(Z)	A	B	650 (295)	700 (318)
150	62	D240-150Y(Z)	B	C	900 (408)	1100 (499)
200	83	D240-200Y(Z)	C	C	1150 (522)	1350 (612)
300	125	D240-300Y(Z)	C	D	1300 (590)	1600 (726)
400	166	D240-400Y(Z)	D	D	1500 (680)	1850 (839)
500	208	D240-500Y(Z)	D	D	1800 (817)	2250 (1021)
600	249	D240-600Y(Z)	D	D	2200 (998)	2500 (1134)
700	291	D240-700Y(Z)	E	E	2600 (1179)	2775 (1259)
800	333	D240-800Y(Z)	E	E	2800 (1270)	3150 (1569)

INPUT: 415 Volts, 380 Volts

Correction rate approx. 15 volts/sec.

Amps	KVA At 415V	Model	Cabinet Y	Cabinet YZ	Weight Y lb. (kg)	Weight YZ lb. (kg)
40	29	D415-40Y(Z)	A	B	500 (227)	550 (250)
60	43	D415-60Y(Z)	A	B	550 (250)	600 (272)
100	72	D415-100Y(Z)	B	B	750 (340)	850 (386)
150	108	D415-150Y(Z)	B	C	1300 (590)	1550 (703)
200	144	D415-200Y(Z)	C	C	1650 (748)	1875 (851)
300	216	D415-300Y(Z)	C	D	1750 (794)	2200 (998)
400	288	D415-400Y(Z)	D	D	2075 (941)	2450 (1111)
500	359	D415-500Y(Z)	D	D	2350 (1066)	2600 (1179)
600	431	D415-600Y(Z)	E	E	2575 (1306)	2800 (1270)
700	503	D415-700Y(Z)	E	E	2750 (1247)	3200 (1452)
800	575	D415-800Y(Z)	E	E	3100 (1406)	3550 (1610)

INPUT: 480 Volts

Correction rate approx. 20 volts/sec.

Amps	KVA	Model	Cabinet Y	Cabinet YZ	Weight Y lb. (kg)	Weight YZ lb. (kg)
40	33	D480-40Y(Z)	A	B	500 (227)	650 (295)
60	50	D480-60Y(Z)	A	B	600 (272)	800 (363)
100	83	D480-100Y(Z)	B	B	800 (363)	1100 (499)
150	125	D480-150Y(Z)	B	C	1000 (454)	1450 (658)
200	166	D480-200Y(Z)	C	C	1140 (517)	1675 (780)
300	249	D480-300Y(Z)	C	D	1500 (680)	2000 (907)
400	333	D480-400Y(Z)	D	D	1900 (862)	2300 (1043)
500	416	D480-500Y(Z)	D	E	2200 (998)	2600 (1179)
600	499	D480-600Y(Z)	E	E	2700 (1305)	3600 (1633)
700	582	D480-700Y(Z)	E	E	2950 (1338)	3800 (1724)
800	665	D480-800Y(Z)	E	E	3800 (1724)	4100 (1860)

Sizes and weights are subject to change. If sizes and weights are critical, request drawing from factory.

NOTE: "Z" at the end of the model number indicates a PAVR with Individual Phase Control

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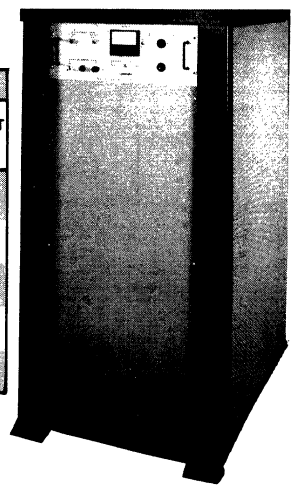
30 YEARS OF SERVICE

Hipotronics®

Peschel™ AUTOMATIC VOLTAGE REGULATORS

Designed to meet your service line requirements from 240 V to 13.8 kV, 40 amps to 2000 amps

CABINET DIMENSIONS			
CABINET	WIDTH in (mm)	DEPTH in (mm)	HEIGHT in (mm)
A	30" (762)	25" (635)	30" (762)
B	30" (762)	25" (635)	52" (1320)
C	30" (762)	25" (635)	72" (1829)
D	30" (762)	42" (1067)	72" (1829)
E	48" (1219)	36" (914)	76" (1930)



AVAILABLE OPTIONS

1) BYPASS SWITCH
2) TRANSIENT FUNCTION
3) MAIN CIRCUIT BREAKER

- INDIVIDUAL PHASE REGULATION AVAILABLE FOR THREE PHASE UNITS
- 99% EFFICIENT
- NO WAVEFORM DISTORTION
- VERY LOW INTERNAL IMPEDANCE
- NO PHASE SHIFT
- NO EFFECT ON POWER FACTOR
- UP TO 20 VOLTS PER SECOND CORRECTION RATE
- TEMPERATURE RANGE - 10 °C to + 50° C
- OUTPUT ACCURACY ± 1% ADJUSTABLE TO ± 5%
- VOLTMETER WITH EXPANDED SCALE
- DRY TYPE, CONVECTION COOLED

The Peschel Automatic Voltage Regulator is a 50/60 Hz., wye connected, dry-type, convection cooled, ac line voltage regulator. It is designed to maintain line voltage to within ±1% of nominal, with an input voltage variation of +9/-14% or ±20%, due to line and/or load changes. The PAVR introduces no harmful waveform distortion, has a very low internal impedance, causes no phase shift, is insensitive to load power factor, has no effect on system power factor, and is approx. 99% efficient.

The PAVR is neither an impedance changing nor a ferroresonant device and uses no SCRs. It is an electro-mechanical device using electro-magnetic transformer action to regulate. Its high efficiency and reliability make it the best solution to today's voltage problems.

Single Phase Input Voltage Range: +9%/-14% of Nominal

INPUT: 240 Volts, 220 Volts

Amps	KVA At 240V	Model	Cabinet	Correction Rate*	Weight lb. (kg)
50	12	A240-50	A	9	275 (125)
100	24	A240-100	A	9	300 (136)
150	36	A240-150	A	9	350 (159)
200	48	A240-200	B	9	380 (172)
300	72	A240-300	B	9	510 (231)
400	96	A240-400	B	9	580 (263)
500	120	A240-500	C	9	620 (281)
600	144	A240-600	C	9	750 (340)
700	168	A240-700	C	9	900 (408)

INPUT: 480 Volts

Amps	KVA	Model	Cabinet	Correction Rate*	Weight lb. (kg)
50	24	A480-50	A	18	350 (159)
100	48	A480-100	A	18	450 (204)
150	72	A480-150	A	18	600 (272)
200	96	A480-200	B	18	750 (340)
300	144	A480-300	B	18	850 (386)
400	192	A480-400	B	18	1050 (476)
500	240	A480-500	C	18	1200 (544)
600	288	A480-600	C	18	1300 (590)
700	336	A480-700	C	18	1500 (680)

* Approx. volts per second

Single Phase Input Voltage Range: ±20% of Nominal

INPUT: 240 Volts, 220 Volts

Amps	KVA At 240V	Model	Cabinet	Correction Rate*	Weight lb. (kg)
50	12	D240-50	A	15	330 (150)
100	24	D240-100	A	15	350 (159)
150	36	D240-150	B	15	400 (181)
200	48	D240-200	B	15	475 (215)
300	72	D240-300	B	15	650 (295)
400	96	D240-400	C	15	800 (363)
500	120	D240-500	C	15	825 (374)
600	144	D240-600	C	15	1000 (454)
700	168	D240-700	C	15	1200 (544)

INPUT: 480 Volts

Amps	KVA	Model	Cabinet	Correction Rate*	Weight lb. (kg)
50	24	D480-50	A	25	450 (204)
100	48	D480-100	A	25	575 (261)
150	72	D480-150	B	25	800 (363)
200	96	D480-200	B	25	925 (420)
300	144	D480-300	B	25	1000 (454)
400	192	D480-400	B	25	1450 (658)
500	240	D480-500	C	25	1590 (721)
600	288	D480-600	C	25	1700 (771)
700	336	D480-700	C	25	1900 (862)

Sizes and weights are subject to change. If sizes and weights are critical, request drawing from factory.

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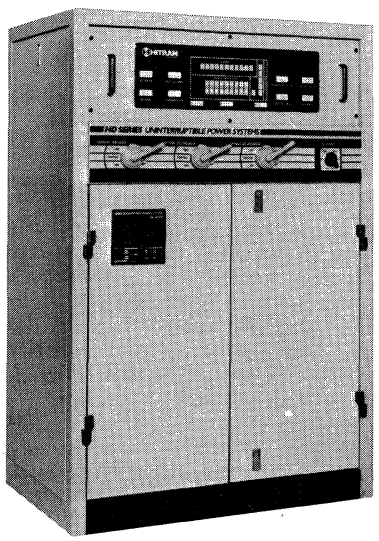
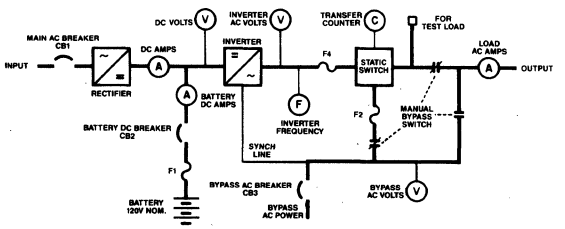
500VA TO 20KVA POWER PROTECTION SYSTEMS

Also see our catalog pages under DC POWER SUPPLIES and TRANSFORMERS.

HD SERIES — UNINTERRUPTIBLE POWER SYSTEMS





STANDARD HD SERIES UPS, 120V, SINGLE PHASE, 60Hz, TWO-WIRE OUTPUT									
Continuous Output (KVA)	Part Number	Input Voltage 3Ph, 3W	Maximum Input* (Amperes)	Inverter Input Volts DC Nominal	Continuous Output (Amperes)	System Full Load Efficiency	Nominal Battery Discharge Constant** (KW)	Dimensions (inches) H x W x D	Approx. Shipping Weight (lbs)
5	BA0277-00	480V	11	120V	41.6	80%	4.81	68 46 30	1,125
5	BA0277-00	208V	26	120V	41.6	80%	4.81	68 46 30	1,125
7.5	BA0278-00	480V	17	120V	62.5	80%	7.22	68 46 30	1,275
7.5	BA0278-00	208V	38	120V	62.5	80%	7.22	68 46 30	1,275
10	BA0279-00	480V	22	120V	83.3	80%	9.60	68 46 30	1,425
10	BA0279-00	208V	51	120V	83.3	80%	9.60	68 46 30	1,425
15	BA0280-00	480V	33	120V	125.0	80%	14.21	68 46 30	1,750
20	BA0281-00	480V	44	120V	166.6	80%	18.94	68 46 30	2,175

*Includes battery-charging requirements and 125% overload capacity with 0.8 power factor load.
**Nominal with ac load at 0.8 power factor for 120Vdc nominal inverter input.

The ultimate in line conditioning equipment for heavy duty use in industrial applications, the Hitran HD Series UPS eliminates power outages, line interruptions, brownouts and short term transients such as line spikes and sags. It protects the load against line disturbances resulting from switching in the transmission system, clearing of line faults, starting of motor loads and even lightning strikes.

The Hitran HD Series is intended for critical process and/or manufacturing control computer installations which cannot tolerate power interruption either in an emergency or even for normal maintenance of the UPS or batteries.

Every effort has been made to build a family of systems which offer the highest levels of reliability and, at the same time, are safe and easy to test, service, and maintain without ever disrupting power to the critical load.

Hitran HD series uninterruptible power systems are three phase input/single phase output. They are intended for 120V, 60Hz loads with either sinusoidal or nonsinusoidal current wave form characteristics and excessive surge current requirements.

Electrical Characteristics & System Requirements

Rectifier/Battery Charger

- Input Voltage Variations: ±10%
- Input Frequency: ±5%
- Transient Protection: As high as 4000V for 10 microseconds with 40 ohms or greater transient source impedance.
- Walk-in: 3 seconds from zero to full load.

Inverter

- Overload Design Capability: 125% of full load current for 10 minutes; 150% for 30 seconds; 200% for 0.1 seconds.
- Output Voltage Regulation: ±3% of output voltage steady state for line, load and temperature.
- Output Voltage Transient Response and Recovery: Less than ±15% with recovery to ±3% within 5 cycles
- Output Harmonic Distortion: <5%
- Output Power Rating: Rated KVA from 0.8 lag to 0.8 lead power factor range.
- Frequency Stability: 0.25%
- Output Frequency Regulation: 1.0%

Static Transfer Switch

- No-break forward or reverse transfer capability in less than ¼ cycle

Manual Maintenance Bypass Switch

- Manual, no-break, forward and reverse transfer capability
- Isolates the static switch and inverter from the bypass line and load

Test Load Terminals

- For testing all functions of inverter without interrupting output

Noise Level

Less than 65dBA sound power level at a distance of five feet from enclosure

Ventilation

Natural convection

Control Panel — Status/Alarm/Command

The control panel shows the complete status of the system at a glance via:
- LED indicators for circuit status of all major system operating parameters
- Digital panel meters for critical voltages, amperages and frequencies
- LED alarm indicators for all critical system conditions. Alarms are also audible and can be connected to remote annunciators via a terminal block.

Commands may be entered through the control panel to transfer load to bypass or inverter, cancel and reset audible alarms, reset inverter, test indicator LEDs and to reset the transfer counter display. For security, load transfer commands may be disabled by an internal switch.

System Options

- Remote status alarm panel
- Special input/output voltages

Batteries, Racks & Accessories

Twenty-year lead-calcium batteries are normally supplied mounted in a separate two-tier steel rack. Other battery types are available on request.

Designs and specifications subject to change without notice.

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500VA TO 150KVA POWER PROTECTION SYSTEMS

Also see our catalog pages under DC POWER SUPPLIES and TRANSFORMERS.

SFR SERIES — SINUSOIDAL FERRORESONANT REGULATOR

The SFR provides low distortion, sinusoidal, computer grade power. It provides a high degree of electrical noise rejection as well as output voltage regulation. Designed to eliminate power line problems caused by brownouts, short term transients and electrical noise, the SFR protects against switching disturbances, clearing of line faults, starting of motor loads and lightning strikes.

Standard Features

- Computer grade sinusoidal output - less than 5% harmonic distortion.
- Electrical noise rejection - Common Mode: greater than 120dB, 1 KHz to 1MHz. - Transverse Mode: greater than 60dB, 10KHz to 1MHz.
- Wide input voltage range - +10%, −20% of nominal input
- Tightly regulated output - ±1% of nominal output voltage.
- Input to Output Coupling Capacitance - Less than 0.005pF.
- Operating Temperature - 0-50°C.

Electrical Specifications

Input

- Nominal Standard Voltages - 1φ: 120, 208, 240, 480 (+10, −20%)
- Frequency - 60Hz or 50Hz ±2Hz.

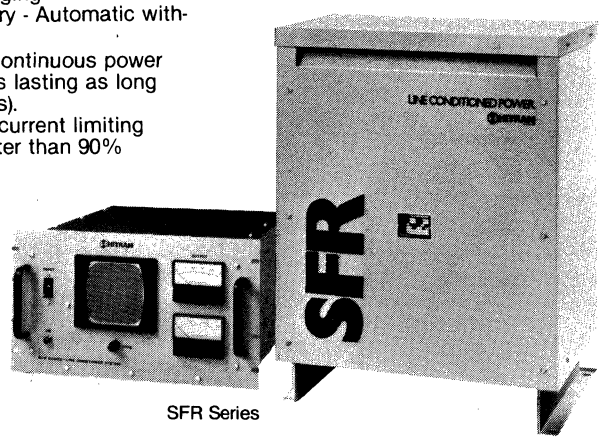
Output

- 1φ - 120/240V ±1%
- Frequency - Same as Input.
- Regulation - Static: ±1%; Dynamic: ±4% with recovery to ±1% in 50ms.
- Load PF - 0.8 lagging
- Overload Recovery - Automatic within 50ms.
- Ride Through - Continuous power during line outages lasting as long as 25ms (1.5 cycles).
- Protection - Self current limiting
- Efficiency - Greater than 90%

Complete Line Conditioner Systems

The SFR Series is also available as a Complete Line Conditioner System. It includes all the standard features listed plus the following accessories:

- *Output Ammeter and Voltmeter*
- *Input Circuit Breaker*
- *Input Power "ON" Indicating Light*
- *Output Fusing and Receptacles*
- *Input Receptacles or Line Cord*
- *19-inch Rack Mount or Free-Standing Assembly*



SFR Series

SFR SERIES – SINGLE PHASE	60 Hz • 600V CLASS • 220°C INSULATION CLASS • NEMA I ENCLOSURE					
	KVA	DIMENSIONS IN INCHES* H	W	D	APPROX. WT. LBS.	TYPE MOUNTING
	0.5	22	18	17	75	Floor/Wall
	1	22	18	17	100	Floor/Wall
	2	22	18	17	160	Floor/Wall
	3	33	24	20	225	Floor (W)
	5	33	24	20	350	Floor (W)
	7.5	33	24	20	490	Floor (W)
	10	43	36	26	600	Floor
	15	43	36	26	815	Floor
	20	43	36	26	1070	Floor

(W) Wall mounting brackets available.

UIS SERIES — ULTIMATE ISOLATION SYSTEM

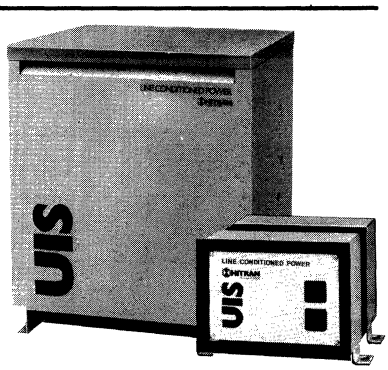
The UIS effectively eliminates common-mode and transverse-mode power line noise in transformer applications for computers, programmable controllers and sensitive instruments.

Standard Features

- High degree of electrical noise rejection,- Common-mode: greater than 140dB, 1KHz to 1Mhz; Transverse-mode: greater than 60db, 10KHz to 1MHz.
- Input to output capacitance coupling - 0.001pF
- DC insulation resistance - 10,000MΩ
- Dielectric strength - 4000Vac min.
- Operating Temperature - 0-50°C
- Efficiency - 97% min. at full load.
- Line Cord & Output Receptacles - Standard on 120V single phase models up through 2.4KVA.

Electrical Specifications

	KVA	INPUT (V)	Hz	OUTPUT (V)
1φ	0.5-2.4	120	50/60	120
	2.5	120/208-240	50/60	120/240
	5-20	120/208-240 or-480	60	120/240
3φ	3	208Y/120	60	208Y/120
	7.5	208Δ or 240Δ	60	208Y/120
	15 & 22.5	208Δ, 240Δ, or 480Δ	60	208Y/120
	30-150	208-240/480Δ	60	208Y/120 or 480Y/277



UIS Series

UIS SERIES – SINGLE PHASE	50/60 Hz • 600V CLASS • 220°C INSULATION CLASS • NEMA I ENCLOSURE					
	KVA	DIMENSIONS IN INCHES* H	W	D	APPROX. WT. LBS.	TYPE MOUNTING
	0.5	4.9	7.2	9.5	25	Floor/Wall
	1	6.8	9	10.2	40	Floor/Wall
	2.4	6.8	9	12.8	60	Floor/Wall
	2.5	6.8	9	12.8	60	Floor/Wall
	5	9.2	12	15	90	Floor/Wall
	7.5	9.2	12	15	145	Floor/Wall
	10	13	14	20	235	Floor/Wall
	15	13	14	22	280	Floor/Wall
	20	13	14	24	355	Floor/Wall

*Dimensions listed are not to be used for construction purposes.

UIS SERIES – THREE PHASE	60 Hz • 600V CLASS • 220°C INSULATION CLASS • NEMA I ENCLOSURE					
	KVA	DIMENSIONS IN INCHES* H	W	D	APPROX. WT. LBS.	TYPE MOUNTING
	3	9.2	39	10.2	140	Floor
	7.5	9.2	39	12.2	205	Floor
	15	9.2	39	14.8	300	Floor
	22.5	36	28	18	470	Floor
	30	36	28	18	825	Floor
	45	43	32	26	1000	Floor
	60	43	32	26	1200	Floor
	75	48	36	30	1600	Floor
	100	48	48	32	1900	Floor
	130	60	54	40	2400	Floor
	150	60	54	40	2700	Floor

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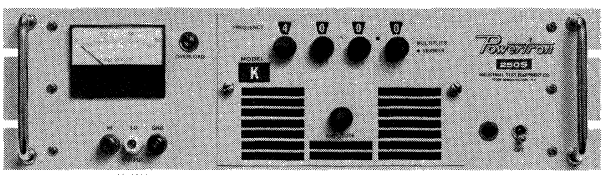
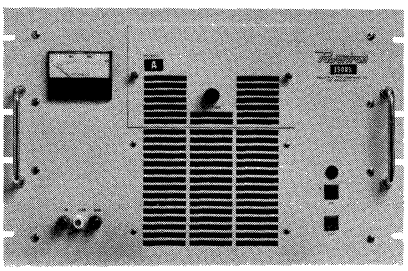
INDUSTRIAL TEST EQUIPMENT COMPANY, INC.

Powertron® 10-100,000 Hz AC Voltage Sources



5.25"



12.25"

GENERAL SPECIFICATIONS:

(request catalog for complete specifications)

(linear circuitry)
stackable for
2 0r 3 phase use

Output : Fully isolated by transformer

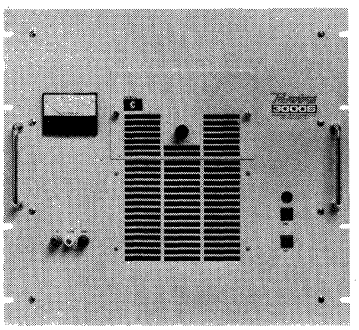
Distortion: 0.5% typical

Load Regulation: Adjustable to perfect

Line Regulation: 0.1%

External signal and synch inputs provided

Input Power: 120V/240V single phase or 3 phase 208V/480V



17.5"

MODEL	WATTS	RACK HT.	FREQUENCY	VOLTAGE RANGES (Zero to:)
80S	80	5.25"	20-20,000 Hz	17, 30, 65, 130, & 260
250S	250	5.25"	20-20,000 Hz	17, 30, 65, 130, & 260
250HF	250	5.25"	10-100,000 Hz	21, & 130
500S	500	5.25"	45-5,000 Hz	17, 30, 65, 130, & 260
1500S	1,250	12.25"	45-3,500 Hz	65, 130, 260 & 300
3000S	3,000	17.50"	45-2,500 Hz	65, 130, 260 & 300
3000HF	3,000	17.50"	350-25,000 Hz	130, 260

*0-480 volt and 0-600 volt built-in output transformers available

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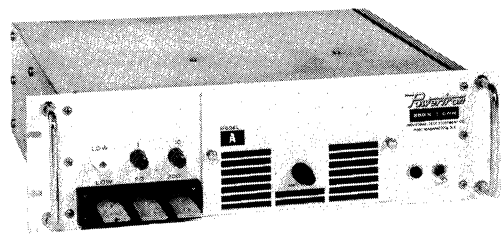
INDUSTRIAL TEST EQUIPMENT COMPANY, INC.

Powertron® AC Current Sources

Constant Current AC Supplies

In addition to constant voltage amplifiers a full line of constant current amplifiers is available. The inherent ability of these amplifiers to maintain a preset current through a load whose impedance may vary makes them ideally suited tot he testing of ammeters, wattmeters, relays circuit breakers, current transformers, and other current sensitive devices. These amplifiers may be driven by the plug-in oscillators. All amplifiers are protected for open load circuit conditions.



GENERAL SPECIFICATIONS:

Output Frequency: Determined by plug-in oscillator.

Current Regulation: ± 1% for loads ranging from short circuit to maximum rate load impedance for the respective amplifier.

Output Distortion: Less than 1%

Constant current amplifiers may be used with similar outputs in parallel when it is desired to increase the current capacity. Constant current supplies may also be used for 3ϕ wye connected load applications. As the standard output transformers may not always provide the optimum current range and compliance voltage, special output transformers may be supplied to meet user requirements.

MODEL	CURRENT AMPS	NUMBER OF RANGES	COMPLIANCE VOLTS
250S-1-CR	0–15	five	7.0
500S-1-CR	0–3	five	7.0
1000S-1-CR	0–8	three	50.0
3000S-1-CR	0–24	three	50.0
250S-1-CRH	0–200	four	0.5
1000S-1-CRH	0–400	four	1.0
3000S-1-CRH	0–1000	one	1.2

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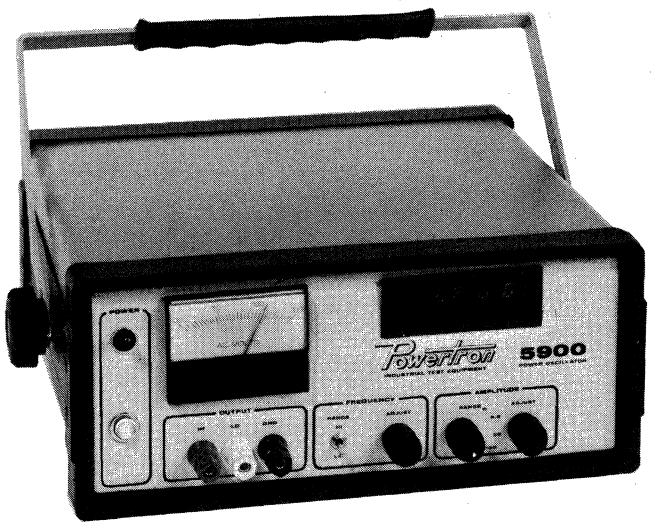
INDUSTRIAL TEST EQUIPMENT COMPANY, INC.

Powertron® Sine Wave Power Supply



Model 5900 Portable

GENERAL SPECIFICATIONS

Output:	Low Range	0 to 8.5 V @ 8.2 A
	Middle Range	0 to 38 V @ 1.8 A
	High Range	0 to 130 V @ .53 A
Power:	Max	70 VA
	Continuous	50 VA
Frequency:	Low Range	45 to 2 KHz
	Middle Range	2K to 19.99 KHz
	Also available with fixed frequency output.	
Distortion		0.3% typ.
Power Requirements		120 V 50 to 400Hz
Dimensions (inches)		12-1/4 x 5-1/4 x 12-1/2
Weight		23 lbs.

Available on Special Order

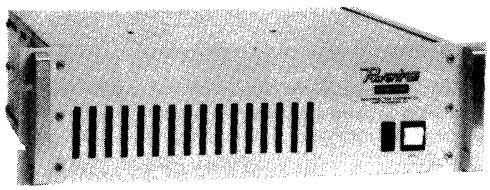
- With Fixed Frequency
- With 260 V Output

THE "STANDARD" OF THE INDUSTRY SINCE 1929

21 YENNICOCK AVENUE, PORT WASHINGTON, NY 11050 • (516) 883-1700 • 1-800-548-0904 • FAX (516) 883-7155

INDUSTRIAL TEST EQUIPMENT COMPANY, INC.

Powertron® Frequency Converters



Convert the AC line frequency to other frequencies for aviation and foreign equipment power.

GENERAL SPECIFICATIONS:

Input power.....115/230 V @ 50 Hz, 60 Hz, or 400 Hz

Distortion.....Less than 1%

Output Voltage.....Adjustable 110 – 130 V AC
220 – 260 V AC on request

Protection.....Short Circuit, overheat

MODEL #	INPUT POWER
80C–* 250C–* 500C–* 1000C–*	120 or 240 Volts 50, 60 or 400 Hz Single Phase
1500C–* 2000C–* 3000C–*	3 Phase 208 VOLTS 50 or 60 Hz

The model # designates the output watts. The " * " designates the output frequency. (The "C" signifies "converter".)

For example, model # 250C-400 is a converter with a 250 watt, 400 Hz output.

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INSTRUMENTATION & CONTROL SYSTEMS, INC. ICS

INSTRUMENTATION & CONTROL SYSTEMS, INC.
520 Interstate Rd. Addison, IL 60101
Phone 708-543-6200 FAX 708-543-6244

UPS

All *ICS* - Built Power Systems are Made in The United States of America

ELECTRO-PAC®

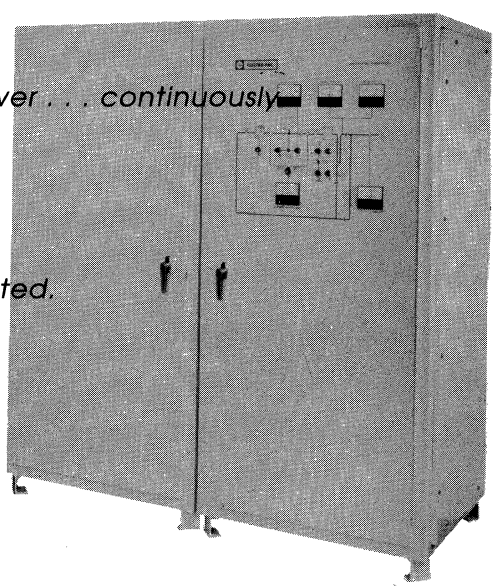
Uninterruptible Power Systems

Continuous Regulated AC Power

ELECTRO-PAC Series E power systems are reliable, ferroresonant designs providing true uninterruptible AC power for critical control and communication applications. The system consists of an electronically regulated battery charger, sine wave inverter, a fast acting static power switch and a storage battery bank. The Series E system protects against outages and blackouts; voltage sags, surges, spikes and transients; electrical noise; frequency deviation and wave form distortion. The design also provides inherent protection from momentary overloads and short circuits. A storage battery bank is specified to match the back-up time required by the application.

Quality Features

- *Pure sine wave output.*
- *Regulates, filters & conditions power . . . continuously.*
- *Standard capacities 1 - 20 kVA.*
- *Regulation ±2%.*
- *Up to 85% inverter efficiency.*
- *High output battery charger.*
- *Soft-start charger circuitry.*
- *Overload and short circuit protected.*
- *High quality meters.*
- *Input circuit breakers.*
- *Seven operation indicator lights.*
- *Five alarm contacts.*
- *Full accessibility for service.*
- *Reliable convection cooling.*
- *Class H insulation on magnetics.*



SPECIFICATIONS: E Series Conventional UPS

Power Rating	OUTPUT (1 Ø) Voltage AC①	OUTPUT (1 Ø) Current Full Load	INPUT Battery Voltage②	INPUT Line Voltage	INPUT Phase	Approx. Weight (Lbs.)	Size (Inches) H x W x D	UPS Model Number
1.0 kVA	120	8.3 AMPS	72	120	1	125③	10.5 X 19 X 20.5③	UP1.0E072-1-1-CDLTW
5.0 kVA	120	42 AMPS	120	240	1	1,400	75 X 36 X 30	UP5.0E120-3-1-CDLTW
7.5 kVA	120	63 AMPS	120	240	1	1,750	75 X 36 X 30	UP7.5E120-3-1-CDLTW
10 kVA	120	83 AMPS	120	240	3	2,150	75 X 48 X 30	UP10.0E120-5-1-CDLTW
15 kVA	120	125 AMPS	120	240	3	2,900	75 X 66 X 30	UP15.0E120-5-1-CDLTW
20 kVA	120	167 AMPS	120	480	3	3,500	75 X 72 X 30	UP20.0E120-6-1-CDLTW

① All models also available with 240 Volt output. ② Battery back-up time specified by customer. ③ UPS Module only. Size and weight for By-Pass and Battery Modules depend on configuration selected.

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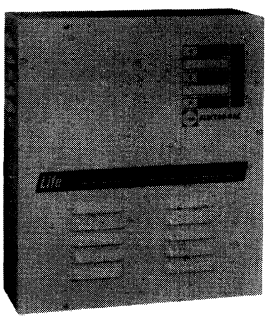
Lifeline® Uninterruptible Power



Always on-line with regulated, clean power.

LIFELINE® UPS systems provide economical, no-break AC power, protecting micro computers from power outages, line noise and voltage fluctuations which cause data losses.

Power Conditioner built-in.

LIFELINE delivers filtered, conditioned, regulated AC sine wave all the time, not just when the utility power is out. Patented circuit gives you full featured UPS at an affordable price.

Quality Features

- *Instant response. No power break.*
- *Up to 90% efficiency.*
- *Capacities from 200 VA or 600 VA.*
- *Maintenance-Free internal battery.*
- *Operates from standard office outlets.**
- *Illuminated status indicators.*
- *Input Voltage: 120 VAC, +10%, −15%, 60 Hz.*
- *Output Voltage: 120 VAC, ±3%, 60 Hz.*

Additional hours of run time can be achieved with external batteries, and/or chargers.

Power Rating	OUTPUT Voltage AC	OUTPUT Current Full Load	OUTPUT Battery Back-Up Time①	OUTPUT Battery Voltage	INPUT Line Voltage	INPUT Phase	Approx. Weight (Lbs.)	Size (Inches) H x W x D	UPS Model Number
LIFELINE® I and II On-line UPS, Sine wave output. *U.S. Patents 3,229,111 & 3,991,319.*									
200 VA	120	1.6 AMPS	7 Min.	12	120	1	62	20 X 16 X 6.5	M95-200
600 VA	120	5.0	15	48	120	1	140	24 X 20 X11.5	M95-600

① At full load.

INVERTERS

Sinewave, solid state control circuitry, special design to assure excellent regulation, low harmonics, line synchronization. Standard19 inch rack or floor mounting. Available with optional electromechanical or static transfer switch.

STATIC TRANSFER SWITCHES

Designed to automatically transfer the load to the secondary power source within 4 ms of the primary power source failure. Manual by-pass switch and output voltage regulator available. Rack or floor mounting. 0.5 kVA to 20 kVA.

DISTRIBUTED PRODUCTS/ON-LINE UNINTERRUPTIBLE POWER SYSTEMS

POWER RATINGS	INPUT VOLTAGE	INPUT FREQ.	OUT PUT VOLTAGE	OUT PUT FREQ.	OUT PUT (RMS) CURRENT	INTERNAL BATTERY BACK-UP FULL LOAD
500 VA, 750 VA, 1000 VA Ⓐ⑦	120, 1Ø	60/50 HZ ①	120, 1Ø ④	60/50 HZ ②	4.2 A, 6.3 A, 8.3 A	10 MIN ③
2 KVA, 3 KVA, 5 KVA Ⓑ⑤⑦	120 208/240, 1Ø	60/50 HZ	120 ④ 208, 240 1Ø	60/50 HZ ②	16.7 A, 25 A, 41.7 A	10 MIN ③

Ⓐ 14.75" H x 7.12" W x 18.5" D 55-70 LBS. Ⓑ22.8" H x 9.8" W x 22.8" D 187 LBS, 27.6" H x 11.6" W x 27.6" D 264 LBS, 29.5" H X 15.0" W X 27.6" D 452 LBS.
① 47.5-63 HZ ②JUMPER SELECTABLE ③ADDITIONAL BACK-UP TIME AVAILABLE; MAINTENANCE FREE BATTERIES
④ WAVEFORM: SINEWAVE, PWM, LESS THAN 3% THD ⑤AS/400Ⓡ INTERFACE; RS 232, ASCII OPTIONAL ⑥EXTERNAL BATTERY CABINET
⑦ UL LISTED, IEEE 587, FCC CLASS A.

7.5 KVA, 10 KVA, 15 KVA	208/240V, 1Ø	60/50 HZ	208/120V 1Ø④ 240/120V 1Ø	60/50 HZ	36A, 48A, 72A	10 MIN ③
20 KVA, 30 KVA, 40 KVA, 50 KVA, 75 KVA	208, 220, 1Ø 415, 208, 480, 600, 3Ø	50 OR 60 HZ	208, 240, 1Ø 240/415, 3Ø 277/480, 3Ø 280/120, 3Ø	50 OR 60 HZ	DEPENDS ON NUMBER OF PHASES/OUTPUT VOLTAGE	10 MIN ③

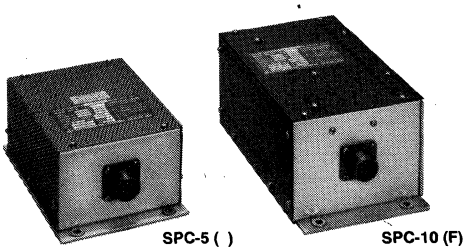
K.G.S. electronics, inc.

kgs electronics A GAR Enterprises Co.

Dept EM • 2029 North Lincoln Avenue • Pasadena, California 91103 • Telephone (818) 798-0786

TSO'D 400 Hz STATIC INVERTER

The KGS ELECTRONIC'S static inverter utilizes solid state circuitry to convert 28 VDC to 115 VAC, 400 Hz sine wave power. Design features include sine to sine or square to sine wave power conversion permitting lightweight and reliable operation.



SPC-5 ( ) SPC-10 (F)

GENERAL SPECIFICATIONS

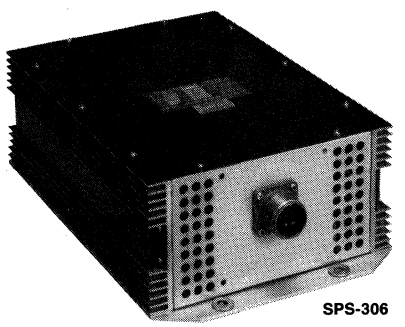
Input Voltage:	20 to 32 VDC
Output Voltage:	115 VAC and/or 26 VAC
Phase/Waveform:	Single/Sine Wave
Frequency:	400 Hz ± 1%
Ampl. Distortion:	Less than 7% (3% typical)
Power Factor:	0.8 to – 0.95
Input Overvoltage:	Operates up to 37 VDC input while supplying full rated VA output power. Output voltage under this condition is 115 VAC + 5%, – 7%
Input Transient:	Withstands transients of 88 volts lasting 1 millisecond on the 28 VDC input line
Overload & Short-Circuit Protection:	Withstands transient damage or degradation load exceeding 150% of rated output to an output dead short. Inverter delivers rated output on removal of above condition
Altitude:	45,000 ft.
Temperature:	– 65°F to + 160°F (– 55°C to + 71°C)
Humidity:	Tested to greater than 95% for 10 days, temperature was cycled between 75°F to 160°F
Environmental:	Meets RTCA Paper DO-160 Env. Cat. D2BREXXXXSXBBBA

SPC-SERIES SPECIFICATIONS

MODEL	OUTPUT VOLTAGE VAC/VAC	OUTPUT POWER VA 115/26/5	INPUT CURRENT ADC	EFFICIENCY PERCENT TYPICAL	FEATURES	WEIGHT LBS. (KG.)	SIZE (INCH) W x L x H
SPC-5( )	115/26	50/30	2.6	67 to 72	PWM to SINE	3.0 (1.3)	4.1 x 6.5 x 2.7
SPC-5(B)	115/26	50/30	2.7	67 to 72	Fault Monitor	3.1 (1.4)	4.1 x 6.5 x 2.7
SPC-10( )	115/26	100/60	4.8	75 to 78	PWM to SINE	5.2 (2.4)	4.5 x 8.3 x 3.5
SPC-10(F)	115/26	250/150	10.6	82 min.	Phase Lock	5.3 (2.3)	4.5 x 8.3 x 3.5
SPC-10(H)	115/26	350/150	16	80	PWM to SINE	5.5 (2.5)	4.5 x 8.3 x 3.5
SPC-30(A)	115/26	300/75	16	70	SINE to SINE	7.6 (3.5)	6.0 x 11.0 x 3.2
SPC-38(B)	115/26	375/75	16	84	PWM to SINE	8.0 (3.6)	6.0 x 11.0 x 3.2
SPC-60(A)	115/26	600/125	31	70	SINE to SINE	14.0 (6.4)	7.7 x 12.0 x 4.0
SPC-60(E)	115/26	750/150	38	70	SINE to SINE	14.2 (6.5)	7.7 x 12.0 x 4.0
SPC-75(B)	115/26/5	750/150/30	32	83	PWM to SINE	14.0 (6.4)	8.0 x 12.0 x 4.0
LC-1000	115/26	1000/150	42	85	PWM to SINE	12.5 (5.7)	8.0 x 12.0 x 4.0

TSO'D 60 Hz/50 Hz STATIC INVERTER

These inverters are particularly applicable as a source of 60 Hz power for the operation of Projectors, Tape Records, TV systems, Typewriters, on Aircraft that have a 28 Volt DC electrical system. For applications requiring greater power, these inverters can be paralleled for higher output.
Inverters available in various voltages, frequency and power are listed in the table below.



SPS-306

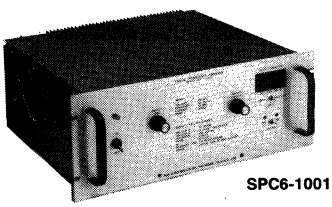
GENERAL SPECIFICATIONS

Input voltage:	1. 28 VDC ± 2 Volts, 14 VDC for SPS-316 2. Withstands 88 Volt Transient for 1 millisecond
Power Factor:	0.8 to 1.0
Amplitude Distortion:	Less than 7%
Wave Form:	Sine
Phase:	Single
Short-Circuit:	Withstand for 1 minute or longer
Temperature:	– 65°F to + 160°F (– 55°C to + 70°C)
Altitude:	45,000 ft.

MODEL	OUTPUT				INPUT		WEIGHT	SIZE (INCH)
	VOLTAGE	POWER VA	WAVESHAPE	FREQ. Hz	VOLTS	AMPS	LBS. (KG)	W x L x H
SPS-206	115 VAC	200	SINE	60 ± 1	28 VDC	10.5 DC	14.5 (6.6 Kg)	7¾ x 12 x 4
SPS-306B	115 VAC	375	SINE	60 ± 1	28 VDC	18.5 DC	18.0 (8.2 Kg)	7¾ x 12 x 4
SPS-3052	230 VAC	270	SINE	50 ± 1	28 VDC	15.8 DC	18.0 (8.2 Kg)	7¾ x 12 x 4
SPS-316	115 VAC	300	SINE	60 ± 1	14 VDC	32.0 DC	18.0 (8.2 Kg)	7¾ x 12 x 4
LS-1000	115 VAC	1000	SINE	60 ± 1	28 VDC	42.0 DC	11.0 (5.0 Kg)	8 x 12 x 4
SPS-750	115 VAC	750	CLIPPED SINE	60 ± 1	28 VDC	33.0 DC	21.0 (9.55 Kg)	7¾ x 14 x 4
SPS-1607	115 VAC	1200	CLIPPED SINE	60 ± 1	28 VDC	64.0 DC	25 (11.5 Kg)	7¾ x 14 x 4

FREQUENCY CHANGER
MODEL SPC-6-( ) SERIES 50 to 60 Hz to 400 Hz

KGS ELECTRONICS' solid state frequency changer converts 115 VAC 50 to 60 Hz to 115 VAC 400 Hz sine wave power. These frequency changers are suitable for use on test benches or labs to check radars, compasses, gyros, synchros, fuel flow gauges, etc. SPC-6-750 is single phase output. SPC-6-1000-3φ is three (3) phase output. Output is monitored via analog meter and is adjustable from 105 to 126 VAC line to neutral. Amplitude distortion is typically 2%.
For SPC-2250-3pH the input is 3 phase 47 to 440 Hz and the output is 3 Phase WYE 400 Hz fixed voltage and frequency.



SPC6-1001

MODEL	*INPUT	OUTPUT OUTPUT VA	OUTPUT FREQUENCY (ADJ.)	SIZE (INCH) W x L x H	WEIGHT (LBS.)
*SPC-6-750A	115 VAC 50 to 60 Hz	115 VAC/750 VA, 26 VAC/500 VA	400 Hz ± 20	19 x 13 x 7	30
*SPC-6-1001	115 VAC 50 to 60 Hz	115 VAC/1000 VA, 26 VAC/250 VA (ADJ. 0–130 VAC)	400 Hz ± 50	19 x 17 x 7	34
*SPC-6-1000-3pH	115 VAC 50 to 60 Hz	120/208 L-L/1000 VA	400 Hz ± 20	19 x 13 x 7	36
SPC-2250-3pH	115/200 or 230/400 VAC 57 to 440 Hz	120/208 WYE/2250 VA	400 Hz	19 x 17 x 10½	71

*For 115/230 VAC, 50/60 Hz DUAL INPUT MODEL, ADD SUFFIX TO "C". EXAMPLE SPC-6-750C.

KIK AC SOURCES

AC Product Qualification Testing

Via GPIB or Local Remote Control • Full Talker/Listener

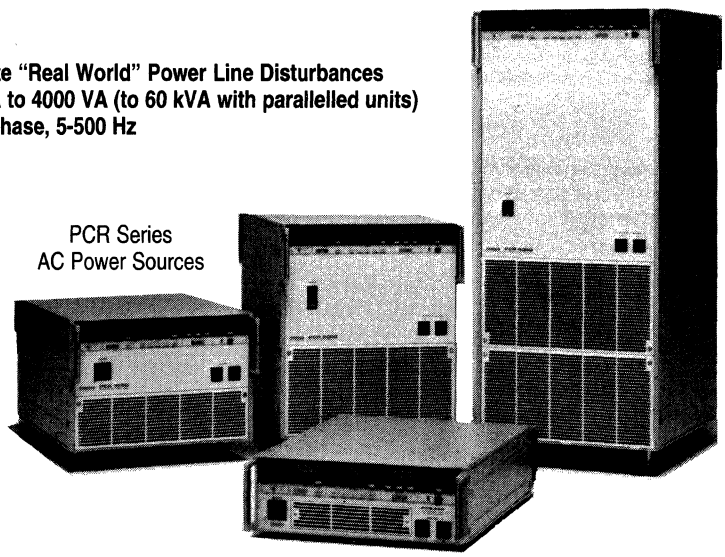
Applications:

Production/engineering/environmental testing
MIL-Std testing
Burn-in program cycling
Aircraft power simulation
Power line disturbance simulation
Frequency testing

For:

All electronic systems
Uninterruptible power supplies
AC motors
AC-DC power supplies
Office equipment
Computers
Appliances

Emulate "Real World" Power Line Disturbances
500 VA to 4000 VA (to 60 kVA with paralleled units)
Multi-phase, 5-500 Hz

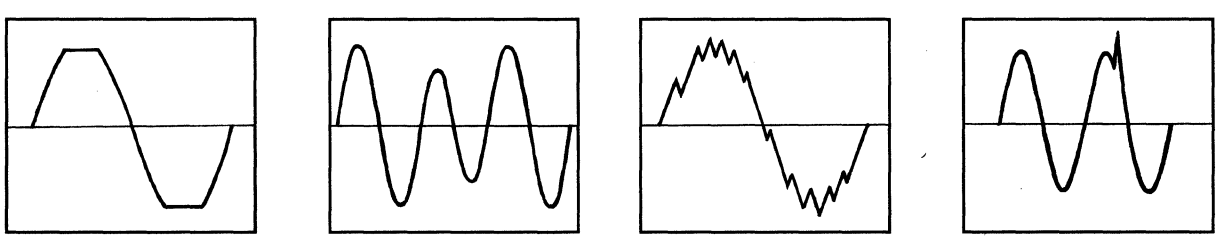


PCR Series
AC Power Sources

CAN BE USED AS A TRUE LINEAR POWER AMPLIFIER
Also — Auxiliary Input, Power Amplifier, For Any AC Signal Source

Features:

- GPIB compatibility
- Total programmability from remote control via IEEE-488 or RC01-PCR for steady state and transient control and display of RMS volts, amps, watts, VA and frequency
- 99 step memory for repetitive tests
- Crystal controlled digital waveform synthesizer
- Remote function expansion - power supply start phase, voltage rise and fall times, voltage fluctuation times, power recovery times, fluctuation starting polarity
- Program phase lead and lag
- Output frequency stability $\pm 5 \times 10^{-5}$
- Sync to input voltage is selectable and fully isolated from output voltages
- <1% total harmonic distortion
- 0.2% load regulation, 0.1% line regulation
- 50 microsec. output voltage response
- Field parallel slave units
- Load and power source protection - overvoltage, overheat, overload
- Quiet operation
- For 19" rack mounting



"We're Not Riding On A Reputation . . . We're Making One"

Specifications subject to change without notice

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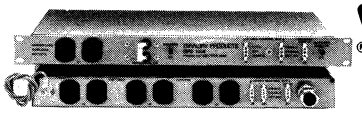
SINGLE PHASE DISTRIBUTION UNITS

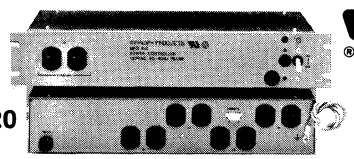
MPD-100R



120V, 1φ, 15/20/30A

- 120V, 1φ, 15/20/30A Breaker
- 2 Unswitched Face Panel Outlets
- 6 Switched Rear Panel Outlets
- Gold Zinc Finish w/Black Legend

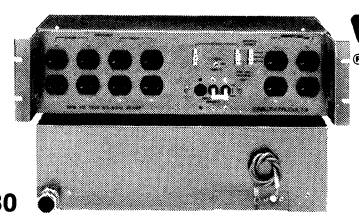
MPD-110/220 2010



120, 240, 120/240V

- 120V, 1φ, 15A Breaker
- 2 Face Outlets, 8 Rear Outlets
- Available with Remote ON/OFF (6 Switched Outlets On Rear)
- Gold Zinc Finish w/Black Legend

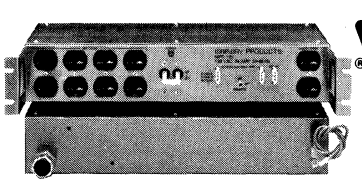
MPD-115/230



115/230V, 1φ, 30/20A

- 115V, Dual 15A Breaker or 230V, 20A Breaker
- 12 Outlets on Face Panel
- Available with Remote ON/OF (8 Switched Outlets and 4 Unswitched Outlets (On Face Panel)
- Gold Zinc Finish w/Black Legend

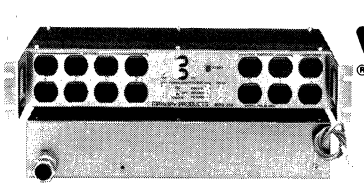
MPD-125



120V, 1φ, 30A

- 120V, 1φ, Dual 15A Breakers (30A Total)
- Standard with Remote ON/OFF (2 Unswitched Face Panel Outlets) (8 Switched Face Panel Outlets)
- Gold Zinc FInish w/Black Legend

MPD-250



240V, 1φ, 20A

- 240V, 1φ, 20A Breaker
- Standard with Remote ON/OF (2 Unswitched Face Panel Outlets) (12 Switched Face Panel Outlets)
- Gold Zinc Finish w/Black Legend

Complete Power Distribution and Control For Rack Mount Systems

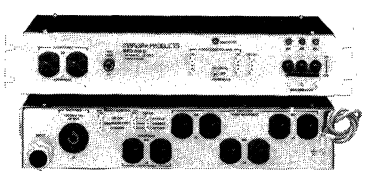
Marway power controllers are a convenient solution for power distribution in rack mount systems. The power controller provides a single point of entry for AC power to the rack. EMI filtering, transient supression and overload protection support the entire rack. Power distribution outlets furnish AC to each system component in the rack. Remote ON/OFF control allows system power up from a single system switch.

Warranty

Marway provides a 10-year limited warranty on all AC power distribution equipment, with a pass-through provision through the OEM to the end user.

THREE PHASE DISTRIBUTION UNITS

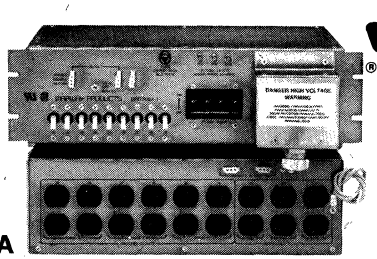
MPD-208B



120/208V, 3φ, 15A/φ

- 120/208V, 3φ, 15A/φ (45 total)
- Remote ON/OFF Control (Six Switched 1φ Outlets) (Four Unswitched 1φ Outlets)
- ON/OFF Control Access Front & Rear

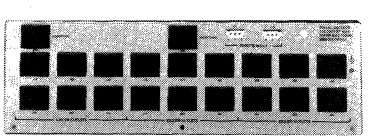
MPD208A



120/208V, 3φ, 30A/φ

- 120/208V, 3φ, 30A/phase breakers
- Remote ON/OFF Control (12 switched outlets for ON/OFF control) (6 unswitched outlets for auxiliary equipment)
- 15A branch breaker for each duplex

Alternate IEC Receptacle Rear Panel for MPD-208A



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OVERLOAD PROTECTION • REMOTE CONTROL

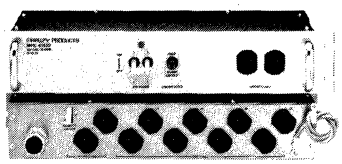
Other Standard And Custom Power Products From Marway

Over 300 models of power controller and power supply products have been built by Marway Products. UL/CSA/TUV approved models are available. Phone for our catalogs covering our standard AC power controllers, and showing a selection of the many custom units we have developed for other customers.

Quality

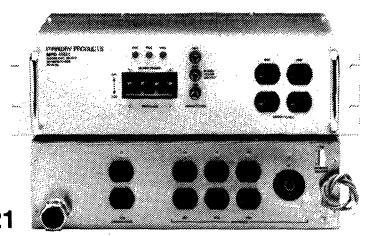
Inspection and test equipment to meet MIL-I-45208A and MIL-C-45662A. All components UL, CSA or VDE listed.

CUSTOM DISTRIBUTION SYSTEMS



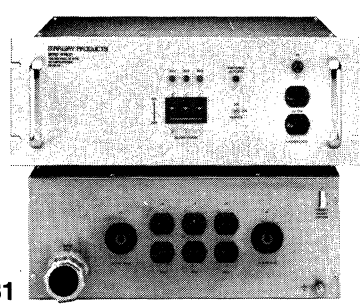
MPD-41620 **120V, 1φ, 30A**

- 19″ rack mt., 3.5″ high × 6″ deep
- Gray #26408–Fed Std. 595 Finish
- Magnetic Circuit Breakers
- 30A High Performance EMI Filter
- Optional 24Vac Remote ON/OFF



MPD-41621 **120V/208V 3φ, 30A/φ**

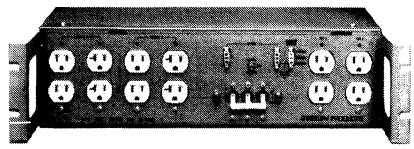
- 19″ rack mt., 5.25″ high × 8″ deep
- Gray #26408–Fed Std. 595 Finish
- Magnetic Circuit Breaker
- 30A/φ, 3φ EMI Filter
- Optional 24Vac Remote ON/OFF



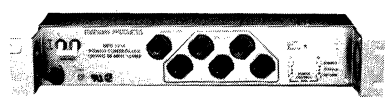
MPD-41631 **120/208V 3φ, 50A/φ**

- 19″ rack mt., 7″ high × 12″ deep
- Gray #26408–Fed Std. 595 Finish
- 60A/φ EMI Filter
- Optional 24Vac Remote ON/OFF

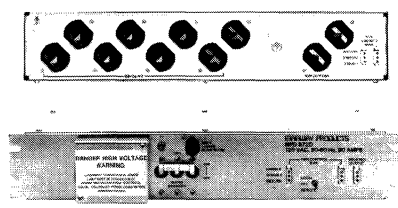
DEC COMPATIBLE SYSTEMS



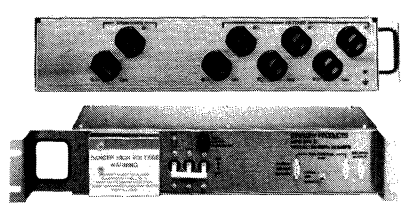
MPD-861 A, B, C
Direct replacement for the DEC Model 861. Complete mechanical, electrical and DEC bus control compatibility.



MPD-871 A, B
Direct replacement for the DEC Model 871. The MPD-871 offers complete mechanical, electrical and DEC bus control compatibility.

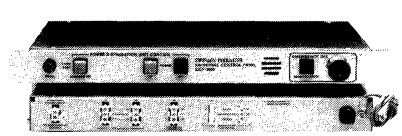


MPD-872 C, D, E
Direct replacement for the DEC Model 872. Offers complete mechanical, electrical and DEC bus control compatibility.



MPD-874 A, B, D, E
Direct replacement for the DEC Model 874. Complete mechanical, electrical and DEC bus control compatibility.

UNIVERSAL CONTROL PANEL



UCP-3000 — COMPLETE POWER CONTROL FOR YOUR SYSTEM. Compatible with any Marway MPD power distribution unit which has the remote ON/OFF feature.

FUNCTIONS:

- System Power Breaker ON Indicator
- Control Panel Lamp/Alarm Horn Test
- Power ON/OFF Control & Indicator
- Emergency Power Off Control
- EPO Indication and Reset
- EPO Alarm Horn (Optional)

MARWAY
PRODUCTS INC.
311 No. Clara Street, Santa Ana, CA 92703 **Call Toll Free: 1-800-4MARWAY** FAX: 714-973-2931 Phone: 714-973-1800

NOVA ELECTRIC
DIV. TECHNOLOGY DYNAMICS, INC.
100 SCHOOL STREET
BERGENFIELD, NEW JERSEY 07421
FAX 201-385-0702

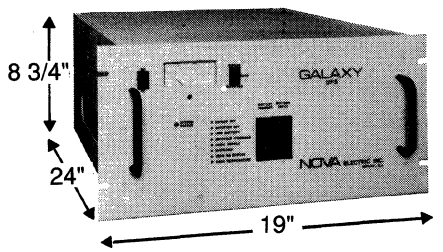
201-385-0500 / 201-661-3434

UPS, INVERTERS, FREQUENCY CONVERTERS

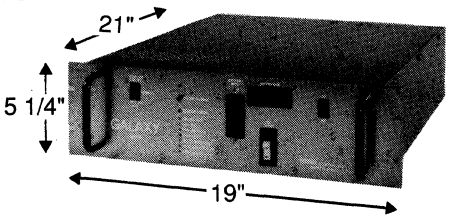
NOVA ELECTRIC, CORP. – *Over 20 Years Experience in AC Power Applications and Solutions*

RACK MOUNT ON-LINE UPS SYSTEMS

1KVA to 5KVA



2,3 & 5KVA UPS



1 & 1.5KVA UPS

COMPACT RACK-MOUNT SYSTEMS

NEW

- 2, 3, & 5 KVA Units: 8¾" High
- 1 & 1½ KVA Units: 5¼" High
- 1 & 1½ KVA Units include 10 minute battery back-up
- Additional battery packs in 7" High racks.

RELIABLE

- MTBF: 30,000 Hrs
- MTTR: Less than 30 Minutes

MILITARY DESIGNS

- MIL-STD-810D
- MIL-STD-1399
- MIL-STD-461C for Class 4A Equipments
- EMP Protection
- Operate from field generators

OEM DESIGNS

- International models automatically accept common global voltages & frequencies
- Can fit in *your* computer cabinet!

GALAXY™ UPS SYSTEMS HAVE BEEN SELECTED BY MAJOR DEFENSE CONTRACTORS AND OEM's FOR CRITICAL TACTICAL AND COMMERCIAL PROGRAMS

GALAXY™ CABINET MODEL UPS SYSTEMS

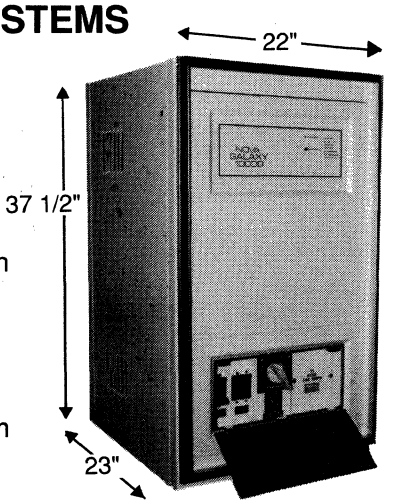
3KVA TO 10KVA

Galaxy UPS systems include all the features that usually cost you much more. NO SURPRISES!

Supply uninterrupted conditioned, transient-free power to computers, process control equipment, emergency lighting and communications systems.

Employ modern PWM transistor technology. Nova systems feature high efficiency and quiet operation.

- No limit on back-up time
- Backed by world wide service
- Smallest 3-10KVA cabinet models available
- Cabinet models include up to 60 min. internal battery back-up
- Three phase input available
- Small
- Casters
- Receptacle Panels
- Maintenance Bypass Switch
- Front access controls
- Up to 60 min. internal no maintenance battery system
- Proven PWM technology
- Up to 90% efficient



GALAXY 3,5,7.5,10, KVA

NOVA ELECTRIC
DIV. TECHNOLOGY DYNAMICS, INC.
100 SCHOOL STREET
BERGENFIELD, NEW JERSEY 07421
FAX 201-385-0702

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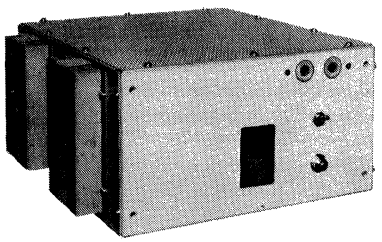
UPS, INVERTERS, FREQUENCY CONVERTERS

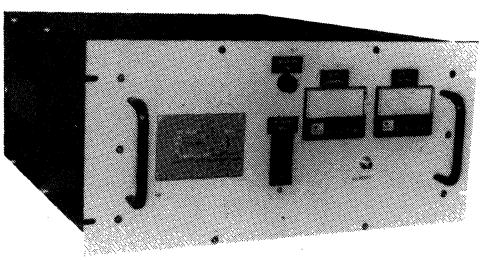
NOVA ELECTRIC, CORP. – *Over 20 Years Experience in AC Power*

Applications and Solutions

SOLID STATE SINE WAVE INVERTERS

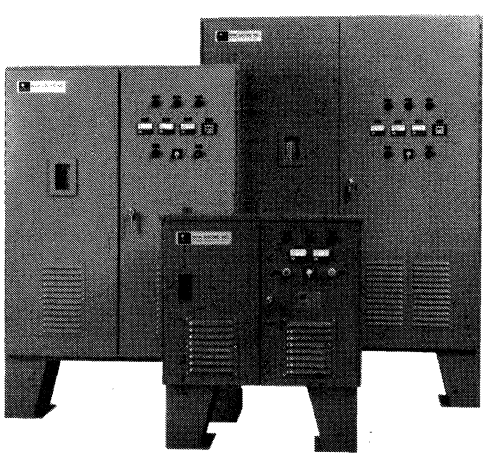


- Input from 10 VDC to 800 VDC
- Output power: 125VA to 90KVA
- 12 VDC inverters for mobile use
- 24 VDC inverters for communications and security systems
- 48 VDC inverters for TELECOMMUNICATIONS
  .5KVA to 3KVA
  Optional solid state transfer switch
- 125 VDC inverters for electric utilities
- 240 VDC inverters for steel mills
- 600 VDC inverters for rapid transit
- Rated for operation to 50°C.



1KVA to 5KVA

SOLID STATE SINE WAVE FREQUENCY CONVERTERS



- 50 Hz, 60 Hz, 400 Hz Output
- Single Phase from 125VA to 15KVA
- Three Phase from 5KVA to 120KVA
- 400 Hz systems for Aviation and Avionics
  Up to 96% Efficiency
  Self Diagnostics
  Paralleling
- Rated for continuous operation at 100% loading
- Input Frequency Range 47-440 Hz
- Operate from field generators
- All output voltages in use anywhere in the world.

7.5KVA to 60KVA

High Performance AC Power Sources

PACIFIC POWER SOURCE CORP.

AC to AC Converters for Power Test Applications, High Quality Laboratory Power, and UPS Requirements

PAGE 1

- **Manual and Programmable AC Test Power up to 500kVA**
- **20 - 5000 Hertz Frequency Changers**
- **Precision Lab Power**
- **High Reliability UPS Equipment**

Product Line Overview -- Pacific Power Equipment covers the range from 250VA to 625kVA. All of Pacific's products feature excellent load regulation, fast response to load transients and very low waveform distortion. The benefit of this performance is the ability to supply high quality power to loads that utilize high frequency switching regulators or multiple pulse rectification. Pacific equipment is unconditionally stable into any power factor load. Each phase is independently regulated and has no load balance restrictions.

Pacific Equipment Series

Each equipment series has application capabilities based on technology and design. For example, Pacific's G-Series is highly modularized, flexible, field expandable, and is serviceable with absolutely minimum spares or logistic support. When driven by an internally mounted 301-E Transient/Signal Generator, G-Series Test systems are unsurpassed in the Power Range of 6-90kVA. Tables I and II provide assistance in selecting the best series for your application. Please call your Pacific Representative or the Factory direct if you would like to discuss your requirements.

TABLE I - Key Specifications By Series

	Power Range (kVA)	Output Freq. (Hz)	Output Reg. (%)	Transient Responge (Microsec.)	Harmonic Distortion (%)
Programmable Test Power					
3120-3600 LN-Series	50-500	50-500	1.0	<250	1.0
330-3450 G-Series/GO Modules	6-90	47-500	0.1	<50	0.75
330-3450 G-Series/GR Modules	6-90	47-5000	0.1	<10	0.75
AT-Series	2.25-6.75	47-5000	0.25	<15	0.75
310-HE	1	20-2000	0.25	<50	1.0
Conditioner & Freq. Changer					
3030 MR-Series	15-30	25-500	1.0	<250	1.0
3062-3625 MS-Series	62.5-625	25-500	1.0	<250	2.0
3120-3600 LN-Series	50-500	25-500	1.0	<250	1.0
330-3450 G-Series/GO Modules	6-90	47-500	0.1	<50	0.75
330-3450 G-Series/GR Modules	6-90	47-5000	0.1	<10	0.75
AT-Series	2.25-6.75	47-5000	0.25	<15	0.75
103-345 K-Series	.25-4.5	47-500	0.5	<30	0.75
110 E-Series	1	47-500	0.5	<50	0.75
Uninterruptible Power Source					
3030 UMR-Series	15-30	50-400	1.0	<250	1.0
3120-3600 ULN-Series	50-500	50-400	1.0	<250	1.0
330-3450 UG-Series	6-90	50-400	0.1	<50	0.75

TABLE II - Product Application Selector

Product Application	UPS Product Series			Power Source Product Series								
	UMR	ULN	UG	MR	MS	LN	G/GO	G/GR	AT	HE	K	E
Test Power - GPIB Programmable					X	X	X	X	X	X		
Voltage Converter - Computer, Facility				X	X	X	X	X	X			
High Frequency, Dynamic Load Testing								X	X	X		
Rackmount, Benchtop compatible									X	X	X	X
Frequency Converter - Computer, Facility	X	X	X	X	X	X	X	X				
Frequency Converter - Laboratory								X	X	X	X	X
UPS - Computer Room, Facility	X	X	X									
UPS - Universal, Modular, Field Expandable		X	X									
Parallelable		X	X		X	X	X	X	X			X
Linear Technology			X				X	X	X	X	X	X
Switching Technology	X	X		X	X	X						
Very High Efficiency	X	X		X	X	X						

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FAX:1-714-891-1928

Transient/Signal Generator

PACIFIC POWER SOURCE CORP.

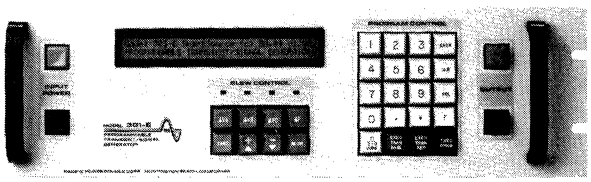
PAGE 2

Applications

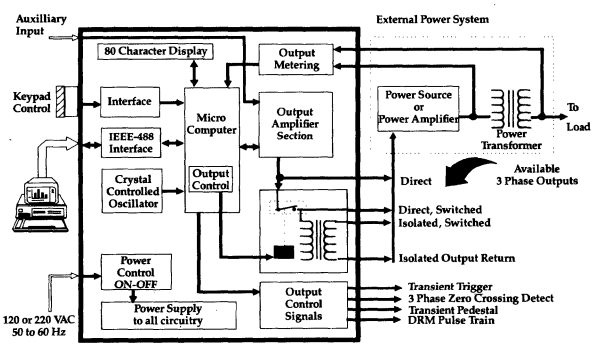
- **Precision 1-3 Phase Signal Source**
- **Mil-Std Transient Simulation**
- **Controller for PPSC G-Series AC Test Power Systems**

Precise, Intelligent Control

The 301-E Transient/Signal Generator is a high performance signal source that provides both steady state and transient AC sinewaves to drive power test equipment.



MODEL 301-E BLOCK DIAGRAM



G-Series AC Test Power

The Model 301-E Generator is located in the top portion of G-Series power source cabinets. This combination provides an AC Test Power System of exceptional flexibility and performance.

Please refer to Page 4 for G-Series system capabilities.

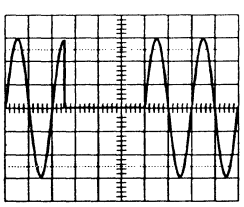
- Single or three phase, switch selectable
- 6 to 90 kVA, field expandable power
- Frequencies from 47 to 5000 Hz
- Full steady state and transient control of AC power

Steady State AC Sinewave Generation

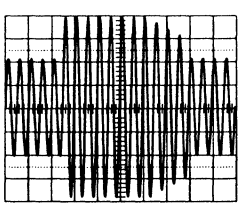
- Programmable via front panel keypad or GPIB
- Output voltage, frequency and phase separation are independently programmable
- Output voltages are ± 10V peak into 600 ohms and are short-circuit protected
- Frequency range is 47 to 5000 Hz - crystal controlled
- Output distortion 0.5% max. from 47 Hz to 2000 Hz
- Output monitoring provided for both primary and secondary voltages
- Operating information displayed on 80 character LCD or may be read via GPIB

Transient AC Sinewave Generation

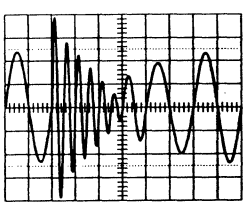
- Transient generation can be either repetitive or single event
- Both envelope and sub-cycle transients are supported
- Transient complexity can include up to 20 individual segments with segment durations from 0 to 30 seconds in 1 ms increments
- Transients can be programmed to begin at any angle relative to phase A
- 301-E provides output signals for transient sync and zero crossing detection
- Complex waveform simulation is accomplished by summing an external signal with the 301-E's internally generated signal via an auxiliary input



Power Dropout



Power Surge



Complex Transient

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2.25 TO 6.75 kVA Test Power Systems

PACIFIC POWER SOURCE CORP.

Flexible AC Power Test Power Systems

PAGE 3

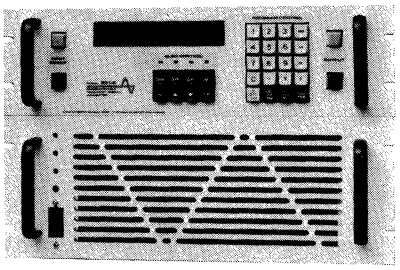
Applications

- **Power Supply Testing**
- **Disturbance Simulation**
- **Burn-in Testing**
- **Mil-Std Testing**
- **Lab/RackPower**
- **Product Qualification**

** NEW PRODUCT **

AT-Series High Performance Programmable Power From 2.25 to 6.75 kVA

These new high performance, high efficiency power sources provide 2.25 kVA of very high quality power in 12.25 inches of rack space. Three units are field parallelable to achieve 6.75 kVA of single or three phase power.



Key features of this equipment are:

- 6:1 Peak current (crest factor)
- Choice of programmable or manual plug-in controller
- Output power forms include:
  - 0-132 VAC direct coupled
  - 0-264 VAC direct or transformer coupled
  - 1, 2, or 3 phase output
- Automatic range changing
- Remote voltage sensing with disable
- No load power factor restrictions for output stability
- Electronic current limiting with auto recovery
- 0.1%/10% line regulation
- 0.25% load regulation
- 0.75% total harmonic distortion
- Output current direct coupled

	Single Phase	Three Phase
Rms	18 amps	6 amps per phase
Peak	100 amps	36 amps per phase
Short, P-P	40 amps	13 amps per phase

- Bandwidth, full power
  - ± 0.1 db, 47-500 Hz
  - ± 0.25 db, 47-5000 Hz
- Less than 15 microsecond response time to a step load transient

Programmable Controller

This programmer provides total control over output voltage, current limit, phase, and frequency from front panel or GPIB BUS up to 99 steady state and one transient program may be stored for execution. Up to 32 programmed wavesets simulating distortion, rectifier loads, squarewaves, etc., are easily accessed for the most stringent test application.

Output Voltage:	0-132/264 VAC ± 1% in 0.1/1.0V steps
Current Limit:	0-64 Amps ± 2% in 0.25A steps
Frequency:	47.00 to 49.99 Hz in 0.01 Hz steps 50.00 to 999.99 Hz in 0.01 Hz steps 1000 to 5000 Hz in 1 Hz steps ± 0.01% ± 1 count
Phase, B&C Ref A:	0-360 degrees in 1 degree steps

Other features include full monitoring, steady state and transient sync signals, and an auxiliary input/phase to superimpose harmonics, etc on the output.

Manual Controller

This controller generates both fixed and manually variable single and three phase sinewaves. The unit also accommodates AM, FM and SUMMED external inputs to drive the power source. Digital meters and a meter select switch provide monitoring of output voltage, current, and frequency.

Output Voltage:	0-132/264 VAC, switch selectable
Master Adjust:	0-full range
Phases B&C:	± 10% around phase A
Output Frequency:	5 position switch 50 Hz fixed 60 Hz fixed 400 Hz fixed 45-500 Hz Var. 450-5000 Hz Var. External input
Accuracy:	0.5%
Display resolution:	0.1 Hz, 45-500 Hz 1 Hz, 450-5000 Hz

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FAX:1-714-891-1928

6-90kVA Ultra High Performance AC Power

PACIFIC POWER SOURCE CORP.

AC Test Power Applications

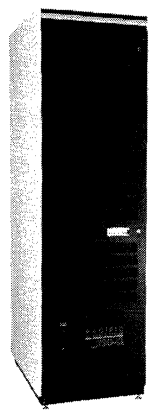
PAGE 4

- **Power Supply Testing**
- **Programmed Burn-in**
- **Power Line Disturbance Simulation**
- **MIL-STD-Testing**
- **Qualification Testing**
- **AC Motor Testing**

The G-Series - The Ultimate in Power System Flexibility

AC power sources utilize high performance linear technology to provide the ultimate in a clean waveform. Key features of this equipment are:

- Modular design/expandable/flexible
- Fail safe circuitry with built-in diagnostics
- Delivers peak currents to 300% of rated capacity
- Fast 10 microsecond response time
- Less than 0.75% total harmonic distortion
- ± 0.1% output regulation at sense point
- No power factor restrictions



Features

- Field parallelable up to 90kVA
- 1Ø/3Ø switch selectable
- Easy installation
- On-line module exchange
- All std. power forms
- Many standard options

Standard Models are complete systems ready for use, including cabinets, oscillators, input circuit breakers and output contactors

MODEL	OUTPUT POWER (kVA)	1 PHASE OUTPUT			3PHASE OUTPUT			CABINETS	
		VOLTS (RMS)	AMPS (RMS)	AMPS (PEAK)	VOLTS(RMS)	AMPS/LEGS (RMS)	AMPS/LEG (PEAK)		
330-G □□□	6	120	48	144	120/208WYE or 208 DELTA	16	48	1 ea. 330-G	
390-G-12 □□□	12	120	96	288	120/208WYE or 208 DELTA	32	96	1 ea. 390-G	Fixed
390-G □□□	18	120	144	432	120/208WYE or 208 DELTA	48	144	1 ea. 390-G	and/or
3120-G □□□	24	120	192	576	120/208WYE or 208 DELTA	64	192	2 ea. 390-G	Variable
3150-G □□□	30	120	240	720	120/208WYE or 208 DELTA	80	240	2 ea. 390-G	Frequency
3180-G □□□	36	120	288	864	120/208WYE or 208 DELTA	96	288	2 ea. 390-G	1 phase or
3210-G □□□	42	120	336	1008	120/208WYE or 208 DELTA	112	336	3 ea. 390-G	3 phase
3240-G □□□	48	120	384	1152	120/208WYE or 208 DELTA	128	384	3 ea. 390-G	User switch
3270-G □□□	54	120	432	1296	120/208WYE or 208 DELTA	144	432	3 ea. 390-G	Convertible
3360-G □□□	72	-	-	-	120/208WYE or 208 DELTA	192	576	4 ea. 390-G	Models
3450-G □□□	90	-	-	-	120/208WYE or 208 DELTA	240	720	5 ea. 390-G	

OUTPUT TRANSFORMER: Add "T" for autoformer with universal tap options

CONTROL OPTIONS: Specify "C" for 301-C, "E" for 301-E, or "F" for 301-F options

POWER MODULES: Specify "O" for 120-GO or "R" for 120-GR modules

Control and Power Options

301-F Universal Control Module

- Provides for selection of three different control options:
  1. Internal oscillator at fixed frequencies of 50, 60, 400 Hz
  2. External signal generator
  3. Input from the 301-E programmable transient/signal generator from 45-5000 Hz
- Provides for selection of the output power form:
  1. Single phase operation or
  2. Three phase operation
- Provides control of the mainframe output contactor to turn output power on and off

301-E Transient/Signal Generator

- Provides total control of the output signal from either the fron panel keypad or from a remote computer via the IEEE bus. Programmable parameters are:
  1. Frequency
  2. Frequency transients
  3. Phase angle separation
  4. Phase transients
  5. Amplitude
  6. Amplitude transients

Power Modules

- 120-GO; Standard modules for applications from 45-500 Hz
- 120-GR; Enhanced modules for applications requiring motor starting, high short circuit current, frequencies to 5000 Hz and fast transient and harmonic reproduction

PACIFIC POWER SOURCE CORP.
15122 Bolsa Chica Street
Huntington Beach, CA 92649
(714) 898-2691
US:1-800-854-2433
CA:1-800-472-8465
FAX:1-714-891-1928

High Performance AC Power Sources

PACIFIC POWER SOURCE CORP.

Frequency Changers, and Power Line Conditioners for

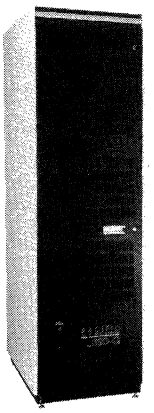
PAGE 5

- **Facility Power**
- **Burn-in Power**
- **Avionics/Marine**
- **Laboratory**

The G-Series - The Ultimate in Linear Power System Flexibility From 6 to 90 kVA

AC power sources utilize high performance linear technology to provide the ultimate in a clean waveform. Key features of this equipment are:

- Modular design/expandable/flexible/easy maintenance
- Fail safe circuitry with built-in diagnostics
- Delivers peak currents to 300% of rated capacity
- Fast 50 microsecond transient response time
- Less than 0.75% total harmonic distortion
- ± 0.1% output regulation at sense point
- No power factor or load balance restrictions
- All standard input power forms
- Many standard options
- Convertible to UPS



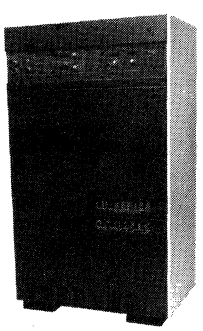
Model	Output Power (kVA)	Cabinets	Output Power Form
330-G	6	1 ea. 330-G	120/208 Direct Coupled.
390G-12	12	1 ea. 390-G	
390-G	18	1 ea. 390-G	
3120-G	24	2 ea. 360-G	All Std. US & INTL Power Forms with Magnetics.
3150-G	30	2 ea. 390-G	
3180-G	36	2 ea. 390-G	
3210-G	42	3 ea. 390-G	
3240-G	48	3 ea. 390-G	1 Phase or 3 Phase User Switch Selectable.
3270-G	54	3 ea 390-G	
3360-G	72	4 ea 390-G	
3450-G	90	5 ea. 390-G	

Systems may be configured to provide fixed, variable or programmable frequency, voltage, and phase. Frequency range - 25 to 500 Hz.

The LN-Series - High Efficiency, High Power Systems From 50 to 500kVA

AC power sources utilize advanced patented solid state switching technology to provide a high quality waveform with excellent regulation 80 ft. or more from the power source location. Key features of this equipment are:

- Modular design/expandable/flexible
- Fail safe circuitry with built in diagnostics
- ± 1.0% NL to FL. Regulation at sense point
- Less that 1% total harmonic distortion
- Fast 250 microsecond transient response time
- No power factor or load balance restrictions
- Fully isolated output
- Full load efficiency - 85-90%
- Convertible to UPS



- Full Digital Instrumentation

Model	Output Power (kVA)	Output Power (kW)	Number of Cabinets	Output Power Form
3120-LN-50	50	37.5	1	
3120-LN-100	100	75	1	120/208 Direct Coupled.
3240-LN-150	150	112.5	2	
3240-LN-200	200	150	2	
3360-LN-250	250	187.5	3	All Std. US & INTL Power Forms with Magnetics.
3360-LN-300	300	225	3	
3480-LN-350	350	262.5	4	
3480-LN-400	400	300	4	
3600-LN-450	450	337.5	5	3 Phase.
3600-LN-500	500	375	5	

Systems may be configured to provide fixed, variable or programmable frequency, voltage, and phase. Frequency range - 25 to 500 Hz.

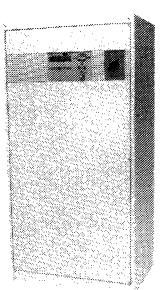
The MR/MS Series - Very High Efficiency, Cost Effective AC Power Systems From 15-500kVA

NEW

AC power sources provide the highest performance available at very competitive costs. This new Series offers the same high quality performance as the LN-Series.

- ± 1% NL to FL regulation
- Less than 1% total harmonic distortion
- Fast 250 microsecond transient response time
- No power factor or load balance restrictions
- Fully isolated output
- Full load efficiency - 88-92%

Up to 10 MS cabinets may be paralleled to provide easy upgrade or downgrade of facility power. MR Series is not parallelable.



- Full Digital Instrumentation

Model	Output Power (kVA)	Output Power (kW)	Number of Cabinets	Output Power Form
3030-MR/0015	15	12	1	
3030-MR/0020	20	16	1	120/208 Direct Coupled.
3030-MR	30	24	1	
3062-MS	62.5	50	1	
3125-MS	125	100	2	All Std. US & INTL Power Forms available with Magnetics
3187-MS	187.5	150	3	
3250-MS	250	200	4	
3312-MS	312.5	250	5	
3375-MS	375	300	6	3 Phase.
3437-MS	437.5	350	7	

MS Systems may be paralleled in 62.5 kVA increments to 625 kVA. Systems provide fixed frequencies from 45-500 Hz.

PACIFIC POWER SOURCE CORP.
15122 Bolsa Chica Street
Huntington Beach, CA 92649
(714) 898-2691
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HE, K, and E Series

Versatile Bench or Rack Mount AC Power Equipment

PACIFIC POWER SOURCE CORP.

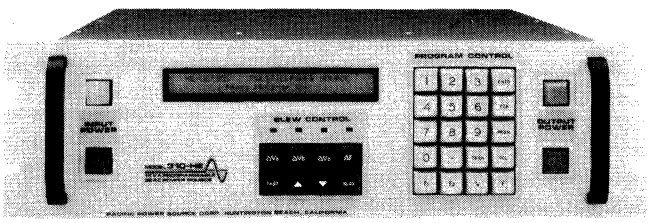
PAGE 6

Applications

- Power Supply Testing
- Bench/Production Test
- Gyro Testing
- Motor Testing
- Power Burn-in
- Motor Controls
- Transient Simulation

The HE-Series With Smart Source™ Interpreter

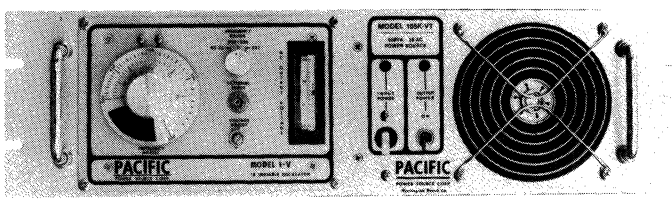
This programmable power source is better by design. High efficiency and superior performance are brought neatly together in a compact package that is competitively priced. Rack mount or benchtop, these 5 1/4" high units combine high power and low profile -- delivering 1000 VA into any power factor load. An IEEE-488 interface enhances application flexibility by providing a variety of talker/listener capabilities which allow the HE to interface just about any ATE setup.



HE, K & E Series Legend

Model	Output kVA	Chassis
110HE - x	1.0	5.25"
310HE - x	1.0	5.25"
1xxK - xx 2xxK - xx 3xxK - xx	.25 - 1.5 .43 - 2.6 .75 - 4.5	5.25/10.5" 5.25/10.5" 5.25/10.5"
110E - xx	1.0 - 3.0	10.5"

R - 0 to 125V output
T - 0 to 250V output
Oscillator type
Product Series
Output power (x100VA)
1 - single phase
2 - three phase DELTA
3 - three phase WYE



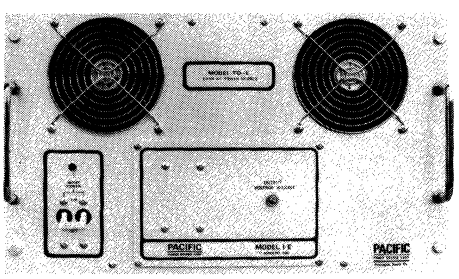
CASE A -- 5 1/4"H x 19"W x 19'D

The K-Series family covers the power range 250 to 4500 VA single and three phase, in lightweight one-man portable units. A variety of plug-in signal generators are available for adaptation to either laboratory variable or fixed parameter OEM applications.

Controller Types

Type	Function	Frequency Rance	Metering	Frequency Control
V	Variable freq.	47 - 500	± 3% analog	Dial. ± 3%
F	Fixed freq.	20 - 2000	± 3% analog	Preset ± .25%

Notes:
1) HE-Series uses its own integrated controller and does not require an optional oscillator.
2) K-Series models are configured in 250 or 750 VA increments. For example a 315K-VR is a three phase WYE model with an output of 1500VA, a variable frequency analog oscillator and 0-125V output.
3) The "E" oscillator listed is compatible only with E-Series equipment.



CASE B -- 10 1/2"H x 19"W x 19"D

The E-Series Units can be paralleled to supply up to 3kVA. The output is fully isolated. Either leg may be grounded. Two types of plug-in oscillators are available to cover fixed, variable, or OEM applications.

PACIFIC POWER SOURCE CORP.
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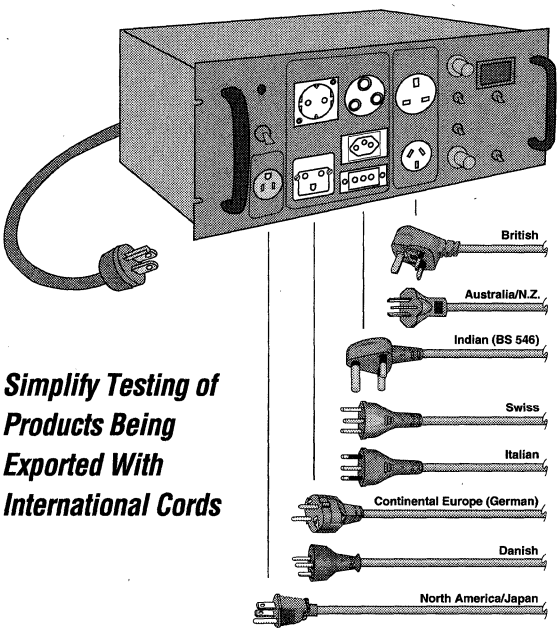
FAX:1-714-891-1928

INT'L power components • see also Sec. 2100 (Connectors, Modules, Int'l. Plugs & Sockets) • 4300 (Fuses) • 5600 (Transformers) • 6000 (Cords)

Interpower™ International Power Source

—test your product before export



Simplify Testing of Products Being Exported With International Cords

The International Power Source provides a low-cost, convenient source of 50 Hz power which is important for testing many products that are exported. At 50 pounds, the International Power Source is sufficiently portable that it can be easily moved between work stations or lab positions as needed. Output power is delivered through one of eight standard international sockets so that products can be conveniently powered during development or just prior to shipment.

Output voltages are adjustable in the 0-250 VAC range. Frequencies can be adjusted in the 47-500Hz range. This flexibility permits testing of products with varying input voltages and frequencies in order to simulate real-world power mains conditions.

The power output capacity of the International Power Source varies by model and depends at least in part on the power factor characteristics of the load. In general, the lower the load power factor, the greater the power capacity of the International Power Source. The power rating on the International Power Source is 750VA or 1500 VA, depending on model.

Three models are available to accommodate U.S. input voltages of either 120V (supplied through a NEMA 5-15P or 5-20P plug) or 230V (supplied through a NEMA 6-15P plug). Dimensions: 19" wide x 7" tall x 19" deep behind the panel (20" deep including handles). Delivery: stock to six weeks; call PCC Customer Service Department for stock level.

SPECIFICATIONS:

Input Voltage:	
#85510500	115 VAC – NEMA 5-15P plug
#85510510	115 VAC – NEMA 5-20P plug
#85510520	230 VAC – NEMA 6-15P plug
Input Frequency:	45 to 65 Hz
Output Voltage:	0 to 130 VAC or 0 to 260 VAC; set from the front panel potentiometer
Output Frequency:	47–150Hz or 150–500Hz; set from the front panel potentiometer
Output VA:	
#85510500	750 VA , single phase
#85510510, 85510520	1 KVA, single phase
RMS Output Current:	
#85510500	130 VAC range: 750 ÷ output volts, 7.5 amps max. below 100 VAC 260 VAC range: 750 ÷ output volts, 5A RMS max. below 200 VAC
#85510510, 85510520	130 VAC range: 1000 ÷ output volts, 10A RMS max. below 100 VAC 260 VAC range: 1000 ÷ output volts, 5A RMS max. below 200 VAC
Monitor Accuracy:	0.25%
Peak Output Current:	2 x RMS (standard models)
Line & Load Regulation:	2% to 100Hz, 3.5% 100-500Hz
Frequency Stability:	0.25%
Efficiency:	75% with full linear load
Harmonic Distortion:	1% maximum into full linear load
Power Factor:	0 to 1
Response Time:	200 µsec with 100% load change
Output Protection:	Automatic peak current limiting; automatic RMS current shutdow; automatic thermal shutdown; automatic shorted output shutdown
Operating Temperature:	-10°C to + 40°C
Storage Temperature:	-40°C to +75°C

Three models accommodate different U.S. input voltages:

#85510500: Interpower™ International Power Source converts North American voltage and frequency (120VAC/60Hz) to international voltages and frequencies, typically 220-240VAC/50Hz, single phase. Digital output monitor displays RMS voltage, current, frequency.

Input voltage: 120VAC/60Hz (supplied through NEMA 5-15P plug)
Output voltage: Variable voltage from 0-260VAC
Output frequency: Switch allows range of 47-150Hz or 150-500Hz
Output capability: 750VA

#85510510: Similar to #85510500 above except input voltage is supplied through a NEMA 5-20P plug; output capability is 1.5KVA, single phase.*

#85510520: Similar to #85510500 above except input voltage is 230VAC supplied through a NEMA 6-15P plug; output capability is 1.5KVA.

** 400Hz input frequency available on special order*

International Power Source includes the following sockets and the standard single-phase voltage and frequency at which they are used:

	For use at	
• Continental Europe CEE 7/7	220VAC*	50Hz
• Australia/New Zealand (Also used in People's Republic of China)	240VAC	50Hz
• British BS 1363	240VAC*	50Hz
• Denmark	220VAC*	50Hz
• India (old British standard BS 546)	220VAC*	50Hz
• Italy 10A	220VAC*	50Hz
• Switzerland	220VAC*	50Hz
• North America NEMA 5-15R (also Japan)	120VAC 100VAC	60Hz 50 & 60Hz

* Note: European standard voltage will be changed from 220V to 230V by 1995.

eem MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

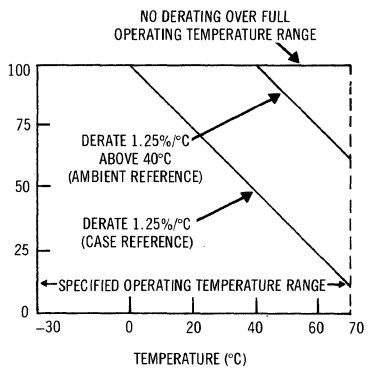


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

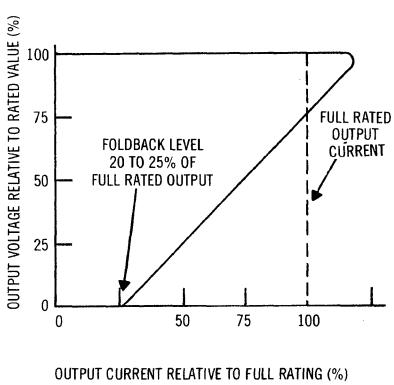


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

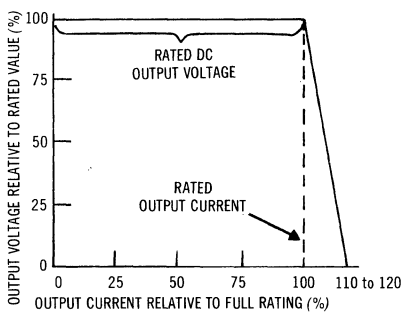


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

Z-LINE® power distribution and control systems.

GENERAL SPECIFICATIONS COMMON TO ALL Z-LINE® POWER DISTRIBUTION AND CONTROL SYSTEMS

TRANSIENT VOLTAGE SPIKE PROTECTION
Multi stage voltage clamping devices have been incorporated for maximum transient protection. 150V A.C. RMS clamping. Transient peak current, 6500 A (8x20 μs). Transient energy to 80 joules (10x1000 μs). Response time approx. 50 nanoseconds.

SPIKE AND SURGE PROTECTION:
LINE TO LINE, LINE TO GROUND, AND NEUTRAL TO GROUND.

RUGGED, 16 A.W.G. STEEL CONSTRUCTION EXCEPT LPC & TPC, 18 A.W.G. STEEL.
Zinc Plated with black silkscreening.

GSA, FSS: 92704-PUL-001
GOV. FSCM #70513
Federal Supply Code for Manufacturers

SAFETY PROTECTION:
Most components.

UL Recognition

CSA Certification

VDE Approval

EMERGENCY SHUTDOWN PROTECTION
Allows easy interfacing with your mechanical, electronic or thermo-switching devices thru the remote power control bus connectors (all but LPC 115 & TPC 115-8.)

EMI/RFI FILTER SPECIFICATIONS

Rated Voltage: 115/250 VAC
Operating Frequency: 50/60 HZ
Operating Temperature: -10° C to 60° C
Dielectric withstanding voltage: 2250 VDC (Line-Case)
(1 minute duration) 1450 VDC (Line-Line)
Maximum Leakage current: .5 mA @ 250 VAC, 60 HZ
(each line to ground)

PC 874 Series, PC 861 Series, PC 125 C-F Series

Typical Common Mode Insertion Loss				
.15MHz	.20MHz	.50MHz	1.0MHz	2.0MHz
20dB	25dB	37dB	46dB	60dB
Typical Differential Insertion Loss				
.15MHz	.20MHz	.50MHz	1.0MHz	2.0MHz
17dB	22dB	32dB	42dB	46dB

PC 726 and PC 300 Series, 3 Phase

Typical Common Mode Insertion Loss				
.15MHz	.25MHz	.50MHz	1.0MHz	2.0MHz
16dB	25dB	40dB	58dB	60dB
Typical Differential Insertion Loss				
.15MHz	.25MHz	.50MHz	1.0MHz	2.0MHz
19dB	23dB	29dB	36dB	50dB

UL file #E94081, CSA FILE #LR63198
TUV FILE #E78003

POWER CONTROL BUS
Mating Plug, AMP #1-480305-0
Mating Contact, AMP #60620-1

OVERLOAD CIRCUIT BREAKER PROTECTION
Precision electromagnetic breaker provides manual switching and opens automatically under overload conditions.

PC 125 A & B, PC 115 A & B, and TPC 8 A & B, TPC 10 A & B

Typical Common Mode Insertion Loss				
.15MHz	.20MHz	.50MHz	1.0MHz	2.0MHz
12dB	18dB	30dB	50dB	50dB
Typical Differential Insertion Loss				
.15MHz	.20MHz	.50MHz	1.0MHz	2.0MHz
8dB	12dB	41dB	42dB	35dB

TPC 115-8 C-F, TPC 115-10/MTD™ C-F and PC 861 Series

Typical Common Mode Insertion Loss				
.15MHz	.20MHz	.50MHz	1.0MHz	2.0MHz
20dB	21dB	25dB	30dB	52dB
Typical Differential Insertion Loss				
.15MHz	.20MHz	.50MHz	1.0MHz	2.0MHz
7dB	8dB	15dB	45dB	60dB

Leakage current at 220 V, 50Hz max. 2x0.2 mA
at 115 V, 60Hz max. 2x0.13 mA

SPECIFICATIONS FOR MODEL NUMBERS: TPC 115-8 A-F, TPC 115-10/MTD™ A-F and PC 115 A & B

MODEL	A	B	C	D	F
A.C. VOLTAGE INPUT	90/135	180/270	90/135	90/135	180/270
HERTZ	47-63	47-63	47-63	47-63	47-63
POLE/WIRE	2/3-G	2/3-G	2/3-G	2/3-G	2/3-G
CURRENT	12 AMPS	12 AMPS	24 AMPS	24 AMPS	24 AMPS
FULL LOAD	1440 VA	2880 VA	2880 VA	2880 VA	5760 VA
CIRCUIT BREAKER	20 AMP	DUAL 20 AMP	DUAL 20 AMP	DUAL 20 AMP	DUAL 20 AMP
FILTER EMI/RFI	20 AMP	20 AMP	30 AMP	30 AMP	30 AMP
OPERATING TEMPERATURE	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C
STORAGE TEMPERATURE	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C
ALTITUDE-MAXIMUM	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.
RELATIVE HUMIDITY	95% MAX.	95% MAX.	95% MAX.	95% MAX.	95% MAX.
POWER CABLE	14/3-9 FT.	14/3-9 FT.	10/3-15 FT.	10/3-15 FT.	12/3-15 FT.
INPUT CONNECTORS-NEMA	5-15P	**	L5-30P	L5-30P	**
MATING CONNECTORS-NEMA	5-15R	6-15R	L5-30R	L5-30R	L6-30R
OUTLETS-NEMA	5-15R	6-15R	5-15R	5-20R	6-15R

**Not provided.
PEI reserves the right to make specification changes without notice. Consult the factory for current information.

PULIZZI ENGINEERING INC.
3260 S. Susan Street, Santa Ana, CA 92704-6865 (714) 540-4229, FAX: (714) 641-9062

PC 115
POWER DISTRIBUTION AND CONTROL SYSTEM

EMI/RFI FILTER
20 Amp, Dual Protection:
Common mode, line to ground.
Differential mode, line to line.

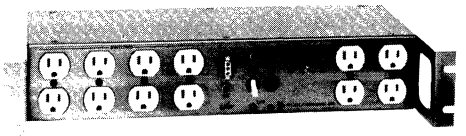
Remote Control
Local Switch (Optional)

12 OUTLETS
8 outlets, switched
4 outlets, unswitched, always "on" for added convenience

POWER CORD
Heavy duty, 9 ft. long.

RACK MOUNTED
Designed to fit standard 19" wide IEC STD. Rack, maximum height only 3½", depth 8⅝". Front panel recessed 2½", with convenient side cut outs for cable routing. Weight: 13 LBS.

PILOT LIGHTS
Power to controller switched circuits on.

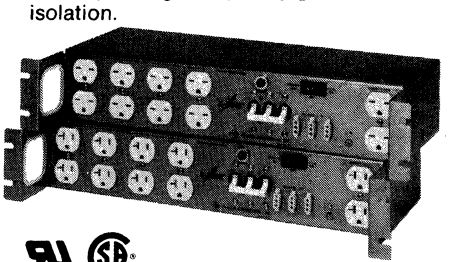


PC 125
POWER DISTRIBUTION AND CONTROL SYSTEM DEC® COMPATIBLE WITH MODEL 871, MODEL 861

10 OUTLETS
8 outlets switched
2 outlets, unswitched, always "on" for added convenience.

Power Cord
Heavy duty, 9 ft. long.

EMI/RFI TRIPLE NOISE PROTECTION
Both common mode and differential mode, plus high frequency ground isolation.

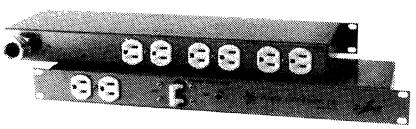


DEC is a trademark of Digital Equipment Corporation

REMOTE POWER CONTROL BUS
3 Remote I/O Connectors for either:
A) Remote Power On/Off
B) Emergency shutdown with a mechanical, electronic or Thermo-switching device.
C) Power-up additional equipment down line with a sequenced time delay.

CHASSIS RACK MOUNTED
Designed to fit standard 19" wide IEC STD. Rack maximum height only 3½", depth 8⅝". Front panel recessed 2½", with convenient side cut outs for cable routing.
Weight: A & B 12 LBS., C-F 16 LBS.

TPC 115-8
POWER DISTRIBUTION AND CONTROL SYSTEM



EMI/RFI FILTER
Dual Protection:
Common mode, line to ground.
Differential mode, line to line.

PILOT LIGHT
Power to Controller switched on.

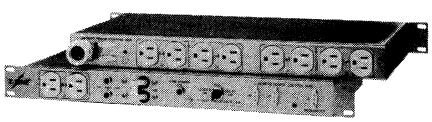
POWER CORD
Heavy duty, 9 ft. long.

RACK MOUNTED
Designed to fit standard 19" wide IEC STD. Rack only 1¾" high, 5" deep.
Weight: A & B 7 LBS., C-F 8 LBS.

TPC 115-10/MTD™
POWER CONTROLLER AND LINE CONDITIONER DEC® COMPATIBLE

RACK MOUNTED
Designed to fit standard 19" wide IEC STD. Rack 1¾" high, 8" deep.
Weight 14 LBS.

10 OUTLETS
8 outlets, switched
(Multiple Time Delay™, standard)
2 outlets, unswitched, always "on" for convenient AC Power requirements.



EMI/RFI FILTER DUAL PROTECTION
Common mode, line to ground.
Differential mode, line to line.

POWER CORD
Heavy duty, 9 ft. A & B, 15 ft. C-F.

PILOT LIGHT
Power to controller switched on.

Time Delay and Multiple Time Delay™ (MTD™) Power Up

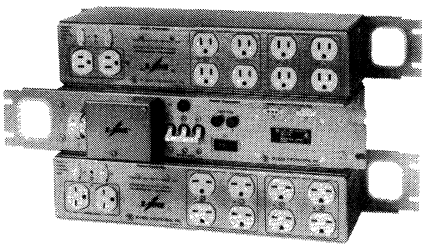
Designed by ***"Z-LINE"*** to provide a four second Time Delay (T.D.) between powering up the switched 1 and switched 2 outlets. You will find this standard on the TPC 115-10/MTD™, PC 874 and PC 861 models.
T.D. is a necessity for those systems with a High Inrush Power problem. The theory behind T.D. is as follows: By allowing the disc drives or other power hungry components in switched 1 to power up and drop down to their proper operating level prior to powering up the components in switched 2 you will avoid power Inrush related problems and expense. Please note that Multiple Time Delay™ (MTD™) is an option that provides a delay between each duplex or any combination of duplexes and remote I/O ports.

PLEASE NOTE: ***"Z-LINE"*** Designs and Manufactures CUSTOM Power Controllers and Line Conditioners to meet your specific engineering requirements.
Multiple Time Delay™ and MTD™ are trademarks of Pulizzi Engineering Inc.

Z-LINE®

PULIZZI ENGINEERING INC.
3260 S. Susan Street
Santa Ana, CA 92704-6865 (714) 540-4229
FAX: (714) 641-9062

PC 874
POWER DISTRIBUTION AND CONTROL SYSTEM DEC® COMPATIBLE WITH MODEL 874



10 OUTLETS
8 outlets switched 2 outlets unswitched always "on" for convenient AC power requirements.

EMI/RFI TRIPLE NOISE PROTECTION
Both common mode and differential mode, plus high frequency ground isolation.

PILOT LIGHTS
Power to controller
Power to switched 1 outlets
Power to switched 2 outlets

TIME DELAY, POWER UP
Time delay, approximately 4 seconds between switched outlets 1 and switched outlets 2, provides sequential power up through the 8 switched outlets (models C., D., E & F.).

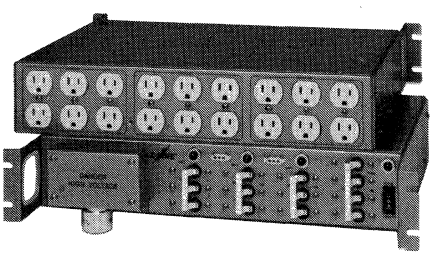
REMOTE POWER CONTROL BUS
4 bussed remote I/O connectors allows for multiple interfacing with your mechanical, electronic or thermo-switching protective controls for emergency shutdown.

CHASSIS RACK MOUNTED
Designed to fit standard 19" wide IEC STD. Rack. Maximum height only 3½" high, 6¾" deep.
Weight: A & B 15 LBS., D-F 18 LBS.

Power Cord
Heavy duty, 15 ft. long

PC 726 and PC 726 MTD™
3-PHASE INPUT, SINGLE PHASE OUTPUT

PENDING



RACK MOUNTED
Only 3½" high, 14½" deep and 19" rack mounted. Recessed 2½" to either the front or back panel. Flush mounted panels are also available.

EMI/RFI FILTER
30 amps per phase, triple noise protection. Both common mode and differential mode, plus high frequency ground isolation.

18 OUTLETS
Located on the back panel. 6 switched receptacles alloted per phase.

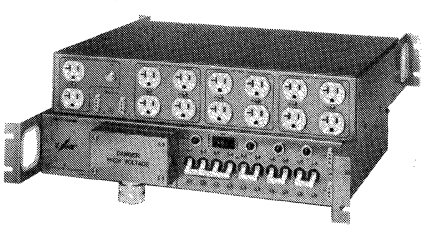
PILOT LIGHT
1 light to indicate "power on" to system. 3 additional lights to indicate "switched power on" to all phases (X,Y,Z).

POWER CABLE
Heavy duty, 15' long.

TIME DELAY, POWER UP
Time delay approximately 4 seconds between phase X, Y and Z provides Multiple Time Delay™ power up through the 18 switched outlets. Optional: The 6 switched outlets per phase can be divided into 4 outlets switched and 2 outlets unswitched per phase, thus providing 1 unswitched Duplex per phase for convenience power.

REMOTE POWER CONTROL BUS
2 bussed remote I/O connectors allows for:
A) Remote Power On/Off
B) Emergency shutdown with a mechanical, electronic or Thermo switching device.
C) Power up additional equipment down line.

PC 300 and PC 300 MTD™
POWER DISTRIBUTION AND CONTROL SYSTEM 3-PHASE



REMOTE POWER CONTROL BUS
4 bussed remote I/O connectors allows for multiple interfacing with your mechanical, electronic or thermo-switching protective controls for emergency shutdown. (3 on both the front & rear panel.)

CHASSIS RACK MOUNTED
Only 3½" high, 14½" deep, the 2nd smallest 19" rack mount 3-phase power controller and line conditioner currently available on the market. Weight: 20 LBS.

EMI/RFI FILTER 30 Amp Per Phase
TRIPLE NOISE PROTECTION. Both common mode and differential mode, plus high frequency ground isolation.

PILOT LIGHTS
3 lights to indicate "power on" to system. 3 additional lights to indicate "switched power on" to all phases (X, Y, Z).

UNIQUE UNIVERSAL MOUNTING
Recessed 2½" to either the front or back panel. We just assemble the mounting brackets to fit your specifications.

14 OUTLETS
Located on the back panel. 4 switched receptacles alloted per phase plus two utility outlets.

Power Cord
Heavy duty, 15 ft. long

OPTIONS

MULTIPLE TIME DELAY™ POWER UP PROTECTION
Time delay, approximately 4 seconds between phase X, Y & Z provides Multiple time Delay™ power up through the 12 switched outlets.

SEQUENCED POWER REMOTE BUS
4 connectors provide independent remote control over each phase as well as sequenced delayed remote control over additional controllers and equipment down line.

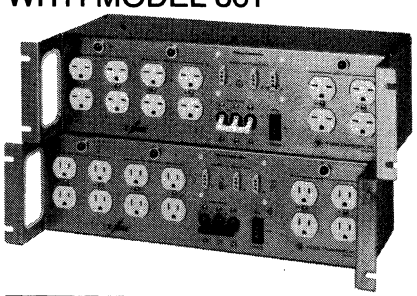
Z-LINE® *PULIZZI ENGINEERING INC.*
3260 S. Susan Street, Santa Ana, CA 92704-6865 (714) 540-4229, FAX (714) 641-9062

SPECIFICATIONS FOR MODEL NUMBERS: PC874A-F/PC 300/PC 726

	PC 874 A-F					PC 300, PC 300 MTD™		PC 726, PC 726 MTD™	
MODEL	A	B	C	D	F	C	D	C	D
A.C. VOLTAGE INPUT	90/135	180/270	90/135	90/135	180/270	120/208	120/208	120/208	120/208
A.C. VOLTAGE OUTPUT	90/135	180/270	90/135	90/135	180/270	90/135	90/135	90/135	90/135
HERTZ	47-63	47-63	47-63	47-63	47-63	47-63	47-63	47-63	47-63
POLE/WIRE	3/2-G	3/2-G	3/2-G	3/2-G	3/2-G	3/4-G	3/4-G	3/4-G	3/4-G
CURRENT-PER-PHASE	12 AMPS	12 AMPS	24 AMPS	24 AMPS	24 AMPS	24 AMPS	24 AMPS	24 AMPS	24 AMPS
FULL LOAD-VOLT AMPS	1440 VA	2880 VA	2880 VA	2880 VA	5760 VA	8640 VA	8640 VA	8640 VA	8640 VA
CIRCUIT BREAKER-MASTER	20 AMP	20/20 AMP	20/20/30 AMP	20/20/30 AMP	20/20/30 AMP	4 POLE,30 AMP	4 POLE,30 AMP	4 POLE,30 AMP	4 POLE,30 AMP
CIRCUIT BREAKER-SECONDARIES						2 POLE,20 AMP	2 POLE,20 AMP	3 POLE,20 AMP	3 POLE,20 AMP
FILTER EMI/RFI	30 AMP	30 AMP	30 AMP	30 AMP	30 AMP	30 AMP/3 PH	30 AMP/3 PH	30 AMP/3 PH	30 AMP/3 PH
OPERATING TEMPERATURE	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C	+5 TO +50°C	+5 TO +50°C	+5 TO +50°C	+5 TO +50°C
STORAGE TEMPERATURE	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +66°C	-40 TO +66°C	-40 TO +66°C	-40 TO +66°C
ALTITUDE-MAXIMUM	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.
RELATIVE HUMIDITY	95% MAX.	95% MAX.	95% MAX.	95% MAX.	95% MAX.	90% MAX.	90% MAX.	90% MAX.	90% MAX.
POWER CABLE	14/3	14/3	10/3	10/3	12/3	10/5	10/5	10/5	10/5
INPUT PLUG-NEMA	5-15P	**	L5-30P	L5-30P	**	L21-30P	L21-30P	L21-30P	L21-30P
MATING RECEPTACLES-NEMA	5-15R	N/A	L5-30R	L5-30R	N/A	L21-30R	L21-30R	L21-30R	L21-30R
OUTLETS-NEMA	5-15R	6-15R	5-15R	5-20R	6-15R	5-15R	5-20R	5-15R	5-20R

**Not Provided

PC 861
POWER DISTRIBUTION AND CONTROL SYSTEM DEC® COMPATIBLE WITH MODEL 861



EMI/RFI TRIPLE NOISE PROTECTION
Both common mode and differential mode, plus high frequency ground isolation.

PILOT LIGHTS
Power to controller
Power to switched 1 outlets
Power to switched 2 outlets

REMOTE POWER CONTROL BUS
3 Remote I/O Connectors for either:
A) Remote Power On/Off
B) Emergency shutdown with a mechanical, electronic or Thermo-switching device.
C) Power-up additional equipment down line.

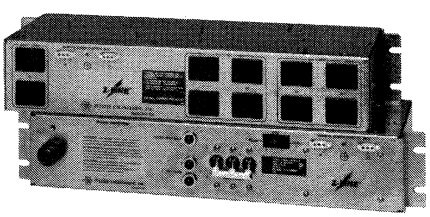
Power Cord
Heavy duty, 15 ft. long

TIME DELAY, POWER UP
Time delay, approximately 4 seconds between switched outlets 1 and switched outlets 2, provides sequential power up through the 8 switched outlets.

CHASSIS RACK MOUNTED
Designed to fit standard 19″ wide IEC STD. Rack 5¼″ high, 8⅝″ deep, front panel, recessed 2½″, with convenient side cut outs for cable routing.
Weight: 18 LBS.

12 OUTLETS
8 outlets, switched
(time delay, standard)
4 outlets, unswitched, always "on" for convenient AC power requirements.

PC 500
DEC® COMPATIBLE



RACK MOUNTED
Designed to fit standard 19″ wide IEC STD. Rack 3½″ high, 6¾″ deep, with a 1″ inset mount. Weight: 18 lbs.

EMI/RFI FILTER
Triple noise protection.
Both common mode and differential mode, plus high frequency ground isolation.

10 OUTLETS
8 outlets switched, 2 outlets unswitched, always "on" for convenient AC power requirements. IEC rated at 10 AMPS/ 250 VAC.

POWER CABLE
Heavy duty, 15′ long.

PILOT LIGHT
Power to controller.
Power to switched 1 outlets.
Power to switched 2 outlets.

TIME DELAY, POWER UP
Time delay approximately 4 seconds between switched outlets 1 and switched outlets 2, provides sequential power up through the 8 switched outlets.

REMOTE POWER CONTROL BUS
4 Remote I/O Connectors for either:
A) Remote Power On/Off.
B) Emergency shutdown with a mechanical, electronic or Thermo switching device.
C) Power up additional equipment.

SPECIFICATIONS FOR MODEL NUMBERS: PC 861 A-G, PC125-A-F

MODEL	A	B	C	D	F	G
A.C. VOLTAGE INPUT	90/135	180/270	90/135	90/135	180/270	125/250
A.C. VOLTAGE OUTPUT	90/135	180/270	90/135	90/135	180/270	90/135
HERTZ	47-63	47-63	47-63	47-63	47-63	47-63
POLE/WIRE	3/2-G	3/2-G	3/2-G	3/2-G	3/2-G	4/2-G
CURRENT	12 AMPS	12 AMPS	24 AMPS	24 AMPS	24 AMPS	24 AMPS
FULL LOAD-VOLT AMPS	1440 VA	2880 VA	2880 VA	2880 VA	5760 VA	2880 VA
CIRCUIT BREAKER	20 AMP	20/20 AMP	20/20/30 AMP	20/20/30 AMP	20/20/30 AMP	20/20 AMP
FILTER EMI/RFI	30 AMP	30 AMP	30 AMP	30 AMP	30 AMP	30 AMP
OPERATING TEMPERATURE	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C	0 TO 60°C
STORAGE TEMPERATURE	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C	-40 TO +70°C
ALTITUDE-MAXIMUM	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.	10,000 FT.
RELATIVE HUMIDITY	95% MAX.	95% MAX.	95% MAX.	95% MAX.	95% MAX.	95% MAX.
POWER CABLE	14/3-9FT.	14/3-9FT.	10/3-15FT.	10/3-15FT.	12/3-15FT.	10/4-15FT.
INPUT PLUG-NEMA	5-15P	**	L5-30P	L5-30P	**	L14-30P
MATING RECEPTACLES-NEMA	5-15R	N/A	L5-30R	L5-30R	N/A	L14-30R
OUTLETS-NEMA	5-15R	6-15R	5-15R	5-20R	6-15R	5-15R

**Not Provided

Z-LINE®

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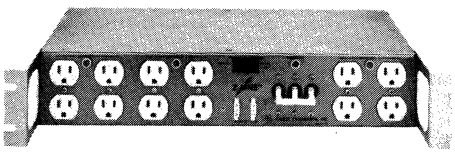
Z-LINE®

AC Power Distribution And Control Systems

DEC is a trademark of Digital Equipment Corporation

PC 585/MTD™ POWER DISTRIBUTION AND CONTROL SYSTEM

DEC® COMPATIBLE



RACK MOUNTED

Designed to fit standard 19″ wide EIA STD. Rack 31½″ high, 10½″ deep.
Weight: 18 lbs.

EMI/RFI FILTER

Triple noise protection:
Common mode and differential mode, plus high frequency ground isolation.

12 OUTLETS

4 outlets for each of the three switched sections.

PILOT LIGHT

Power to controller.
Power to switched 1 outlets.
Power to switched 2 outlets.
Power to switched 3 outlets.

TIME DELAY POWER UP

MTD systems incorporate Multiple Time Delay power up and down between the switched sections. This is approximately 4 seconds between switched outlets 1, 2 and 3 powering up and powering down. 1/MTD systems incorporate Multiple Time Delay power up between the switched sections only. 585 systems without MTD do not incorporate Multiple Time Delay at all. All three switched sections power up at one time.

REMOTE POWER CONTROL BUS

2 Remote I/O connectors for either:
A) Remote Power On/Off.
B) Emergency shutdown with a mechanical, electronic or Thermo switching device.
C) Power up additional equipment.

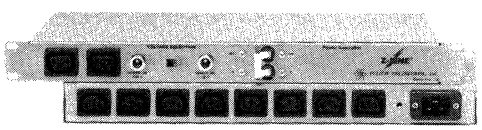
NOTE:
Specifications are listed below for models C through F.

SPECIFICATIONS FOR MODEL NUMBERS: PC 585, PC 585-1/MTD, PC 585/MTD

MODEL	C	D	F
A.C. VOLTAGE INPUT	90/135	90/135	180/270
A.C. VOLTAGE OUTPUT	90/135	90/135	180/270
HERTZ	47-63	47-63	47-63
POLE/WIRE	3/2-G	3/2-G	3/2-G
CURRENT	24 AMPS	24 AMPS	24 AMPS
FULL LOAD-VOLT AMPS	2880 VA	2880 VA	5760 VA
CIRCUIT BREAKER	20/20/30 AMP	20/20/30 AMP	20/20/30 AMP
FILTER EMI/RFI	30 AMPS	30 AMPS	30 AMPS
OPERATING TEMPERATURE	0 TO 60° C	0 TO 60° C	0 TO 60° C
STORAGE TEMPERATURE	-40 TO +70° C	-40 TO +70° C	-40 TO +70° C
ALTITUDE-MAXIMUM	10,000 FT.	10,000 FT.	10,000 FT.
RELATIVE HUMIDITY	95% MAX.	95% MAX.	95% MAX.
POWER CABLE/AWG & LENGTH	10/3 15.0′	10/3 15.0′	12/3 15.0′
INPUT PLUG-NEMA	L5-30P	L5-30P	—
MATING RECEPTICLES-NEMA	L5-30R	L5-30R	N/A
OUTLETS-NEMA	5-15R	5-20R	6-15R

TPC 884 INTERNATIONAL

DUAL VOLTAGE, SWITCHABLE POWER DISTRIBUTION AND CONTROL SYSTEM



■ The IEC Advantage

Equipment can be manufactured utilizing the IEC 320 inlet regardless of final destination.

RACK MOUNTED

Designed to fit standard 19″ wide EIA STD.
Rack 1¾″ high, 5″ deep.
Weight: 8 lbs.

EMI/RFI FILTER

Dual Protection:
Common mode, line to ground.
Differential mode, line to line.

10 OUTLETS

8 on the rear and 2 on the front panel-switched, always on for convenient AC power requirements. IEC 320: rated at 10 AMPS/250VAC (VDE) or 15 AMPS/250VAC (UL/CSA) as well as 15 AMPS/125VAC (UL/CSA)

PILOT LIGHT

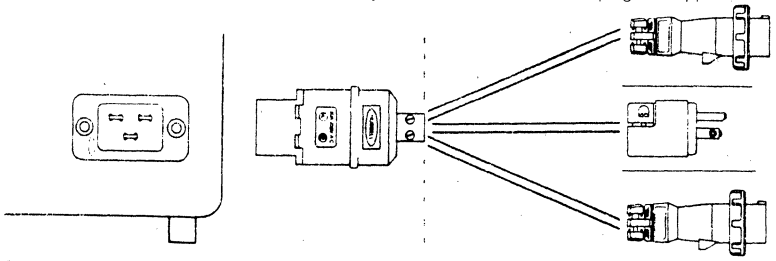
Power available to the 120VAC. System
Power available to the 240VAC. System

VOLTAGE SELECTABLE

Select to operate on 120VAC input: 15 AMP or 20 AMP
Select to operate on 220-240VAC input 15 AMP, 16 AMP or 20 AMP
Please verify that the power input matches what you have selected

NOTE:
Specifications are determined via the input power you provide and the voltage selection switch. Please note the configuarations listed below.

Provided by PEI — Power cable and plug not supplied



Panel Mount Inlet — Detachable Connector — Portable Cord — Detachable Plug

3-Wire 20A. 250VAC. IEC 309 plug for the North American Market.

3-wire 15A. 250VAC. NEMA 6-15P
3-wire 20A. 250VAC. NEMA 6-20P
3-wire 20A. 250VAC. NEMA L6-20P
3-wire 15A. 125VAC. NEMA 5-15P
3-wire 20A. 125VAC. NEMA 5-10P
3-wire 20A. 125VAC. NEMA L5-20P

3-wire 16A. 220-240VAC. IEC 309 plug for the International Market.

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SYMBOLS USED BY INTERNATIONAL REGULATORY AGENCIES

These symbols appear on many electrical/electronic components distributed in the world market. They indicate that a country's standard-setting agency has approved the design of the component and/or a testing agency has approved the performance of the component in meeting the standard. This page lists only those countries that have a *symbol* to represent their authority.

Argentina (IRAM) Instituto Argentino de Racionalization de Materiales

Australia (SAA) Standards Association of Australia

Austria (ÖVE) Öesterreichischer Verband für Elektrotechnik

Belgium (CEB) Comité Electrotechnique Belge

Brazil (ABNT) Associação Brasileira de Normas Teonicas

Canada (CSA) Canadian Standards Association

Czechoslovakia Urad pro Normalizaci a Mereni (Office for Standards and Measurements)

Denmark (DEK) Dansk Elektroteknisk Komite (Danish Electrotechnical Committee)

Egypt (EOS) Egyptian Organization for Standardization and Quality Control

Finland (SETI) Electrical Inspectorate

France (UTE) Union Technique de l'Électricité

Germany, Democratic Republic of (East) (ASMW) Amt für Standardi-sierung Messwesen und Warenprufung (Office for Standardization, Metrology and Quality Control)

Germany, Federal Republic of (West) (DKE) Deutsche Electrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE)

Greece (ELOT) The Hellenic Organization of Standardization

Hong Kong Hong Kong Standards & Testing Centre

Hungary (MSZH) Magyar Szabvanyugi Hivatal (Hungarian Office for Standardization)

India (ISI) Indian Standards Institute "Manak Bhavan"

Indonesia Badan Kerjasama Standardisasi LIPI-YDNI (LIPI-YDNI Joint Standardization Committee)

Iran Institute of Standards and Industrial Research of Iran

Ireland (IIRS) Institute for Industrial Research and Standards

Israel (SII) Standards Institution of Israel

Italy (CEI) Comitato Elettrotecnico Italiano (Italian Electrotechnical Committee)

Japan (JISC) Japanese Industrial Standards Committee Agency of Industrial Science and Technology

Korea, Republic of (South) Industrial Advance Administration

Mexico (DGN) Dirección General de Normas Secretaria de Patrimonio y Fomento Industrial Puente de Tecamachalco

Netherlands (NEC) Nederlands Elektrotechnisch Comite

New Zealand (SANZ) Standards Association of New Zealand

Norway (NEK) Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee)

Pakistan Pakistan Standards Institution

Poland Polski Komitet Normalizacji Miar i Jakosci (Polish Committee for Standardization, Measures and Quality Control)

Portugal (CEP) Comissão Electrotécnica Portuguesa

Romania Institutul Roman de Standardizare (Romanian Standards Institute)

Singapore Singapore Institute of Standards and Industrial Research

South Africa (SABS) South African Bureau of Standards

Spain (IRANOR) Instituto Nacional de Racionalización y Normalización

Sweden (SEK) Svenska Elektriska Kommissionen (Swedish Electrotechnical Commission)

Switzerland (SEV) Schweizerischer Elektrotechnischer Verein Postfach

Turkey (TSE) Turk Standardlari Enstitusu (Turkish Standards Institution)

United Kingdom (BSI) British Standards Institution

United States Underwriters Laboratories Inc. Recognized Component Mark

United States Underwriters Laboratories Inc.

Venezuela CODELECTRA en Conjunto con COVENIN Avda. Ppal.

Yugoslavia Federal Institute of Standardization

Wilmore DC-To-AC Inverters

- **Power Ratings From 50 To 1000 Watts**
- **High Efficiency**
- **Rugged Design And Construction**

Wilmore manufactures solid-state transistor-switching dc-to-ac inverters to power loads up to 1000 volt-amperes from a dc power source. These inverters are characterized by conservative electrical and thermal design. Attention to detail in areas such as mechanical layout and structural integrity ensures trouble-free operation in harsh electrical and mechanical environments.

Inverters on this page provide a three-level step waveshape having peak, average, and rms voltages that approximate those of a pure sine wave while maintaining operating efficiencies comparable to square-wave inverters. They are suitable for powering sensitive electronic loads including microcomputers, chart recorders, communications equipment, and test instruments. Most models also provide a 2:1 output-power surge capability for powering loads with high inrush current, such as small motors, heating elements, lighting equipment, and small power tools. Additional features include excellent frequency stability (±0.15 Hz), wide operating ambient temperature range (-20°C to 55°C), and low idle-current demand.

Protection

All inverters are protected either electronically or by a front-panel circuit breaker from overloads or short circuits on the output. Protection against accidental reversal of dc polarity at the battery terminals is also provided. The 250-, 500-and 1000-VA units include an electronic cutout circuit to protect against excessive discharging of the battery source (undervoltage) or brief exposure to an overly high dc-input voltage (overvoltage).

Availability

Standard models are generally available from stock. For information about custom-designed inverters or standard inverters available in custom enclosures, contact our sales department.

Output Power (Volt-Amps)	Nominal Input Voltage (Vdc)	Nominal Output Voltage (Vac)	Output Frequency (Hz)	Dimensions (h" x w" x d")	Weight (Pounds)	Efficiency (Typical)	Model Number
50	12	115	60	4.2 x 5.2 x 7	6	60%	**1401-12-115-60**
50	12	230	50	4.2 x 5.2 x 7	6	60%	**1401-12-230-50**
50	24	115	60	4.2 x 5.2 x 7	6	65%	**1401-24-115-60**
50	24	230	50	4.2 x 5.2 x 7	6	65%	**1401-24-230-50**
50	48	115	60	4.2 x 5.2 x 7	6	65%	**1401-48-115-60**
50	48	230	50	4.2 x 5.2 x 7	6	65%	**1401-48-230-50**
250	12	115	60	7.7 x 9 x 12	31	80%	**1402-12-115-60**
250	12	230	50	7.7 x 9 x 12	31	80%	**1402-12-230-50**
250	24	115	60	7.7 x 9 x 12	31	85%	**1402-24-115-60**
250	24	230	50	7.7 x 9 x 12	31	85%	**1402-24-230-50**
250	48	115	60	7.7 x 9 x 12	31	85%	**1402-48-115-60**
250	48	230	50	7.7 x 9 x 12	31	85%	**1402-48-230-50**
500	12	115	60	8.7 x 12.7 x 11	44	80%	**1403-12-115-60**
500	12	230	50	8.7 x 12.7 x 11	44	80%	**1403-12-230-50**
500	24	115	60	8.7 x 12.7 x 11	44	85%	**1403-24-115-60**
500	24	230	50	8.7 x12.7 x 11	44	85%	**1403-24-230-50**
500	48	115	60	8.7 x 12.7 x 11	44	85%	**1403-48-115-60**
500	48	230	50	8.7 x 12.7 x 11	44	85%	**1403-48-230-50**
1000	24	115	60	8.7 x 12.7 x 11	47	85%	**1404-24-115-60**
1000	24	230	50	8.7 x 12.7 x 11	47	85%	**1404-24-230-50**
1000	48	115	60	8.7 x 12.7 x 11	47	85%	**1404-48-115-60**
1000	48	230	50	8.7 x 12.7 x 11	47	85%	**1404-48-230-50**

NEW

The first products in our new Series 1600 sine-wave inverters are being introduced in 1991:

- **Regulated Sine Wave**
- **Rackmount, Convection-Cooled**
- **5¼" High, 20 Lbs. (500-VA Version)**

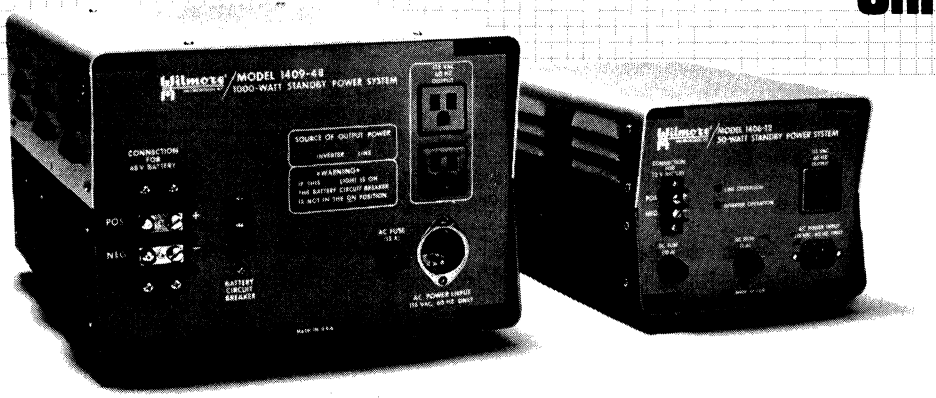
For more information, request Bulletin 1061

WILMORE ELECTRONICS CO., INC.

P.O. Box 1329, Hillsborough, N.C. 27278 • Telephone: (919) 732-9351
FAX: (919) 732-9359

Wilmore

Uninterruptible Power Systems



- **Power Ratings To 1000 Watts**
- **Economical Standby Operation**
- **High Efficiency For Longer Backup Times**

Serious problems may result when commercial ac power is unexpectedly interrupted to sensitive equipment such as point-of-sale terminals, PABX and communications equipment, small computers, or security systems. Wilmore's point-of-use uninterruptible power systems protect these critical loads from severe brownouts and loss of commercial power.

Each Series 1400 Uninterruptible Power System (UPS) consists of a dc-to-ac inverter, a battery charger and sensing/transfer circuitry. In normal operation, commercial power is presented directly to the load, and the Series 1400 UPS float charges the battery and monitors the ac line. When commercial power is interrupted, the sensing circuitry detects the loss of power and the UPS is automatically transferred to inverter operation. This transfer takes less than 15 milliseconds. When the commercial power returns, the sensing circuitry will sample the ac line for a period of 5 to 7 seconds to ensure that proper ac voltage is maintained. The reverse transfer from inverter operation to normal ac operation is then accomplished, also in less than 15 milliseconds. With the load again being supplied directly from the commercial line, the battery charger begins to recharge the batteries. Systems which operate in this standby mode are inherently less expensive to purchase and more economical to operate than "on-line" systems which must always power the user's equipment from the inverter.

Batteries

Standby power for the system is provided by external batteries which are maintained at full charge by the built-in battery charger. Batteries are not supplied with Wilmore's UPS units. They can be purchased locally and easily installed by the customer. The capacity of the user-supplied battery bank determines the backup time available from the UPS. Contact our sales department for assistance in sizing a battery bank for your particular application.

Inverter Output

The dc-to-ac inverter in each Series 1400 UPS provides a three-level step waveshape having peak, average, and rms voltages that approximate those of a pure sine wave. It is suitable for powering sensitive electronic loads including microcomputers, point-of-sale terminals, and communications equipment. Most inverters in this series also provide a 2:1 output-power surge capability for powering loads that demand high inrush current, such as small motors and lighting equipment.

Protection

All models are protected against output overloads and against accidental reversal of dc input-voltage polarity. An undervoltage sensing circuit helps to protect the batteries from excessive discharging.

Availability

The 115-volt, 60-Hz version of each model is normally shipped from stock. Allow two weeks delivery time for 230-volt, 50-Hz versions. For information about custom designed UPS products or standard units available in custom enclosures, contact our sales department.

Output Power (Volt-Amps)	Battery Input Voltage (Vdc)	Battery Charger Current (Adc max)	Nominal Output Voltage (Vac)	Frequency (Hz)	Dimensions (h" x w" x d")	Weight (Pounds)	Model Number
50	12	3	115	60	6.3 x 8.5 x 11.5	15	**1406-12-115-60**
50	12	3	230	50	6.3 x 8.5 x 11.5	15	**1406-12-230-50**
50	24	2	115	60	6.3 x 8.5 x 11.5	15	**1406-24-115-60**
50	24	2	230	50	6.3 x 8.5 x 11.5	15	**1406-24-230-50**
250	12	3	115	60	8.7 x 12.7 x 11	42	**1407-12-115-60**
250	12	3	230	50	8.7 x 12.7 x 11	42	**1407-12-230-50**
250	24	2	115	60	8.7 x 12.7 x 11	42	**1407-24-115-60**
250	24	2	230	50	8.7 x 12.7 x 11	42	**1407-24-230-50**
500	12	6	115	60	8.7 x 12.7 x 16	56	**1408-12-115-60**
500	12	6	230	50	8.7 x 12.7 x 16	56	**1408-12-230-50**
500	24	3	115	60	8.7 x 12.7 x 16	56	**1408-24-115-60**
500	24	3	230	50	8.7 x 12.7 x 16	56	**1408-24-230-50**
1000	24	3	115	60	8.7 x 12.7 x 16	60	**1409-24-115-60**
1000	24	3	230	50	8.7 x 12.7 x 16	60	**1409-24-230-50**

WILMORE ELECTRONICS CO., INC.
P.O. Box 1329, Hillsborough, N.C. 27278 • Telephone: (919) 732-9351
FAX: (919) 732-9359

Xentek
EXTREME ISOLATION TRANSFORMERS

FEATURES

- Commercial, industrial and medical applications
- Guaranteed to stop noise problems
- Eliminates power and system ground loops
- Up to 160dB common-mode rejection
- UL listed
- CSA approved
- VDE certified models
- TWO-YEAR WARRANTY

SPECIFICATIONS

Input:
Nominal voltage ±15% (1 KVA and up); ±10% (750 VA and below); 50-60 Hz.

Load Regulation:
±3% of input voltage, no load to full resistive load.

Common Mode Rejection:
160dB (-3x models); 140dB (-2x models); 120dB (-1x models).

Normal Mode Rejection: 60dB.

Isolation:
Resistance: 10,000 MΩ.
Capacitance: 0.0001pf (-3x models); 0.001pf (-2x); 0.005pf (-1x).

Leakage Current:
≤50μA (EIT, TRI and VDE Series).
≤10μA (LGT Series).

Dielectric Strength:
2500VAC (all EIT, TRI and LGT);
3750VAC (all VDE Series).

Efficiency: Greater than 92%.

Operating Temperature:
Full load up to 40°C ambient.

Approvals:
UL 1012; CSA 22.2-066 and UL 544 (ordinary patient care) on all models.
VDE 0550 on VDE prefix models.
UL 544 (patient connected) on all LGT Series.

250 - 750 VA SINGLE PHASE MINI-ISOs

INPUT	OUTPUT	250 VA	500 VA	750 VA
115V	115V	EIT 250-11	EIT 500-11	EIT 750-11
230V	230V	EIT 250-12	EIT 500-12	EIT 750-12
230V	115V	EIT 250-15	EIT 500-15	EIT 750-15
115V	230V	EIT 250-16	EIT 500-16	EIT 750-16

Note: all models are equipped with 6.5' line cord and duplex receptacles.

1.0 - 5.0 KVA SINGLE PHASE

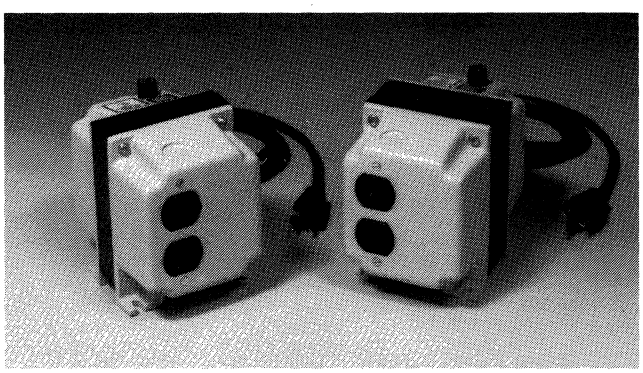
INPUT	OUTPUT	1.0 KVA	2.5 KVA	5.0 KVA
115/230V[1]	115/230V[1]	EIT 1.0K-20	EIT 2.5K-20	EIT 5.0K-20
115V[2]	115V[3]	EIT 1.0K-21	EIT 2.5K-21	
230V	230V	EIT 1.0K-22	EIT 2.5K-22	
115V	115/230V	EIT 1.0K-23	EIT 2.5K-23	
230V	115/230V	EIT 1.0K-24	EIT 2.5K-24	
230V	115V	EIT 1.0K-25	EIT 2.5K-25	
115V	230V	EIT 1.0K-26	EIT 2.5K-26	
Universal[4]	120/240	EIT 1.0K-27 VDE 1.0K-27	EIT 2.5K-27 VDE 2.5K-27	EIT 5.0K-27 VDE 5.0K-27
Universal	120V	EIT 1.0K-28	EIT 2.5K-28	EIT 5.0K-28
Universal	240V	EIT 1.0K-29	EIT 2.5K-29	EIT 5.0K-29

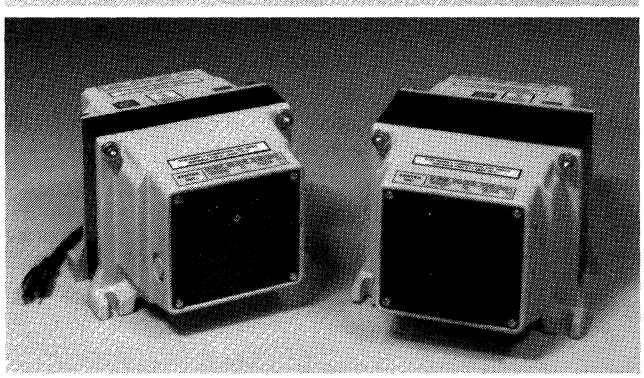
Note: models shown are rated for 140dB CMR. For 160dB CMR, replace the "-2" in the model number suffix with "-3", e.g., for 1.0 KVA, 115VAC input/output with 160dB CMR, specify model EIT 1.0K-31.
[1] All multiple voltage input and output connections are via barrier strip.
[2] All single voltage input connections are via 6.5' line cord.
[3] Single voltage output connections: 1KVA – duplex receptacle; 2.5KVA – single Twistlok receptacle.
[4] Universal input: 100/120/200/220/240VAC.

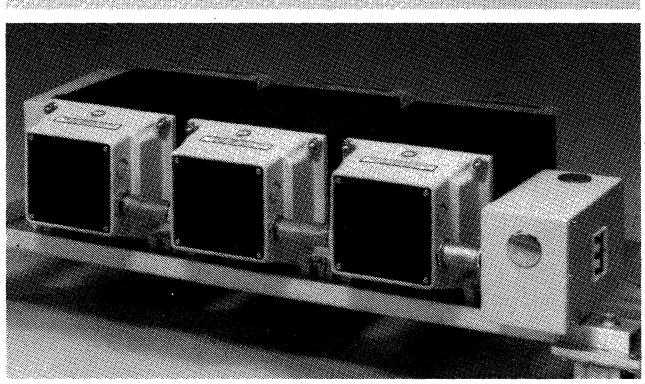
3.0 - 15 KVA THREE PHASE

INPUT	OUTPUT	3.0 KVA	7.5 KVA	15.0 KVA
208Y/120	208Y/120	TRI 3.0K-20	TRI 7.5K-20	TRI 15K-20
240 Delta	208Y/120	TRI 3.0K-21	TRI 7.5K-21	TRI 15K-21
480 Delta	208Y/120	TRI 3.0K-22	TRI 7.5K-22	TRI 15K-22

Note: models shown are rated for 140dB CMR. For 160dB CMR, replace the "-2" in the model number suffix with "-3", e.g., for 3.0 KVA, 208Y/120 input/output with 160dB CMR, specify model TRI 3.0K-30.







Xentek
A Taiyo Yuden Company
760 Shadowridge Drive • Vista, CA 92083 • (619) 727-0940 • Fax: (619) 727-8926

Life Guard™ *Medical Isolation Transformers*

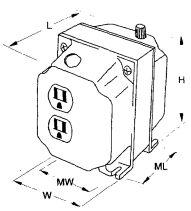
FEATURES

- UL 544 Listed for isolated patient connected applications
- Leakage Current less than 10μA
- Hospital Grade line cord and receptacles on most models
- TWO-YEAR WARRANTY

Special care must be taken in medical and dental applications to *isolate* the equipment from common-mode noise and ground-loops and *insulate* the equipment against potentially harmful leakage currents.

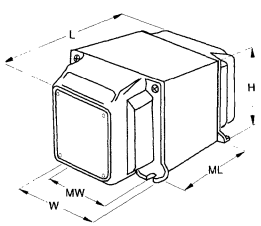
All Xentek extreme isolation transformers comply with UL544 leakage requirements for non-patient connected equipment. And Xentek Life-Guard extreme isolation transformer models comply with UL544 requirements for isolated patient connection.

Xentek Life-Guard extreme isolation transformers offer the ultimate in leakage current protection. These top-quality units are fully certified under UL544 for isolated, patient connected applications. Leakage current is limited to under 10μA. And all LGT Series models provide complete protection against common-mode noise and transients.



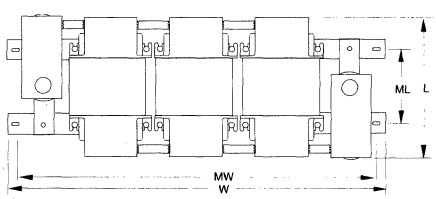
DIMENSIONS

		Size (in)			Mounting	
Series	VA	H	W	L	MW	ML
LGT	125	5.75	4.38	6.00	3.50	2.75
EIT	250	5.75	4.38	6.00	3.50	2.75
LGT	250	5.75	4.38	6.75	3.50	3.50
EIT	500	5.75	4.38	6.75	3.50	3.50
EIT	750	5.75	4.38	8.00	3.50	4.75



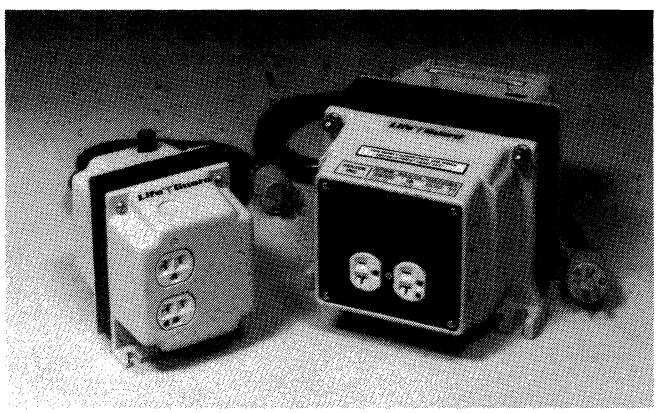
DIMENSIONS

		Size (in)			Mounting	
Series	VA	H	W	L	MW	ML
LGT	500	6.50	8.50	9.75	7.25	3.50
LGT	750	6.50	8.50	10.75	7.25	4.50
EIT	1.0K	6.50	8.50	9.75	7.25	3.50
VDE	1.0K	6.50	8.50	9.75	7.25	3.50
LGT	1.3K	6.50	8.50	11.50	7.25	5.25
EIT	2.5	6.50	8.50	11.50	7.25	5.25
VDE	2.5	6.50	8.50	11.50	7.25	5.25
LGT	2.5	6.50	8.50	16.25	7.25	10.0
EIT	5.0K	6.50	8.50	16.25	7.25	10.0
VDE	5.0K	6.50	8.50	16.25	7.25	10.0



TRI SERIES DIMENSIONS

	Size (in)			Mounting	
KVA	H	W	L	MW	ML
3.0	7.50	38.5	9.75	36.5	3.50
7.5	7.50	38.5	11.5	36.5	5.25
15.0	7.50	38.5	16.25	36.5	10.0



125 VA - 2.5 KVA MEDICAL ISOLATORS

INPUT: 120VAC		OUTPUT: 120VAC	
RATING	MODEL	INPUT	OUTPUT
125 VA	LGT 125-11	Hospital Grade Cord[1]	Hosp. Grade Duplex Recep.
250 VA	LGT 250-11	Hospital Grade Cord	Hosp. Grade Duplex Recep.
500 VA	LGT 500-21	Hospital Grade Cord	Hosp. Grade Duplex Recep.
750 VA	LGT 750-21	Hospital Grade Cord	Hosp. Grade Duplex Recep.
1.3 KVA	LGT 1.3K-20	Barrier	Barrier
2.5 KVA	LGT 2.5K-20	Barrier	Barrier

Note: models shown with "-2" in the model number suffix are rated for 140dB CMR. For 160dB CMR, replace "-2" with "-3", e.g., for 750 VA with 160dB CMR, specify model LGT 750-30.
[1] Models from 125VA to 750VA are equipped with hospital grade 6.5' line cord and duplex receptacles.

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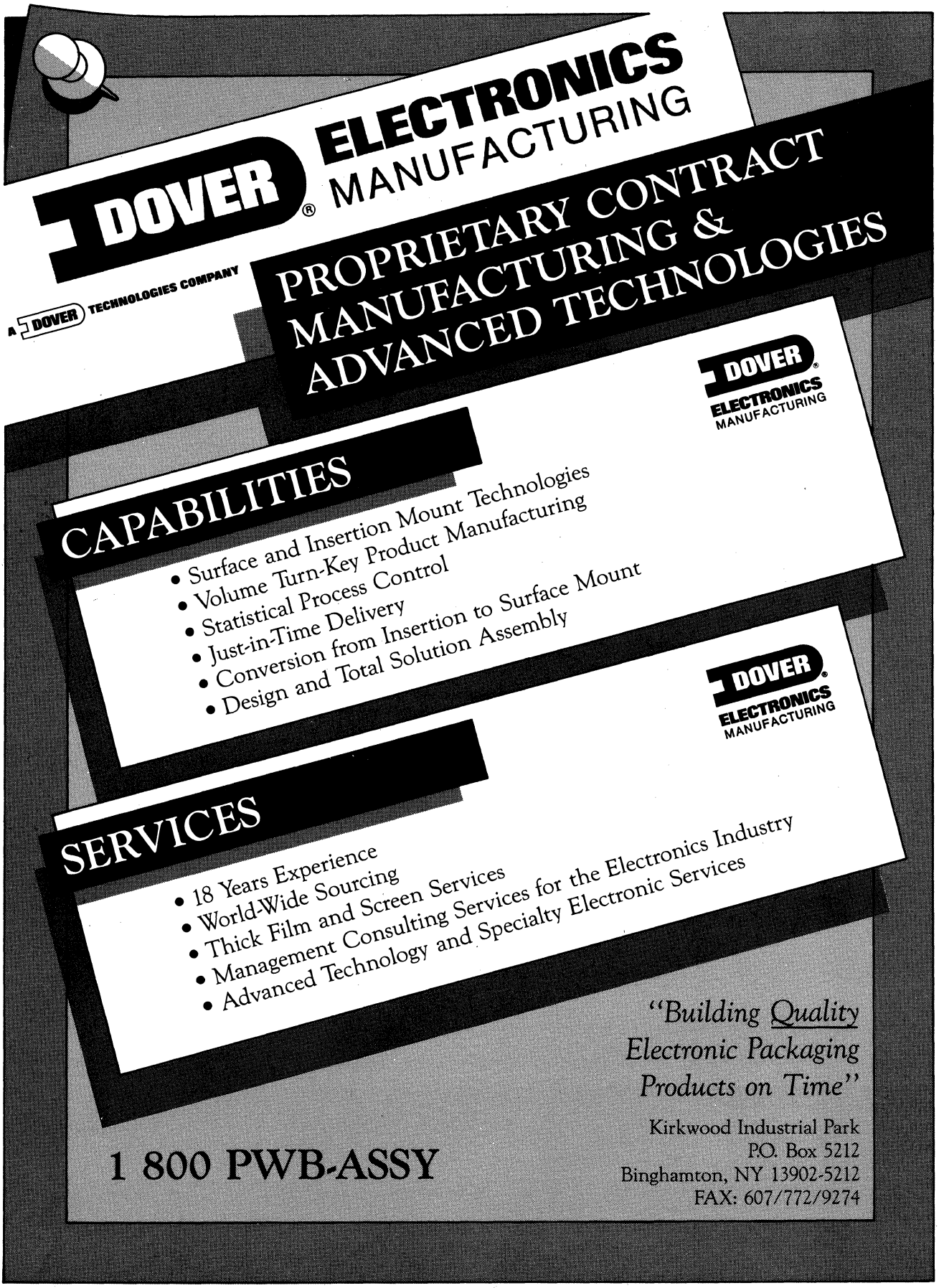
A Taiyo Yuden Company
760 Shadowridge Drive • Vista, CA 92083 • (619) 727-0940 • Fax: (619) 727-8926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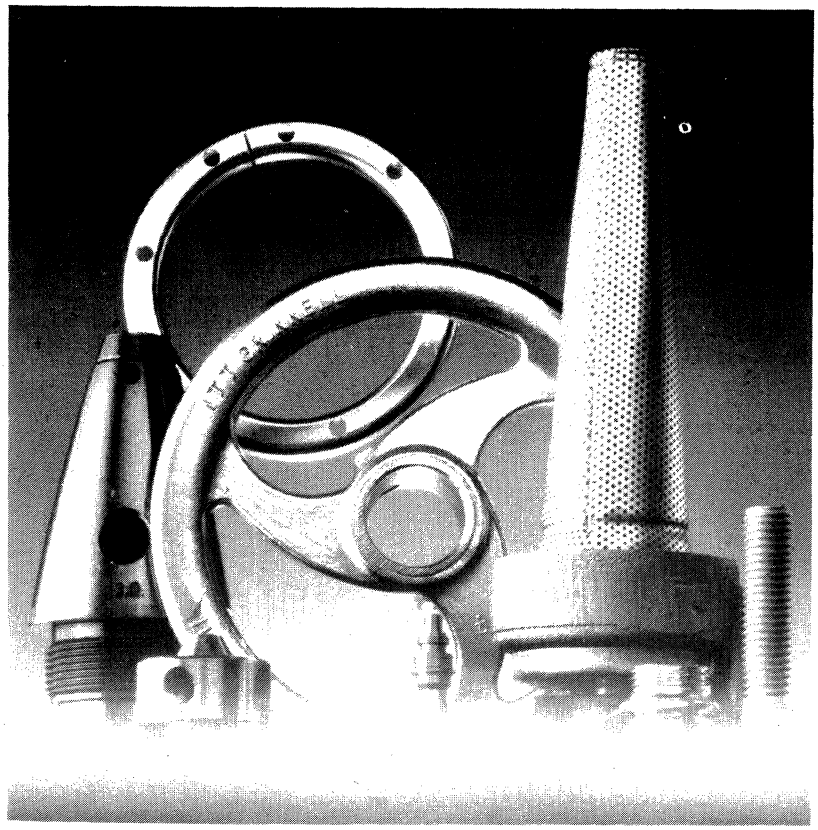

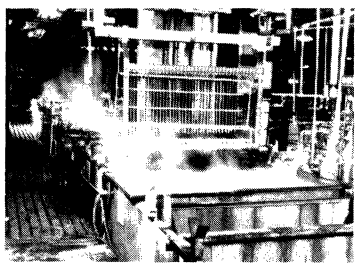

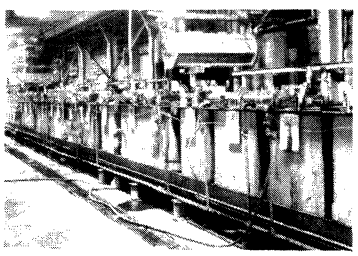

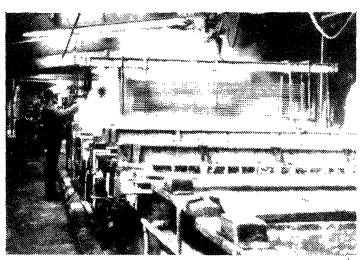

Heritage incorporates the latest and most advanced plating techniques for finishing metal parts and for strict adherence to MIL-SPEC and industrial specifications to ensure accurate quality.

Our plating facilities consist of eleven process lines with computer controlled plating cycles. We can plate a wide variety of parts ranging from nuts and bolts to 12 foot long rods, and 20 foot long shafts for hard chrome.

Finishing Processes Available

- Nickel
- Nickel-Chrome
- Rack Zinc
- Barrel Zinc
- Hard Chrome
- Electroless Nickel
- Electro-polishing
- Anodizing
- Aluminum Conversion Coating
- Phosphating
- Passivate
- Buffing & Polishing

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Heritage Metal Finishing Inc.

800 South Market Street, Elizabethtown, PA 17022
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MEMBER OF NAMF NATIONAL ASSOCIATION OF METAL FINISHERS

3M Introduces Compact Electric Air Ionizer

Unique Ionized Air Blower intrinsically generates ion-balanced air

The new 3M 961 Ionized Air Blower will neutralize static charge on non-conductors such as insulative tapes, plastics, and circuit board substrates. This will remove the hazard that these objects present to static sensitive electronic components.

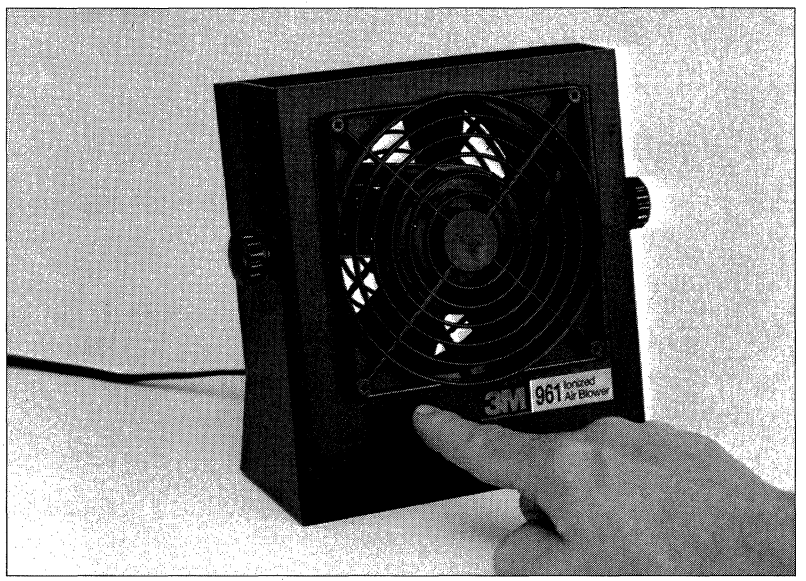
The 3M 961 Electric Ionized Air Blower delivers an equal number of positive and negative ions to effectively neutralize charged objects.

The proprietary self-balancing power supply circuitry will continue to deliver a balanced ion stream even if emitter points become dirty or corroded. The ion balance feature never needs calibration or periodic adjustment.

The air delivery is so gentle and quiet that a red monitor light has been added to let operators know that the unit is on.

The air blower's small size requires very little workbench space and weighs only two pounds for easy movement. The light weight also makes it practical for service technicians to carry in their tool kits.

Call 1-800-328-1368



Small, but powerful enough to gently bathe the work place with balanced ionized air.

Choose the 3M 705 Bag Check to get continued use from 3M 2100/2100E Series Static-Shielding Bags

Quick, easy way to identify bags suitable for reuse

The 3M 705 Bag Check is a quick and easy-to-use test unit designed to measure the "around-the-bag" resistance of the 3M 2100/2100E Series of static-shielding bags.

Three resistance ranges can be selected to measure the electrical condition of used or new bags and their corresponding shielding capability.

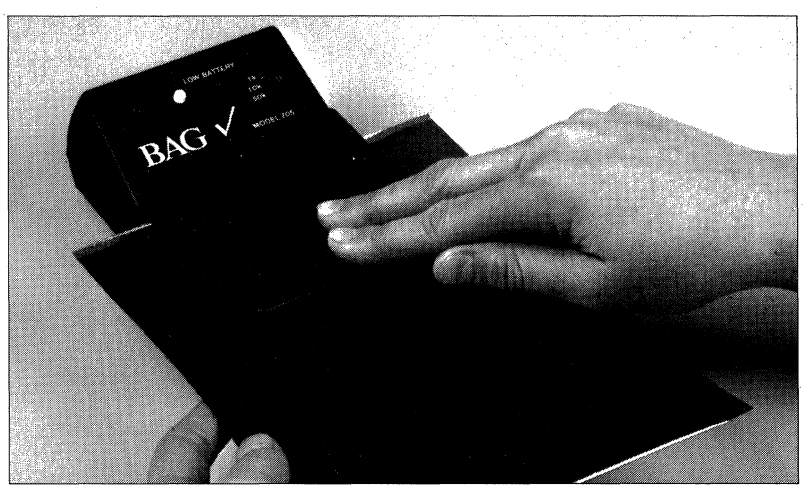
Red and green LEDs indicate whether or not the bag's electrical resistance is within the selected range. The tester operates from an AC adaptor for bench type use or from a 9-volt battery.

Customers who regularly test and reuse their bags report considerable savings on the total applied cost of the bags.

The Model 705 has special electrodes designed to provide positive contact with the conductive layer of the 3M 2100/2100E Series Static-Shielding Bags.

A calibration check is included with every Model 705 to verify its accuracy.

Call 1-800-328-1368



Static-shielding bags should not be reused unless they are tested.

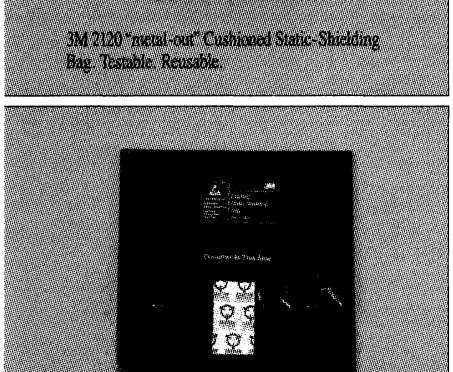
3M Electrical Specialties Division
PO Box 2963
Austin, Texas 78769-2963

3M

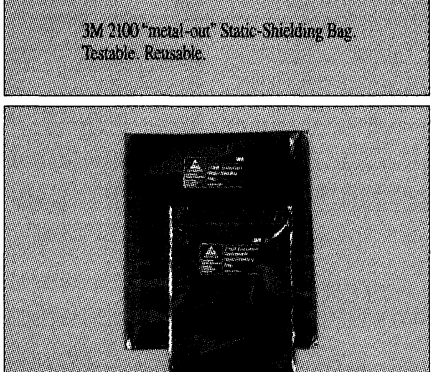
3M 2120 "metal-out" Cushioned Static-Shielding Bag. Testable. Reusable.

3M 2100 "metal-out" Static-Shielding Bag. Testable. Reusable.

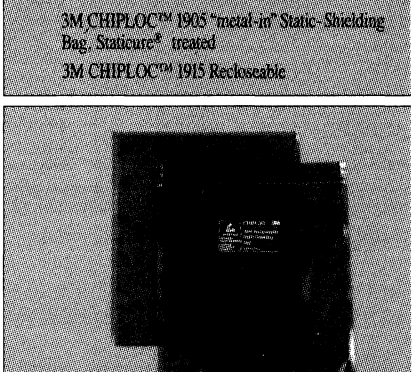
3M CHIPLOC™ 1905 "metal-in" Static-Shielding Bag. Staticure® treated
3M CHIPLOC™ 1915 Recloseable



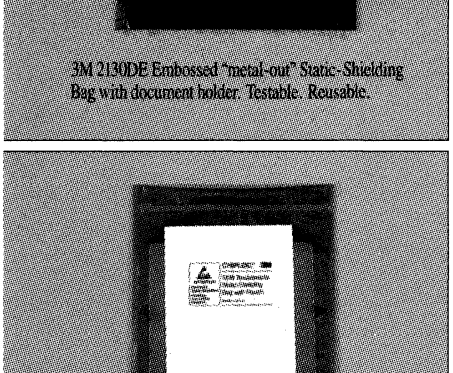
3M 2130DE Embossed "metal-out" Static-Shielding Bag with document holder. Testable. Reusable.



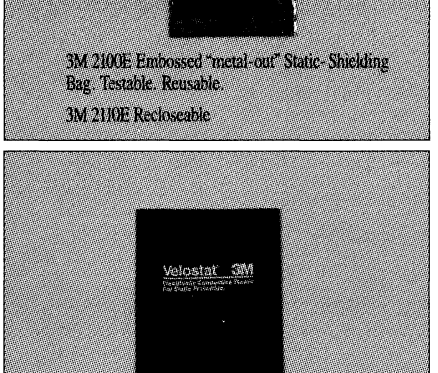
3M 2100E Embossed "metal-out" Static-Shielding Bag. Testable. Reusable.
3M 2110E Recloseable



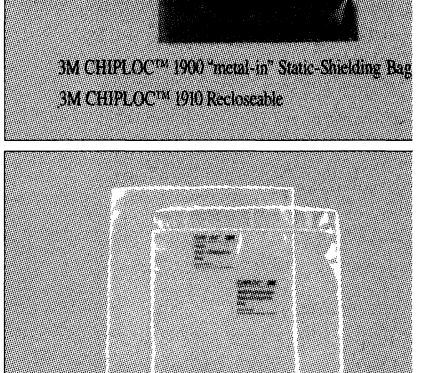
3M CHIPLOC™ 1900 "metal-in" Static-Shielding Bag
3M CHIPLOC™ 1910 Recloseable



3M CHIPLOC™ 1916 Recloseable Static-Shielding Bag, with document pouch, Staticure® treated



3M 2004 Velostat™ Electrically-Conductive Bag



3M CHIPLOC™ 1600 Static-Dissipative Bag
3M CHIPLOC™ 1610 Recloseable

Choose the 3M bags that best fit your static control requirements

You can now select static control bags from 3M based on the level of protection that you feel your products need. Read the descriptions, select the appropriate bags, then write one order.

You will be getting the right bags, for the right applications, from the right source, at the right price, worldwide.

You can also use the services of our experienced Sales Representatives to help you in your bag selection process. In addition, they are also available to provide management seminars, plant surveys, employee training and on-site testing of static control products.

For more information, contact a 3M Sales Representative or authorized distributor by calling 1-800-328-1368.

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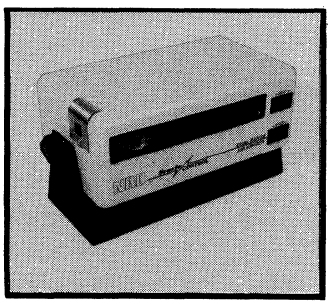
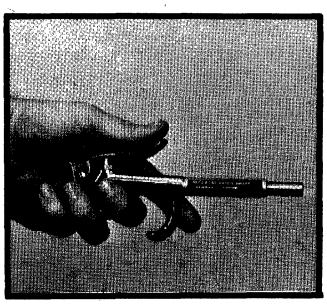


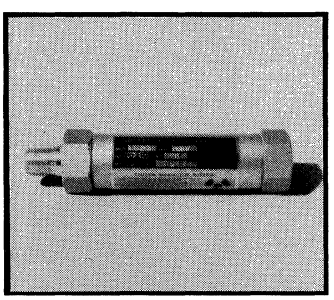
Dual Range Ion Air Blower Model 4062

Neutralizes static charges on non-conductors. Two fan speeds. At low speed covers work areas with a gentle flow of ionized air. At high speed controls static charges even on equipment. Heater and filter are included. Replaceable ion cartridge available on annual lease basis.



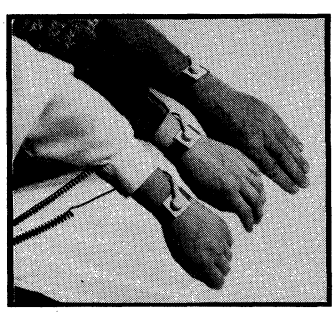
Nuclecel Ion Air Gun P-2051

An effective, flexible, versatile means to neutralize static charge, remove surface particles and control the attraction of contaminants. Constant balanced ion output, unequaled reliability and simplicity. Available on annual lease basis.



Nuclecel In-Line Ionizer P-2031

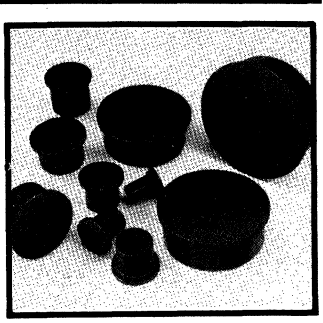
Control static and remove particles in fixed compressed gas line applications. Move large volumes of air at low input pressures to cover irregular surfaces and cabinet interiors. Available on annual lease basis.



Wrist Strap Assembly 5057-06

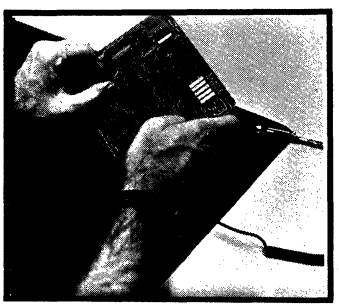
Soft, easy wearing assembly. Retains its shape for a long service life. Three color coded sizes require no operator adjustments. Six foot curl cord.

Small—Gray
Medium—Maroon
Large—Blue



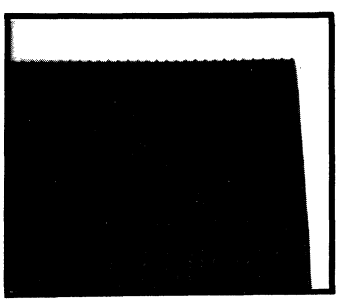
Caplugs Conductive Protectors DCC, CEC, CEP

These cost effective plugs and caps provide both physical and ESD protection to sensitive connectors, pins and leads. They meet MIL. STD 1686-A and are available in sizes to fit round and sub-miniature "D" type connectors.



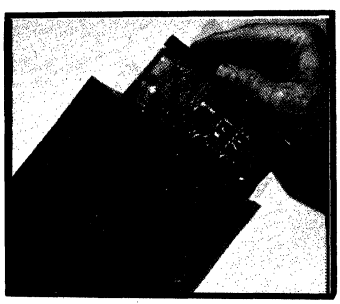
Softouch Mats 5046

Soft, attractive long service mats that provide a comfortable work surface. Includes snap fasteners and groiund cord. Colors: putty, light blue, chocolate brown. Sizes: 24" x 36", 24" x 48" or 24" and 48" rolls to 100' long. Additional sizes available on request.



Softouch V-Groove Floor Runners/Mats 5049

Comfortable and lightweight, these static dissipative mats & runners are ribbed to prevent dirt buildup, retain positive contact longer and make cleaning easier. Color: Black.
Sizes: 36" x 72" or roll 36" wide to 100' long.



Static Shielding Bags 5070

Transparent, humidity independent and heat sealable, these bags protect parts from electrostatic discharges and fields while allowing easy parts identification.

Sizes: (opening × length)
3" × 5", 4" × 6", 5" × 8",
6" × 10", 8" × 10", 8" × 12",
10" × 12", 10" × 14", 11" × 15",
15" × 18", 10" × 24", 10" × 30"

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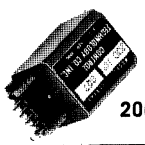
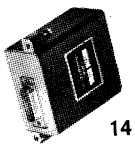

200 HP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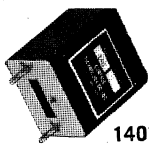
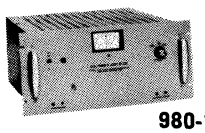

140

416-3

916 (Flat Pack)


980-1

AMPLIFIERS FOR A.C. SERVO MOTORS

MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
200-HP	3.5 W	40 VCT	400 Hz	400 Hz	10K	2,500	28 VDC	−55°C +125°C
200-5	3.5 W	40 VCT	400 Hz	400 Hz	10K	5,000	28 VDC	−55°C +125°C
930	3.5 W	40 VCT	400 Hz	400 Hz	250K	2,000	28 VDC	−55°C +125°C
200-8	3.5 W	40 VCT	400 Hz	400 Hz	10K	2,500	115 V 400 Hz	−55°C +125°C
216B	6 W	40 VCT	60 Hz	60 Hz	10K	1,000	28 VDC	−55°C +85°C
140	6 W	40 VCT	400 Hz	400 Hz	50K	1,000	28 VDC	−55°C +125°C
141	6 W (90°)	40 VCT	400 Hz	400 Hz	30K	1,000	28 VDC	−55°C +125°C
416-3	16 W	40 VCT	400 Hz	400 Hz	10K	1,000	28 VDC	−55°C +71°C
416A/D	16 W (0°/90°)	40 VCT	400 Hz	400 Hz (2)	10K	1,000	28 VDC	−55°C +100°C
416M	16 W (90°)	40 VCT	400 Hz	DC (2)	10K	200	28 VDC 115 V 400 Hz	−55°C +125°C
159	16 W	40 VCT	60 Hz	60 Hz	10K	1,000	28 VDC	−55°C +100°C
159A/D	16 W (0°/90°)	40 VCT	60 Hz	DC	100K	1,000	28 VDC	−55°C +100°C
174	40 W (90°)	40 VCT	60 Hz	60 Hz	20K	1,000	28 VDC	
956B	40 W (90°)	40 VCT	400 Hz	400 Hz	10K	1,000	28 VDC	−55°C +100°C
956C	40 W (90°)	40 VCT	400 Hz	DC	10K	500	28 VDC 115 V 400 Hz	−55°C +100°C
170-1	100 W (90°)	40 VCT	400 Hz	400 Hz	10K	1,000	28 VDC	−55C° +85°C
170-3	180 W (90°)	36 VCT	400 Hz	400 Hz	10K	1,000	28 VDC	−55°C +85°C

MODIFICATIONS to gain, input impedance, signal frequency, and power level are available. Matching transformers for driving motors at other voltages in stock.

LINEAR D.C. POWER AMPS

998-2	40 W (Short Proof)	22V	DC	DC (2)	10K	50	28 VDC	−55°C +85°C
916	110 W (Short Proof)	20V	DC	DC (2)	10K	$3x10^5$	28 VDC −15 VDC	−55°C +100°C
987-17	200 W (Short Proof)	20V	DC	DC (2)	10K	10	28 VDC ±15 VDC	−55°C +71°C
980-1S	500 W (Short Proof)	50V	DC	DC	10K	100	115 V 50-400 Hz	−55°C +71°C
980-28	1350 W (Short Proof)	52V	DC	DC	10K	100	50-400 Hz 3 Phase (1 Phase Available.)	−55°C +71°C
980-27	3000 W (Short Proof)	95V	DC	DC	10K	100	105 VDC and AC Fan Power	

MODIFICATIONS to gain, input impedance, signal frequency, power level and operating temperature available.

SYNCHRO AMPLIFIERS

180-1	5W	11.8V Synchro	400 Hz	400 Hz SIN/COS	50K	3′	±15 VDC	−55°C +100°C
180-2	5W	90V Synchro	400 Hz	400 Hz SIN/COS	50K	3′	±15 VDC	−55°C +100°C
180-3	5W	90V Synchro	50/60 Hz	50/60 Hz SIN/COS	50K	3′	±15 VDC	−55°C +100°C

MODULATORS AND DEMODULATORS

312	Full Wave	10V	DC	60 Hz	10K	10	28VDC 115V Reference	−55°C +125°C
334-1	Full Wave	50V	DC	400 Hz	10K	180	28VDC 115V 400 Hz	−55°C +125°C
334-2	Full Wave	30V	DC	400 Hz	125K	1	115V 400 Hz	−55°C +71°C
312-1	Full Wave	10V	DC	60 to 5000 Hz	10K	10	28VDC 115V Reference	−55°C +125°C
350-1	Full Wave	15V	DC	400 Hz	10K	10	28VDC 115V 400 Hz	−55°C +125°C

MODIFICATIONS to gain, output voltage and input impedance available.

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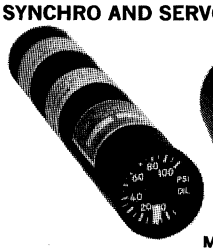
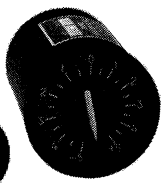
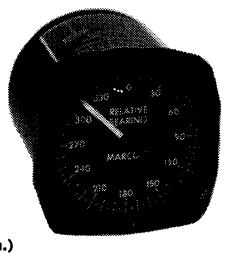
SYNCHRO AND SERVO REPEATERS



MS-33639 Case (1 in.)



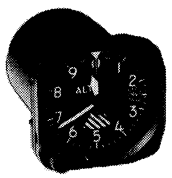
MS-33639 Case (2 in.)



MS-33638 Case (3 in.)

SIMULATOR INSTRUMENTS

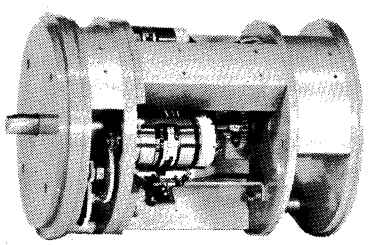
Mach Air Speed



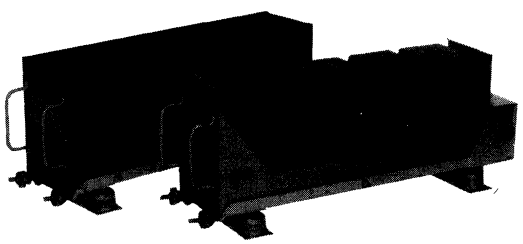
Altimeter

Air Speed

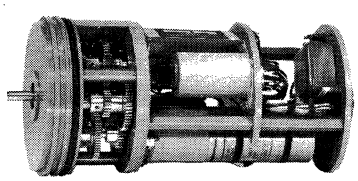
SERVO ACTUATORS



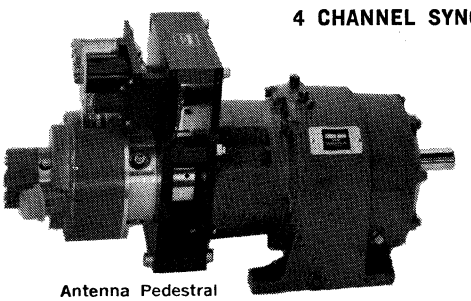
CS-202-2 300 lb. in. actuator



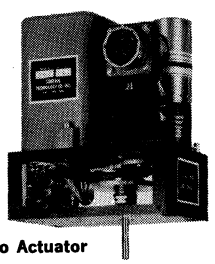
4 CHANNEL SYNCHRO AMPLIFIER



CS-198 250 oz. in. 0.1% accuracy actuator

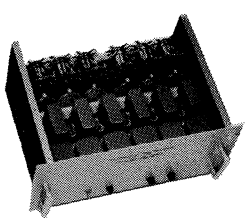


Antenna Pedestral
Azimuth Servo Drive

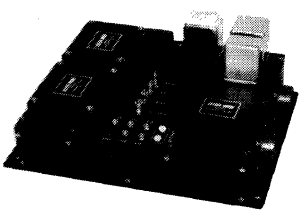


Custom Servo Actuator

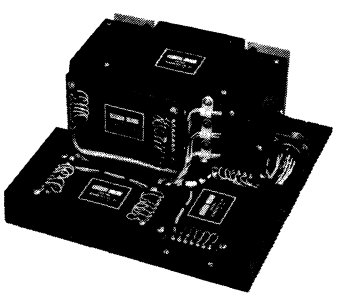
SPECIAL CONTROL SYSTEMS



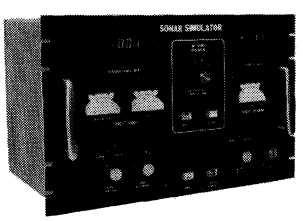
Control System used in ASW



HYDRAULIC
SERVO CONTROL SYSTEM



Digital Control System



SIMULATOR CONTROL SYSTEM

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ASCII Code **D**•1086
Batteries, Product Selection Guide **D**•1427
Batteries & Fuel Cells, Characteristics **D**•1468
Cabinets, Enclosures, Racks & Chassis, Product Selection Guide **C**•1003
Capacitors, Basic Formulas **A**•1078
Capacitors, Miniglossary **A**•1054
Capacitors, Product Selection Guide **A**•1003
Coils, Chokes, Inductors, Product Selection Guide **A**•1155
Conductors, Maximum Current Capacity of Copper & Aluminum **C**•1825
Connectors, Miniglossary **C**•1329
Connectors, Terminals & Sockets, Product Selection Guide **C**•1149
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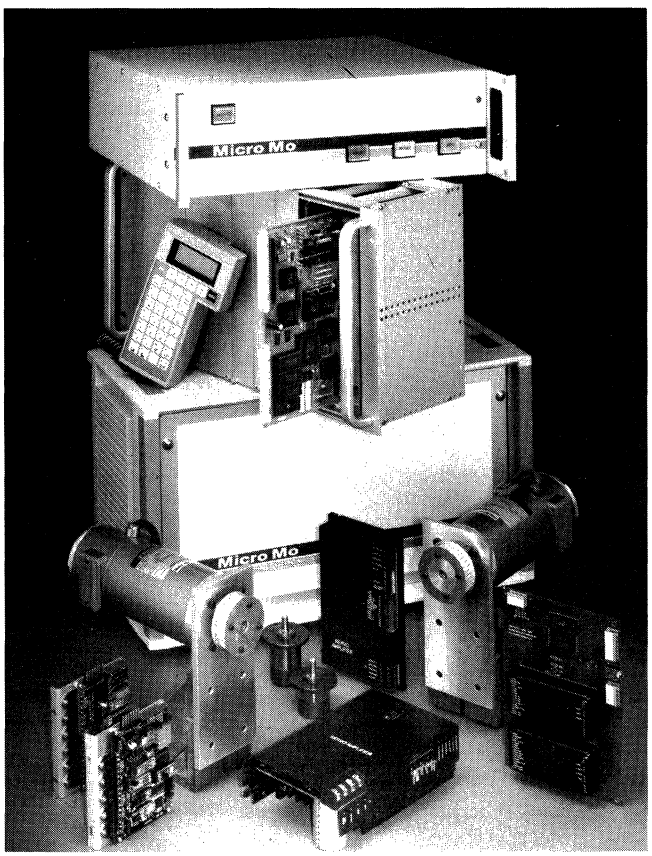

If you specify, program, or build Motion Control Systems for:

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MINIGLOSSARY SERVO COMPONENTS

SPECIFICATIONS

Excitation: The input voltage and frequency.

Transformation Ratio: The ratio of the output voltage, at maximum coupling, to the input voltage.

Phase Shift: The lead or lag of the output voltage with respect to the input voltage. For most synchros and resolvers, the phase shift can be approximated by the angle whose tangent is the ratio of the primary winding's DC resistance to its reactive component.

Impedance: Specified as R + jX, where R is the AC resistive component and X is the reactive component. Important impedances are: (a) Z_{po} (or Z_{ro} for rotor primary units), which is the impedance of the primary winding with the secondary open; (b) Z_{so}, which is the impedance of the secondary winding with the primary open; and (c) Z_{ss}, which is the impedance of the secondary with the primry shorted (essentially when driven by a low impedance).

Null Voltage: The voltage remaining when the unit is at electrical zero or in the minimum coupling position.

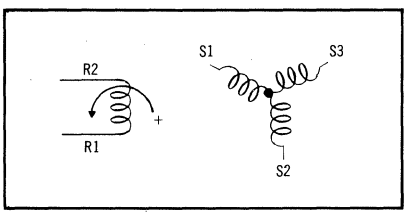
Accuracy: The error of the position of the rotor with respect to the electrical angle. It is defined as the output voltage driven by the "speed" (pole pairs) of the unit, referenced to the starting point of the calibration (usually the electrical zero position). Error is commonly expressed in minutes of arc (1/60 of a degree) or in seconds of arc.

Loads: For a transmitting unit, the impedance that the output voltage signal faces. This can be a receiver, a differential with its load, a control transformer, an A/D converter, etc.

Operation Temperature: The ambient temperature range over which the unit performs its primary function.

FUNCTIONS

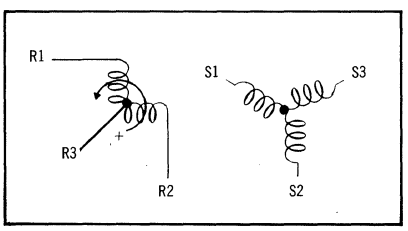
Transmitter: A unit with a Y-connected stator that outputs a signal proportional to the position of its single-phase excited rotor. High power units, called "torque transmitters," are used to drive one or more receivers. Low power transmitters are used to drive control transformers.



Receiver: A unit with a three-phase stator excited by the input, usually from a torque transmitter, and a single-phase rotor that follows the resulting stator field. Usually used to drive a position pointer.

Control Transformer: A unit with a three-phase stator excited by the input from a transmitter and a single-phase rotor mechanically driven to the null position by an external motor or other device.

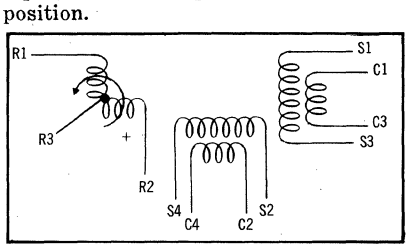
Differential: A unit with a three-phase stator and a three-phase rotor. It is usually connected between a transmitter, which excites its stator, and a receiver or control transformer. It can be used to "dial in" correction factors for the synchro chain.



Transolver: A unit with a three-phase stator and a two-phase rotor that can be used either as a control transmitter (with one rotor phase excited and the other shorted), or as a control transformer with the signal obtained from one phase of the rotor—making sure the other phase is equally loaded to prevent unbalances.

Differential Resolver: A unit with a two-phase stator and a three-phase rotor that is used as a transolver with the advantage that when connected as a control transformer, the signal does not travel through slip rings.

Resolver: A unit with a two-phase rotor and a two-phase stator that is used to create or receive SIN-COS signals such as vector resolutions for solving inertial platform coordinate transformations, unknowns of right triangles, etc. Resolvers can also be used as transmitting, differential, or receiving elements by proper choice of impedances. It is also possible to use resolvers as phase shifters where, in one mode, one rotor phase is excited and the two stator windings are feeding an appropriate RC network and indicating a phase shift, referred to the input, that corresponds to the rotor position.



Compensated Resolver: A unit with a "2×2" phase stator and a two-phase rotor used as a resolver with the added benefit of feedback windings in parallel with the stator windings that increase the useful accuracy over a wide range of environmental operating conditions.

Linear Transformer: A unit with a single-phase stator and single-phase rotor designed to provide a linear output voltage that is directly proportional to the rotor input angle. It operates over a range of less than ±90°, and is analogous to a potentiometer providing infinite resolution, but without contact between the elements. It can be used only with AC voltages.

Brushless Synchro: Available in two types—hairspring and bobbin. Hairspring synchros use spiral wound conductor springs to pick off the rotor signal, and are generally limited to a ±165° rotation. Most have mechanical stops to prevent damage due to overrotation. Bobbin synchros pick off the rotor signal with rotary transformers inside the unit, allowing the rotor unlimited motion.

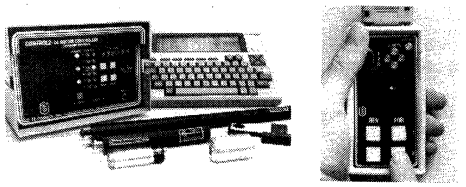
Pancake Unit: A name derived from the physical dimensions of the unit, which has a diameter that exceeds axial length. Sizes range from under 1" to 20" or more. The unit is frequently used as a gimbal pickoff element and is designed to fit a particular application envelope. It can be supplied as a rotor and stator only.

TS PRODUCTS ➡ *Motion Products*

LINEAR/ROTARY COMPONENTS FOR MICRO-POSITIONING
CLOSED/OPEN LOOP CONTROLLERS FOR IRONLESS-CORE DC-MOTORS
CUSTOM MOTION SYSTEMS • OEM CONFIGURATIONS

μ-PROCESSOR CONTROLLERS

CONTROL2 "SMARTBOX"



Designed for TSP actuators, **CONTROL2** links an IBM computer via RS-232 and/or IEEE-488 to DC-motors and quadrature-phase encoders. Operating through an external velocity servo, it provides closed-loop position and velocity control. Numerous ASCII commands assure operational flexibility. Coupled with the 1000C2-RT REMOTE TERMINAL, **CONTROL2** becomes a stand-alone motion system with programming capability. A JOYSTICK controls six axes from front-panel or optional remote location.

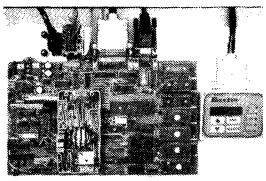
Digital Velocity Control creates a speed range of .01 to 20,000.00 encoder counts per second (1 part out of 2,000,000 regulation). Programmable start and stop ramps accommodate various motor dynamics/loads.

Continuously improved from user suggestions, **CONTROL2** features zero overshoot on point-to-point movements and high stability in the presence of external loads.

FEATURES

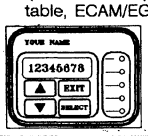
- Simultaneous 2/4/6 axes
- Jog/Slew Buttons
- Digital Velocity Control
- Backlash compensation
- Triple encoder filter
- Multilayer driver board
- Limit detection/backoff
- Emergency STOP buttons
- Power condition outputs
- No move @ Pwr ON/OFF
- Rackmount Option
- Accepts external power
- Watchdog timer
- Remote E-stop input
- Internal non-volatile program memory
- Concurr. RS-232/IEEE-488
- Programmable ramps
- Velocity mod during travel
- Conditional movement
- Heidenhain encoder OK
- H/P HCTL-2000 Counters
- 16/32/48 TTL inputs
- 8 TTL outputs
- Motion condition outputs
- Int/Ext Status Indicators
- 1/2/4x counting factors
- Accepts ext limit switches
- Pwr OFF coord retention
- 1ms-2.4hr Delay command
- EMI shielding option
- Remote Terminal

CONTROL3



Stand-alone, programmable 2-axis DC-motor controller in 6"x10"x2" modules. Designed to be *customized* and installed into small spaces. Controls TSP linear/rotary actuators as well as many types of DC motors. Executes an internally-stored program or ASCII commands from RS-232/IEEE-488 Host computer.

- 32 axes Master/Slave gang
- Written in "C" for customization
- Point-to-point, external tracking, trapezoidal/triangular, circular-/parabolic interpolation, look-up table, ECAM/EGEAR.



Remote Panel displays/inputs information from/to menu tree.

IRONLESS-CORE DC-MOTORS

TSP components feature formed cylinder and flat armature configurations with *high accelerations* due to absence of moving heavy iron laminations or magnets.

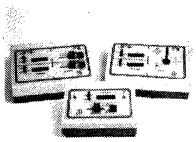
BENEFITS: High torque/size (weight) ratio • low acoustic/electronic noise • long brush life • vibrationless • straight-line torque/velocity response • closed-loop operation • zero resonance.

MANUAL CONTROLLERS

1000-SERIES

INTEGRATED

Controlling one or two motors, the 1000INT-1, -2, -J are our smallest, lowest-cost, open-loop Controllers with position display.



•Joystick version • 6-digit Position Display for each axis • 2x/4x Encoder Counting • 10:1 Slewing and Jogging Range • Limit indicators • Computer interface option.

MODULAR

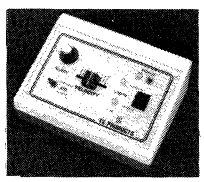
The 1000MOD-series controls 1 to 3 motors constructed from the following modules:

- 1000S Single-axis Speed Controller
- 1000JM Joystick
- 1000D Single-axis Position Display
- 1000PE 3-axis Position Entry
- 1000M Mainframe
- 1000R Remote Control
- 1000P Power Supply

1200-SERIES

4-AXIS SPEED CONTROLLER

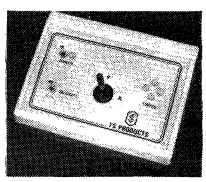
A simple mover without precision position information, the 1200SC controls 1 out of 4 axes.



- 10:1 Slewing speed range
- Direction selection
- Limit sensing with backoff
- Small step JOG function
- 1200SC-C computer-interface
- 1200-OEM version to integrate into an operator's control panel.

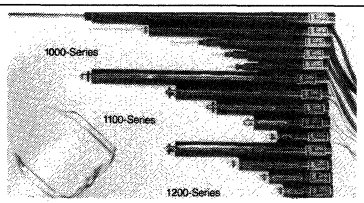
2-AXIS JOYSTICK

Controlling two-axes simultaneously, the 1200J features an elegant feeling joystick with fast/slow ranges. With a simple computer-interface, the 1200JC, duplicates all front panel functions. Built on a single PCB, the 1200J-OEM version economically fits into your system.



ACTUATORS

LINEAR

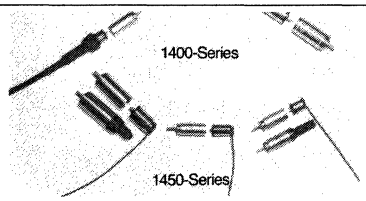


1000-Series High-quality, high-precision for semiconductors, optics, metrology, medicine. • Non-rotating plunger • Position encoder • ½", 1", 2", 4", 6" travel • 100 lb thrust max • 15mm/sec max • 2.5nm resolution min • 2μm/in accuracy • Integral velocity servo & limit-of-travel/torque sensor

1100-Series Smaller, less accurate with encoder. • ½ length of 1000-series • ¼", ½", 1", 2", 4", 6", 8", 10", 12" travel • Visual display of position • Adaptable to push/pull

1200-Series Smallest, simple mover • ¼", ½", 1", 2", 4", 6", 8", 10", 12" travel • Use external encoder • Adaptable to push/pull

ROTARY



1400-Series

- Built-in encoder
- Up to 640,980 counts per revolution
- Smooth velocity from .04 to 1300 RPM
- Torques to 2514 in-lb
- 13 gearratios

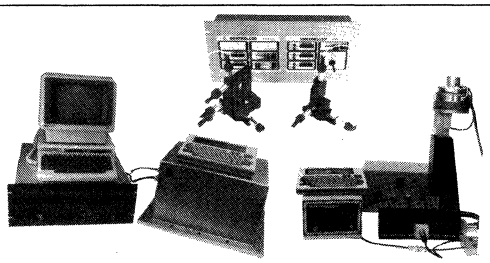
1450-Series

- Similar to 1400-series but 3/4" shorter
- No built-in encoder
- External encoder OK

SLIDES/TABLES/STAGES

1300-Series ROTARY Heavy-duty, high-accuracy, robust construction for abusive environments • #1300: 6" dia • #1310: 4" dia
1500-Series ROTARY Compact; #1500 has encoder feedback; use #1550 where position is not critical or is determined by other means.
1600-Series LINEAR Compact, low-profile, single axis with integral leadscrew • gang into X/Y/Z • with 1400 or 1450-series Actuators.
CUSTOM STAGE ASSEMBLIES Linear/rotary motion subsystems assembled to your specifications from new designs or our vendors.

CUSTOM MOTION SYSTEMS



We take full responsibility for your motion subsystem. Using our own or other technologies, we meet your motion, mechanical fit, and delivery time specifications. For a quick solution, we use our **CONTROL2**. Instead of complex cams and open-loop control, we use **CONTROL3** for programmable synchronized movement. Replace bulky, inefficient movements with our compact, cost-effective designs.

TS PRODUCTS welcomes the opportunity to supply high-quality motion-producing and motion-controlling products. Although we pay special attention to one-of-a-kind needs, we emphasize OEM configurations of our standard products. Please talk to one of our applications sales engineers about your special needs. Qualifying OEMs may receive a quantity discount. A catalog of our standard items together with dimensional specifications is available on request.

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eem SI UNITS

RELATIVE QUANTITY SYMBOLS

$\neq$	not equal to
$\approx$	approximately equal to
$\propto$	proportional to
$<$	smaller than
$\leq$	smaller than or equal to
$\ll$	much smaller than
$>$	larger than
$\geq$	larger than or equal to
$\gg$	much larger than
$\equiv$	identical to or equivalent
$\uparrow$	increases
$\downarrow$	decreases

PREFIXES FOR SI UNITS

Multiple	Prefix	Symbol
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p

Quantity	Symbol	SI Unit	Symbol	Derivation
acceleration	a	m s^{-2}	—	velocity/time
acceleration due to gravity	g	m s^{-2}	—	velocity/time
amount of substance	n	mole	mol	mole fraction (n) used
amplification factor	μ	*a ratio*	—	—
angle	$\theta_1,\varphi_1,\alpha_1$	—	—	—
angle of incidence	i	degree or radian	°	—
angle of refraction	r	degree or radian	°	—
angle, Bragg	θ	number	—	—
angle, critical	c	degree or radian	°	—
anode slope resistance	R_A	ohm	Ω	$\Delta V_a / \Delta I_a$
area	A	metres squared	m^2	$l \times b$
atomic number	Z	a number	—	number of protons
Avogadro constant	L, N_A	number	—	—
breadth	b	metre	m	fundamental unit
capacitance	C	farad	F	charge/p.d.
charge, electric	Q	coulomb	C	current × time
charge on electron	e	coulomb	C	$1{\cdot}6 \times 10^{-19}$ C
conductance	G	ohm^{-1}	Ω^{-1}	reciprocal of resistance
current, electric	I	ampere	A	fundamental unit
decay constant	λ	*a ratio*	—	—
density	ρ	kg m^{-3}	—	m/V
distance along path	s	metre	m	fundamental unit
efficiency	η	*a ratio*	—	work output/work input
electrochemical equiv.	z	g C^{-1}	—	mass/charge
electromotive force	E	volt	V	energy/charge
electron	e	—	—	—
energy	E	joule	J	N m
energy, kinetic	E_k	joule	J	N m. $E_k = 1/2mv^2$
energy, potential	E_p	joule	J	N m. $E_p = mgh$
Faraday constant	F	coulomb mol^{-1}	C mol^{-1}	96,500 C mol^{-1}
field strength, electric	E	V m^{-1}	—	potential gradient: p.d./dist.
field-strength magnetic	H	ampere-turns	—	current × no. of turns
flux, magnetic	Φ	weber	Wb	e.m.f/rate of change of flux
flux density	B	tesla	T	flux/area
focal length	f	metre	m	—
force	F	newton	N	kg m s^{-2}
free energy	ΔG	joule	J	—
frequency	f	hertz	Hz	oscillations/time
gas constant	r	joule	J	energy
half-life,radioactivity	$t_{1/2}$	second	s	fundamental unit
heat capacity	C	J K^{-1}	—	quantity of heat/temp. rise
heat of reaction	ΔH	joule	J	heat energy
heat capacity, specific	c	J K^{-1} kg^{-1}	—	heat capacity/mass
heat, quantity of	q	joule	J	energy

SI UNITS

Quantity	Symbol	SI Unit	Symbol	Derivation
height	h	metre	m	fundamental unit
image distance	υ	metre	m	fundamental unit
inductance, mutual	M	henry	H	induced e.m.f./rate of change of current
inductance, self	L	henry	H	—
intensity of radiation	I	*a number*	—	—
latent heat	L	joule	J	quantity of heat
latent heat, specific	l	J kg^{-1}	—	quantity of heat
latent heat, molar	L_m	joule mol^{-1}	J	quantity of heat
length	l	metre	m	fundamental unit
magnetizing force	H	ampere-turns	—	—
magnetic moment	m	Wb m	—	torque in unit magnetic field
magnification, linear	m	*a ratio*	—	—
mass	m	kilogramme	kg	fundamental unit
mass number	A	*a number*	—	number of neutrons + protons
molar volume	V_m	(dm^3)	—	volume of 1 mole
molar solution	M	*a ratio*	—	moles/dm^3
moment of force	—	N m	—	force × perp. distance
neutron number	N	*a number*	—	number of neutrons
number	n	—	—	—
number of molecules	N	—	—	—
number turns on coil	n	*a number*	—	—
number order spectrum	p	*a number*	—	—
object distance	u	metre	m	fundamental unit
peak current	I_o	ampere	A	see current
peak e.m.f.	E_o	volt	V	see e.m.f.
period	T	second	s	fundamental unit
permeability	μ	H m^{-1}	—	henry/metre
permeability, vacuum	μ_o	H m^{-1}	—	—
permeability, relative	μ_r	*a ratio*	—	$\mu = \frac{\mu}{\mu_o}$
permittivity	ε	F m^{-1}	—	farad/metre
permittivity, vacuum	ε_o	F m^{-1}	—	farad/metre
permittivity, relative	ε_r	*a ratio*	—	$\varepsilon_r = \frac{\varepsilon}{\varepsilon_o}$
potential, electric	V	volt	V	energy/charge
potential difference	V	volt	V	energy/charge
power	P	watt	W	J s^{-1}
pressure	p	pascal	Pa	N m^{-2}: force/area
radius	r	metre	m	fundamental unit
reactance	X	ohm	Ω	E_o/I_o
refractive index	n	*a ratio*	—	—
resistance	R	ohm	Ω	p.d./current
resistivity, electrical	ρ	ohm-metre	—	resistance × length
relative density	d	*a ratio*	—	ρ_{sub}/ρ_{water}
r.m.s. current	$I_{r.m.s}$	ampere	A	see current
r.m.s. voltage	$V_{r.m.s}$	volt	V	see e.m.f.
slit separation	s	metre	m	fundamental unit
tension	T	newton	N	see force
temperature, Celsius	θ	degree C	°C	from kelvin
temp. interval	θ	degree	° or K	—
temp. absolute	T	kelvin	K	fundamental unit
thickness	d	metre	m	fundamental unit
time	t	second	s	fundamental unit
torque	T	Nm	—	see moment
turns ratio	T	*a ratio*	—	n_{sec}/n_{prim}
(unit of electricity)	—	kW h	—	kilowatt × hour
velocity	u,υ	ms^{-1}	—	distance/time
velocity, angular	ω	$second^{-1}$	s^{-1}	angle/time
velocity, e.m.waves	c	m s^{-1}	—	—
velocity of sound	υ	m s^{-1}	—	—
volume	V	metre cubed	m^3	l × b × h
wavelength	λ	metre	m	fundamental unit
work	w	joule	J	force x distance (Nm)
weight	W	newton	N	kg m s^{-2}or mg

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 91/92 EDITION OF EEM

Abbreviations/Acronyms A•1114, B•1037, C•1116, D•1068
AC Power Supplies, Product Selection Guide D•2146
ASCII Code D•1086
Batteries, Product Selection Guide D•1427
Batteries & Fuel Cells, Characteristics D•1468
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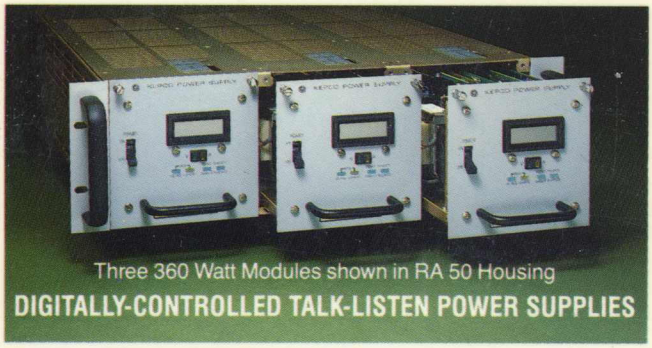

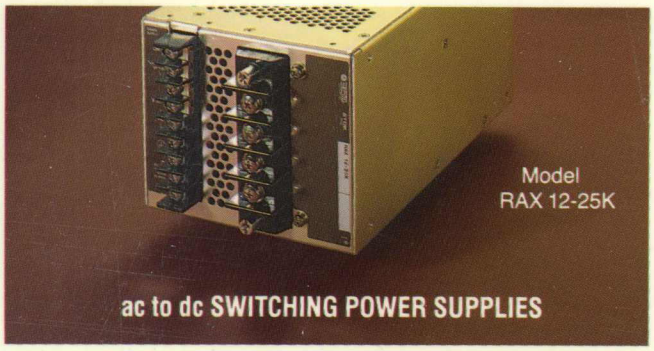

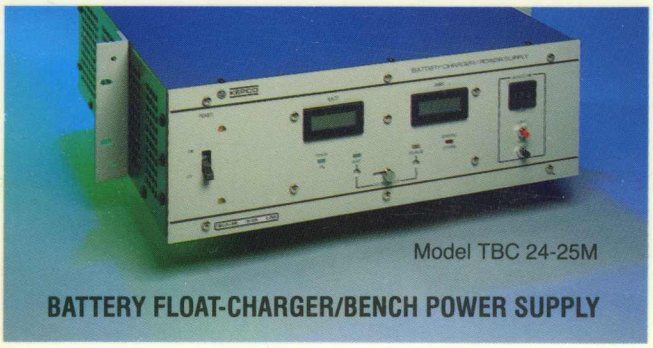

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